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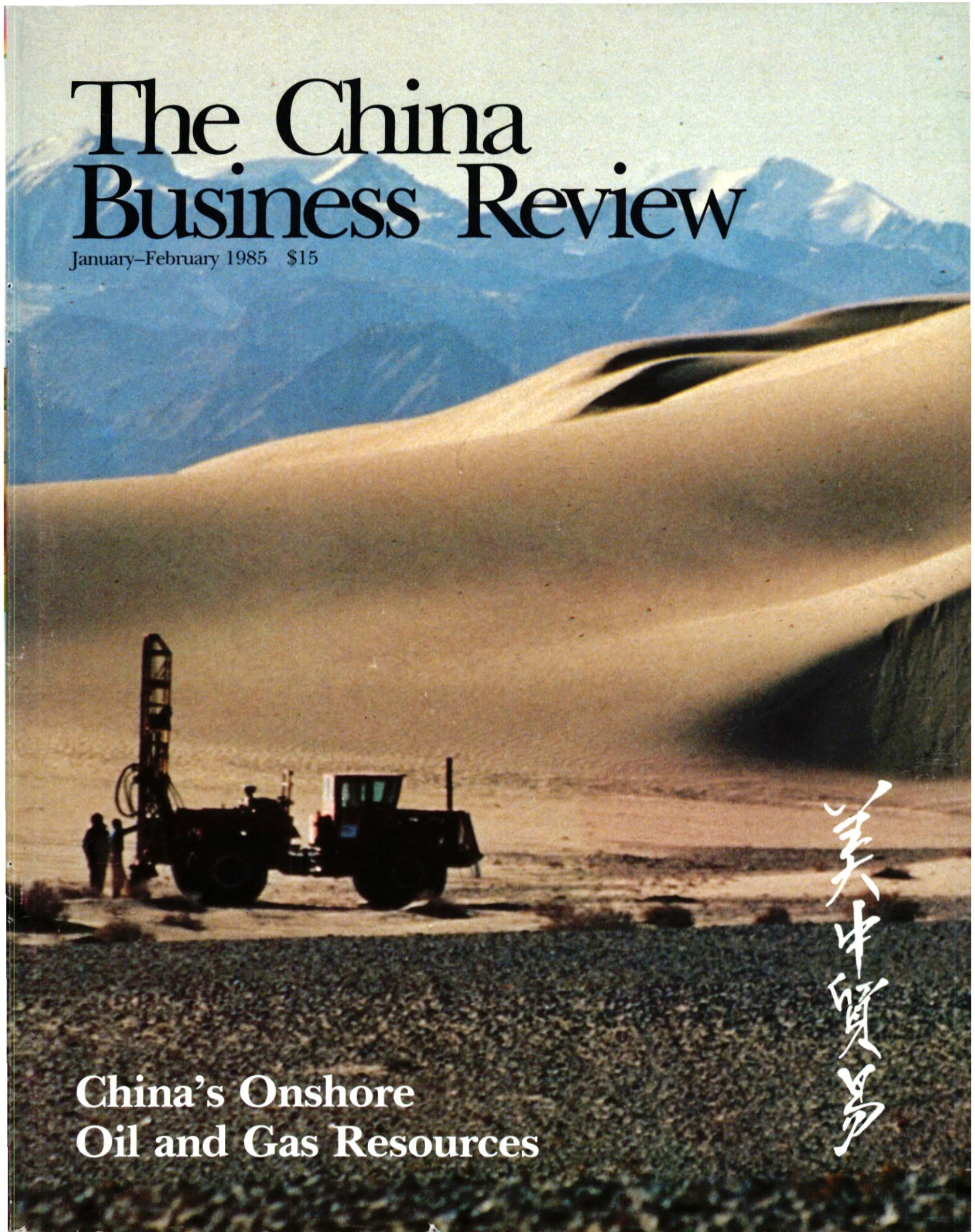

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The China Investment Guide is the only ***authoritative Guide*** on China's investment and trading infrastructure, with the rules and regulations you **must** follow in order to do business in China.

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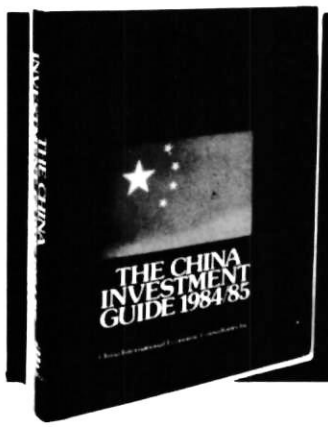

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The new era, heralded by China's "open door" policy towards the West has presented unrivaled investment and trading opportunities. Since the late seventies, foreign trade has increased substantially and overseas investment is now welcomed.

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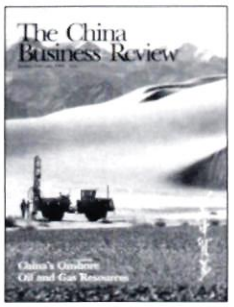
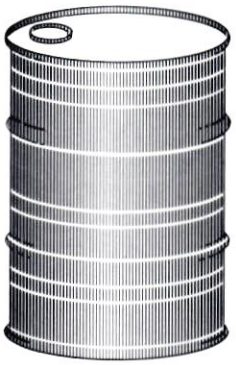
The China Business Review

The magazine of the National Council for US–China Trade

January–February 1985 Volume 12, Number 1

Cover: Shothole rig at work on seismic survey in western China's Qaidam Basin. *Photo courtesy of Oil & Gas Journal.*





Oil: China maintains oil exports to earn foreign exchange despite rising domestic needs. **Page 14.**

Fertilizer: Organic fertilizer may still meet 40 percent of China's demands by the year 2000. **Page 43.**

摘要

STATE'S QUOTA SYSTEM WITHERS

As China embarks on industrial reforms, it is not neglecting further reform of its agricultural sector. In a move with potentially sweeping implications, the Communist Party has announced that many farmers will no longer be obliged to sell their harvest to the state. For its part, the state is no longer obligated to buy a prearranged amount of farmers' and collectives' output.

Compulsory government procurement of agricultural production was one of the earliest and most important socializing measures adopted in the early 1950s. It guaranteed city dwellers food at low prices and played a crucial role in determining agricultural production decisions. The Party now says producers should depend primarily on contracts and the market to make these decisions.

This latest reform is probably not the wholesale dismantling of the quota system depicted in both Chinese statements and Western reaction. The quota system remains in effect for some as yet unspecified farm products. But it does represent another incremental step in the prevailing direction of ongoing reform.

A major purpose of the reform is to save the government money. Government basic procurement prices were raised significantly in 1979. This increased peasant incentives to produce, but it also increased the government's financial burden since the selling price to consumers did not rise commensurately.

The government now buys grain for which it sets a quota at this basic procurement price, and above-quota grain at a price about 50 percent higher. In recent years, farmers have also sold surplus grain as well as select cash crops on open markets at still higher prices. But the bumper harvest of the last two years has depressed the market prices to near, and in some cases possibly below, the above-quota price.

Increasing use of contracts instead of quotas would allow the state to limit the quantity of grain it is committed to buy, and to pay the reduced market price. This might not invigorate the rural economy in just the way grain producers hoped, but it would reduce the agricultural burden on the budget. At the same time, allowing more grain on the open market should continue to moderate its price.

Some Western economists believe any reduction of the State's role in agricultural procurement will inevitably bring inflation. In his statement announcing the reform, Premier Zhao Ziyang made clear that Chinese leaders took this analysis to heart in seizing this moment to downgrade the quota system. Breaking the state monopoly on buying and selling grain was "what we have hoped to do but could not and dared not do for many years. Now we are able to do it as conditions are ripe." —TE

AVIATION: WHO'S IN CHARGE HERE?

A high-level Chinese delegation including representatives from the State Council, Ministry of Defense, Air Force, CAAC, and the Ministry of Aviation has just concluded a US study visit to learn about airways and aviation management. Specifically, they came to learn more about the US system of interaction among aviation manufacturers and regulatory agencies, civilian and military agencies, and airlines and regional agencies.

These problems are particularly pressing for CAAC, whose monopoly over domestic and international flights is being split among at least four new airlines—one for international flights and three regional airlines covering the east, south, and southwest parts of the country. Other small airlines will be formed to fill regional traffic demands, such as the Xiamen Airlines Ltd. The relationships between these new airlines and CAAC is far from clear.

CAAC will continue to act as the government department in charge of planning and management of civil aviation, in a manner similar to the US Federal Aviation Administration; the FAA was the sponsor of the recent aviation delegation. But CAAC faces immense problems of coordination. Even when CAAC operated all flights, CAAC's regional administrations did not cooperate with each other.

The operation of flights from Beijing to Xian illustrates the problem. Under the old system, two CAAC flights leave Beijing for Xian each evening: the earlier one, a Trident 333 operated by the Beijing Regional Administration, flies to Xian and returns to Beijing for the night. It is followed by the departure of an Ilyushin 28 operated by the Lanzhou Regional Administration, which flies to Xian and remains there for the night. If one flight happens to be full, there is no coordinated ticketing system for referring passengers to the other flight. Even worse, if one of the planes needs repairs while in the other's region, the necessary parts may have to be specially flown in—they are often not stocked at the other region's airports. If the Lanzhou region's plane cannot be repaired at Beijing on a given night, its passengers for Xian will have to try again the next day.

Steps must be taken to ensure that this lack of coordination does not worsen as new airlines are established. China's insufficient aircraft and ground navigation equipment complicate the situation and pose tremendous logistical—not to mention safety—problems. The Chinese aviation delegation investigated navigation aids and radar while in the United States, as well as the organization and responsibilities of those agencies involved in air traffic control. China must improve the current situation in which poor weather conditions at any point along the route are often sufficient cause to grind service to a halt. Collisions are

avoided simply by scheduling long time intervals between flights.

The aircraft China uses for domestic flights are among the oldest in CAAC's inventory; many of them have been in service for 10 to 20 years. The new regional airlines will need to acquire medium-range aircraft for regional routes and feeder aircraft for short hops.

The newly formed airlines have already begun making contacts with foreign aircraft manufacturers about the purchase of new aircraft to satisfy immediate demand. Yunnan Province took the lead, ordering two new 737-300 twinjets from Boeing early this year. And McDonnell Douglas's proposed joint production arrangement will help in the long term by producing MD-80s and smaller feeder aircraft in Shanghai for use throughout the country. But these planes will not be coming off the production line for at least five years. In the meantime more pilots need to be trained, better navigational aids installed, and a reliable organizational structure put in place.

In general, regional airlines have been asked to refrain from signing major contracts early this year while aviation authorities try to decide who will make final purchasing decisions. CAAC will be in charge of registering and regulating China's aircraft, and thus wants a say in what is flown. The Ministry of Aviation would like the regional airlines to purchase domestically made aircraft whenever possible. But many of the regions would like to be left alone to work out innovative arrangements, often with foreign partners.

China's aviation officials face a tremendous task of establishing new bureaucratic lines of authority and improving basic infrastructure. Without these, the new decentralized airline system could be worse than the previous system. All who travel in China have a stake in the successful outcome of their efforts. —MCR

OPEN DOOR TO THE EAST

China's three new trade and technical cooperation agreements with the Soviet Union confirm that the open door policy does not apply exclusively to the capitalist West. The pacts were signed during last December's highly publicized, and apparently successful, visit to China by Soviet Deputy Premier Ivan Arkhipov—the first high-ranking official Soviet visit in 15 years.

The agreements put a stamp of diplomatic legitimacy on the recent expansion of Sino–Soviet trade and provide for further growth in the rest of the decade. The two countries exchanged goods worth about $1.2 billion last year—almost double the 1983 total—and plan on $1.6 billion worth of trade this year. China exports mainly agricultural goods and textiles to the Soviet Union, and imports steel, cement, machinery, and timber. By 1990, China and Russia's trade may reach $6 billion, about the level of US–China trade last year.

Arkhipov's leadership of the extensive Soviet assistance programs in China in the 1950s qualified him as a returning "old friend," and the Chinese received him as such. The two sides agreed that Moscow will help modernize factories built during that friendlier era. They will also resume work on plants left unfinished when the Russians bolted with their blueprints as political relations between the two allies crumbled In the late 1950s. The Soviet Union and other Eastern European countries are likely to become involved mainly in a select group of heavy industrial projects, for which they can supply appropriate equipment relatively cheaply. Aside from expanded direct trade with Russia and industrial aid, China hopes that improved relations will allow expanded use of the Siberian railway to transport its growing volume of trade with Europe, both eastern and western.

Among other Chinese leaders, Arkhipov met with veteran economic planner Chen Yun, with whom he worked in the 1950s. Chen Yun has opposed the most far-reaching of the economic reforms pushed by China's top leader Deng Xiaoping. But Arkhipov balanced this gesture by a visit to Shenzhen, the special economic zone in Guangdong Province that is a leading symbol of Deng's industrial and trade reforms.

China says there has been little progress in settling its political and strategic disputes with the Soviet Union, but that this need not prevent progress in economic and technical cooperation. However, few expect Sino–Soviet economic cooperation to expand to the levels of Sino–American commercial ties, partly because the political tensions in the former relationship still far outweigh those in the latter. —TE

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商业旅行

Business travel to China is becoming more convenient all the time. The entrance of Northwest Orient into the US–China skyways last May has brought to three the number of airlines servicing China's mainland directly from our own. Next-day service to Beijing or Shanghai is now possible from four US gateways, six days a week.

In addition, Northwest Orient's direct Tokyo–Shanghai service has increased the business traveler's options in the Far East. For those who are connecting into China through Tokyo, service is available on Northwest, Pan Am, CAAC—China's national carrier, Japan Air Lines, and Iranian Airlines.

Competition is also fairly keen in other Far East hubs. CAAC, British Airways, and Cathay Pacific all run flights from Hong Kong to Beijing, Shanghai, and Guangzhou. From Bangkok to China the choices are CAAC, Thai Airways, and Cathay Pacific. Travelers coming in from Manila can fly CAAC and Cathay Pacific, as well as Philippine Airlines. In Singapore, the carriers are Thai Airways, Philippine Airlines, and, once again, Cathay Pacific.

Gone are the days when CAAC flew virtually everyone into China. Travelers today have choices. They can easily compare the schedules, in-flight service, comfort, and fares of nine airlines servicing China from the US and the Far East. The "Big Four" airlines flying from the US—Pan Am, Northwest, CAAC, and Japan Air Lines—all fly 747s, charge about the same fares, and spend roughly the same amount of time in the air (JAL spends an extra night on the ground). Still, it's apparent that each is beginning to differentiate its services slightly, offering the business traveler just a little extra in a bid to capture a consistent share of the market. For example:

Pan Am. Business traffic is the sole target of Pan Am's "Million Dollar Baby" campaign. The carrier is literally investing $1 million in each of its 747s to expand and improve Clipper Class. Within a few months, all Pan Am 747s servicing the Far East will have 100 wider business-class seats arranged six across, overhead storage bins five times larger than before (with room for 190 lbs of luggage or several garment bags laid flat), a new four-course meal service, and a state-of-the-art video system complete with electronic headsets. Clipper Class is made up of three sections, including the upper-cabin "Quiet Zone," where children will not be seated.

Pan Am's financial problems in recent years are well known to the business world, as are the problems of its China service. Despite approval for additional departures, demand had dictated that only two direct flights leave for China each week, one from New York and the other from San Francisco. The earlier flap over Pan Am's Taiwan service threatened to eliminate its China flights altogether. In the past, Pan Am experienced little competition on its China route. Now this is changing, and the airline is spending a great deal of money promoting Clipper Class as "the business class to beat."

CAAC. China's national airline inaugurated its US–China service at the same time as Pan Am. Today, four years later, CAAC offers five weekly departures from three US cities to Pan Am's two, and has a loyal clientele made up largely of PRC citizens and the overseas Chinese community. The seat configuration attests to the difference in traffic: CAAC offers only 12 business-class and 18 first-class seats, versus 256 in economy.

The airline's decision to cater to Chinese passengers makes good economic sense; its level of in-flight service, while constantly improving, does not yet meet the standards of most American business travelers. That could change markedly, though, as CAAC undergoes far-reaching changes. Beginning sometime this year, the new Air China will take over CAAC's international and domestic routes, as CAAC's old guard leaders move upstairs to administrative jobs. New regional airlines are expected to start limited service out of Shanghai, Xiamen, and Guangzhou to other do-

US–CHINA DIRECT AIR SERVICE*

New York–China

Flight	Day	Depart JFK	Arrive Shanghai	Arrive Beijing
Pan Am 15	Wed	10:30 a.m.	7:25 p.m. +1 day	10:35 p.m. +1
CAAC 982	Thur	10:00 a.m.	6:20 p.m. +1	9:05 p.m. +1
	Sun			

San Francisco–China

Flight	Day	Depart SFO	Arrive Shanghai	Arrive Beijing
Pan Am 17	Sun	12:00 noon	—	9:10 p.m. +1
CAAC 982	Sun	2:35 p.m.	6:20 p.m. +1	9:05 p.m. +1
CAAC 986	Mon	2:15 p.m.	6:00 p.m. +1	8:45 p.m. +1
CAAC 982	Thur	2:35 p.m.	6:20 p.m. +1	9:05 p.m. +1
CAAC 984	Fri	2:55 p.m.	6:40 p.m. +1	9:10 p.m. +1

Seattle–China

Flight	Day	Depart SEA	Arrive Shanghai
NW 77	Fri	1:40 p.m.	8:20 p.m. +1

Los Angeles–China

Flight	Day	Depart LAX	Arrive Shanghai	Arrive Beijing
CAAC 984	Fri	11:50 a.m.	6:40 p.m. +1	9:10 p.m. +1

*Schedule effective April 1–November 1. CAAC flights depart one hour earlier in the winter months.

Carol S. Goldsmith is director of corporate communications for First Family of Travel, and managing director of its China Travel Bureau.

mestic cities, and, possibly, to Hong Kong and other nearby Asian points.

In the meantime, business travelers should watch for improved services designed to make CAAC more attractive. Business class recently was moved to the upper-deck cabin, with four-abreast seating, and the Japan Air Lines lounge in Tokyo has been made available to CAAC business-class passengers. Zhang Nairong, CAAC's progressive general manager in the US, has even submitted a proposal to start a CAAC frequent flyer program.

Northwest Orient. The carrier with arguably the firmest commitment to the Orient waited a long time to win the third direct US–China route. Now, with weekly service from Seattle to Shanghai, Northwest serves the Far East from more US cities (55 at last count) than any other airline. It also has the most US gateways for nonstop flights to the Orient: New York, Chicago, San Francisco, Los Angeles, Seattle, and Honolulu.

With its numerous gateways and destinations in place, Northwest has locked up a good deal of the tourist traffic to China and to the rest of the Orient. Attention, consequently, has been turned toward in-flight service, an area of importance second only to schedule in the business traveler's mind.

Northwest has designated two zones of the 747 as executive class: the "B Zone" between the first and second doors of the aircraft, and the upper-deck cabin. Its "Regal Imperial Service" features six Western or Japanese courses at each meal, complimentary beverages, electronic stereo headsets, first-run films and audio programs, and amenity (or travel) kits, along with a number of special services for the business traveler: separate check-in, advance seat selection, and use of the Top Flight Club lounge at any airport (a benefit many airlines reserve for their first-class passengers). In addition, Northwest offers a translation and printing service for Oriental business cards. Passengers can have the information translated into Chinese and either printed on the back of existing cards, or on a new set. The cards can be picked up in two weeks at any Northwest Orient office, including the new one in Shanghai.

Just as important to business travelers is the airline's frequent flyer program, which is "one of the richest in the industry," according to Richard Moran, Northwest's director of commercial marketing. The "Free Flight Plan" gives credit for every leg of the journey flown on Northwest (or on a participating airline) regardless of mileage. Changes in the program this spring are expected to further improve benefits for the Far East traveler.

Japan Air Lines. JAL has a longer track record with China service, and with business service, than any other carrier. It was the first airline to fly across the Pacific to China (via Tokyo). It was the first international carrier to offer business travelers a separate category of service in 1975. Today, in competition with the three "direct" China carriers in the US, JAL encourages business people to spend an extra night getting to China (via Tokyo) by offering what it considers the most comprehensive business services along the way.

JAL Executive Service provides a number of programs and services at a modest charge: an Executive Hotel Service at selected properties in the Far East, offering JAL business travelers special check-in facilities and a twin-bed room at a reduced rate; translation and printing of Chinese–English business card services (which can be picked up in Japan or Hong Kong only); Chinese-language instruction cassettes; and a number of booklets on getting around and doing business in China. Business travelers also may use the office facilities of the JAL/JETRO Executive Service Lounge in Tokyo's Imperial Hotel.

It should be noted that JAL charges slightly more than its competitors. However, with less than a hundred dollars separating the highest from the lowest-priced business class ticket, choosing an airline to China comes down to a matter of schedule and service.

—Carol S. Goldsmith

US–CHINA BUSINESS CLASS AIR SERVICE

Airline	Aircraft	# Seats	# Abreast	Recline	Pitch*	Special Features	Roundtrip Fare**	
Northwest Orient	747	32	8	37°	37″	Private upper-deck and "B Zone" cabins; first-run films and audio program; electronic stereo head sets; amenity kit; frequent flyer plan; use of all Top Flight Club lounges; business card translation and printing service†	First class: Executive: Economy: Apex††:	$3110 $1978 $1590 $1170
Pan Am	747SP	100	6	30°	37″	Three Clipper Class zones, with upper-deck "Quiet Zone"; first-run films; electronic stereo head sets; amenity kit; expanded overhead storage; frequent flyer plan	First class: Executive: Economy: Apex:	$3104 $1972 $1584 $1124
CAAC	747SP	12	4	30°	37″	Private upper-deck cabin; first-run films; stereo head phones; use of JAL lounge in Tokyo	First class: Executive: Economy: Apex:	$3104 $1972 $1584 $1138
Japan Air Lines	747	118-128	8	37°	36-37″	Private upper-deck cabin; first-run films and audio program; electronic stereo head sets; amenity kit; frequent flyer plan; business card translation and printing service†; Executive Hotel Service†; Chinese-language cassettes†; Chinese business and travel books†	First class: Executive: Economy: Apex:	$3218 $2046 $1696 $1203

*Total floor space available to passenger, including area under front seat.
**West Coast to Shanghai.
†Available at an additional charge
††Apex is advance purchase excursion fare, to be booked no earlier than 21 days and no later than 7 days before departure.

石油快讯

The announcement of a second round of bidding for leases on China's continental shelf has rekindled excitement in the offshore oil industry—an excitement on the wane since early 1984 under a mounting string of dry holes in the early exploration programs. Although the Japan–China Oil Development Corporation (JCODC) continues to make finds in the Gulf of Bohai, and Atlantic Richfield's delineation drilling south of Hainan has been encouraging, exploration in the Pearl River Basin has been disappointing. Success in that strategic basin is critical to the long-term viability of China's offshore exploration program. To date, 13 of the 17 wildcat wells drilled in the Pearl have been dry, three had marginal shows, while the single strike by Esso/Shell appears subcommercial.

At year-end 1984, 16 rigs were drilling off China's shore: 11 in the South China Sea (seven in the Pearl River Basin and four in the Tonkin Gulf), one in the Yellow Sea, and four in the Bohai. Development efforts are currently underway by JCODC at the Chengbei oil field in the Gulf of Bohai. France's Total Chine should begin its development efforts in the Beibu Gulf late this year, and decisions are pending this year from ARCO, JCODC, and perhaps Esso/Shell.

The Chinese began their own "self-reliant" offshore drilling in the early 1970s with some successful wildcatting in the Gulf of Bohai. Perhaps the most important result of these early efforts, though, was an awareness of the limit of China's own technology for the sophisicated procedures involved in offshore exploration and development.

In October 1978 China made the unprecedented move of inviting foreign oil companies to participate in a broad-gauge seismic evaluation of vast areas of the continental shelf. Thirty-three companies from 17 countries participated in the seismic surveys at an approximate cost of $200 million during 1979–1980. The hefty price tag for these surveys was paid entirely by the foreign companies, and the seismic information provided free of charge to the Chinese. However, by participating in the surveys these foreign companies gained the right to bid for offshore concessions in China's first competitive lease sale.

During 1980–1982 contracts covering 50,000 square kilometers were awarded to the Japan National Oil Company (JNOC) in the Bohai, France's Elf Aquitaine (Bohai), Total Chine (Bohai and Northern Tonkin Gulf), and ARCO (Southern Tonkin). JNOC, Elf, and Total began drilling in their contract areas in 1981, using jackup rigs contracted from the Chinese. ARCO brought in the first foreign-owned rig, the ill-fated Glomar Java Sea drillship, to spud its first well in October 1982.

Meanwhile, in a single week in February 1982, the Beijing leadership announced formation of the China National Offshore Oil Corporation (CNOOC), promulgated the Offshore Petroleum Regulations and Foreign Enterprise Income Tax Law, and issued invitations to bid on 100,000 sq km of China's continental shelf, opening the first official round of bidding in the South China Sea. In August 1982, 20 consortia submitted 102 bids on 43 contract areas. Six months of official silence and avid rumor-mongering followed as CNOOC evaluated the bids. In February–March 1983, the companies were called to Beijing for "competitive discussions"—primarily to negotiate the crude split or "x-factor" of the contracts. Finally, the first contract was awarded to British Petroleum for five concession areas—four in the Pearl River Basin and one in the Yellow Sea—on May 10, 1983. This award was followed closely by awards to Esso/Shell (two in the Pearl) and Occidental Petroleum (four in the Pearl), with others announced throughout 1984.

British Petroleum (BP) was the earliest of the first round winners to begin drilling. BP spudded its first well in November 1983 using the Chinese-owned Aker H3 semisubmersible Nanhai II rig, under a drilling services subcontract to the Nanhai-Houlder Drilling Company (a joint venture of CNOOC's Nanhai West Oil Company and Houlder Offshore). The action continued to expand through 1984. The major actors and their activities at the close of the year were as follows:

BP, the operator for various consortia on its four contract areas, has drilled six dry holes and come up with marginal shows on a seventh well in the Pearl River Basin. All wells have been drilled using the Nanhai II rig. BP has added the Wodeco 8 (Fluor) to its South China drilling activities. The fifth BP consortium has also drilled one well with a marginal oil show on its Yellow Sea contract area (23/06) using the Chinese jackup Bohai X (Bohai Oil Co.), but this program was discontinued after drilling the single well.

Esso/Shell has drilled a marginal show, an oil strike and a dry step-out well in area 40/01, as well as a dry hole in area 04/27. The strike, Wenchang 19-1S, showed an "open

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This column will appear regularly in The China Business Review, *focusing on specific programs and events in China's offshore theater. The first column reviews steps leading to the current programs, the activities of foreign operators, and the present status of the early drilling programs on China's continental shelf.*

Richard S. Ondrik is a director of Energy Projects (S.E. Asia) Ltd., a firm that provides specialized consulting, representation, and project management to energy-related firms in China. Ondrik was formerly the Houston manager for China Energy Ventures, Inc. Prior to this he was a project associate at the National Council, where he co-authored China's Petroleum Equipment Factories *(NCUSCT, 1983).*

flow" (no choke) rate of about 3,200 bopd of 35° API crude from a rumored 300-foot pay zone at 12,000 feet. Because of the dry delineation well, Esso plans to evaluate a 3-D seismic shoot to be done early this year before continuing to drill on the Wenchang 19-1S structure. All wells have been drilled by the rig Jim Cunningham (Reading & Bates), which has been moved to a new area of 40/01 to drill a fifth well.

Occidental Petroleum has drilled four dry holes using the Sedco 602 (Sedco). Its exploration program has been temporarily suspended to evaluate early results. Personnel have been withdrawn and the rig released.

Phillips/Pecten contracted the Sedco 602 released by Occidental, and spudded their first well in area 15/11 in late November.

ACT, the joint operating group of Agip, Chevron, and Texaco, had a marginal oil show on the first well of its three to four well program in area 16/08, which was tested during late December. ACT is using the South Seas Driller (Nanhai-Houlder Drilling Company).

Huanan Oil Development Company, a JNOC consortium, has drilled a dry hole in area 28/14. The Hakuryu III (Japan Drilling Co.) is now drilling its second well in the contract area.

Pearl River Oil Operating Company (PROOC), comprising Texaco's Getty subsidiary, Sun Orient, Texas Eastern, and JNOC, is drilling its first well on area 15/33 using the Sedco 600.

Pennzoil/Sun is using the Chinese jackup Nanhai IV, contracted from the Nanhai West subsidiary of CNOOC and managed by Reading & Bates. Pennzoil, the operator for area 22/36, plugged and abandoned its first well without testing in November. The rig then drilled a dry hole in Sun's operating area (23/25), and will drill a second well for Sun before returning to Pennzoil's area.

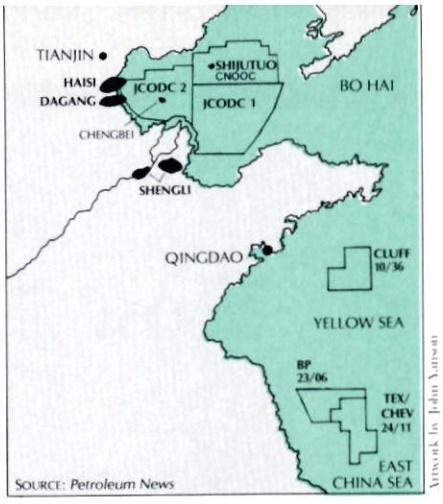
Idemitsu contracted Nanhai West's other jackup rig, Nanhai III, managed by Forex-Neptune. The rig has drilled one dry well in Tonkin area 22/22 and spudded a second well.

Candt Orient Group (COG), the Yellow Sea company of Texaco and Chevron, is drilling its first well with China's Bohai X jackup rig released by BP. The rig is managed by CNOOC's Bohai Oil Co. subsidiary.

ARCO/Santa Fe Minerals has completed the step-out program for its gas discovery using the Zapata Arctic (Zapata), which will drill three to four additional exploration wells in 1985. ARCO's second rig, the Wodeco 9 (Fluor), has been released after completing a three-well wildcat program. No new discoveries have been made, but the gas field may be larger than originally anticipated. The structure may produce up to 500 million cu ft per day from a single platform. Negotiations on developing the field are moving slowly.

Total Chine has agreed to develop its single find in the Tonkin Gulf (Weizhou 10-3). Using an early production system (EPS) mounted on a light platform, Total plans six initial completions to pay at about 7,500 feet with output estimated at 10,000–20,000 bopd of 37°–39° API crude. Staff and resources are returning to the South China Sea, but project implementation is unlikely before late 1985.

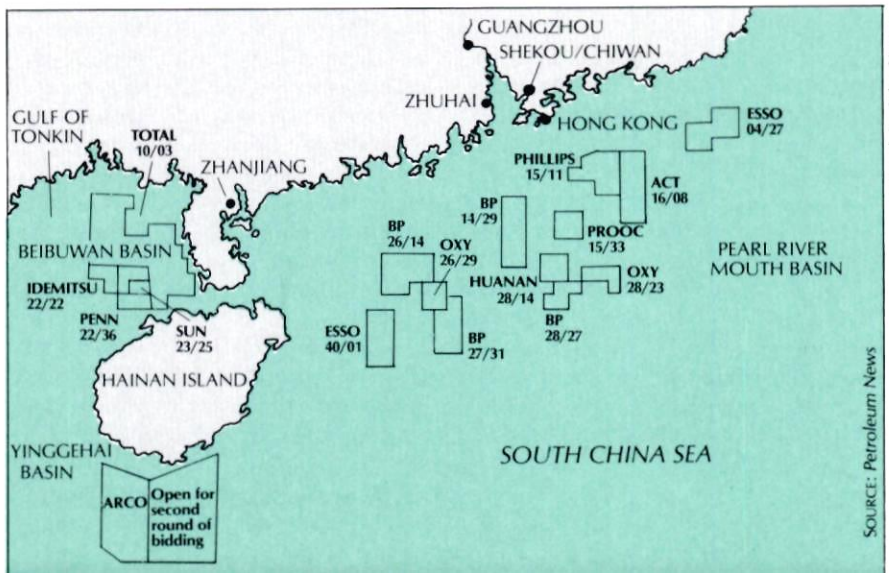
JCODC will expand its drilling program in the Bohai by adding the new rig Hakuryu IX, managed by the China-Bohai Japan Offshore Drilling Company Ltd. Development of the Chengbei field with JCODC's Chinese partner, the Bohai Oil Co., continues with both platforms—Chengbei A & B—in place. Drilling of 28 production wells has been finished from Chengbei B, and 14 of 28 from the A platform. All completions will be done in mid- to late 1985, with output targeted at 3,000–5,000 bopd. JCODC will probably decide late this year whether to place an EPS on the largest of its discoveries (BZ 28-1).



Drilling activity on these first-round contract areas is likely to continue at a modest pace this year. Although foreign operators have until the end of 1986 for exploration, most plan to wrap up the minimum well programs by year-end 1985 to provide ample time for evaluation. Therefore, about 30 wildcats should be drilled this year. Any significant discoveries will require additional rigs for step-out drilling. In the absence of a major discovery, the rig count is likely to stabilize at about 16 to 18 through most of the year.

On November 22, 1984, CNOOC announced the opening of a second round of bidding for an additional 100,000 sq km of the coastal shelf. Second-round bidding is not limited to companies that participated in the 1979–1980 surveys, and is being conducted in phases. The first phase covers 13,300 sq km in the east Yinggehai basin adjacent to the ARCO/Santa Fe area. Foreign companies had to confirm their intent to bid by January 31. CNOOC plans to invite bids on March 5, with September 5 the deadline for tender submission. Companies hope that the experience CNOOC gained from the first round of bidding will enable it to evaluate the tenders and conduct final negotiations more quickly this time. Both the accelerated pace of the tender process and the likelihood that new operators will become involved could lead to additional rig mobilizations and increased drilling activity toward the end of 1985.

—Richard S. Ondrik



One US importer's example illustrates that the China business is not for everyone

How Not To Do Business With China

Thomas N. Thompson

The prospects for American trade and investment in China, whatever the past disappointments and frustrations, continue to show medium- and long-term promise. Yet the China business is not for everyone. Unsuccessful business ventures do occur, often the result of mistaken perceptions of how to do business in China, as well as short-sighted business planning. The experience of a small importer of sand and gravel equipment provides a useful illustration of some potential pitfalls for other firms contemplating business with China.

Like many others, the executives of this American importing company were impressed in the early 1980s with China's low wage rates and the possible cost savings of manufacturing in China. Their desire for the easy, short-term profits that China seemed to promise overwhelmed careful, step-by-step business development.

At the urging of a Hong Kong trading company, the US firm invited and paid for draftsmen from China to visit its facilities to make production drawings of American-made sand and gravel equipment. In addition, several American-made machines were shipped to China for exact reproduction. By 1983 the American company was importing up to $1.5 million worth of Chinese-manufactured machinery annually.

Much of the basic equipment in the sand and gravel equipment industry is technically simple in design and construction. The basic technology is generally of pre-World War II origin and virtually free of patent protection. The equipment is used in pits, quarries, and mines to crush, classify, separate, dewater, and convey rock, sand, and metallic ore.

This importer's attempt to reproduce widely used American-designed equipment in China was, in essence, an effort to short-cut the more typical manufacturer's investment in research and development, industrial plant start-up, market entry, sales, and after-sales service. The American company blithely expected to enjoy the increased profitability of offshore contract manufacturing made possible by low-cost Chinese labor. Unfortunately, the effort proved disastrous.

Quality control breakdown

One big mistake the American company made was to leave quality control up to the Chinese. US representatives were not present when the initial machines were assembled, to ensure that they met all the specifications of the original American-made equipment. When the Chinese factory representatives visited the US, they did not see the equipment operating in the field to ascertain exact operating requirements. It was apparent during subsequent visits to some of the participating Chinese factories that, with minor exceptions, they lacked sufficient first-hand experience and expertise with the equipment they were making for the American buyer.

As a consequence, quality control procedures were minimal, makeshift, and did not include field testing. In some cases, Chinese factories had not set up quality control schemes at all. Even when factory managers recognized the theoretical importance of factory control, they were still likely to rely on cheap and easy solutions. In the case of a defective gearbox housing, for example, putty was used to fill in cracks or indentations instead of improving the casting. It was then painted over.

According to one of the US importer's customers, the Chinese did not want to admit that they could not manufacture all of the contracted equipment. Much of the contracted machinery was technically simple, such as sand screws that are still being rented to satisfied customers. But other items are subject to much higher wear, and thus require more stringent production specifications including, in some cases, specialty steel. When the sand screws worked well enough, the American firm made the mistake of assuming that more advanced machinery would also work—even in the absence of quality control procedures. "But the Chinese share in the blame," says the buyer, "because they had to save face; they couldn't admit that they couldn't make the more advanced equipment."

Bureaucratic and systemic factors probably also played a role. For example, sometimes a Chinese factory was dependent for a component part on a ministry other than the one that governed its own operations, and thus the factory had little influence over the component's quality. More generally, poor quality is traceable to a central planning and production system that still places primary stress on fulfilling quantity, not quality, goals.

To be fair, the record shows that Chinese factory representatives clearly expressed at the outset their concern over manufacturing equip-

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ment to the American firm's specifications and design, and not their own. They worried that in the event of equipment failure, the American company would unfairly try to hold them responsible. Yet the Chinese factories remained eager, perhaps too eager, for the business. Had they been more familiar with the design and application of the equipment, they might have insisted on detailed contract provisions to address their worst fears.

As early as the summer of 1980, the Chinese argued that "it was very important to work out a standard for check and acceptance." As a short-term solution, the Chinese proposed, and the American firm accepted, that the quality of the Chinese-made production sample, upon acceptance by the American firm, would serve as the standard against which all future production of that particular model of equipment would be accepted.

The Chinese agreed to guarantee "any faulty main parts within, generally speaking, a year of shipment." But, because of their ignorance of the equipment's design and application, the Chinese factories refused to warranty "any part to be knocked, heavy-loaded, or that touched directly with rock, sand, or ore." The two sides never reached an agreement delineating in unambiguous language the nature and extent of Chinese factory guarantees. They never even thoroughly discussed the matter or agreed on an exact method for settling disputes.

Spare parts short-cut backfires

Failure to supervise quality control was not the only mistake the American company made. It also examined the Chinese samples only superficially, and rarely field-tested any of them prior to confirming sales agreements or establishing production requirements. In its zeal to maximize profits starting with initial sales, the company also failed to order *any* spare parts for most machines, and inadequate quantities for others. Company managers made this decision based on the fact that the parts were interchangeable with original American-made equipment. The firm would not need to provide spare parts and service because customers could obtain these elsewhere. But users of the sand and gravel equipment had to pay more for new American-made spare parts than for Chinese-made spares. And in many cases, parts were not immediately available in the US, so the end user would have to shut the machine down until the needed part could be acquired. This frustrating situation hardly promoted repeat sales or fostered a reliable reputation for the equipment.

Machinery was ordered from China a year in advance of shipment. It was not until early 1983 that the number of Chinese-made machines in the field became large enough to appreciate widespread equipment failures. Bolts sheared, springs broke, bearings failed, metal bent and cracked, and railings and chains snapped. As one disgruntled customer described an apron-feeder machine that he ordered, "The thing was lousy, the material was terrible, and the chain went to pot right away."

Without comprehensive guarantees from the Chinese factories, the American company chose to provide its own open-ended warranties and guarantees for the equipment. It did this for three reasons. First, the equipment was new and would need some form of guarantee to compete with similar American-made equipment. Second, the importer believed that a warranty would reduce customer resistance to buying an imported product. Third, the American firm wanted to minimize inventory costs by moving the machinery to end users as quickly as possible.

In the final analysis, the cost to the importer of honoring its warranties and guarantees more than offset the advantage of buying from China—even though the Chinese-made equipment was bought at one-half to two-thirds the cost of US-made equipment. For example, the US company had to repair the failed equipment with expensive American-made replacement parts. When a defective part was discovered in the field, it was necessary to replace the importer's entire inventory of that part. In addition, those replacements and repairs were made with relatively expensive American labor. The American company often had to fly a mechanic to a job site to correct chronic equipment problems. Eventually, customers began to resist buying *any* Chinese-made equipment, even those items that had been relatively trouble-free. It became virtually impossible to move any inventory at a profit.

Photo courtesy of Thomas N. Thompson

Workers at a north China factory assemble a sandscrew prior to shipment to the US importer described in this case study.

Salvage efforts: too little too late

As problems with the equipment increased, both the Hong Kong trading company and the Chinese factories made ad hoc efforts to save a deteriorating situation that threatened to ruin the entire business relationship. Though they had no contractual obligation to do so, the Hong Kong firm and a Chinese trading organization offered the American partner partial compensation in the form of cash, equipment at no charge, and future price reductions. As additional compensation, the Hong Kong company proposed a joint venture with the American importer to continue to supply what all parties hoped would be much improved equipment on better financial terms.

For their part, as a matter of "friendly discussion," Chinese factory representatives agreed that the merchandise was not being checked carefully enough during production and prior to shipment. Chinese trade officials admitted that "sometimes a factory started production and shipment properly, but in later deliveries the quality deteriorated." Regardless of who was responsible for the design of the equipment, the Chinese admitted that they had a quality control problem. They initiated a system of increased factory inspection by appointed engineers, with the understanding that factory inspection "could not affect the rights of the final buyer to make a claim if it found later that the production does not correspond to the drawing/sampling/testing procedure."

Despite these efforts to continue working together, the American firm was selling equipment at a loss be-

cause of its own failure to assess the costs of doing business with China. In the resulting acrimonious environment, the American firm refused to acknowledge any joint responsibility for problems with the equipment, and cancelled all current and future orders from China. The Chinese, however, had already manufactured additional equipment. Several shipments had already arrived at a West Coast port and others were on the water. Regrettably, US courts will now decide the final cost to each party for what has been a bitter and frustrating experience for everyone.

The need for manufacturer's knowledge

Many of the problems that occurred could have been avoided. The US firm made both strategic and tactical mistakes. Tactically, the American company transferred too much of its own responsibilities for supervision and ultimate control of the contract manufacturing to a third party—the Hong Kong trading company. The Hong Kong firm, which had no experience with sand and gravel equipment, was left to select the Chinese factories that would manufacture the equipment.

As one customer put it, "Everyone shares in the blame. It was a classic case of two guys snowing each other. The Hong Kong exporter and the American importer both saw big bucks in the deal; both saw stars. The problem was that the deal involved an exporter and an importer—there was no manufacturer directly involved." This lack of a manufacturer's knowledge of the products made extra work absolutely necessary. Representatives of the American company and the Chinese factories should have made every effort to visit end-user job sites in both the US and China. In so doing, they would have learned whether the equipment they were supplying met the customers needs and standards.

From the Chinese point of view, a bargain was struck at the outset, and the available evidence suggests that they tried to hold up their end of it. When the initial vision of trouble-free profits began to fade, however, the American company's management proved to be neither temperamentally nor technically qualified to do the China business originally envisioned. American negotiating teams never included any equipment manufacturing specialists. The American side tended to substitute arrogant, heavy-handed language for the necessary technical expertise. Venting frustrations and issuing ultimatums hardly helped resolve differences of opinion. Indeed, the Chinese consider venting frustrations with abusive language a sign of defeat and a reason for distrust. Chinese trade representatives have indicated that in their eyes, the American company displayed "an exploitative as well as patronizing attitude toward China."

The value of an ongoing relationship

If the American firm had employed a gradual approach to its China business, allocating sufficient resources to learning the Chinese contractors' strong points and limitations, their China relationship might have survived and prospered. It is the perceived value of an ongoing relationship and its future possibilities that typically govern Chinese attitudes toward long-term business. But the importance the Chinese attach to this fact was lost on the American company. Over the years, for example, various Chinese organizations have steadily searched for reliable suppliers of high-capacity, used, and reconditioned mining equipment. If a relationship of trust and benefit had developed, the US firm might have enjoyed an excellent foundation for other business with China. But they were far more interested in short-term profits, and never realized that China is not a country for the "fast buck." The US firm in this tale was probably never sufficiently organized or financially prepared to develop the level of business that the Chinese were led to believe was likely.

It is easy in retrospect to suggest a variety of measures that could have saved what eventually became a disastrous relationship. Some of the equipment manufactured in China was relatively free of problems, and with minor improvements, would have been very marketable in the US. But for the parties described here, the wisdom of hindsight suggests that they came together with widely differing expectations. The wisest decision in their case may have been not to pursue any business with each other. After all, no business is better than bad business. 完

A little understanding may go a long way

How To Do Business With China

Zou Siyi

How does one do business with China? Several American business people have expressed indignation and frustration about negotiations that run on like endless marathons, delays in decision making on the Chinese side, and sudden changes in foreign trade policies. Some say they cannot get into the Chinese market because they don't even know whom to approach to negotiate their business.

Most people attribute these distressing circumstances to China's bureaucratic system or to the inefficiency of the Chinese people. In analyzing the Chinese negotiating style, some so-called experts even reach the conclusion that the Chinese simply employ patience as a weapon to outlast their foreign counterparts. The Chinese are often dubbed masters of the art of stalling.

I do not wish to cover up the shortcomings of my countrymen or deny the imperfections of our system. China is relatively inexperienced in dealing with the West, it is true. Our knowledge of modern foreign trade, and even more so of foreign investment, is scant. The existence of many overlapping bureaus in our economic structure irritates not only foreigners, but also Chinese. In some cases, however, frustrations are caused by a mutual lack of information and understanding—a problem that is solvable given time and patience.

Problem for investors

The fields of foreign investment, joint venture, compensation trade, co-production, and technical cooperation are especially complicated and generate the most complaints. The reason is very simple: these fields are new to China. Even 10 years ago, we never thought of inviting foreign investment. Not until 1979 did the Chinese government adopt a more open policy, and draft the joint venture law. The Regulations for the Implementation of the Law on Joint Ventures were only promulgated in 1983. Even this law is far from perfect, leaving many questions unanswered. Only through experience can we reach a stage of maturity where the laws and regulations will be better formulated and more workable.

One obstacle that usually arises in joint ventures is the question of "buy-back." This problem also affects compensation trade, co-production, and technical cooperation ventures. Many American manufacturers would like to set up ventures in China in order to explore the Chinese market, but they are reluctant to let the products compete with their own goods in overseas markets. But prospective foreign investors should be prepared to share a portion of the overseas markets with the Chinese. A joint venture must, in principle, balance its foreign exchange. Thus the foreign investor's profit can only be realized by selling the joint venture's products outside China. Regulations have recently been relaxed to allow payments in foreign exchange for joint venture products urgently needed in China, or usually imported anyway. But this only covers a small portion of joint ventures. Generally, we still expect a joint venture to sell at least some of its products outside China.

Another important issue is with whom to negotiate a joint venture. Joint ventures should be negotiated with production personnel, not traders. A trading company or an investment company may act as a bridge, but the foreigner's real partner will be the production organization. Large projects should be discussed with the appropriate industrial ministry, medium and small-scale projects with the production organizations under the local government. To expedite the process of forming joint ventures, the Chinese government has recently broadened the decision making powers of local governments to approve projects utilizing foreign investment.

Still, negotiating a joint venture requires patience. In the past year the time required to form a joint venture has been greatly shortened, but certain procedures must still be followed. Even if all parties agree on a project, it must still be approved by the relevant Chinese central or local authorities. And the funds, raw materials, electricity, and labor required must be incorporated into the state or local development plan to ensure supplies of these inputs. The time necessary to set up a joint venture can be shortened by greater efficiency, but there is no way to shorten it as much as many American friends expect.

Trade in a planned economy

Foreigners planning to enter business negotiations with China should also not forget that China has a planned economy. Each year's imports and exports are planned in advance and it is much more difficult to buy or sell products that fall outside the plan. On the other hand, items included in the plan can be purchased very quickly. One occasionally sees a Chinese purchasing mission in the US buying goods worth millions of dollars in a few short weeks.

Several exporters selling commodities such as grain and fertilizer have described Chinese businessmen as the best in the world. But other exporters spend much time traveling back and forth to China without results: they may well be selling items that are not in the current import plan.

Suppose a foreign company offers China a product that is not part of the import plan. If the foreign exchange is provided for locally, any end user who wants this product must apply for permission through various levels of the bureaucracy until he reaches a competent authority of the local government. If foreign exchange is supplied by the central government, the would-be buyer must go several steps further, until he reaches a competent authority in the central government for final approval.

How can foreigners know the contents of the plan? Unfortunately, in most cases they cannot. The Chinese often consider the purchase plan a commercial secret, and do not wish to reveal it. Sometimes even the Chinese trading corporations lack details of the plan. For instance, the annual import plan may allocate a few hundred million dollars to buy hospital equipment for the Ministry of Health. But the related Chinese trading corporation may not know the type of hospital equipment needed until the Ministry of Health submits a detailed purchase order.

An American manufacturer who wants to do business with China should first offer his products to the Chinese trading corporation concerned. He can expect quick results if his products happen to be on the purchasing list; if not, he will have to wait. In the meantime, he should continue trying to introduce his products to the end user. Provided the end user has foreign exchange and accepts an offer, a purchase order can be submitted through the appropriate trading corporation, and negotiations can begin. If the end user wants the products but does not have the foreign exchange, he must apply through many levels for his purchase, and the seller must wait even longer. Many foreigners may not like this game of hide-and-seek, but it is a reality they must face.

Without trying to defend or blame anyone, I do want to paint a realistic picture useful to Americans who wish to trade with China. The prospects for US–China trade and economic cooperation are very bright, but further mutual understanding is required. 完

Zou Siyi is chairman and president of China United Trading Corporation. Registered in the US and based in New York, China United was jointly organized in 1983 by Chinese national and local trading corporations to handle US–China business.

China's Oil Industry Charts a New Course

Investment and foreign involvement are on the rise

David Denny

Dramatic changes are underway in China's onshore "oil patch." The government is allocating substantially greater resources to develop on land oil and natural gas reserves. The oil fields themselves are buying substantially more foreign equipment. Most striking, oil fields have recently begun to contract for a wide variety of technical services with foreign companies (*see* box, page 18), and are seriously considering risk- and product-sharing contracts for oil and gas exploration.

Nationwide economic reforms are also changing the face of China's domestic oil industry. The Central Committee's strategic October decisions to give basic level enterprises greater authority and production incentives will accelerate changes at the oil field level. The concurrent restructuring of the foreign trade system, which gives end users much more authority over trade decisions, will affect even the critically important oil and gas industries.

Previously China's on land oil industry symbolized success through the policy of self-reliance. Prior to 1978, one could find signs throughout China reading "learn from Daqing," the country's biggest oil field. A large part of the implicit message was that Daqing did not rely on outside help to achieve success and neither should other enterprises. But recent years have seen a dramatic turnaround: Daqing has hired foreign technical consultants, obtained funds from the World Bank, and may even be considering joint ventures with foreign companies. A significant shift in priorities is clearly underway.

Shifting energy priorities

Behind the drive to give oil and gas fields greater resources and expanded authority is the gloomy assessment made by China's leaders of their recent oil and gas exploration and development experience. As they forecast future needs and compare them with past accomplishments, it has become clear that a new course must be charted.

For the last three decades, China's industrial performance has been impressive. China is one of only a few countries in the world that have sustained annual industrial growth rates of 10 percent or more for more than 30 years. Much as in the United States, this rapid industrial growth has been fueled by cheap sources of energy. Industrial growth has been accompanied by an almost equally rapid annual growth rate for all primary energy sources of just under 10 percent, while output of electricity has grown at an even more rapid rate.

Exceptionally high growth rates for oil and natural gas from the early 1950s until the mid-1970s were the most important factor in maintaining China's energy increases. Coal output grew impressively, but less rapidly throughout this period, and its share of total primary energy fell from 97 percent in 1952 to 71 percent in 1982. The growth in hydropower contributed to the decreasing importance of coal, but the contribution from oil and natural gas played a key role (*see* page 15).

Such high energy growth rates created few incentives for energy conservation. As a result, Chinese industry became a profligate user of energy. As oil output grew, there was even a short-lived enthusiasm to replace coal-fired boilers with oil-burning equipment in electric power plants and in other facilities. The lack of a rational price system also reduced the incentive to conserve energy in general and oil in particular. This has led the World Bank to conclude that "China uses energy, especially in industry, a good deal less efficiently than other developing countries."

In the mid-1970s, growth rates for all primary sources of energy and electricity began to fall. The declines, however, were most pronounced for hydropower, oil, and natural gas. Their growth during the late 1970s averaged only about one-third of their long-term growth rates.

In retrospect, it is clear that Chinese economic planners were lulled by the ease of developing the oil and gas industry during the 1950s and 1960s into a false sense of security. This led them to set unrealistically high goals for industrial growth and to make critical errors in allocating investment. Investment in exploration of new oil fields was neglected, as was the development of new coal mines and major hydropower stations to assist energy-starved east and southwest China.

The recent sharp decline in growth rates for all energy sources, and electric power in particular, has caused great concern among China's top officials. China's "energy czar," Vice Premier Li Peng, has hoisted public danger signals for two years about the immediate and long-term problem of energy shortages. The *People's Daily*, in a statement typical of the official view, summed up the situation in late 1983: "Energy supply has become a pressing problem since the 1970s. It has become a weak link in

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the development of China's national economy, in part because of our previous inconsistent energy policy that one-sidedly emphasized extraction and neglected exploration."

Western observers have also concluded that energy shortages constrain China's short- and medium-term industrial goals. According to the World Bank, "although energy production has grown rapidly since the 1960s and potentially exploitable energy reserves appear to be abundant, China may face a very difficult energy situation in the 1980s, largely as a consequence of inappropriate policies and inadequate investment over the past 10–15 years."

Onshore oil and gas gain top priority

Abundant coal and hydropower resources may be China's best hope for long-term energy security. But there are several good reasons why onshore oil fields may hold the key to China's short-term industrial prospects. First, development of hydropower and coal resources will require relatively long time periods and massive capital investments. Chinese planners already recognize that it will be difficult to attain the present targets for coal and hydropower output by the year 2000. Asking these sectors to do even more to make up for oil and gas shortfalls would further strain China's budgetary resources.

Second, substantial investment has already been made in important industries that use oil and natural gas as feedstock, such as petrochemicals (particularly fertilizer factories) and electric power production. To quickly reorient these industries using coal instead of oil would require a significant chunk of China's scarce investment resources. Third, even if this shift from gas to coal were possible, it would seriously overload the already strained transportation sector. Fourth, such a shift would also markedly worsen China's already polluted environment—just when Chinese authorities have increased their commitment to clean it up.

Fifth, the export of crude oil and refined oil products is a crucial source of foreign exchange (*see* table, page 16). For the last four years these products have accounted for 20–25 percent of all of China's exports and an even larger share of hard currency earnings. China's planners seem intent on preserving this trend, and the country has adopted an aggressive oil and gas export policy. Last year, China reportedly even lowered prices to increase its market share at the expense of other oil exporters.

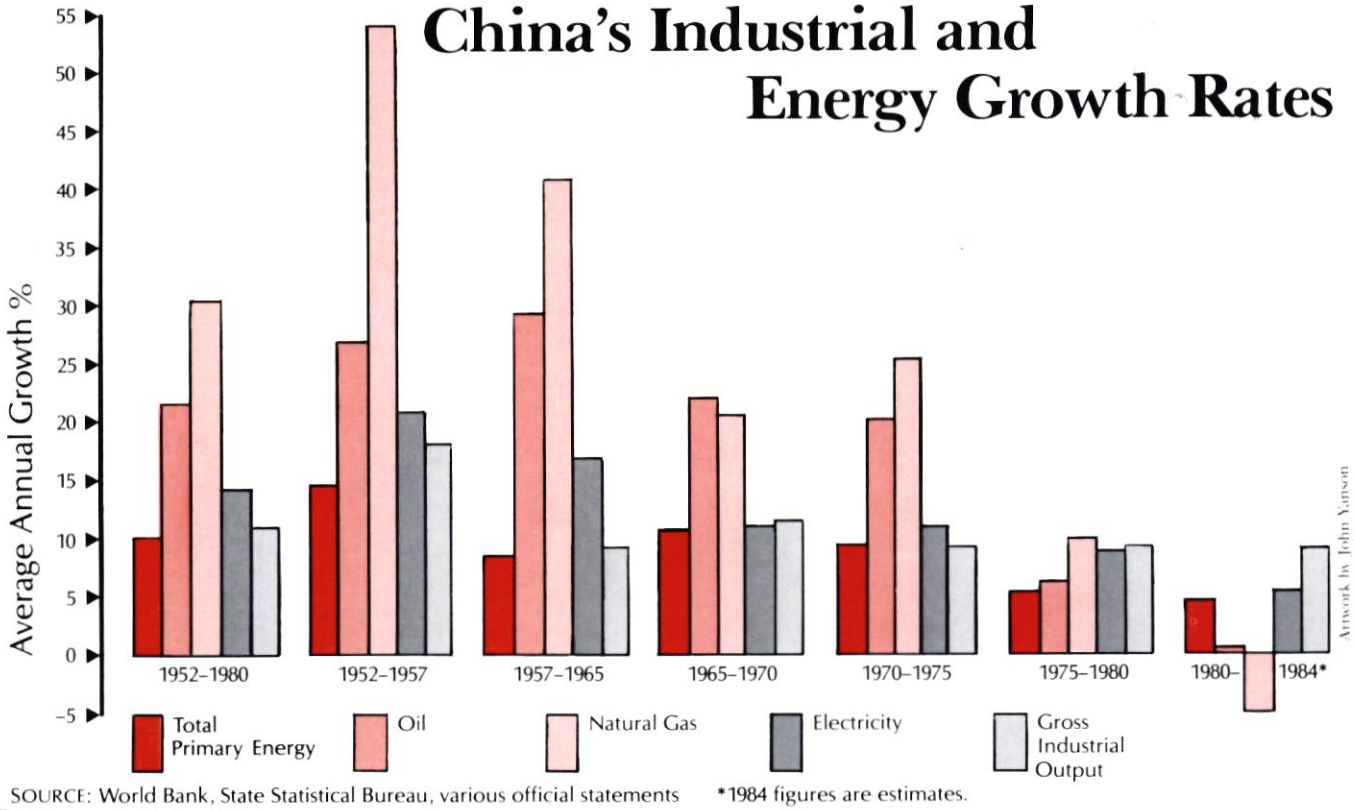
This policy of exporting critically short oil while domestic industry is forced to cut back oil consumption is even more striking in view of China's large and growing foreign exchange reserves. To a certain extent, it reflects the narrow interests of the Ministry of Petroleum Industry (MOPI), which now receives greater credit for its crude oil exports. But continued high oil exports also reflect the fundamental financial conservativism of China's planners, who are attempting to build up as much foreign exchange as possible so that they can make large foreign purchases during the Seventh Five-Year Plan (1986–1990) and the 1990s.

Finally, China must focus resources on land-based petroleum exploration because of the results during the first year of widespread offshore drilling. The most optimistic thing that can be said about the geologic formations of the South China Sea is that they did produce oil—in fact, oil shows were found in a fairly large proportion of the wells. But even at the most promising structure found to date—an Esso exploration well with a test flow of 3,200 barrels per day (bopd)—subsequent drilling has failed to confirm any commercially exploitable oil fields.

The urgent need for investment

Until 1978, it would have been dif-

China's Industrial and Energy Growth Rates



SOURCE: World Bank, State Statistical Bureau, various official statements *1984 figures are estimates.

ficult to fault Chinese planners for failing to allocate sufficient investment to the petroleum sector. For many years China devoted more resources to energy development than most other developing countries: energy typically obtained 40–50 percent of all industrial investment. Given the rapid growth of oil output in the first 20 years of development and the fact that oil supplies outstripped domestic demand, it would have been very difficult for planners to shift investment resources to the petroleum sector from other needy sectors such as transportation, coal, and communications. Investment in petroleum has been about the same as for coal, even though petroleum's contribution to total energy production has been smaller.

The equation began to change in the mid- to late 1970s. Petroleum output began to level off and China's industry began to bump up against energy constraints as a consequence. Moreover, the annual additions to new oil and natural gas production capacity declined sharply, a particularly worrisome trend because of a concurrent decline in well productivity at older fields such as Daqing.

Despite these danger signals, investment in the oil industry also dropped after 1978. To a certain extent, this represented only a cutback from an unsustainably high level of investment in 1978 (more than double the 1977 rate). But the fact that this decline persisted for four years in the face of stagnant oil production and severe energy constraints has been criticized by both Chinese and foreign analysts as shortsighted. In the early 1980s, China's petroleum industry reinvested less than 1 percent of its gross revenues. Although comparisons with foreign companies are complicated by different prices and cost structures, this Chinese reinvestment rate was low by any standard. For example, in the same period, the Chevron Corporation reinvested nearly 10 percent of its total gross sales.

The decline in investment resources must have been particularly galling to MOPI when it considered the vast revenues and foreign exchange that it earned for the central government coffers through oil exports. China has invested only about $2 billion annually in the entire petroleum sector, compared with the sector's $4 billion exchange earnings. Daqing alone makes contributions to the central government budget that are approximately equal to investment in the petroleum sector.

Naturally, many considerations go into any complicated budgeting decision. In the case of oil and gas, large expenditures are often in vain. They would make no sense at all if China was already thoroughly explored or if existing oil fields were extracting oil and gas fully and efficiently. But other articles in this issue make it clear that this is not the case. Vast areas of China remain largely unexplored, while other areas close to current oil basins remain underexplored. Finally, foreign oil company executives invariably comment on the relative lack of in-fill drilling in China's older oil fields.

Underinvestment in new oil exploration techniques has been especially striking—an apparent legacy of the ease of locating Daqing and other large fields. China's oil industry continued for many years to use the same equipment and technologies that had been successful in locating the easy-to-find fields. Unfortunately, the new structures turned out to be smaller, located at greater depths and in much more complex and remote geologic structures than Daqing. As one observer put it, China "continued to use inferior seismic equipment; as a result, they were often shooting in the dark."

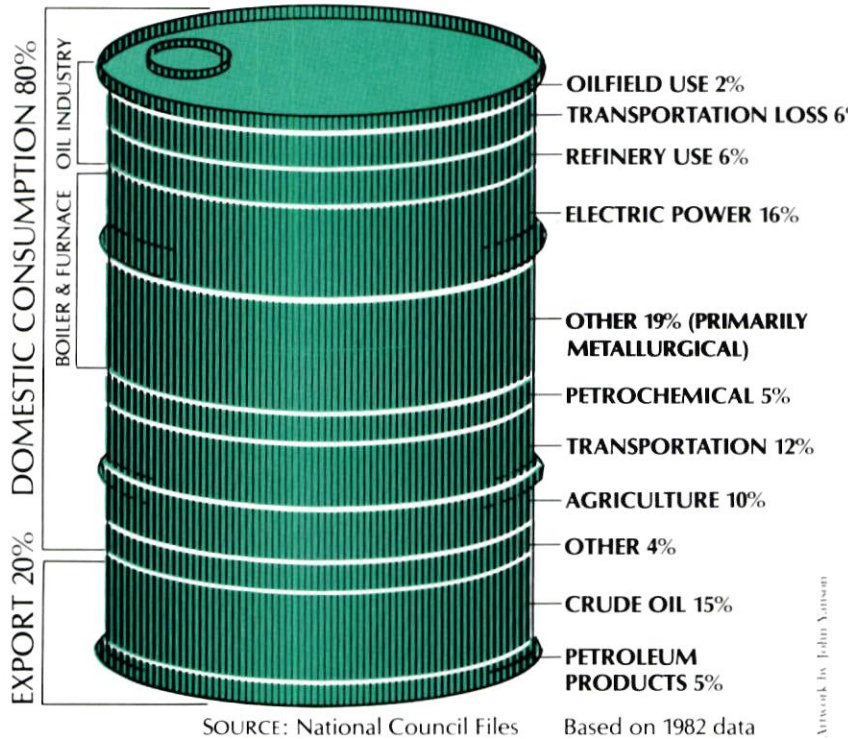
CHINA'S EXPORTS OF CRUDE OIL AND REFINED PETROLEUM PRODUCTS

Volume in million barrels
Value in $ billions

	1981		1982		1983		1984 (first half)	
	volume	value	volume	value	volume	value	volume	value
crude oil	102.2	3.26	108.0	3.20	108.8	2.89	71.3	1.79
refined products	34.5	1.37	36.0	1.37	36.0	1.31	20.6	.67
total value		4.63		4.57		4.20		2.46

SOURCE: *China's Customs Statistics.*
Dollar values computed from official exchange rates.
1 barrel = 0.136 tonnes = 42 US gallons

China: Demand for Oil



SOURCE: National Council Files Based on 1982 data

Artwork by John Yanson

US DRILLING AND OIL FIELD EQUIPMENT EXPORTS TO CHINA
(millions of dollars)

1977	2.9
1978	44.7
1979	200.8
1980	76.4
1981	43.8
1982	53.4
1983	70.2
1984 (Nov)	104.5

SOURCE: *Highlights of US Export and Import Trade*, US Dept. of Commerce (various issues).
Table prepared by David Denny.

Looking abroad for solutions

Since late 1982, China's top officials have responded to these problems by substantially increasing their support for the petroleum sector. In his late 1982 report to the 12th Communist Party Congress, General Secretary Hu Yaobang stated, "to ensure a fair rate of growth in the national economy, it is imperative to step up the exploration of energy resources." Throughout 1983 and 1984, Hu and other senior Chinese leaders made regular visits to oil fields. Viewing the industry's problems firsthand has helped build high-level support for increased cooperation with foreign companies. Last September, Hu told MOPI officials to vigorously utilize foreign equipment and technology to modernize the industry. He paid tribute to the industry's previous success in self-reliant development, but went on to state forcefully that, "we have not yet solved a number of problems that have already been solved abroad. Therefore, it is necessary to go all out to use foreign funds, import additional equipment and, through cooperation with foreign firms in exploiting continental and offshore petroleum deposits, promote the development of China's petroleum industry."

The concern of Hu and other Chinese leaders has been translated into major new allocations of foreign exchange to the oil fields. Oil fields have responded by stepping up equipment purchases and foreign technical assistance contracts. As one company executive who has been involved in marketing petroleum equipment in China for more than 10 years summarized the current situation, "they are just buying like they are going nuts."

One measure of the increased activity is the flood of Chinese petroleum-related delegations that visited US equipment companies in 1984—particularly during the last half of the year. They have arrived to hold general meetings, assess US technology, and purchase petroleum equipment. The two most important delegations were led by Petroleum Minister Tang Ke and the president of Daqing oil field, Li Yugang. At this high level, discussion focused on general principles for cooperation. However, both delegations also spent a great deal of time studying US technology and equipment in the enhanced oil recovery area.

Most of the delegations visiting the US have been on purchasing missions, or are working-level teams here to assess technology. Two of the most important working-level delegations were headed by the deputy directors of MOPI's drilling and development departments. Both delegations included oil field representatives, and were accompanied by leading negotiators from the China National Machinery Import–Export Corp. (MACHIMPEX). The drilling delegation bought 10–20 newly produced but stockpiled drilling rigs, a large number of mud pumps, and a wide assortment of other old but unused equipment. The delegation from the development department will probably soon make recommendations for future procurements of thermal and water flooding equipment for enhanced oil recovery operations at Shengli and Dagang.

In addition to Chinese teams visiting the US, American petroleum equipment marketing executives spent more time in Beijing in the last half of 1984 than at any time since 1978. MOPI and the Ministry of Geology and Mineral Resources (MOGMR) have been carrying on a wide range of negotiations with both private sector companies and the World Bank. US representatives began negotiations on joint ventures, technical assistance contracts, and equipment sales. Many firms visited the oil fields, which can now carry on their negotiations directly with foreign firms. In fact, MOPI officials in Beijing are even encouraging such direct contact.

This stepped-up interest in foreign technology has already begun to be reflected in US exports of oil field equipment. Through November of last year, oil field equipment sales as defined in US Customs statistics exceeded every year since 1979. These figures would show even greater increases if they included computers and seismic equipment, which are being sold to MOPI and MOGMR in much greater quantities to improve exploration techniques and data processing, partly as a result of more

Photo courtesy of New China Pictures

A view of Daqing oil field, China's largest.

SALES OF FOREIGN OIL FIELD SERVICES

Foreign company	Technical service	End user
American Cyanamid (US), Mitsui Toatsu Chemical (Japan)	polyacrylamide enhanced oil recovery treatment	Dagang
Baker Sand Control (US)‡	technical assistance for Shengli Sand Control Research Center	Shengli
Bechtel (US)	reservoir engineering	one Hubei oil field/two Sichuan gas fields
Companie General de Geophysique (France)*	seismic survey	Karamay
Core Laboratories Int'l (US) owned by Litton Industries	laboratory, engineering consulting, and field services	CNOGEDC
Dresser, Magcobar (US)	deep well mud products and services	Zhongyuan
Fluor Corporation (US)*	surface facilities engineering	Daqing
Fluor Corporation (US)	renovation of Tieling–Dalian segment of Daqing–Dalian crude oil pipeline	MOPI's Pipeline Bureau
Forex Neptune (France)* owned by Schlumberger	well drilling and completion	Zhongyuan
Geosource (US)	seismic surveys	Qaidam Basin
G.S.I. (US) owned by Texas Instruments	seismic surveys	Unknown
Hong Kong firm*	oil field safety	Daqing/Zhongyuan
Improved Petroleum Recovery, Inc. (US)*	well drilling and completion	Daqing
Japan National Oil Corporation (Japan)	joint oil and gas exploration	Ordos Basin/Yellow River, Jiangsu
Keplinger Associates (Singapore)*	reservoir engineering	Zhongyuan
Parker Drilling (US)	directional drilling	Shengli
Pool-Intairdrill (US) owned by Enserch	rigging up and directional drilling	Zhongyuan
Schlumberger (Netherlands)	well logging	Zhongyuan
Schlumberger (Netherlands)	analysis of geology and fracture structure of major oil and gas fields	Sichuan Petroleum Administration Bureau
Scientific Software (US)	reservoir engineering	Qaidam Basin
Snam Proggetti (Italy)*	LPG feasibility study	Zhongyuan
Technip Geoproduction, Institut Francais du Petrol, and Elf Aquitaine (France)*	enhanced oil recovery feasibility study	Daqing
Telemedia (US)*	training program for oil field workers	Zhongyuan
Western Geophysical (US)	seismic surveys	Daqing/China Shallow Seas Oil Corporation
Western Geophysical (US)	operation of seismic data processing center at Zhouxian near Beijing	Ministry of Petroleum

* under World Bank loans to China
‡ under UNDP program
SOURCE: National Council files and company officials.
Chart prepared by David Denny.

liberal US export controls. As a result of aggressive Chinese purchasing activity, oil industry observers believe that within the last six months China has spent $100 million for submersible pumps, $60–70 million for drill rigs, and $50–60 million for fracturing and cementing equipment. Other important recent purchases include drill bits and a barge to be used in shallow water. Most of these purchases came late in 1984, and will be reflected in 1985's trade statistics. As a result, US petroleum equipment shipments to China in 1985 will probably even exceed the 1979 record.

The level of petroleum equipment sales to China for the foreseeable future is difficult to estimate, but in 1983 World Bank experts concluded that MOPI would spend between $200 million and $400 million of foreign exchange annually during the 1980s for on land exploration and development. With China's new policies and priorities, it appears likely that worldwide purchases could reach $500 million per year by the mid-1980s.

In addition to equipment sales, there has been a remarkable increase in China's willingness to employ foreign companies on technical assistance contracts. Many such contracts were under discussion in the 1978–79 period, but only a few came to fruition. The successful ones (such as Parker Drilling Company's contract to drill a directional well to control a blown-out well) were highly specific and generally of an emergency nature.

In the last two years, however, there has been a big increase in the number of foreign engineering companies and petroleum consultants providing technical assistance at Chinese oil fields (*see* box). This trend is an important new source of business for the West's depressed petroleum industry. Such on-site activity will also generate future business as the foreign consultants make their recommendations to Chinese oil and gas officials.

In short, the priority being attached to onshore oil and gas exploration and development makes this an increasingly important part of China's overall energy plan for the foreseeable future. Meanwhile, the sweeping reforms affecting the industry promise growing opportunities for foreign sales and services. 完

A Survey of China's Land Oil Fields

Enhanced recovery at existing fields and stepped-up frontier exploration will be key issues for the future

Richard S. Ondrik and Kim Woodard

The attention of the world petroleum industry is shifting this year to the achievements, reserve potential, and problems facing China's land-based oil fields. Although offshore exploration has received far more publicity in recent years, virtually all of China's petroleum production comes from onshore fields that have been producing for some two decades. China's oil industry must now face the challenge of sustaining current production levels at existing land fields in northeast China while the potential of the continental shelf and vast basins of the far west are more fully explored.

Although China's onshore oil industry still faces severe problems, 1985 began on an optimistic note. Higher levels of domestic investment and the introduction of foreign technology in recent years are having a positive impact: official PRC reports indicate verification of more than 3 billion barrels of new in-place reserves on land in 1983, and at least that much again in 1984, bringing the current level of proven plus probable reserves into the 10–15 billion barrel range. Output levels, originally projected by many sources to decline by 1985, rose 8 percent in 1984 to average nearly 2.3 million barrels of oil per day (bopd), with further growth of 5 percent per year targeted through the end of the decade by China's planning agencies.

It will not be easy to achieve this steady growth rate. The major oil fields of China's northeast corridor (Daqing, Shengli, Renqiu, Liaohe, and Dagang) reached a production plateau, or have declined in output since 1978. Daqing, which produces 1 million bopd, half of China's current crude oil production, will be able to maintain current output levels through the end of the decade only by investing heavily in in-fill drilling and enhanced recovery. Both Shengli and Liaohe have managed to reverse production declines through the use of modern seismic surveys and other advanced exploration technology, but the list of problems remaining at China's mature fields is impressive:

- ▶chronic underinvestment—basic investment in exploration and field development has grown to perhaps $2–3 billion per year, up from an average of $1.5 billion in past years, but still very low by international standards;
- ▶falling well productivity—due to water flooding and extensive infill drilling on existing structures, average well productivity has declined by 8 percent per year between 1980 and 1983, from 105 bopd to 85 bopd on a national average;
- ▶rising water cuts—the use of early water injection to maximize production levels has led to serious reservoir damage at some fields. Water production from oil wells at Daqing has reached 70 percent and is increasing by 3 percent per year. China's oil fields now inject 2.5 barrels of water for every barrel of oil produced, and over 90 percent of China's fields must use water injection to maintain reservoir pressure and oil production;
- ▶obsolete equipment—production of a wide array of petroleum equipment at 240 domestic machinery plants has saved foreign exchange, but also burdened China's fields with a vast inventory of obsolete or nonfunctional equipment;
- ▶lack of expertise—the petroleum industry can draw upon a great number of good workers and engineers, but few have modern drilling or production experience—they particularly lack expertise in key technical fields including reservoir engineering, geophysical survey, data processing, and enhanced recovery technology;
- ▶bureaucratic management—this problem is often cited in the Chinese press as the parent of all the others. Overcentralized decision-making, the "iron rice bowl," excess staff, poor communications, and regionalism stifle initiative and create risk aversion across a broad spectrum of China's oil field organizations.

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Paying the price for early success

China's recognition of the petroleum industry's current basic shortcomings contrasts with previous years. From the early development of Daqing oil field in the late 1950s until 1978, the petroleum industry basked in a glow of success, achieving 20 percent annual growth rates. But in 1978 this growth curve ended abruptly, and for the past seven years national crude oil output has hovered at just over 2 million bopd.

This present plateau in national output can be attributed in large part to the development of Daqing. It can be argued that both the size and relative ease of Daqing's development lulled the Chinese petroleum industry into a state of self-confidence, inhibiting technological advancement. Using little more than obsolete equipment and revolutionary slogans, the Chinese were able to achieve exponential increases in oil production at Daqing. But with the maturation of Daqing and other northeast oil fields in the late 1970s,

China had reached the limits of its technology. Furthermore, the ease of early development led to a pattern of chronic undercapitalization and underinvestment in both exploration and development. Finally, the discovery of Daqing reinforced a regional bias toward petroleum development in the heavily industrialized areas of the northeast. As a result of this policy, the huge and promising basins of the far west remain largely unexplored—and more important, they still lack roads, railways, communications, and even the most basic infrastructure needed for exploration and development.

A pressing need for new discoveries

The Ministry of Petroleum Industry (MOPI) has responded to this situation by stepping up exploration efforts. MOPI drilled 115 more wildcat wells in 1983 than in 1982, and put 800 drilling teams (about 250,000 personnel) to work drilling a total of 26.3 million feet, nearly 3 million more feet than the previous year.

According to *World Oil* magazine, MOPI drilled a total of 4,124 wells in 1983, including 2,244 development wells, 902 service wells, and 978 exploration wells. In addition, the Ministry of Geology and Mineral Resources conducted its own wildcatting program with about 60 of its 100 rigs in constant operation. The average 1983 rig count was 850–900 active rigs (including rigs in transit), up from an average count of 700 active rigs in 1981.

By the end of 1983 two-thirds of the 25,214 wells in service in China required pumping. Almost 90 percent of the producing wells were in the mature fields of the northeast corridor, while it is estimated that there is only one well for every 230 sq kms of basin area in China's vast far western basins. To date, only 20 percent of China's sedimentary basins have been extensively explored.

Development at existing fields

The main focus of activity at China's eastern fields is the effort to rehabilitate and extend the life of the existing fields. Many of these field complexes are experimenting with enhanced recovery technology, and stepping up exploration efforts on the peripheral areas of the fields. These programs are beginning to have an impact, with some fields projecting current output levels further into the future, and others hoping for rising production during the Seventh Five-Year Plan (1986–1990).

Daqing: Daqing, the supergiant oil field complex located in northern Heilongjiang Province in the Songliao Basin, is still very much the backbone of China's petroleum industry. Daqing produced 1.04 million bopd of medium quality crude in 1983, and will average slightly more than this in 1984.

Both foreign and Chinese experts recently projected that Daqing would experience a serious decline in production levels by the mid-1980s, but it now appears that the field may be able to sustain production at or near the 1 million bopd level through the end of the decade. If this occurs, it will be a major triumph for the Chinese petroleum industry, buying time for frontier exploration and providing a major source of export crude. Daqing now supplies the bulk of China's 400,000 bopd in crude and petroleum products exports, earning $4 billion per year in precious foreign exchange—a figure that exceeds total annual investment in the oil industry.

Daqing has 6,000 producing wells, of which about two-thirds require artificial lift. Average well flow rates are 200–300 bopd, although this overstates productivity, since the water cut has reached 70 percent and is still increasing. Key recovery technologies include the extensive use of electric submersible pumps, imported over the past several years from TRW Reda, chemical injection, fracturing, and efforts to plug water fingering.

Daqing has also resorted to widespread use of infill drilling to overcome the waterflooding problem and sustain output levels. Development drilling averaged 400 wells per year prior to 1980, but rose to 700 wells per year in 1981 and 1982. More than 1,000 wells were drilled in 1983, including 765 production wells, and current plans call for continuation of infill and development drilling at about this level through 1987.

Several exploration programs are also underway on the Songliao plain near Daqing. Currently 14 exploration rigs are active in the area, including two run by foreign crews. During 1983, 77 exploration wells con-

Photo from National Council files

Chinese workers on a drilling rig at Daqing oil field.

firmed 440 million barrels of new reserves. This program was extended in 1984, with discoveries for the year projected at 510 million barrels. Recoverable reserves were estimated at 3.5 billion barrels in August 1983 or about eight to 10 years at current production levels. Discoveries announced in the last two years have equaled about two-thirds of the current output level, indicating that production declines can be expected by the end of the decade.

Shengli: Located near the mouth of the Yellow River in Shandong Province, Shengli symbolizes China's effort to extend the life of existing fields while intensifying the search for new reservoirs. Communist Party General Secretary Hu Yaobang and Premier Zhao Ziyang both visited Shengli during 1984, when Hu called on Shengli to become China's "second Daqing" by the end of the decade. This ambitious target would imply a doubling of current output levels.

The Shengli oil field presents an interesting study in the impact of modern oil field technology and management on an existing field complex previously thought to have reached output maturity. Crude oil output at Shengli reached an early peak of 350,000 bopd in 1980, and then declined to 325,000 bopd in 1981 and 1982. But meanwhile, under the leadership of oil field president Zhu Wenke, Shengli adopted a series of management reforms and began to rapidly introduce foreign equipment and geophysical services. These measures had an immediate effect, both in stabilizing output from existing structures and in identifying new reservoirs under and around existing production zones. In 1983, Shengli's crude oil output recovered to the level of 365,000 bopd. By August 1984, production had jumped to 430,000 bopd, an 18 percent increase in a single year. Several factors have been important in this success:

▶sand control—Shengli has severe sand control problems stemming from unconsolidated sand in shallow producing zones (3,500–5,000 feet). At the end of 1982, only 3,000 of the field's 5,000 wells were producing, with many of the rest sanded in. The Shengli Sand Control Research Center was established to correct this problem and has begun to import modern gravel packing technology and equipment. The current pace of gravel packing is slow (about 50 wells per year), but has already begun to rehabilitate fields where production had been shut in.

▶investment and technology acquisition—basic capital investment in Shengli has been stepped up to include importation of critical equipment for enhanced recovery, as well as foreign seismic, well-logging, and drilling services that have led to a number of new field discoveries in the past two years. In the 1980s Shengli has opened its door to direct contact with petroleum service and equipment companies and has encouraged technical exchanges at the oil field level, a practice previously frowned upon in other fields and in other levels of the bureaucracy.

▶drilling activity—development drilling jumped from 140 wells in 1982 to 460 wells (3.6 million feet) in 1983 and may have reached 750 wells (6 million feet) in 1984. Exploratory drilling probably reached 100 wells in 1984, while 6,000 miles of seismic lines were run, double the 1983 level. Drilling is also reaching deeper producing zones, ranging up to 16,000 feet. As a result of this activity, at least six field discoveries have been made in the past year, with test yields in the 5,000–25,000 bopd range. Additions to reserves at Shengli were about 1.5 billion barrels in 1983 and probably were even greater in 1984. A doubling of production by the end of the decade (to 700,000–800,000 bopd) may not, therefore, be an unrealistic target, although this would still fall short of Daqing's 1 million bopd.

▶heavy oil development—Shengli, along with the Liaohe and Karamay oil fields, has substantial heavy oil reserves. This year the US Trade and Development Program (TDP) funded a $300,000 feasibility study for Shengli's Shanjiasi heavy oil reservoir, which has proven reserves of 275 million barrels and possible recovery of 950 million barrels. Production of the oil would require steam injection to 3,500 feet in an unconsolidated formation, which would stretch the limits of available thermal recovery technology. Two 20 million BTU steam generators have already been purchased for an experimental "huff and puff" program. Development of the Shanjiasi heavy oil reservoir could cost $265 million, including approximately $115 million in imported equipment.

Shengli's well-deserved recognition stems from the successful combination of enhanced oil recovery at existing fields and the vigorous exploration program. Shengli will not cure all of the oil industry's headaches in China: Shengli's crude, for example, is heavier and less desirable on the export market than Daqing crude. But it is clear that the leadership at Shengli has taken the first dose of the right medicine.

Liaohe: Located at the northern edge of the North China basin near Shenyang, Liaoning Province, Liaohe oil field's characteristics are similar to those of Shengli and Dagang. The field was discovered soon after Daqing in 1965, and brought into production in the late 1960s. Reservoir depths range from about 3,500 to 10,000 feet. Present output at Liaohe is about 154,000 bopd, but new discoveries continue to be announced from this highly faulted area. Last year alone, over 7 million barrels of additional reserves were verified, largely through the use of advanced seismic and coring techniques. The field's drilling program averages about 120 wells per year.

Liaohe, like Shengli, has been selected as the site for a heavy oil recovery pilot project, this one sponsored by the World Bank in association with the Karamay development project. Liaohe has experimented with some pilot projects already, but none have resulted in commercial applications. The World Bank will provide expert assistance, reservoir engineering, monitoring, and advanced equipment and technology to the pilot projects. If successful, thermal recovery techniques will likely be extended to the entire field.

Dagang: Dagang oil field is located in Hebei Province on the shores of the Bohai Bay. Production from Dagang began in 1969, peaked at 94,000 bopd in 1975, and has now stabilized at just under 60,000 bopd. However, all of this production came from 900 wells sunk in a shallow reservoir. In 1978, an exploration well was drilled to 13,000 feet, yielding 1,950 bopd of crude oil and 1.1 million cubic feet per day of natural gas.

In 1983 China's first deep-horizon oil field, the Maxi field, went into production. The depth and high pressure in the strata called for the use of sand fracturing techniques to open the seams and achieve good

China's Land Oil Basins

SOURCE: *Petroleum News*, China Energy Ventures

permeability. The 15 wells of the Maxi field (in the southern portion of Dagang) each produce an average of 330 bopd oil and 777,000 cu ft of gas per year. Output will probably increase substantially as further deep-horizon development gets underway. In addition, the Chinese are pressing forward with exploration of the shallow sea and beach areas around Dagang. Thirty-two wildcats were drilled last year, and more than 300 Chinese seismologists have been involved in survey work. In addition, two seismic teams from Western Geophysical have been contracted to assist in field operations on the expanded exploration effort.

Renqiu (Huabei): Huabei oil field is a complex of five distinct oil fields in central Hebei Province covering a total area of about 30,000 sq km. Of the five—Renqiu, Baxian, Yongqing, Hejian, and Yanling—only Renqiu currently produces oil. However, development is progressing on a second structure where at present four wells produce 2,500 bopd of crude and 2 million cu ft per day of natural gas.

Renqiu was the first Pre-Cambrian reservoir discovered in China, with reservoirs at 11,000–13,000 feet and oil-bearing strata about 200–400 meters thick. The structures are known as "buried hill" formations, similar to the anticlinal structures found in the US, yet are actually ancient hills subsequently buried by sedimentation. The discovery of Renqiu was a major breakthrough for the Chinese: it was both the first carbonate oil field found in China and had the thickest known reservoir formation.

Renqiu currently produces 240,000 bopd from 80 wells, giving it the highest per-well yields in China. Wellhead pressures are 440 pounds per square inch, with high bottom-hole temperature and pressure conditions. This complicates the installation of monitoring and artificial lift equipment, requiring pumps with high temperature resistance. Water cuts average 40 percent, although some wells already produce 65 percent water. Renqiu's output has declined seriously from the 350,000 bopd achieved in 1979, making it one of China's problem fields.

Zhongyuan: The Zhongyuan complex presently consists of six small oil fields, namely, Wenliu, Fucheng,

Wenminzhai, Weicheng, Guoyunji, and Qiaokou. Situated about 500 km south of Beijing in a densely populated agricultural area on the Yellow River, Zhongyuan covers 4,000 sq km in Henan and Shandong provinces.

Eighteen hydrocarbon-bearing structures have been identified, with producing zones in both limestone/dolomite and sandstone formations. Chinese geologists expect to verify reserves totaling 3.5 billion barrels of oil and 2 trillion cu ft of natural gas this year. Present proven reserves are 1.5 billion barrels of oil-in-place, 700 billion cu ft of associated gas, and 550 billion cu ft of nonassociated gas. Oil deposits are generally from 50–80 feet thick, and the oil has a low sulphur content.

Development at Zhongyuan did not begin until 1979, and the program is still in its initial stages. Current efforts involve about 80 active rigs drilling exploration and development wells and about 40,000 workers. Targeted production from all fields this year is 100,000 bopd of oil and 60 million cu ft per day of natural gas. Present production is 60,000 bopd of crude and 30 million cu ft per day of associated gas.

Frontier exploration

The fields discussed above are all located in either the North China Basin or the Songliao Basin. With the exception of Zhongyuan, they all reached maturity five to seven years ago. If the introduction of advanced foreign technology at these existing fields fails to extend their life through 1990, the impact of declining petroleum production will be felt throughout the Chinese economy and will imperil the modernization programs of Deng Xiaoping. This underlines the urgent priority of exploring the other 80 percent of China's land basins located in the far west and elsewhere. Further delays in frontier exploration could lead to declining petroleum production in the early 1990s, when today's mature fields may reach their ultimate limits. It takes at least three to five years to bring a fully delineated field discovery into production, and will take even longer in the remote and hostile desert environment typical of China's western basins, so there is no time to waste.

Karamay and the Junggar Basin: Oil production from China's huge 130,000 sq km Junggar Basin in the arid and desolate Xinjiang Autonomous Region comes from one single area—the Karamay oil field. Karamay, located at the northwestern tip of the Junggar Basin near the Soviet border, is an area of surface oil seeps and solid asphalt mounds; in fact, the Uighur name "Karamay" means "black hill." Since its discovery, nearly 20 oil fields have been developed in the Karamay vicinity.

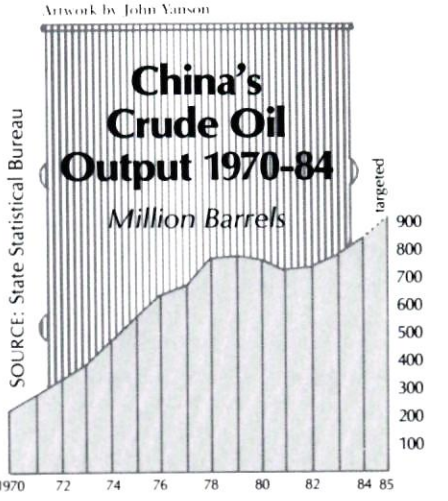
Development began under Soviet guidance in the mid-1950s, but investment and resources soon shifted to Daqing and other fields in the northeast corridor. Output remained at about 10,000 bopd for 20 years, growing slowly to 30,000 bopd in 1979. However, the plateau in national oil production led to renewed efforts to develop the Karamay region in the late 1970s and early 1980s so that production now exceeds 80,000 bopd. The Chinese expect the field to be producing 140,000 bopd by the end of the decade. Current reserve estimates are in the range of 300 million barrels.

In October 1980, the Chinese signed a three-year contract with Companie Generale de Geophysique of France for seismic surveying in the areas surrounding Karamay. During the three-year period three French and seven Chinese seismic teams shot 8,686 km of seismic lines, and delineated 30 potential hydrocarbon-bearing structures. Soon after the contract ended in October 1983, China announced the discovery of a 5,000 sq km overthrust zone bearing substantial quantities of oil and gas. The French company won another contract to conduct further seismic surveys under a $750 million exploration and development program financed in part by a loan from the World Bank.

Since 1980 the Chinese have drilled an additional 700 wells at Karamay and plan to drill 600 more by the end of this year. Water injection is common in the mature fields, as well as acidizing and fracturing in the carbonate structures. Karamay became the site of the first contract for onshore drilling by a foreign company (Parker Drilling) in 1980.

An experiment in steam injection for the recovery of heavy crude was completed in September 1983, and deemed a moderate success. After injection of 2,000 tonnes of steam, the extraction rate from formerly nonproducing wells reached about 116 bopd for 20 days. The second application resulted in similar output levels for 30 days. A major aspect of the World Bank loan to Karamay is the funding of a heavy oil recovery pilot project at the field. The bank expects the project to increase known reserves by about 2 billion barrels of heavy oil in-place in the shallow reservoirs of Karamay. If successful, thermal recovery is expected to be applied on a large scale at Karamay for recovery of heavy oil.

Tarim Basin: Covering 560,000 sq km, the Tarim Basin is the largest single land basin in the world. Extensive seismic surveys, conducted by both Chinese and foreign crews, have barely scratched the surface, although they have been underway since 1980. Last October the Ministry of Geology announced the single largest discovery in the basin to date, a wildcat well yielding 3,000 bopd of crude, and a large amount of natural gas. Parker Drilling has done some of the drilling in the area under contract to the Ministry of Geology. Shallow sediments in the Tarim Basin are of marine origin, while the deeper sedimentary layers are of the lacustrine type more typical of China's major basins. It is simply too early to judge, even in the most speculative terms, what oil and gas resources the Tarim Basin may hold, but the basin is certain to be a key frontier exploration region for the remainder of the century. The Tarim Basin is one of the areas that may be opened to foreign exploration before the end of the decade, although the transportation barrier (the basin lies 3,000 miles from the coast) will make the logistics of production



sharing difficult at best.

Qaidam Basin: The Qaidam basin lies at an average elevation of 10,000 feet and has severe weather, making logistics and transportation extremely difficult. Prospecting in the Qaidam Basin began in 1954 under Soviet assistance, yet oil deposits verified in the past four years equal the total confirmed reserves of the previous 20 years.

China signed a three-year $34.2 million contract with Geosource for seismic exploration in the Qaidam Basin, which provides for 10,000 km of seismic lines and transfer of technology to Chinese geophysicists. This effort has resulted in the discovery of the Gasikule Lake oil field—expected to be a high-yield formation in the southwestern part of the basin, which could produce 20,000 bopd beginning in 1987. To date, 13 exploration wells have been drilled and development is planned to begin in early 1985.

Four other structures have also been found: Nanmasi and Youshashan in the west, and Shizigou and Lutoushan in the south. Another 20,000 bopd is currently produced at the Lenghu, Yushashan, and Utuburek oil fields in the Qaidam Basin.

Ordos Basin: This basin has been known for a long time, but very little modern exploration has taken place. A cooperation agreement has been signed with the Japan National Oil Company for joint exploration of the northern part of the basin area.

Eren Basin: The Eren Basin in the central section of Inner Mongolia is targeted for expanded exploration in the next four years. A few wildcats have been drilled, and reserves are estimated at 7 billion barrels. Oil field construction has begun in four regions of the basin area, and initial production is expected in mid-1985.

Bose Basin: The Tiandong field, recently discovered in the Bose Basin of the Guangxi Zhuang Autonomous Region, is the only sizable field discovered so far in southern China. It has yet to begin production, but is the site of increasing activity. Tiandong covers 340 sq km, has thick sediments, and good trap structures. Oil and gas strikes have been made in 65 of 90 wildcats drilled to date, and production is expected to reach 2,000 bopd of crude by 1986. In July 1984, a stepped-up exploration program began with funding from the United Nations Development Program—the single largest UNDP program in China. The Chinese may also seek foreign private sector participation in developing this field.

The opening door to China's land oil fields

The possibility of production sharing arrangements with foreign operators for onshore exploration and production in China has recently become the subject of much speculation. Both Petroleum Minister Tang Ke and State Councilor Kang Shi'en have publicly indicated that the Ministry of Petroleum is seriously considering the subject, and is preparing draft production-sharing contracts for use in negotiations with foreign exploration companies.

Many of the major oil companies active in the South China Sea are interested in exploring China's great land basins as well. Small independent oil companies may also want to try their hands at land exploration in China, either on a service contract or production-sharing basis. The increase in oil field autonomy means that marketing efforts should reach beyond the central ministry level in Beijing to the individual oil fields, and will require emphasis on the fit between product lines and field requirements.

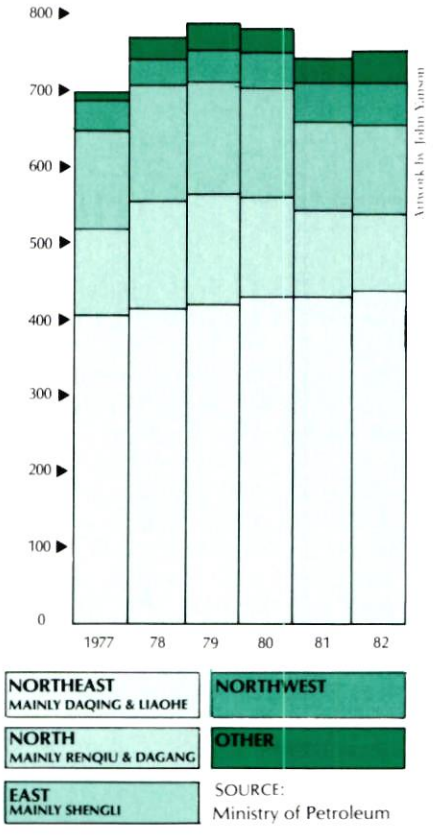
The Chinese have yet to designate which basins will be opened for foreign exploration. Only one region, Hainan Island, has called for tenders from foreign companies, to explore and develop the Qiongbei onshore oil field in conjunction with the opening of the second round of offshore tenders. The Hainan government carried on low-key negotiations with many foreign exploration companies throughout 1984, and it appears that the Qiongbei project may become the first "test case" for onshore production sharing agreements.

Discussions continue over other areas as well. The Japan National Oil Company (JNOC) has agreed to do joint seismic exploration in the Ordos Basin and the shallow areas of the Yellow River in Jiangsu, which could lead to production-sharing arrangements at a later stage. Similarly, Japan's Export–Import Bank is lending some $2.4 billion for development assistance at Dagang, Liaohe, Daqing, and the Bohai offshore fields. A few major oil companies were invited to Beijing last year to express their views on exploration of the land basins. China is likely to make initiatives to some of them this year, but reaching final agreements will be a slow and involved process. Technology transfer programs are likely to be emphasized.

Barring a major shift in economic policy, China's modernization program will require substantial increases in investment and imports for China's land oil fields over at least the next six years. In contrast to the euphoria and disappointment of the 1978–1982 period, the rest of the decade should be a time of modest but sustained growth in China's land-based oil production, and foreign sales of petroleum equipment, services, and technology to China. 完

China's Regional Oil Production 1977-82

Million Barrels



The World Bank's Petroleum Loans

Creative solutions to boost onshore production

Matthew J. Matthews

Of all the sectors of the Chinese economy that the World Bank has lent to, none is more controversial than onshore oil. In the past two years the bank has approved three loans totaling more than $360 million to help explore and develop onshore fields, and is currently investigating the possibility of a fourth loan for technical assistance to natural gas fields in Sichuan Province.

Some of the bank's members, notably the United States, have expressed concern that World Bank lending for petroleum projects crowds out capital that could be lent by commercial banks. The World Bank has recently adopted new, more restrictive guidelines for petroleum lending to all developing countries, but it hopes to remain an active supporter of energy development in China. Flexibility in implementing the new guidelines and a Chinese willingness to engage in new forms of cooperation should create conditions for continued World Bank participation in that vital sector.

The bank's energy strategy in China has been to stabilize onshore oil production during the critical short and medium term, to allow the country time to develop its long-term energy alternatives in coal, hydropower, and offshore oil. The loans approved to date—to Daqing, Zhongyuan, and Karamay—combine short-term production and long-term modernization benefits. In the short term, the bank has sought to reverse recent production declines in older oil fields by introducing enhanced recovery techniques and exploring and developing peripheral reservoirs. The goal has been to help the Chinese maintain onshore production at over 735 million barrels per year at least in the medium term.

The bank designed the loans to have a long-term payoff by including training programs in new oil field technologies and modern management techniques. The loans are to be vehicles for as broad a range of technology transfer as possible. Each project addresses a unique set of technical production obstacles, requiring its own specially tailored mix of technology, technical assistance, and training.

The bank's first loan was $160 million for Daqing oil field's $675 million Gaotaizi Reservoir Development Project. Daqing, the most important oil field in China, produces about half of total onshore production. The fundamental challenge was to improve oil recovery from the deep Gaotaizi reservoir through the application of modern enhanced oil recovery technology. The project calls for drilling 615 oil wells and 206 water injection wells. High pressure water pipelines and flow lines are being laid, water injection pumping stations are being built, and the capacity of existing dehydration stations is being expanded. The project is expected to increase crude production by more than 22 million barrels per year. With its training centers for field and management workers, laboratories, and computer center, Gaotaizi will represent an example of the latest oil field technology for the entire Chinese petroleum industry.

The World Bank has lent $100 million to the Zhongyuan-Wenliu oil field 500 km south of Beijing for a project with a total investment of $500 million. The 1983 loan includes a larger exploration component than Daqing, and provides funds to tackle a new set of technical issues centered around improved secondary recovery techniques and up-to-date completion practices. Construction of a liquified petroleum gas plant to process associated gas is one aspect of the project that helps China make use of this vastly underutilized resource. The Zhongyuan project also includes a technical assistance program, training center, laboratories, and a computer center—all to be completed by 1987.

A $100 million loan to the $750 million Karamay Oil Field Project in the Junggar Basin of northern Xinjiang Province focuses on exploring the Karamay oil belt and extracting heavy oil. Two seismic survey teams are being outfitted for three years to carry out the planned exploration. The bank expects that the surveys will increase known reserves by about 2.2 billion barrels. A total of 530 exploration and appraisal wells are to be drilled. Two pilot projects will test the ability of steam injection technology to extract heavy oil more economically than current methods. Some funds will also go to Liaohe oil field to study this issue. Transport and treatment systems will also be modernized to further reduce operating costs. The project is well underway, and the pilot projects will be completed by 1989.

Management of the Karamay oil field will be upgraded with the installation of a computer center and expansion of Karamay's seismic data processing capabilities. Outside consultants will be hired to conduct studies and design better methods of reservoir management and development.

Most observers are convinced that by helping China acquire better technology, the bank's loans will bring immediate production increases. The technology transfer component in each loan will also upgrade China's long-term ability to explore and develop its oil resources. Reinforcing this, the bank's training programs for oil industry personnel will provide a more highly skilled workforce to handle the new technologies with increased efficiency and safety.

Given such apparently laudable financial and developmental success, it may seem surprising that the bank's endeavors in this sector are so controversial. Ironically, it is the very financial soundness of the loans that has been the center of controversy. The US government has questioned the wisdom of making loans for 20 years that can conceivably be repaid in less than 10. The Reagan Administration maintains that the potentially high rates of return in the petroleum sector make the loans appropriate for private sector financing. Reducing petroleum loans would also free up scarce World Bank resources for loans to other sectors of the economy with lower rates of return.

The World Bank's new guidelines for petroleum loans stress its role as a catalyst for attracting private capital, and require that future projects in the petroleum sector include at least one of the following: co-financing with commercial banks; extensive use of foreign services, involving either a joint venture with international oil companies or the purchase of oil field services under contract; or policy conditionality. Under the latter requirement, the bank must be satisfied that the loan makes a positive impact on a country's petroleum sector policies.

Since the Chinese have consistently opposed such requirements, the level of future World Bank lending to China's petroleum sector is unclear. But the new guidelines seem to allow for various means of implementation. Given sufficient flexibility on both sides, the new guidelines should not signal the end of World Bank lending to China's petroleum sector. Indeed, the two sides may be able to work out creative new financing schemes that will enable the bank to build on its already substantial contribution to China's onshore oil development, and perhaps encourage greater participation from foreign firms at the same time. 完

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Natural Gas: the Untapped Energy

Is China ready for a major commitment to natural gas?

Tom Engle

Natural gas is an industry in need of invigorating. Gas supplies only 3 percent of China's energy needs, compared to about 70 percent for coal and 20 percent for oil. Annual output has dropped about 20 percent since 1979. Geography can be blamed for some of the problems facing the industry. But the Chinese government, through official neglect, has failed until now to capitalize on the country's apparently bountiful gas reserves. The time may have come to rethink that strategy.

While searching for oil off the south China coast in 1983, Atlantic Richfield discovered huge natural gas reserves. The discovery sheds light on both the problems and the prospects of China's natural gas industry. Located 65 miles from the closest Chinese shoreline, the find presents obvious problems of utilization. Yet the apparent enormity of the find has encouraged ARCO to invest considerable resources in searching for a profitable way to exploit the gas. With luck, the two sides will agree on a scheme to pipe the gas to a proposed huge fertilizer plant on Hainan Island that will allow China to reduce its imports of this critical commodity (*see* page 27). The project, which would increase China's gas output by 50 percent, may provide just the shot in the arm needed by the country's natural gas industry.

Production concentrated in Sichuan and the northeast

No one really knows how large China's natural gas reserves are. Estimates range from that given by an optimistic Chinese petrogeologist, who put reserves at some 870 trillion cubic feet (enough to last more than 2,000 years at current low levels of consumption), to a World Bank estimate that puts recoverable reserves at 4.6 trillion cu ft. The latter implies only a 10-year reserve at current consumption levels. The bank, however, notes that gas reserves have not been adequately explored and that known reserves may be a small fraction of the full potential. China currently produces less than 420 billion cu ft of gas per year, the great majority of it at two widely separated areas of the country.

Sichuan Province accounts for at least half of China's known natural gas reserves and annual production. The province reportedly produced about 186 billion cu ft in 1983. The people of Sichuan have some experience in finding and using gas: they drilled their first gas well 1,900 years ago during the Eastern Han dynasty and used the product as fuel to evaporate brine for salt. Sichuan's gas is "nonassociated," i.e., not part of any oil deposits. More than 100 drilling and exploration rigs are in operation in about 60 producing gas fields in the province. China's biggest producing field—at Weiyuan in the Sichuan Basin south of Chengdu—is thought to have reserves of about 1.4 trillion cu ft.

Despite production declines in Sichuan since 1980, a recent Chinese press report said the province could double its gas output by the end of the decade. But there are indications of only a modest increase in exploration and development efforts. In 1983, 61 exploration wells were drilled in the province and 21 new gas discoveries verified. Fortunately for ambitious provincial planners, 60 percent of the known oil- (and thus often gas) bearing strata in the Sichuan Basin have not yet been drilled.

Most of the rest of China's natural gas is associated gas produced in northeast China's major oil fields, especially Daqing and Shengli. Much of this gas traditionally has been burned off as waste, but Chinese engineers have made greater efforts in recent years to capture the gas along with the crude oil. Still, Daqing's gas output peaked at 330 million cu ft per day in 1980 and by 1983 had slipped to 240 million cu ft per day. Almost 10 percent of China's 1983 gas output was gathered from oil fields at Shengli, near the mouth of the Yellow River in Shandong Province.

Areas of future promise

Though dwarfed by these main producing areas, shallow gas deposits are also known to exist along the coastal plain in Jiangsu, Shanghai, and Zhejiang. Several other onshore gas sites, although unimportant in terms of current production, deserve mention as areas of active exploration and/or estimated high reserves. Chinese experts believe associated gas reserves of some 1.8 trillion cu ft may be present in the Zhongyuan Basin, a 2,000-square mile area along the border between Henan and Shandong provinces. Drilling is continuing in an effort to verify this optimistic estimate. Official Chinese reports say Zhongyuan will soon replace Daqing as the biggest natural gas producer in eastern China, with annual output exceeding 20 billion cu ft.

At the Huabei complex of five oil fields in central Hebei Province, four new gas wells discovered in late 1982 and early 1983 produce 840,000–2.2 million cu ft per day. Associated gas reserves at the Liaohe oil field in Liaoning Province are estimated at about 1.2 trillion cu ft; 111 gas wells were in operation there last year.

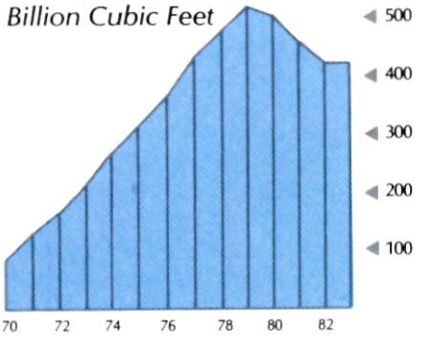
China's major untapped gas reserves are believed to lie in the far west. Chinese and French seismic teams have mapped 30 potential oil and gas bearing structures over the past three years in Xinjiang's Junggar Basin, where France's General Geophysical Co. has been working under contract with the Petroleum Corporation of China. Gas was discovered more than 20 years ago in the Qaidam Basin in Qinghai, but has so far been used only in small amounts for local consumption; the rest has been shut in because of the absence of pipelines to transport the fuel to more populated areas.

China also has substantial but currently inestimable gas reserves offshore. The principal confirmed find, ARCO's in the Yingge area of the South China Sea south of Hainan Island, is expected to produce 500 million cu ft per day after development. The French oil company Total Chine has also found gas in the South China Sea. Two test wells sunk in 1983 have flows of 2.5 million cu ft and 6.3 million cu ft per day.

In the east, the China Shallow Sea Oil Exploration Co. says rich oil and gas reserves have been found in the waters and beaches near Tianjin. Three hundred seismic experts are reportedly at work in the field, including two teams from Western Geophysical Co. China's Ministry of Geology has also found big natural gas deposits in the East China Sea. But besides the transport problem, development of these fields is complicated by the fact that they lie in territories disputed among China, Japan, South Korea, and Taiwan. Still, some experts envision China selling this gas to Japan via pipelines to be built before the end of this century. And some even foresee Chinese gas sales to Taiwan as one element in an eventual rapprochement between the mainland and the island.

China's Natural Gas Output 1970-83

Billion Cubic Feet



SOURCE: State Statistical Bureau

How China uses its gas

The country's severe shortage of pipelines dictates that almost all natural gas is used near the production site. Thus gas is an extremely rare commodity outside of Sichuan Province and the northeastern oil fields. Published Chinese estimates of how gas is used are only partially helpful, so some speculation is required to arrive at a complete picture.

The single biggest use of gas in China, about 30 percent, is as feedstock for making fertilizer. Gas from fields in southern Sichuan, for example, is piped to Luzhou's Natural Gas Chemical Works, which produces 400,000 tonnes of synthetic ammonia and 640,000 tonnes of urea per year using equipment imported from the United States and Holland.

About a quarter of the gas produced is used in other heavy industries, mainly other petrochemical industries and metallurgy. Sichuan's gas reserves have fueled a rising chemical industry in the province. The Sichuan Changshou Vinylon Plant in Chongqing, China's first large complex producing chemical products and fibers from natural gas, was built between 1974 and 1979. Seven complete sets of production equipment were imported from France and Japan for the factory, which produces vinylon staple and draft yarn, polyvinyl alcohol, and vinyl acetate. (*See* page 41.) China's first natural gas treatment factory to incorporate foreign and domestic technologies went into full operation at Wolonghe near Chongqing in 1982 after almost two years of trial operation. The plant, whose main components were imported from Japan, produces petrochemical products using sulfur it removes from highly sulfurous natural gas. Clean gas is also produced.

China's oil fields probably use about 20 percent of the gas produced, or about half of the associated gas. Oil fields use gas to heat oil, to heat workers' houses and administrative buildings, or reinject it to force more oil to the surface.

Most experts believe that about 15 percent of China's natural gas is used by households and commercial enterprises. The latter includes small factories, which probably make up the bulk of this category. Residential use of gas apart from oil workers' housing is small but growing. Facilities in 83 cities permit some 18 million people to use gas for heating and cooking, four million more than in 1980. But this includes families using bottled gas; households that rely on piped gas constitute only a small minority. And most of the gas consumers live in Sichuan, the only part of the country with a large-scale distribution network for household use. Still, the government is making efforts to upgrade existing urban gasworks and build new facilities as it tries to improve living standards and reduce air pollution from burning coal. Projects recently completed or under construction will bring gas of one sort or another to 700,000 more households in Beijing, Shenyang, and Tianjin by 1987.

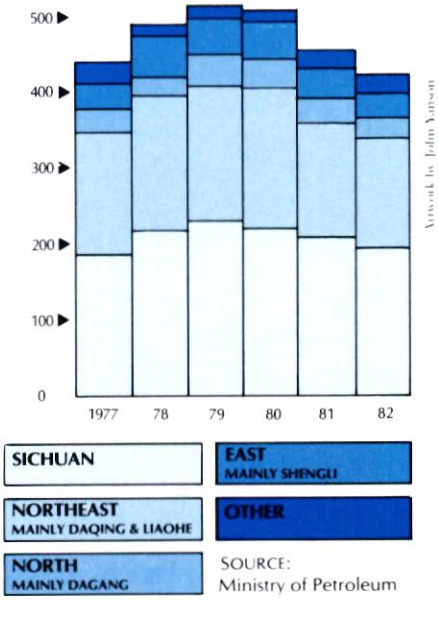
China burns the remainder of its natural gas, some 10 percent, in thermal power plants. But this figure does not represent all the gas directly burned as fuel since some of the gas counted for industrial use is actually burned by power plants adjacent to factories.

An industry confronted by problems

Natural gas, like oil, is an industry

China's Regional Natural Gas Production 1977-82

Billion Cubic Feet



SOURCE: Ministry of Petroleum

that is resource-constrained and thus driven by new discoveries. The problem is that most of China's gas is thought to be underwater or found in environmentally harsh western regions—thus raising exploration costs. China has not sufficiently invested in exploratory drilling that might confirm the existence of actual deposits, despite the country's prodigious estimated reserves. Annual investment in natural gas exploration is perhaps $60 million while investment in development is an even smaller $50 million at most.

The problematic location of China's gas also means that exploratory drilling, while necessary, is only the first headache. Transporting the gas is also expensive under such conditions. The country is beginning to make some progress in building gas pipelines. A 90-mile line will link the Zhongyuan field to a fertilizer plant in Henan Province while another planned line will send gas 230 miles to plants in Hebei and Shandong. New pipelines are being built to supply industries and households in Beijing with gas from the Huabei fields. The effort remains scant relative to the need, however, and will stay that way unless more investment funds are allocated for pipeline construction.

Still, the problems facing the natural gas industry do not end with inadequate investment in exploration and development. Where the Chinese are exploring, they are confronting important technical barriers. As one recent visitor to China, Robert Hefner IV of the GHK Companies put it, "Most exploration is in shallow sediments—that's where they are limited to exploring due to the available technology. There's a higher volume of gas in deeper wells, but the Chinese don't have the technology to drill for it. They haven't begun to drill for gas in China."

Another frequently cited reason for the recent production decline is bad reservoir management at existing nonassociated gas fields in Sichuan. Many Western experts say Sichuan fields are experiencing a decline in reservoir pressure because Chinese engineers are allowing too much gas to flow up the wells too quickly. As pressure drops, water below the gas deposits more readily penetrates the gas and becomes mixed with it at the wellhead. But another recent visitor to China, CER Corporation President G.R. Leutkehans, says the situation is not so simple. "It's not obvious that water coning is the source of the problem even though that's the first logical explanation. Various things happen during gas production: pressure drop, pipe corrosion, water coning, etc. The Chinese know they have a problem but lack the data to understand the production dynamics. The remedies they've tried haven't worked."

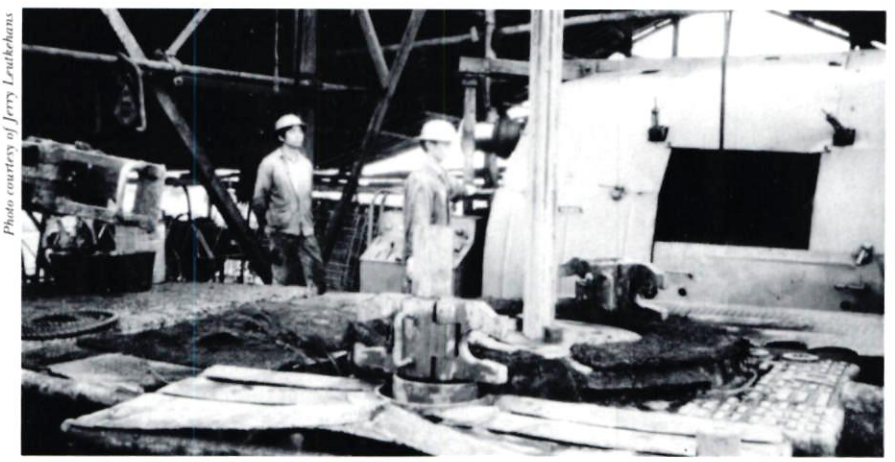
China has made more progress in reducing the waste of natural gas produced as a byproduct at oil fields. In burning off this associated gas, China has merely followed a pattern established by developed countries. In trying now to reduce waste, the country is going through the same evolution. Gas once wasted is now used to make electricity or as feedstock for fertilizer plants. The Ministry of Petroleum Industry is expected to use gas to fire two heavy-duty turbines it is buying from General Electric that will provide power at the Karamay and Daqing oil fields.

But there is still much room for improvement; gas flares remain an all too familiar sight at oil fields. As much as half of the gas produced at the Zhongyuan oil field, for example, is reportedly still burned off. And China's coal mines annually discharge 106 billion cu ft of methane, an amount equal to one-fourth of annual gas output. This methane could potentially be piped to cities for residential and commercial use.

Photo courtesy of New China Pictures

A natural gas pumping station in Sichuan Province. Sichuan currently produces about half of China's gas and hopes to import modern technology to help it double output by the end of the decade.

Photo courtesy of Jerry Leutkehans



Workers at a wellhead at Sichuan Province's Weiyuan gas field, the country's largest.

Energy crisis forces rethinking of the potential of gas

Widespread agreement prevails among Western experts that China faces a serious energy shortage, and that the failure to exploit the nation's gas reserves is one facet of the shortage. China's modernization goals require energy production increases that will be difficult to achieve, especially since China hopes to continue generating a large portion of its annual foreign exchange receipts through petroleum exports. Many experts think that resolving this dilemma will require a broad-based energy policy that places a higher priority on developing China's gas resources. Optimists believe Chinese energy planners are moving toward just such a decision.

GHK's Hefner says, "The Chinese

realize how much energy it will take to be a developed country and they realize the potential of their natural gas resource base. The commitment is there to invest in gas and in the whole infrastructure associated with it." CER President Leutkehans gained the same impression during his visit to Sichuan: "Saving the Sichuan gas fields requires a big investment, but the Chinese are going to have to make it. I had the feeling they're committed."

There are other indications that planners may be shedding their prejudice against gas. The country plans to expand its gas-based fertilizer and chemical industries. And the government has recently raised the price of gas, providing an additional incentive to develop existing resources. Hefner says Central Planning Commission officials told him the price rose threefold between June and September last year. But it remains artificially low: the new official price, expressed in oil equivalent terms, is $8 per barrel. Hefner says, "The Chinese realize prices must be brought more into line with other countries, but it will take quite some time."

Opportunities and problems for foreign involvement

If China is truly rethinking its neglect of natural gas, it may have to turn to foreign firms, for the time being at least, in order to gain the technology needed to reverse the production decline at established fields and effectively explore and develop new fields. One Western expert described foreign involvement in China's gas development to date as one of the areas of greatest potential but least action. Any increase would be from a base of virtually nil—although some foreign seismic teams are working under contract in China, no foreign companies are now drilling specifically for gas onshore. Until ARCO's serendipitous find made confirmation drilling necessary, the same held true for offshore areas.

In terms of foreign activity, ARCO's discovery and proposed fertilizer deal is thus easily the biggest game in town. ARCO and its partner Santa Fe Minerals (Asia) Co. Ltd. have been negotiating with the Chinese on piping the gas to a proposed fertilizer plant on Hainan Island that would produce at least 3 million tonnes of ammonia per year. Reports say the pipeline would cost about $500 million and the factory $2.5 billion. ARCO Chairman Robert Anderson has discussed the venture with China's top leader Deng Xiaoping and Premier Zhao Ziyang, both of whom have approved the project's general concept.

Fertilizer companies from Japan and several Western countries have expressed interest in building the plant. It is not yet known if all the gas produced would be used as fertilizer feedstock. Many experts believe that if China and ARCO set the deal some of the gas will also be used to generate electric power. According to one report, Premier Zhao supports a plan to pipe some of the gas as far Guangzhou, where it would be used to generate electricity for mainland Guangdong Province.

If China is truly rethinking its neglect of natural gas, it may have to turn to foreign firms to gain the technology needed to reverse production declines at established fields and effectively explore and develop new fields.

GHK Corp. is another American company trying to position itself for expanded business opportunities in natural gas. Hefner, the firm's coordinator for exploration and production, has made several trips to China to discuss possible onshore drilling in different parts of the country. Among the areas where GHK would like to do business is Sichuan, which has geologic similarities to the Anardako Basin in western Oklahoma where the company does the bulk of its business. Hefner is optimistic about reaching some form of an agreement and believes prospects are good for smaller independent firms—especially in areas where the reserves are not thought to be large enough to attract multinational firms.

GHK is trying to sell China on the idea that as much as one-third of its future energy growth could come from natural gas. Gas is clean, efficient, and can be used as fuel for power plants of various sizes. It requires lower capital investment than developing coal or nuclear power sources. Hefner believes China will soon negotiate various business arrangements with foreign firms ranging from drilling service contracts to production sharing agreements. CER Corp. is discussing a proposal to perform reservoir evaluation and stimulation methods. Corporation President Leutkehans hopes the firm will sign an agreement to work in China in the first half of this year.

A production sharing arrangement, which GHK would prefer, presents obvious problems due to the fact that onshore gas cannot be exported. The virtual absence of international trade in natural gas means that there is no established world price. At what foreign exchange price should the foreign investor in a production sharing arrangement be remunerated? Hefner says he and the Chinese have been discussing schemes whereby the partners arrive at an average world price, or in which the foreign partner would be paid in exportable oil on an energy-equivalent basis. Such considerations are sure to bedevil any proposed foreign equity involvement in China's gas industry.

World Bank to the rescue?

The nonexportability of gas raises concern that foreign capital will not become involved as readily as the optimists predict. China has been reluctant to spend foreign exchange in developing an industry unless there is a prospect of product exports. Gas can only be used domestically, and so cannot pay for itself in terms of foreign exchange.

The World Bank has been investigating the possibility of a loan that might show a way out of this knot. The bank would lend the foreign exchange component of a technical assistance project for Sichuan Basin gas fields. By eliminating the need for China to spend its reserves on foreign equipment and technology, the loan renders gas development more attractive. No one is suggesting such a policy as a long-term solution to developing China's gas resources. But such funding may be an important impetus in the development of a neglected industry. 完

China's On Land Oil and Gas Organizations

The industry looks outward

David Denny

China's onshore oil and gas industries are in the midst of significant changes that will affect both their internal organization and their relationships with foreign companies. New economic reforms have granted China's on land oil and gas fields more flexibility and incentives to maximize output, while opening up the possibility of joint exploration and production-sharing arrangements with foreign firms. Meanwhile, the traditionally restrictive purchasing system is being abandoned in favor of granting more direct control over purchasing to the ministries in charge of oil and gas exploration and development. Much of this authority will be in turn further passed down from the ministries to their lower-level units.

These trends will accelerate in 1985. But while the general policy direction is clear, there is still tremendous uncertainty about how the new system will work in practice. Although China is moving toward greater competition in general, key commodities such as oil and gas will remain under the tight control of central planners. Therefore, decisions about these industries will often be based not on market factors alone, but on the political ties and bureaucratic clout of various Chinese players. Bureaucratic warfare over certain key questions pertaining to the structure of the oil and gas industries has already begun.

The Ministry of Geology and Mineral Resources (MOGMR) and the Ministry of Petroleum Industry (MOPI) are the chief operational units that explore and develop China's hydrocarbon resources. They are large, complicated, and powerful organizations in the midst of change. This article presents what is known about these and other key organizations responsible for on land oil and gas resources, with emphasis on recent changes in their responsibilities and functions.

MOGMR: a role in exploration

MOGMR's basic responsibility is to survey China's surface and subsurface terrain (offshore as well as on land) for natural resources, with a mandate to develop detailed (on a scale of 200,000:1) geologic maps. MOGMR locates resources through extensive seismic surveys and stratographic drilling, but turns them over to other ministries for development once they are determined to be commercially exploitable. Thus, MOGMR's function is like that of the US Geological Survey, with which MOGMR maintains a technical exchange and cooperative research program. MOGMR shares another similarity with its US counterpart: both have a relationship with the oil industry that is at once mutually supportive and openly competitive and even hostile. As the competitive spirit is unleashed in China, rivalries between MOGMR and MOPI have become more visible.

MOGMR devotes substantial resources to exploring for petroleum. These efforts are planned and coordinated at the national level by the Petroleum Exploration Survey Department—one of MOGMR's dozen or more functional departments (*see* organizational chart page 31). Regional or provincial entities carry out the actual geologic work.

MOGMR already has an aggressive program to locate on land hydrocarbon resources. It has recently been active in five separate areas that it staked a claim for in late 1982: (1) central and east China (including western Sichuan and the Ordos Highland in Inner Mongolia) and the southern region of northeast China; (2) offshore areas in the East and South China Seas; (3) northwest China, especially the Tarim Basin; (4) complex geologic structures in east China's Mesozoic and Cenozoic basins; and (5) the carbonates in the upper and lower reaches of the Yangtze River.

Last October the Chinese press announced that MOGMR had drilled a wildcat well producing almost 3,000 barrels of oil per day (bopd) in the Tarim Basin. And MOGMR's North China Petroleum Geologic Headquarters has claimed credit for finding 370 million barrels of oil reserves and 353 billion cubic feet of natural gas reserves "at the periphery" of the Zhongyuan oil field in central China. The latter claim is particularly interesting because MOPI, rather than MOGMR, usually takes the lead in exploring for oil in and around proven oil fields.

MOGMR is clearly interested in developing more extensive relations with foreign companies. The ministry has requested aid from a Japanese company to explore for oil along the Jiangsu Province portion of the Yangtze River. And MOGMR officials in Sichuan have discussed hiring US crews to renovate and operate an old Romanian rig, similar to arrangements MOPI has with Parker Drilling Co. and Pool-Intairdrill (*see* page 18). MOGMR has also formed local companies for offshore geologic exploration: The Guangzhou Marine Geologic Exploration Company and the Shanghai Geoexploration and Drilling Company, which have purchased foreign equipment, and discussed joint ventures with foreign companies to provide drilling and other technical services.

In an October interview, a MOGMR official confirmed that cur-

rent policy bars MOGMR from actually developing the commercial resources it finds. But the same official suggested that this prohibition could be lifted in the future. Until this is done MOGMR units will have difficulty offering foreign companies terms as attractive as those offered by MOPI. According to several US companies, these restrictions have caused dissatisfaction among MOGMR professionals, who would also like ready access to foreign petroleum exploration technology.

Despite restrictions on MOGMR's operations, US companies have begun preliminary discussions on forming exploration and development joint ventures with the ministry. Officials from the State Planning Commission's Fuels and Power Department met with one US company and indicated that, in principle, MOGMR will not be prohibited from exploiting resources it might find: a final decision will depend on MOGMR's ability to put together a satisfactory contract. Nevertheless, foreign companies should approach such ventures with MOGMR using more than the usual caution, since they constitute a very basic change in the ministry's area of responsibility. It would also set a precedent for MOGMR to attempt to exploit other resources—a precedent that would presumably be resisted by the Ministry of Metallurgical Industries and other concerned agencies.

A close-up look at MOPI

MOPI is similarly undergoing organizational changes that will affect a broad range of its activities, including relations with foreign companies. MOPI's present organizational structure has four main elements: (1) functional departments that plan oil field output targets, exploration and drilling activities, and allocate resources among fields; (2) producing oil fields; (3) specialized companies; and (4) miscellaneous supporting organizations.

Functional departments. These departments transform the general plans of the State Planning Commission (SPC) into operational orders. They are also the instruments through which oil fields receive their allocation of investment, foreign exchange, and other resources needed for plan fulfillment.

MOPI's Planning Department is the channel between oil fields and the SPC. It is responsible for reconciling national oil and gas production goals with the specific targets for each field. Since the Planning Department monitors the long-term development of China's oil and gas fields, it plays a key role when important new developments are under consideration. It also has primary responsibility for the World Bank oil field loans to China, and has coordinated MOPI's requests to the US government's Trade and Development Program for financing feasibility studies.

MOPI's Equipment Manufacturing Department controls the ministry's own petroleum equipment manufacturing facilities. The Supplies Department is in charge of obtaining the equipment that the oil fields and the various other functional departments need to fulfill their plans. Other departments, such those for oil field development, drilling, and geologic exploration, monitor and provide general direction for the activities of subordinate companies that carry out the actual work. They receive regular reports on activities of their subordinate organizations in the oil fields and periodically make inspection tours to the fields.

As in other sectors of the Chinese economy, the lowest operating units—in this case the oil fields' exploration or drilling companies—appear to be under dual control of the relevant MOPI departments in Beijing and local oil field officials. In the past, department officials have been powerful arbiters of local oil field plans and exercised control over the resources necessary to fulfill

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  Lin Xuefeng
- HYDROLOGY AND ENGINEERING GEOLOGY
  Zhang Hongren
- MINERAL EXPLORATION ENGINEERING
  Guo Zhenxi
- PETROLEUM EXPLORATION SURVEY
  Xu Baoren
- SUPPLIES
  Jiang Ping
  *Bin Zhaoji**

NATIONAL COMPANIES AND MAJOR RESEARCH INSTITUTES

- CHINA GEOEXPLORATION AND DRILLING ENGINEERING COMPANY

  Guangzhou Marine Geologic Exploration Company

  Shanghai Geoexploration and Drilling Company

- GEOLOGY EXPLORATION, ENGINEERING, AND EQUIPMENT MANUFACTURING COMPANY

- RESEARCH INSTITUTES

  Geologic Remote Sensing Center

  Institute of Exploration Techniques

  Institute of Application of Computer Techniques

  Geology and Mineral Resources (including 7 institutes specializing in specific regions or historical periods)

* Deputy Director

SOURCES: The National Council's Beijing office; US Geological Survey; and National Council files.
Chart prepared by David Denny.

those plans. For example, the drilling companies of the various oil fields appear to take their orders for specific drilling activities from the local oil field officials. But annual drilling plans and the number of drilling rigs and staffing needs are monitored and approved by MOPI's Drilling Department in Beijing.

When an oil field needs additional drilling resources, it requests them from the Drilling Department. MOPI's Drilling Department then has a number of possible options: (1) transfer drilling resources from other fields; (2) ask the Supplies Department for inventoried resources or to requisition newly produced Chinese equipment; or (3) request the Supplies Department to import the equipment. It is difficult to neatly categorize the decision-making process among these various departments and oil fields. Foreign companies report that when technical discussions on importing equipment actually begin, MOPI is often represented by individuals from the Supplies Department, the relevant functional department (e.g., Drilling Department), and the end-user oil field.

Oil fields. Large oil fields have been accorded department-level status under MOPI. Directors of these fields thus report directly to the petroleum minister or vice minister. Almost all of China's nonassociated natural gas fields are located in

MINISTRY OF PETROLEUM INDUSTRY ORGANIZATIONS AND PERSONNEL INVOLVED IN ON LAND ACTIVITIES

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  Imports: *Wu Xunyue*
- GEOLOGIC EXPLORATION
  Zhai Guangming
  Physical Surveying: *Pan Shuqi*
  Logging: *Lu Dawei*
- OIL FIELD DEVELOPMENT
  *Tan Wenbin, Zheng Hao**
  Technology
  Engineering
  Production
- DRILLING
  Chang Hongfa
  *Wang Guanqing**
  *Li Rongzao**
- PLANNING
  Zhou Qingzu
  *Cai Shusheng**
- SUPPLIES
  Chen Zexuan
  *Zhang Delu**
- EQUIPMENT MANUFACTURING
  Xia Peiqing
- TRANSPORTATION AND MARKETING
  Sun Yanzhen
- CAPITAL CONSTRUCTION
- FINANCE
  Hu Hanbing
- PERSONNEL AND EDUCATION
  Chen Hongfa
- PIPELINE BUREAU**
  Zhu Hongchang

NATIONAL COMPANIES AND RESEARCH INSTITUTES

- CHINA NATIONAL OIL AND GAS EXPLORATION AND DEVELOPMENT COMPANY
  President: *Li Tianxiang*
  Vice Presidents: *Dou Bingwen, Li Yuan, Li Xianglu, Fu Zhida*
  Advisor: *Zhang Wenbin*
  Procurement Department: *Wu Xunyue*
- CHINA NATURAL GAS EXPLORATION AND DEVELOPMENT COMPANY
  General Manager: *Wang Jingxing*
  Deputy General Manager: *Li Zhaoren*
- CHINA PETROLEUM ENGINEERING AND CONSTRUCTION COMPANY
  General Manager: *Shan Yongfu*
- CHINA SHALLOW SEAS COMPANY
  General Manager: *Ma Jixiang*
- PETROLEUM SCIENTIFIC AND INTELLIGENCE RESEARCH INSTITUTE
  Director: *Hu Jianyi*
- PETROLEUM EXPLORATION AND DEVELOPMENT RESEARCH INSTITUTE
  Director: *Hu Xiangyao*

OIL FIELDS WITH DEPARTMENT-LEVEL STATUS

- DAGANG
- DAQING
  Li Yugeng
- JIANGHAN
- KARAMAY
  Zhang Yi
- LIAOHE
- RENQIU
  Hu Liangcai
- SHENGLI
  Zhu Wenke
- SICHUAN
- YUMEN
- ZHONGYUAN
  Hu Xiaoyun

* Deputy Department Directors
** located at Langfang in Hebei.
SOURCES: National Council's Beijing office; Foreign Commercial Service, US Embassy in Beijing; National Council files; World Bank reports, and comments by company officials.
Chart prepared by David Denny.

Sichuan Province and their directors report to the Sichuan Petroleum Administration, which also has department level status within MOPI.

The balance of power between the oil fields and MOPI has shifted considerably over the years. During the early growth years of China's petroleum industry, MOPI's power went largely unchallenged. It could move resources around the country at will as new oil fields were discovered. For example, after the discovery of Daqing, large numbers of technicians were moved there from Yumen in northwest China. The same process occurred in the late 1970s when skilled workers at Daqing were moved en masse to Shengli.

Although MOPI's functional bureaus still wield considerable authority, the power of the local oil fields has since grown, while that of MOPI's departments has declined. Older oil fields such as Daqing have become large, powerful organizations in their own right, and as a result, are better able to protect their own resources despite pressure from Beijing. For instance, one Daqing oil field technician told an American friend about his desire to transfer to south China to work in offshore exploration. Such a transfer seemed to make good sense, since he had excellent English and technical expertise. But when the American suggested that the technician discuss the transfer with MOPI's Beijing headquarters, the individual replied resignedly that Daqing would probably not release him. The oil fields obviously guard their best employees jealousy, and have some control over their assignments.

Another anecdote comes from a US petroleum equipment exporter, whose company wanted to modify a contract calling for the delivery of drilling rigs to two different Chinese oil fields. The US firm stated that oil field "A" did not need the rigs immediately, and that it would make more sense (and save the company transport costs) to send the first batch of rigs to oil field "B". But when the firm suggested the change to a MOPI official, he seemed unable to make the decision. Instead, he skeptically asked the US company if they were sure they could get the oil field to agree to the change.

Last December, President Li Yugang of Daqing oil field emphasized that relations between oil fields and MOPI functional departments would henceforth be on a "business" basis. Relations would be that of "sister" units, implying that oil fields will no longer take orders from the departments.

As their power has grown, China's oil fields have also become insulated from each other. People working closely with the oil fields have noted an extremely limited exchange of information, technology, and resources. One of the most important World Bank criticisms of China's petroleum organizations is that "these large oil companies, self-contained as they are, have little or no contact amongst themselves or with the rest of the world; the resulting insulation makes learning from one another's experiences and diffusion of new technology significantly more difficult." Ironically, the recent reforms could complicate matters by further increasing the oil fields' independence and insulation.

Specialized companies. The Ministry of Petroleum Industry has formed several corporations with specialized functions. One such company, the China Petroleum Engineering and Construction Company (CPECC), acts as MOPI's domestic and international engineering company. In the past, it has constructed oil and gas fields, petrochemical refineries, and oil and gas pipelines. CPECC now aggressively seeks opportunities to work abroad and has authority to negotiate contracts directly with foreign companies.

The China National Oil and Gas Exploration and Development Company (CNOGEDC) is very familiar to foreign industry representatives. When Chinese officials travel abroad or host foreign companies in China, they often wear a CNOGEDC hat. Occasionally, this has led to the erroneous conclusion that CNOGEDC has independent operational authority over oil fields or other MOPI operating entities. In fact, the opposite appears to be the case. CNOGEDC has been a small shell organization used by MOPI to meet, greet, and, occasionally, negotiate with foreign companies. Except for a small secretariat of officials who maintain liaison with foreign firms, CNOGEDC draws its "personnel" from the various MOPI departments or oil fields that have an interest in foreign equipment and technology.

CNOGEDC is likely to become even more visible, since it is currently being expanded and given important new responsibilities. CNOGEDC has heretofore had no operational functions, but in the future it will play the same role for onshore development that the China National Offshore Oil Company (CNOOC) plays in offshore operations. In fact, CNOGEDC may become even more powerful than CNOOC because MOPI has indicated that foreign oil companies exploring on the mainland must utilize Chinese personnel and equipment to an even greater extent than offshore.

CNOGEDC undoubtedly will draw its resources from MOPI's subordinate bureaus and oil fields. However, it is not clear that CNOGEDC will be built up as an integrated independent oil company with substantial amounts of permanently transferred resources. It could remain a shell company that obtains its resources on short-term loan or contract with other MOPI organizations.

MOPI has also announced the formation of the China Natural Gas Exploration and Development Company (CNGEDC). Little is known about the new company, but it has met with at least one US company interested in exploring for natural gas in China. This suggests that CNGEDC may be the formal MOPI entity that would cooperate with foreign companies when nonassociated natural gas is the target for exploration. However, MOPI officials have indicated that at this point CNGEDC does not have authority to sign formal contracts with foreign companies.

The China Shallow Seas Company (CSSC) has authority to drill in waters with depths up to 50 meters. It has been active in areas near Dagang and Shengli. CSSC recently hired two Western Geophysical seismic crews to operate in the Bohai.

Educational, scientific, and other organizations. MOPI also incorporates a large number of entities that are only indirectly related to the ministry's petroleum and gas exploration and production responsibilities. These include at least six specialized petroleum colleges and a large number of general social units. The latter units support the needs of more than one million MOPI workers, most of whom live in integrated "factory towns."

Supraministerial organizations

To round out the organizational

picture, business people should be aware of supraministerial agencies that often hold life and death power over the ministries. These include the State Planning Commission (SPC), the State Economic Commission (SEC), and the State Council.

The SPC is responsible for both the annual operational plan and long-range plans of 5, 10, and 20 years. The SPC's main role in the area of energy planning is to analyze the prospective long-term balance between energy supplies and demands, and to make the necessary investment resources available. In recent years, State planners have recognized the need to increase investment in energy, especially in onshore oil exploration and development. The key bureaus within the SPC involved in energy planning are the Fuel and Power Bureau and the Energy Conservation Bureau.

The SEC monitors industrial plans and tries to eliminate imbalances. Since energy shortages are seen as a major constraint on industrial development, the SEC plays a key role in national energy planning. When the former State Energy Commission was broken up in 1982, the SEC took over most of its units including the Energy Research Institute (ERI). In an interview last October, an ERI official said the State Council had assigned ERI four tasks: (1) to forecast energy output targets for annual and five-year plans, along with the SPC's Fuel and Power Department; (2) to analyze and make recommendations on energy conservation; (3) to research alternative sources of energy; and (4) to provide information and statistics on China's energy situation.

The State Council is the supreme supraministerial organization and final arbiter of interministerial debates. The State Council itself has a small regular staff that supports the premier and vice premiers. It also occasionally organizes ad hoc interagency groups to reconcile the competing needs of various ministries. For example, the State Council has a "leading group" for making offshore petroleum equipment decisions. While this group was originally formed to officiate on questions of offshore petroleum equipment purchases, the similarity of some technologies and equipment suggests it may also become involved in purchases for on land exploration and production.

Increasingly, business people obtain guidance from the SPC, the SEC, and other supraministerial organizations as to the viability of a given project, and whether its goals are consistent with central government policy. One example of this in the oil industry is the SPC's willingness to comment on MOGMR's role in resource development. However, direct contact with supraministerial organizations on specific deals remains the exception rather than the rule.

The role of MOFERT's trading organizations

The Ministry of Foreign Economic Relations and Trade (MOFERT) has the authority to approve major projects involving foreign companies, especially when foreign investment and technology licensing are involved. MOFERT also controls several foreign trade corporations (FTCs) that in the past have been the nearly exclusive purchasers of petroleum-related equipment and technology. The FTCs did not themselves make the key decisions—the State Planning Commission authorized MOPI to spend certain amounts of foreign exchange to achieve planned import targets. Nevertheless, MOFERT's FTCs were the only organizations with contract-signing power through which these petroleum equipment imports could be arranged.

In the last two years, there have been significant changes in what China's petroleum and geology ministries have been buying, and in the channels through which they can acquire oil field equipment. Further striking changes are expected this year. The traditional role of MOFERT's FTCs is also changing. However, the three FTCs discussed below will probably continue to play a significant role in purchasing petroleum equipment and services.

The chief duty of the China National Technical Import Corporation (TECHIMPORT) is to purchase technology, complete plants, and technical services. Because MOPI and MOGMR have mainly bought equipment, not complete plants, TECHIMPORT did not play a key role in their purchases in the past. However, this has changed over the last few years in which China has received three major World Bank petroleum loans, and financial aid from the Japanese government earmarked for oil field development. Since TECH_IMPORT is the purchasing agent for all such concessionary grants and loans, it has gotten involved with the oil industry through such projects. TECHIMPORT's involvement in the oil industry has also grown in step with the recent proliferation of technical assistance contracts listed on page 18. TECHIMPORT negotiated and signed most of these contracts together with CNOGEDC.

The primary role of the China National Instruments Import–Export Corporation (INSTRIMPEX) has been to purchase computers, instruments, seismic survey equipment, and other high-tech electronics equipment for MOGMR and MOPI. This has been a particularly booming business as China's exploration activity has accelerated. Finally, the bulk of petroleum equipment has been purchased by the China National Machinery Import–Export Corporation (MACHIMPEX), and by its Third Bureau in particular.

Both foreign business people and Chinese petroleum officials have been unhappy with this system of trading exclusively through MOFERT's FTCs. Foreign firms criticize the barriers between themselves and their ultimate customers—the oil fields. MOPI officials chafe at bureaucratic delays, unnecessary haggling, and the lack of expertise displayed by FTC officials. The FTCs often buy equipment that gathers dust because of a breakdown in communications between MOPI and the FTCs.

A decentralization of purchasing power

The system is now being modified. While MOPI's organizations generally continue to use the FTCs to sign foreign contracts, officials of MOPI's departments, institutes, and oil fields are becoming more approachable. Foreign business people can now meet with end users directly. Companies now hold technical discussions with Chinese end users and even go far toward finalizing the details of a contract with no involvement by FTCs. Indeed, Chinese oil field officials now aggressively approach foreign firms without using any intermediaries.

This, of course, has given rise to a

new problem: how is the foreign business person to judge the credibility of the many Chinese organizations that want to make a deal? In this respect, the old days were easier because one could assume that if the FTC made an inquiry, then the project already had official approval.

The second major change in the purchasing system involves a devolution of authority within MOPI itself. Oil field officials have more authority over foreign exchange expenditures, partly because of a new system whereby oil fields are credited with the value of their above-quota oil output. Quotas are fixed for several years and above-quota output is valued at international prices rather than low domestic prices. Oil fields are also allowed to retain a portion of the foreign exchange generated from their own output. These incentives, combined with much greater access to foreign companies, help eliminate several layers of middlemen. They should also lead to better purchasing decisions and a more productive use of imported equipment.

Finally, MOPI has increasingly been utilizing nontraditional (i.e., non-MOFERT) FTCs. In particular, China's Hong Kong-based Everbright Corporation has been the agent for at least two oil field equipment purchases by Daqing. Executives of one US firm were greatly surprised when Daqing officials told them that they wished to seal a deal through Everbright rather than MACHIMPEX. Nevertheless, they agreed to discuss the transaction and ended up concluding one of the easiest, least time consuming, and most profitable deals they had negotiated with China in 10 years. Other active companies include the China Resources Corporation (a PRC company based in Hong Kong), the China North Industries Corporation, and provincial foreign trade corporations.

A nationwide reform of the foreign trade system being put into effect this year will accelerate changes in petroleum equipment purchasing activities and further erode the monopoly of MOFERT's FTCs. Under the new reforms, the traditional FTCs are to become "economic organizations" that no longer routinely receive MOFERT budget subsidies to cover their losses. The FTCs will become merely the foreign trade agents of Chinese producers and end users, and will be increasingly encouraged to compete among themselves. Thus, oil field equipment suppliers may find themselves negotiating with INSTRIMPEX in some of MACHIMPEX's traditional lines and vice versa.

The trade reforms will also make the local branches of FTCs increasingly independent of the Beijing headquarters, while allowing many more new trading organizations to provide additional competition for MOFERT's FTCs. In the petroleum sector, the most potent new competitor to older FTCs like MACHIMPEX will be CNOGEDC. It is setting up a procurement division, and plans to play an important trade role, based on the fact that for years it has been the MOPI corporation in charge of arranging all foreign contacts for the oil fields.

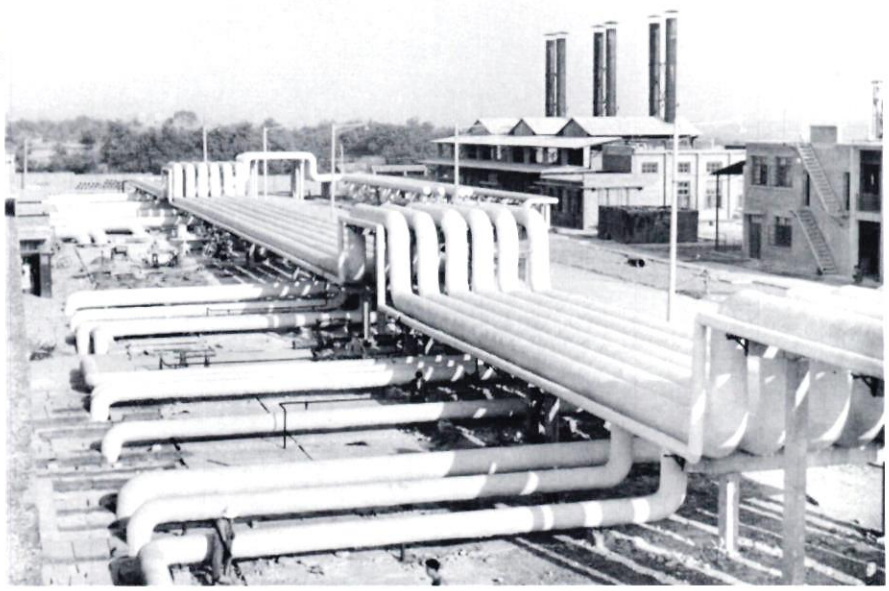
Provincial authorities will also form new foreign trade companies, some of which have already tested the waters. Last December, one such provincial trust and investment company approached the National Council's Beijing office with the claim that it could procure oil field equipment on behalf of one of China's smaller oil fields. No mention was made of the traditional FTCs or MOPI.

How the trade reforms will ultimately affect the conventional trade channels used by MOPI and MOGMR is not yet clear. New organizational structures are just now being formed. New "turf wars" have begun as old and new organizations struggle for supremacy. But oil remains a centrally planned commodity, so all production and distribution decisions will continue to be closely monitored if not totally controlled. Thus, for the immediate future, SINOCHEM retains its monopoly over the export of crude oil and will act in this regard as MOPI's agent. In the future, oil fields may gain power to export some of their own crude that is considered above-quota output, and could trade through local branches of FTCs, SINOCHEM, or even CNOGEDC. However, in the near future, all oil export decisions can be expected to be monitored closely by MOFERT and the State Planning Commission, because of their strong impact on China's foreign exchange laws and domestic economic plans.

In the petroleum equipment area, greater decentralized authority is expected much sooner for purchasing decisions. Even for this sector, however, MACHIMPEX, INSTRIMPEX, and TECHIMPORT will retain a substantial portion of the business. This is partly due to the strong central government interest in oil field development, and the fact that most equipment purchases will continue to be financed out of the central government's foreign exchange reserves. The old FTCs also have an obvious advantage in commercial experience and foreign company contacts.

A group of US business people

Photo courtesy of New China Pictures



A booster station at Yicheng, Jiangsu Province, along the Linyi–Nanjing oil pipeline.

who met with Petroleum Minister Tang Ke and some of his MOPI subordinates last fall asked for clarification of the current fluid situation. One lower-level MOPI official privately assured US companies that, beginning this year, MOPI no longer had to use the FTCs, saying "just to come and deal directly with us." When Minister Tang Ke was later asked the same question in a more formal setting, he responded more carefully, "In the future, we will be more powerful and actively involved in import decisions, but we will continue to use MACHIMPEX." Minister Tang's clear message was that wise business people should begin building better bridges to MOPI, but they should not burn their old ones to MACHIMPEX.

A sign of the times

A final example illustrates the general direction of current reforms as well as the uncertainty and bureaucratic in-fighting that currently characterize foreign trade decisions related to petroleum equipment. According to a US company with excellent connections in China, Daqing oil field sent a delegation to the US to purchase equipment late last year. The delegation was not accompanied by representatives of MACHIMPEX or any other FTC, but reportedly had its own purchasing authority. Daqing's access to foreign exchange apparently came from above-quota production, which entitled it to additional foreign exchange allocations. According to the US firm, Daqing was allowed to use these funds only to purchase spare parts. But Daqing and MACHIMPEX sharply disagreed over the definition of a spare part. Daqing would like to have equipment such as drill bits defined as spare parts. But MACHIMPEX realizes that if major components such as drill bits are spare parts, then there will be precious little oil field equipment not included in that category.

This as yet unresolved dispute indicates the growing power of the oil fields in foreign trade decisions. However, it is also a useful reminder that basic decisions about who may purchase what and for whom are still being made administratively. The future will see many such battles between oil fields and trading corporations over who can purchase what. The industry is in a state of flux, but the trend is toward greater oil field autonomy and foreign trade authority. 完

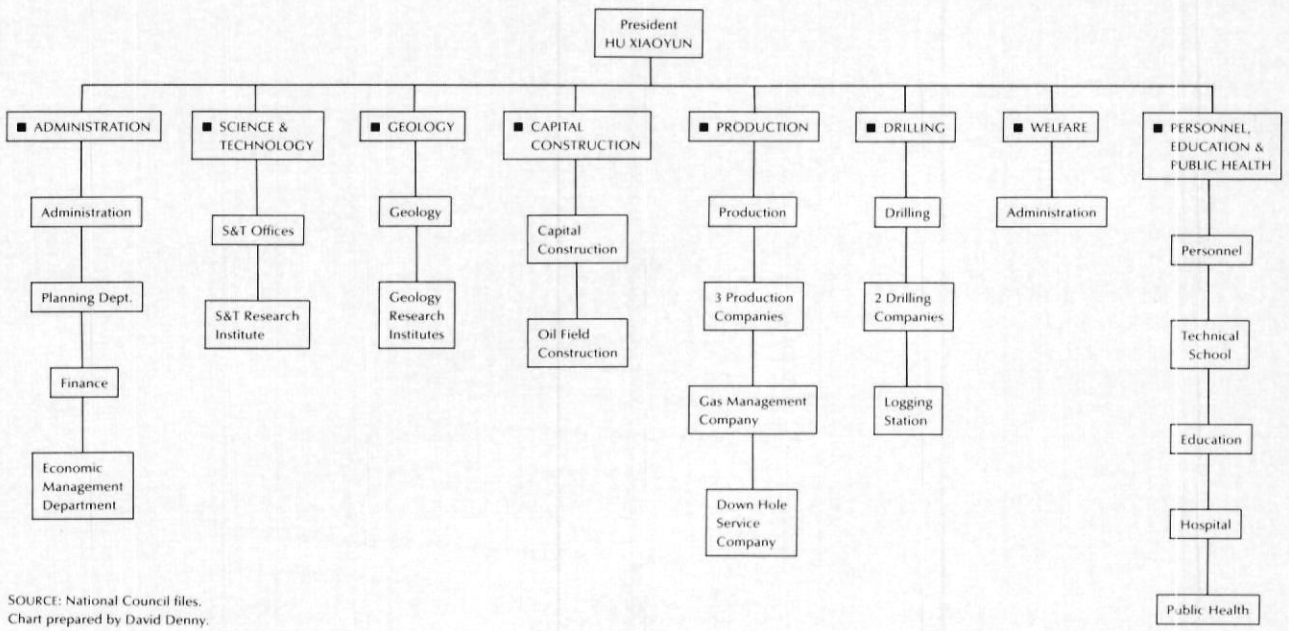
ZHONGYUAN OIL FIELD

The major oil fields, or Petroleum Administration Bureaus, are extremely large and complicated organizations. Each is headed by a president who has the same status as the directors of MOPI's functional bureaus.

Zhongyuan oil field in Henan Province illustrates the general organizational pattern common to all Chinese oil fields. Because of its relative newness and recent rapid growth, Zhongyuan is probably less autonomous than the older fields such as Daqing, Shengli, and Karamay. Each of Zhongyuan's eight vice presidents heads a functional department that includes the specialized companies that carry out the work of the oil fields.

Currently Zhongyuan has three production companies responsible for developing its three subordinate oil fields. The production companies obtain drilling services from one of the field's two drilling companies. Exploration drilling is managed and financed by the Zhongyuan Petroleum Administration Bureau and performed by the No. 2 Drilling Company. The drilling companies, in turn, obtain specialized services such as well logging, surface construction, cementing, mud, and core analysis from the specialized companies set up under the appropriate vice president. Like other oil fields, Zhongyuan has research and laboratory facilities to support the activities of the production, drilling, and specialized companies.

The various functional companies are divided first into brigades and then into teams according to standard Chinese organizational techniques. For example, Zhongyuan's No. 1 Drilling Company has 6,300 workers divided into 66 drilling teams. A typical team is led by an experienced worker who is in charge of 50 or so others. While Zhongyuan's organization may appear formidible, it is a small organization compared to Daqing, which has seven oil production companies with about 200 production teams, and two drilling companies with about 40 drilling teams.



SOURCE: National Council files.
Chart prepared by David Denny.

China's New Petrochemical Giant

SINOPEC sets out to fulfill its broad charter

Andrew S. Heyden

The China National Petrochemical Corporation, known to most foreigners simply as SINOPEC, was created by the State Council in July 1983 to coordinate, plan, and rationalize the operations of the petroleum refining and petrochemical industries. Considerable curiosity abroad greeted the birth of the huge new national corporation, not only because of the trade opportunities it may represent, but also because it seemed to run counter to current economic trends. According to corporation president Chen Jinhua, "SINOPEC is a planned exception to the national policy of decentralization, to bring about the maximum utilization of China's crude." During SINOPEC's first corporate-level visit to the United States last November, Chen indicated that SINOPEC's primary task was to "eliminate the inefficiencies and duplication of facilities" created by the more than two decades in which different ministries engaged in similar areas of refining and petrochemical manufacture without adequate reference to one another. The formidable nature of this task is not lost on SINOPEC's managers. Although technology transfer discussions were part of the rationale for SINOPEC's trip to the United States, the central purpose was to investigate management techniques and organizational philosophies of large-scale oil and petrochemical companies with an eye to their selective application to SINOPEC.

In the words of Wang Zhenhua, vice president of SINOPEC International, SINOPEC's jurisdiction covers the "vast majority of the petrochemical industry in China." Indeed, after its first year of operation, SINOPEC has emerged with complete control over the country's crude oil and associated gas refining. This gives SINOPEC control over about 80 percent of China's crude, while the remainder is exported. SINOPEC produces all types of fuels, naphtha, and other basic petrochemical feedstocks from crude. SINOPEC is also the dominant producer of synthetic fibers and plastic intermediates and polymers, and the sole manufacturer of asphalt, and synthetic rubber from petroleum.

SINOPEC inherited the nation's 39 largest refineries and petrochemical manufacturing facilities from three separate existing ministries: Petroleum, Chemicals, and Textiles. SINOPEC also took over administration of the research institutes and construction corporations devoted to petrochemicals that formerly belonged to these three ministries and to the China National Chemical Construction Corporation (CNCCC). As envisioned in its original charter, the corporation's scope of activity includes not only the supervision of production, but the eventual administration of all domestic and international trade in related products, technology, and equipment.

Despite the all-embracing character of SINOPEC's charter, some significant areas of industrial responsibility overlap still exist. Several major petrochemical facilities remain outside of SINOPEC's control, the most important being the Jilin Petrochemical Works in Jilin Province (under the Ministry of Chemicals) and the Wujing Petrochemical Plant in Shanghai (under the Shanghai Municipal Bureau of Chemical Industry). SINOPEC officials claim that these facilities remain separate because they do not exclusively use crude or associated gas, but instead employ mixed feedstock streams, including coal gas.

Room for confusion also remains in some manufacturing areas, notably synthetic fiber spinning and agricultural chemicals. The extreme vertical integration at many of China's largest refinery complexes led to SINOPEC's inheritance of substantial synthetic fiber-spinning operations when it took over the facilities. The Sichuan Vinylon Plant, although it produces primarily synthetic fibers and methanol from unassociated natural gas feedstocks, is a SINOPEC facility. Only one SINOPEC plant weaves textile products, a polypropylene carpet mill at the Yanshan Petrochemical Works. Most other plants in China that are exclusively engaged in synthetic fiber spinning and weaving, including some that produce polymers for synthetic fibers like the Yizheng Chemical Fibers Plant in Jiangsu, will remain under the Ministry of Textiles.

Responsibility for the manufacture of agricultural chemicals also remains divided. All ammonia and urea plants using naphtha as feedstock are now SINOPEC facilities, as are natural gas feedstock plants associated with existing refineries. But coal gas or unassociated natural gas feedstock plants (the latter primarily found in Sichuan Province) remain under the Ministry of Chemicals. SINOPEC has no significant activities in crop protection chemicals. Pesticide and herbicide manufacture takes place in plants reporting ultimately to the Ministry of Chemicals, although

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SINOPEC supplies some component materials to these facilities.

SINOPEC also generally stops short of the manufacture of engineered plastic items. These are primarily the responsibility of the Ministry of Light Industry. Nevertheless, SINOPEC has recently expressed some interest in developing more downstream activity in this area, particularly in items with construction applications, (PVC pipe, foam board, insulation materials, etc.)

With registered capital and combined assets of ¥21 billion, SINOPEC is China's largest corporation. Gross revenues in 1983 reached ¥25 billion, with a pre-tax profit of ¥9.9 billion. SINOPEC's original payroll in 1983 listed some 480,000 individuals, but by late 1984 corporate leaders indicated that a figure closer to 500,000 would be more accurate.

As if this weren't enough, in January, SINOPEC added approximately 200,000 additional employees to its roster by taking over all domestic wholesale and retail petrochemical product distribution functions from the Ministry of Commerce. The latter's China Fuel Corporation became part of SINOPEC's Marketing and Supply Division in a takeover that fulfilled the scope of SINOPEC's original mandate from the State Council. The acquisition should enable SINOPEC to control transfer pricing of materials between facilities. SINOPEC administrators frankly admit that when authority was split among several different ministries, a contentious rivalry existed between facilities over transfer prices.

A close-up look at SINOPEC and its leaders

SINOPEC is not the first 'super corporation' of its kind in China, although it is the largest. Both the China National Automotive Corporation, created in May 1982, and the China National Nonferrous Corporation, founded in April 1983, were established to avoid overlap within their respective industries. Each corporation holds a status equivalent to an industrial ministry, but is distinct from a ministry in being chartered as a profit-making enterprise. Another unique feature of these corporations is their high degree of control over subsidiary operations. Ministerial-ranked corporations like SINOPEC not only have the rights and privileges of a ministry, but have also bought out the local interests in production facilities from provincial and municipal bureaus. In theory, this gives SINOPEC headquarters in Beijing complete authority over all facilities in the manner of a Western corporation with wholly owned subsidiaries. China's industrial ministries, in contrast, do not exert direct control over plants in their spheres; instead, they share authority with the localities in which these facilities are located, and act through industrial bureaus that are actually under provincial and municipal control.

The leaders of SINOPEC thus have an unusually large amount of power compared to most Chinese administrators. Their management abilities will be put to the test this year, as SINOPEC assumes full responsibility for its profits and losses. The corporation will pay taxes and retain all after-tax profits, including foreign exchange earned. The application of the responsibility system to such a major corporation confirms the nation's commitment to market-oriented reform.

SINOPEC International, the only part of SINOPEC with authority to sign joint ventures valued at more than ¥5 million, has entered into two joint ventures so far, both with American companies.

A glance at the backgrounds of SINOPEC's leaders indicates that they have been carefully chosen for the job. Day-to-day control of the huge corporation rests in the hands of the president and his four corporate vice presidents. SINOPEC's President, Chen Jinhua, is an economist by training and a political administrator by experience. For the eight years prior to taking up his present post, Chen was vice mayor of Shanghai and an ardent supporter of the benefits of the open door policy, particularly technology transfer through foreign investment.

Vice President Zhang Wanxin, a petroleum engineer trained at Qinghua University and in the Soviet Union, was chief engineer at the Yanshan Petrochemical Works before joining SINOPEC. He and fellow Qinghua graduate, Vice President Zhang Haoruo are generally considered to be behind most production planning and major technology selection decisions for SINOPEC facilities. Vice President Sheng Huaren, and his deputy Lu Shoubin, supervise the 15,000 SINOPEC employees devoted to research and development in the corporation's various institutes and schools. Vice President Fei Zhirong supervises domestic marketing activities and corporate accounts.

SINOPEC's 39 production facilities (*see* map) report to the president and vice presidents through the Manufacturing Group. The directors of the 12 largest facilities can approve capital expenditures, including imports and joint venture investments up to ¥5 million ($1.79 million at the "internal settlement rate"). Any expenditure beyond this level for the large plants or significant capital expenditure for any of the 27 smaller production facilities must be approved by President Chen Jinhua.

SINOPEC has a 22-member board of directors drawn primarily from the corporation's four parent ministries (Petroleum, Chemicals, Textiles, and Commerce). The board is primarily honorary, with most of its members retired from active administration.

An active role in international trade

SINOPEC International, a subsidiary of SINOPEC, is the center of the corporation's foreign trade activities. SINOPEC International's chief, Zheng Zhongfang, carries the title of president and is supported by two vice presidents and a chief engineer. The company shares offices with SINOPEC's corporate organization in the Beijing Worker's Stadium and will open its first overseas office in New York during the first quarter of this year. SINOPEC International acts as the first point of contact for foreign companies marketing products to SINOPEC, trying to license technology or engage in a production joint venture with a SINOPEC facility. In the days before SINOPEC, a refinery or petrochemical plant in China might have imported technology and equipment through the China National Chemicals Import–Export Corp. (SINOCHEM), the China Na-

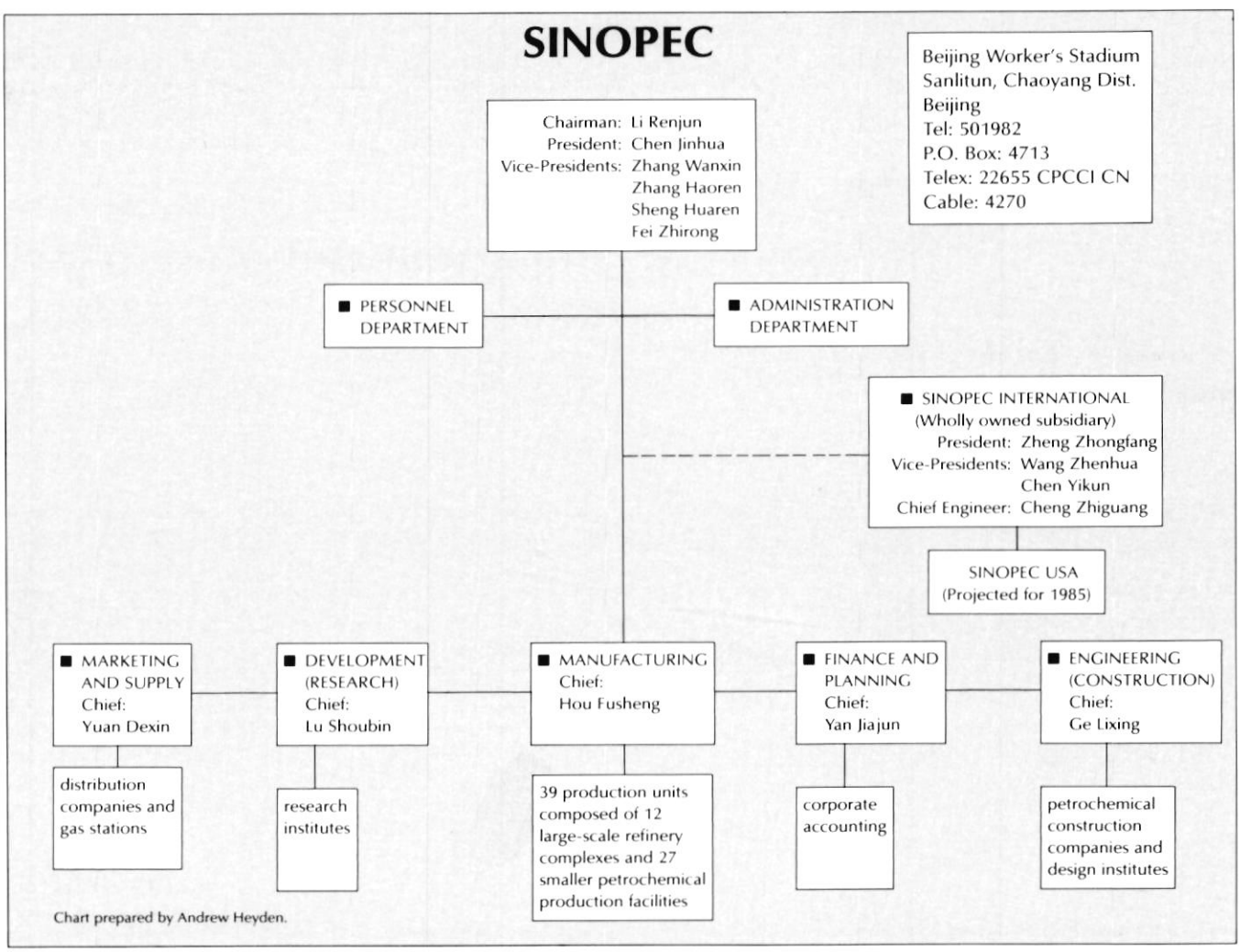
tional Technical Import Corp. (TECHIMPORT), the China National Instruments Import–Export Corp. (INSTRIMPEX), or the China National Machinery Import–Export Corp. (MACHIMPEX), all foreign trading corporations under the Ministry of Foreign Economic Relations and Trade (MOFERT). SINOPEC International now insists that it will handle all of this import and licensing activity.

The responsibility for exports, however, is not as clear cut. SINOPEC officials indicate that SINOCHEM will continue to act as their export agent, handling all petroleum products for the time being. The only refined products China exports in significant volume are gasoline and naphthas. These are exported to over 50 countries. The United States has become a major importer since 1981, with purchases of approximately $300 million in 1983. Sales to the United States for the first three quarters of 1984 were up a modest 1.6 percent from the same period in 1983, primarily because of increased naphtha exports, offsetting greater allocation of gasoline to the domestic market. Gasoline and naphtha exports should continue to be important foreign exchange earners for some years to come. Some importers predict, however, that Chinese sales may suffer this year and beyond due to price competition from Middle Eastern exporters just entering the market. At least throughout this year, SINOCHEM will continue to handle these products, as it does the crude that it exports on behalf of the Ministry of Petroleum.

SINOPEC sent representatives to the Guangzhou Trade Fair for the first time last fall, but they went primarily to purchase, not sell. Nevertheless, SINOPEC International says that it plans to promote the export of petrochemical processing equipment from its own factories, and provide construction and engineering services to customers abroad, independently of any other Chinese organization.

Joint ventures off to a brisk start

Authorities at SINOPEC International emphasize that they are also the branch of the corporation empowered to negotiate foreign joint ventures. SINOPEC International, the only part of SINOPEC with authority to sign joint ventures valued at more than ¥5 million, has entered into two joint ventures so far, both with American companies. The first was a blending and packaging plant for lube oil in the Shenzhen special economic zone. China Sun Oil, created last June, is a joint venture between SINOPEC International and the Sun Refining and Marketing Company. Zheng Zhongfang of SINOPEC International is the chairman of the new venture, which has an initial registered capital of $6.5 million, and will produce finished motor lubricants for export to Hong Kong and other Asian markets. The output will be distributed by a Hong Kong firm known as Lithcon Petroleum Ltd., which is involved in managing the joint venture and is also the export agent for base lube oils manufactured by SINOPEC.



China's Petrochemical Industry

SINOPEC Facilities

1 Shanghai Gaoqiao Petrochemical Corporation
Address: Pudong, Dongtang Road, Shanghai Municipality
Tel: 483475
Includes seven factories and the Shanghai Petrochemical Research Institute. Major subsidiaries are the Shanghai (Gaoqiao) Refinery, Gaoqiao Chemical Works, Shanghai No. 2 Synthetic Fiber Factory, Shanghai No. 2 Detergent Factory, and Gaoqiao Power Station

2 Jinling Petrochemical Corporation
Address: Yangziji, Nanjing, Jiangsu Province
Tel: 61409, 52475
Chairman: Wang Bingshi
Capacity: 4 mmt/year
Composed of the Nanjing Refinery, Qixiashan Chemical Fertilizer Plant, Nanjing Alkylbenzene Plant, Changjiang Chemical Plant, Zhongshan Chemical Plant, and Nanjing Plastics Plant

3 Fushun Petrochemical Company
Address: Fushun, Liaoning Province
Tel: 25777, 24956, 24521
Includes three refineries and two chemical plants. Refinery products include kerosene, diesel oil, paraffin, coke, gasoline, jet fuel, naphtha, activated and granulated bleaching earths, oil-based carbon black, nitrile and carboxylic ester nitrile emulsions. China's largest shale oil refinery.

4 Jinzhou Petrochemical Company
Address: Jinzhou, Liaoning Province
Tel: 8105
Composed of two refineries, one chemical plant and one petrochemical works. Products include gasoline, rubber solvent, extraction solvent, petroleum ether, jet fuel, diesel oil, fuel oil, additives, isopropanol, polybutadiene, naphtha, and synthetic rubber.

5 Tianjin Petrochemical Company
Address: Shanggulin, Dagang District, Tianjin Municipality
Tel: 25128
Capacity: 2.5 mmt/yr
(Includes the Tianjin Petrochemical Fiber General Plant.) Produces gasoline and diesel fuel, organic industrial raw materials, including fertilizer feedstock, and PVC.

6 Beijing Yanshan Petrochemical Company
Address: Yanshan District, Beijing Municipality
P.O. Box 295, Beijing
Tel: 933-2291, 933-2568
Telex: 22609 YSPGCN
Deputy General Manager: Liang Chihui
Capacity: 4.5 mmt/yr
Includes seven refineries and petrochemical plants, four research and development units, two engineering corporations, and other facilities. Products include fuels, lubricants, ethylene, propylene, polyethylene, polypropylene, polybutadiene rubber, phenol, acetone, pyrolytic gasoline, alkyl benzene, pure benzene, ethlyene glycol, paraffin, synthetic ammonia, nitric acid and ammonia nitrates. China's largest petrochemical complex.

7 Qilu Petrochemical Company
Address: Xindian, Zibo, Shandong Province
Tel: 2613
General Manager: Shi Zhida
Consists of a refinery, fertilizer plant, rubber plant, catalyst plant, and other facilities. Major products include gasoline, jet fuel, kerosene, diesel oil, fuel oil, asphalt, petroleum coke, benzene, toluene, orthoxylene, ethyl benzene, acrylonitrile, naphthenic acid, sodium sulphate, sulphur synthetic ammonia, urea, polybutadiene rubber, and a variety of catalysts.

8 Lanzhou Chemical Industry Company
Address: Xigu District, Lanzhou, Gansu Province
Tel: 55981
Manager: Lin Yincai
Consists of nine production plants and numerous research and design institutes. Major producer of machinery and equipment for chemical plants; has installation and maintenance branch. Chemical products include nitramine, urea, ammonium sulphate, nitric acid, methyl alcohol, formaldehyde, urotropine, pentaerythritol, synthetic rubber, polystyrene, polyethylene, polypropylene, PVC, polyacrylonitile, polypropylene fiber, ABS resin, phenol, acetone, accelerator-M, -DM, -TMTD, -C2, antiager D, -SP, caustic soda, DDVP, and other chemicals.

9 Maoming Petroleum Industry Company
Address: Changqian Road, Maoming, Guangdong Province
Tel: 2951, 2981
Manager: Jian Jian
Capacity: 5 mmt/year.
Processes both petroleum and shale oil. Major products include gasoline, kerosene, jet fuel, solvent naphtha, diesel oil, fuel oils, liquefied petroleum gas, cement and petroleum processing equipment.

10 Yangzi Petrochemical Company
Address: Dachang District, Nanjing City
Tel: 52527
Currently under construction after a three year delay; completion of first facilities targeted for 1986.

11 Daqing General Petrochemical Works
Address: Daqing, Heilongjiang Province
Tel: 6429 Capacity: 5 mmt/yr
Consists of facilities for the production of petrochemicals, fertilizers, and fibers. Major producer of ammonia, ammonium nitrate and urea; other products include jet fuel, gasoline, kerosene, diesel fuel, lubricating oil, wax, petroleum coke, benzene, aromatics, acrylic staple fiber, and acrylonitrile.

12 Anqing General Petrochemical Works
Address: Anqing City, Anhui Province
Tel: 2891
Capacity: 2.5 mmt/yr
Consists of oil refinery and chemical fertilizer plant. Products include synthetic ammonia, urea, gasoline, and light diesel fuel.

13 Guangzhou General Petrochemical Works
Address: Huangpu, Guangzhou, Guangdong Province
Tel: 79720
Director: Ni Hengde
Capacity: refineries rated at 2.5 mmt/yr
Consists of two refineries and two chemical fertilizer plants. Products include gasoline, diesel oil, fuel oil, lumpy sulphur, naphthenic acid, sodium carbonate and lpg.

14 Shanghai (Jinshan) General Petrochemical Works
Address: Jinshanwei, Shanghai Municipality
Tel: 931931
Director: Fu Yifu
Jinshan consists of two chemical plants, three chemical fiber plants, a plastic plant, and four auxilliary plants—for water, waste water treatment, electric power, and machinery repair. Products include ethylene, propylene, acetaldehyde and acetic acid, VAM, benzene, acrylonitrile, polyester, vinylon, and low-density polyethylene.

15 Liaoyang Petrochemical Fiber Company
Address: Hongwei District, Liaoyang, Liaoning Province
Tel: 803127
General Manager: Tian Zifu
Produces polyester, ethylene, ethylene glycol, propylene, nylon 66, high-density polyethylene, polypropylene, and refinery by-products.

16 Sichuan Vinylon Plant
Address: Changshou, Chongqing, Sichuan Province
Tel: 52891, 52230
China's first large-scale complex producing chemical products and fiber from natural gas. Major products are methanol, vinyl acetate, polyvinyl alcohol, vinylon staple and draft cutting yarn.

17 Dalian Petrochemical Company
Address: Dalian City, Liaoning Province
Tel: 61353, 62512
Capacity: 5 mmt/yr
Products include gasoline, aviation fuel, diesel oil, marine oil, lubricants, wax, and petrobenzene. Exports jet fuel.

18 Anshan Refinery Address: Tiexi District, Anshan City, Liaoning Province
Tel: 44321 Capacity: 2.5 mmt/yr
Produces diesel oil, heavy oil, kerosene, and naphtha. Part of the Anshan Iron and Steel Company complex; completed in 1973.

19 Qianguo Refinery
Address: Qianguo Banner, Jilin Province
Tel: 89
Capacity: 2.5 mmt/yr
Provides feedstock to the adjacent Jilin Petrochemical Complex, one of the major plants not under SINOPEC.

20 Linyuan Refinery
Address: Daqing City, Heilongjiang Province
Tel: 48489, 8496
Director: Wan Jintai
Produces lpg, gasoline, diesel oil, heavy gas oil, naphtha, paint naphtha, fuel oil, and petroleum asphalt.

21 Harbin Refinery
Address: Huagong Road, Taiping District, Harbin, Heilongjiang Province
Tel: 72521
Director: Shang Zengyu
Capacity: 0.5 mmt/yr
Produces naphtha, gasoline, diesel oil, fuel oil, and lpg.

22 Lanzhou Refinery
Address: Xigu District, Lanzhou, Gansu Province
Tel: 55911
Director: Liu Qifu
Capacity: 3.0 mmt/yr
Produces aviation fuels, lubricating oils, cracking catalysts, additives, chemical products, refining equipment, urea and ammonia.

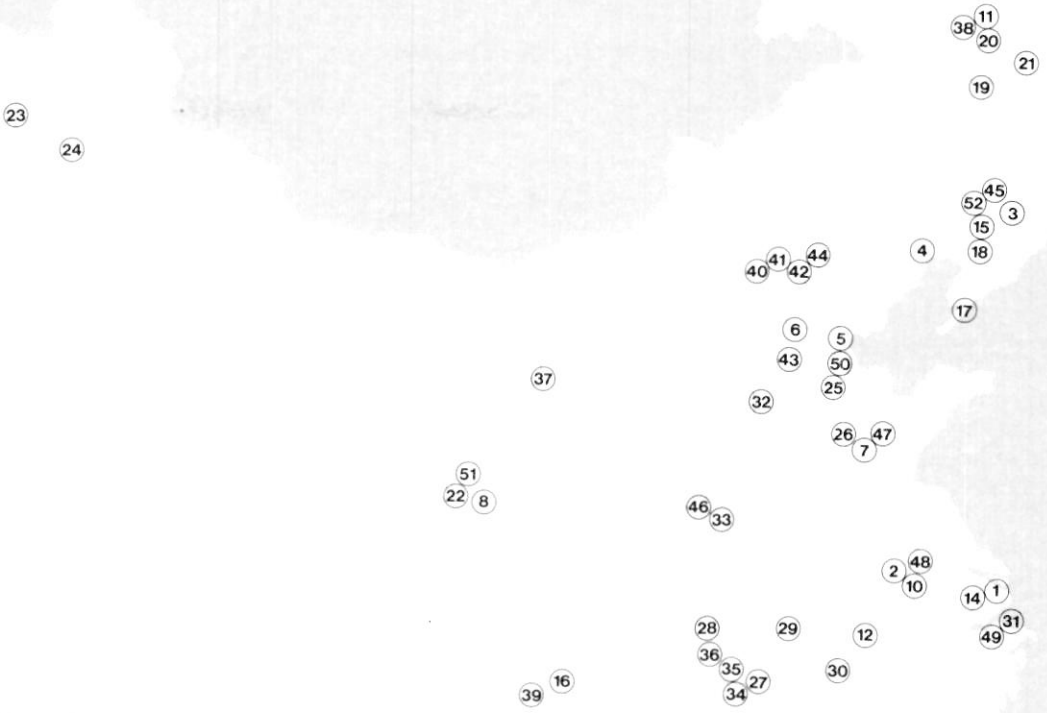
23 Dushanzi Refinery
Address: Dushanzi, Xinjiang Uigur Autonomous Region
Tel:231
Produces gasoline, diesel oil, and lubricants

24 Urumqi Petrochemical Works
Address: Urumqi City, Xinjiang Uigur Autonomous Region
Tel: 42858
Capacity: Urea—520,000mt/yr; Ammonia—300,000mt/yr
Produces mainly urea and ammonia

25 Cangzhou Refinery
Address: Cangzhou City, Hebei Province
Tel: 4811
Capacity: Urea—480,000 mt/yr; Ammonia—300,000 mt/yr
Produces fertilizers at a plant supplied by Kellogg

26 Jinan Refinery
Address: Licheng, Jinan City, Shandong Province
Tel: 43622
Capacity: 1.0 mmt/yr
Produces various refined goods including lubricating oil

27 Changling Refinery
Address: Linxiang County, Hunan Province
Tel: 3031
Capacity: 3.5 mmt/yr
Produces naphtha, gasoline, kerosene, jet fuel, diesel oil, cracking catalysts, petrobenzene, etc.



SOURCE: SINOPEC

Artwork by John Yanson

28 Jingmen Refinery
Address: Jingmen City, Hubei Province
Tel: 2501
Capacity: 1.8 mmt/yr

29 Wuhan Petrochemical Works
Address: Qingshan District, Wuhan City, Hubei Province
Tel: 663534
Directors: Song Hanming, Zhou Huashan
Capacity: 2.5 mmt/yr
Produces naphtha, diesel oil, sulfur, lubricating oils, white oil, etc.

30 Jiujiang Refinery
Address: Jiujiang City, Jiangxi Province
Tel: 4911
Capacity: 2.5 mmt/yr

31 Zhenhai General Petrochemical Works
Address: Zhenhai County, Zhejiang Province
Tel: 55911
Capacity: Urea—520,000 mt/yr; ammonia—300,000
Consists of oil refinery and chemical fertilizer plant. Refinery produces gasoline, light diesel oil, heavy oil, kerosene and feedstock for affiliated fertilizer plant. Fertilizer plant produces urea and ammonia

32 Shijiazhuang Refinery
Address: Shijiazhuang City, Hebei Province
Tel: 49931
Capacity: Probably 2.5 mmt/yr
Produces a wide variety of refined goods

33 Luoyang Refinery
Address: Luoyang City, Henan Province
Tel: 206

34 Yueyang General Petrochemical Works
Address: Yenchi, Yueyang City, Linxiang County, Hunan Province
Tel: 3248
Director: Yuan Shuchuan
Produces polystyrene, polyester, styrene, propylene, synthetic fibers, and polybutadiene synthetic rubber

35 Dongting Nitrogenous Fertilizer Plant
Address: Qilishan, Yueyang City, Hunan Province
Tel: 886
Capacity: Urea—480,000 mt/yr; ammonia—300,000 mt/yr
Produces urea and ammonia from naphtha feedstocks

36 Hubei Chemical Fertilizer Plant
Address: Zhijiang County, Hubei Province
Tel: 373
Capacity: Urea—480,000 mt/yr; ammonia—300,000 mt/yr
Produces urea and ammonia; Kellogg supplied plant

37 Ningxia Chemical Works
Address: Xinshi District, Yinchuan City, Ningxia Hui Autonomous Region
Tel: 7379
Capacity: Urea—480,000 mt/yr; ammonia—300,000 mt/yr
Under contruction; will produce urea and ammonia

38 Daqing Ethylene Project Headquarters
Address: Daqing City, Heilongjiang Province
Tel: 31044

39 Yiping Chemical Works
Address: Ba Xian County, Chongqing City, Sichuan Province
Tel: 169

40 Changcheng Premium-Grade Lube Oil Corp.
Address: Qinghe, Bejing
Tel: 275786

41 Research Institute of Petroleum Processing
Address: Haidian District, Beijing
Tel: 277551

42 Beijing Engineering Institute
Address: Liupukang, Deshengmenwai, Beijing
Tel: 445261

43 Xushui General Survey Company
Address: Xushui County, Hebei Province
Tel: 462

44 Scientific and Technology Information Research Institute
Address: Beijing
Tel: 462961

45 Fushun Research Institute of Petroleum and Petrochemicals
Address: Fushun City, Liaoning Province
Tel: 89543

46 Luoyang Research and Engineering Institute
Address: Luoyang City, Henan Province

47 The Tenth Construction Company
Address: Xindian, Zibo City, Shandong Province
Tel: 330

48 The Second Construction Company
Address: Yaohuamen, Nanjing City
Tel: 61051, 61388

49 The Third Construction Company
Address: Zhenhai County, Zhejiang Province
Tel: 72462

50 The Fourth Construction Company
Address: Shanggulin, Dagang District, Tianjin City
Tel: 26963

51 Lanzhou Technology of Petroleum School
Address: Lanzhou, Gansu Province

52 Fushun College of Petroleum Processing
Address: Fushun, Liaoning Province
Tel: 89543

SINOPEC's second joint venture was signed last November. It joins the Fluor Corporation with SINOPEC's Beijing Design Institute to provide engineering, technical design, and project implementation services for technical transformation projects in oil refineries and petrochemical facilities in and out of China. Press reports have linked this new service joint venture with the development of the ARCO natural gas find off Hainan Island, but no firm plans for the commercial development of that discovery have yet been announced. SINOPEC's seven other engineering design institutes outside Beijing could conceivably sign their own engineering joint ventures similar to that between the Beijing Design Institute and Fluor, according to President Chen Jinhua. SINOPEC has already signed letters of intent for this purpose with at least three other US engineering firms.

Development priorities; SINOPEC and the world

On October 19, 1984, the State Council approved SINOPEC's first full five-year plan, to coincide with the seventh national Five-Year Plan (1986–1990). Although details of the plan remain largely unknown, Xinhua news agency reports that SINOPEC intends to "make fewer investments (in new facilities) and strive for greater and faster production so as to quadruple its output value, profits, and taxes by 1990." Chen Jinhua confirmed in November that the modernization of existing facilities is SINOPEC's first priority, yet—somewhat paradoxically—he also said that 70 to 80 percent of SINOPEC investment during the seventh Five-Year Plan will be for new construction. The reason given for this apparent contradiction is that SINOPEC this year will complete its first great task: the construction of five major ethylene plants contracted for between 1978 and 1980. These new production units will require significant investment in downstream processing facilities to utilize the ethylene feedstocks they generate.

SINOPEC's latest spate of contract signing confirms that the period of "economic readjustment" for petrochemicals in China is over. Technology licensing and joint ventures in downstream processing appear to be the major areas of activity. While in the United States last November, SINOPEC leaders signed licenses for an acrylonitrie plant (SOHIO) and a linear low density polyethylene facility (Union Carbide) for the Daqing complex in Heilongjiang, and another for acrylic fiber manufacture (Chemtex/ American Cyanamid).

Most recently SINOPEC signed its largest deal yet: a contract worth approximately $50 million with the M. W. Kellogg Company to modernize an ethylene chemical plant in Gansu Province. The transfer of Kellogg's ethylene technology will enable the Lanzhou Chemical Company to process both naphtha and gas oils from an adjacent refinery, and double current ethylene yields. Kellogg officials are optimistic that this will lead to additional contracts for ethylene facilities in China over the next few years.

SINOPEC has also expressed interest in technology acquisition for styrenics and acrylics of all types, and is increasing its purchases of instruments and control systems. Fisher Controls sold a "Provox System" to SINOPEC's Research Institute for Petroleum Processing (RIPP) in Beijing last year. RIPP also purchased a Sperry 1100/72 dual mainframe processor and associated equipment in the last quarter of 1984 valued at $1.75 million. SINOPEC is also the chief customer of the Shanghai–Foxboro Instruments joint venture, purchasing about 75 percent of its output in 1984. The drive to increase the efficiency of existing facilities and diversify downstream product output presents the greatest opportunities for trade with SINOPEC over the next few years, in the form of both instrument sales and technology licensing. Related capital equipment sales will be far more difficult, due to price considerations resulting from the strong US dollar.

This emphasis on the renovation of existing plants and development of new downstream capacity does not mean that SINOPEC will abandon the selective expansion of upstream refining capacity. SINOPEC and MOFERT have asked the US State Department's Trade and Development Program (TDP) to fund a feasibility study for a major heavy oil residua processing capacity expansion at the Qilu Petrochemical Company in Shandong Province. The renovation will include an expanded and improved plant for asphalt production, another of SINOPEC's major development priorities. This expansion, which SINOPEC insists will go forward regardless of whether foreign assistance is granted for the feasibility study, should present substantial opportunities for the sale of technology licenses, sophisticated process control equipment, and related engineering services.

SINOPEC is also avidly pursuing negotiations for a variety of production and service joint ventures that will involve the transfer of proprietary technology. The main roadblock to these developments is the concern of US firms that they will be burdened with international distribution responsibilities for the venture's output in an unattractive environment of excess global refining capacity. SINOPEC also would like foreign assistance in the retail marketing and distribution of gasoline and car care products, since this becomes its exclusive responsibility this year. But since these operations cannot generate foreign exchange earnings, with the limited exception of stations located within the special economic zones, it will be difficult for SINOPEC to provide needed incentives for foreign firms to enter into such ventures.

Given the understandable preoccupation of the international petrochemical industry with the growing problem of excess global capacity, the desirability of selling process technology to SINOPEC comes constantly into question. When asked about SINOPEC's plans for the export of products generated by new imported technologies, Chen Jinhua replied that, "Our first priority is to serve the rapidly expanding requirements of our domestic market. Expansion of refining and petrochemical capacity in China cannot be compared to similar developments in the Middle East, where the lack of a sizable domestic market will compel producers to export a large proportion of their refined products." A major oil strike could eventually lead China to place greater emphasis on exports of both crude oil and refined products, and require foreign petrochemical companies to reassess SINOPEC's international role. But unless China's crude oil production rises significantly, SINOPEC will probably continue to employ approximately 80 percent of all Chinese crude as feedstock for products destined for the domestic market. 完

The Facts about Fertilizer

An in-depth look at the countryside's hottest commodity

David Richter

China's current leaders like to attribute the country's impressive agricultural performance of the past few years to enhanced producer incentives and other enlightened government policies. While these policies have indeed been important, any complete list of reasons would have to include a frequently overlooked factor: continuing increases in the application of chemical fertilizers.

Fertilizer has become a de facto currency in the countryside. Fertilizer's importance to the individual peasant is dramatized by the many complaints of insufficient supply, and reports that anyone with access to the commodity tries to divert supplies to his friends.

Fertilizer is no less important at the national level. Since 1970 China has spent more than $2 billion on foreign fertilizer plants and equipment. But the domestic production boost this equipment has provided is still not sufficient to meet national demand. China remains the world's biggest importer of fertilizer, spending about $1 billion a year—5 percent of the country's total import bill—on the commodity.

Fertilizer's importance can only increase in the future. Most experts believe China's introduction of the celebrated contract responsibility system has effected a one-time major agricultural production boost. Further farm gains will come only through increased use of fertilizer and other modern inputs. If this prognosis is correct, fertilizer will become an even more important avenue to wealth in the countryside, and will continue to require enormous government investment. At the same time, China's role in the world fertilizer market will continue to grow.

Solid progress in utilization rates

China has only recently become the world's biggest consumer of chemical fertilizers. Indeed, the growth in consumption of chemical fertilizers is one of the big success stories of Chinese agriculture. In 1983, Chinese farmers applied about 12 million tonnes of nitrogen fertilizer, 3.1 million tonnes of phosphates, and 700,000 tonnes of potassium. This volume amounted to an average of 148.5 kilograms of combined chemical fertilizer per hectare of arable land, up from just 5 kg/ha in 1962. According to the United Nations Food and Agriculture Organization (FAO), China's per hectare application rate is about three times the average for all developing countries and compares favorably with almost all countries except the extremely intensive users among China's East Asian neighbors. The FAO says Japan applies 387 kg/ha while South Korea uses 351 kg/ha. These figures overstate Chinese consumption somewhat, however, because China is more likely than other countries to plant two or three crops on the same hectare of land each year.

Chemical fertilizer is only half the story in China. Traditionally, the Chinese have relied on organic fertilizer to replenish their soils. Organic fertilizers include barnyard manure, oil cakes, crop residue, nitrogen-fixing bacteria, and night soil. The greatest proportion is made up of pig excretia—pigs are in fact referred to in government propaganda as walking fertilizer factories! Today, organic fertilizer still accounts for 50 percent of plant nutrients used in China, according to some estimates. This percentage will probably decline as domestic chemical fertilizer production and imports increase. But the government continues to stress organic nutrients, and urges peasants not to waste the crop residues that accompany agricultural production. Officials also count on the expected increase in livestock to augment the organic fertilizer supply. By the year 2000, 40 percent of the fertilizer used in China is still expected to be organic.

Nevertheless, Chinese officials realize that continuing food production gains depend on continued increases in application of chemical fertilizer, due to constraints on other inputs. Organic fertilizer cannot solve all of China's soil fertility problems. Neither can the country depend on increasing the amount of arable land. Despite land reclamation efforts, urban expansion will leave arable acreage unchanged if not reduced in the next decade.

The need for phosphate and potassium

In order to use chemical fertilizers effectively, China must solve two problems that are linked with efforts to increase the aggregate application rate: an overreliance on nitrogen fertilizers, and regional imbalances in fertilizer usage rates around the country.

China applies the three main kinds of chemical fertilizers in ratios that are far from ideal for optimal soil enrichment. Advanced countries use nitrogen, phosphate, and potassium in the ratio of 1.0:0.55:0.4. In China this ratio was 1.0:0.25:0.002 in 1983, indicating serious deficiencies of phosphates and potassium. Although

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this was an improvement over 1981's ratio of 1.0:0.2:0.0, much progress still needs to be made.

These deficiencies were exacerbated in the past by a deliberate emphasis on nitrogen fertilizer. In the 1970s, China depended almost exclusively on nitrogen for its chemical fertilizer as the government began to push production and application of nitrogen. Initially, the policy met with great success. For example, in 1960 one unit of applied nitrogen yielded a 3–5 unit increase in grain output. Today, however, each extra unit of nitrogen fertilizer yields only one increased unit of grain, due to serious deficiencies of potassium and phosphate in the soil. This is a fairly common occurrence in developing nations, as farmers tend to favor the quick results that the application of nitrogen provides. Chinese government policy has until recently perpetuated this situation.

Beginning with the Sixth Five-Year Plan (1981–1985), the Chinese began to correct this imbalance. The government tried to build up phosphate and potassium fertilizer supplies through both expanded imports and the development of domestic resources. Consumption of phosphate and potassium jumped sharply in 1982 to almost 570,000 tonnes of potassium (up from 407,000 tonnes in 1981) and 3.5 million tonnes of phosphate fertilizer (up from 3 million tonnes). Most of the increase was due to imports, since domestic production of these two products has remained basically unchanged. While consumption of phosphates dipped a bit in 1983, substantial imports in 1984 should re-establish the upward trend.

Imports of potassium may remain somewhat below those of phosphate due to lingering resistance on the part of farmers to use what for them is still a largely unproven commodity. But the national and provincial governments are investing heavily in farmer education and soil experiments in an effort to reduce this resistance. For example, soil experiments in Hunan Province indicate that 1 kg of potassium applied produces an increase of 6 kg of grain. Hunan's farmers are among the leading users of potassium fertilizer: in 1983 they applied 200,000 tonnes, more than one-third of the nation's total. Hunan also invited a group of Canadian scientists to lead a seminar on potassium use in Changsha in June 1984 attended by researchers from Hunan and Zhejiang provinces.

Provinces take steps to rectify regional imbalance

China's chemical fertilizer is not evenly distributed. Farmers in the agricultural suburbs of Shanghai use 10 times as much fertilizer per sown hectare as farmers in Inner Mongolia. The top 10 provincial or municipal users in 1982 applied an average of 159 kg per sown hectare while the 10 smallest consumers applied just 51 kg per sown hectare.

One solution to the problem of unequal consumption is being tried at the provincial level: fertilizer-poor provinces are beginning to invest in the fertilizer production operations of their more well-endowed neighbors. Also, provinces rich in one type of fertilizer are connecting with other provinces to bring in the missing elements. For example, Liaoning provided interest-free loans to Hubei, Yunnan, and Guangdong to develop phosphate mines in return for fertilizer once the mines are operating. Similarly, Guangdong invested ¥2.5 million in Yunnan phosphate mines. The central government encourages such cooperative ventures as one means of mitigating regional inequalities.

Government tries to control distribution

Distribution channels for chemical fertilizer exist on three levels: national, provincial, and county. The China National Agricultural Inputs Corporation (CNAIC), which reports to the Ministry of Commerce, is responsible for purchasing both domestic and imported fertilizer. On the national level, CNAIC runs wholesale stations in nine regions of China. These stations purchase, receive, and allocate chemical fertilizer according to the State plan. They are located near large fertilizer plants and important coastal and river ports. On the provincial level, the Provincial Agricultural Inputs Corporation implements national policy and oversees county-level operations.

On the county level, the County Agricultural Inputs Corporation (CAIC) receives fertilizer from small local plants and then allocates and distributes it to the supply and marketing co-ops. These co-ops account for 87 percent of all rural fertilizer sales. The CAIC network consists of 55,000 stores that sell agriculture inputs. Fifty percent of rural fertilizer sales are from these stores. An additional 30 percent occurs at 110,000 retail stores, and another 5 percent is sold through temporary commission agents.

While more extensive and efficient than that of many developing countries, China's fertilizer distribution system still has gaps. For example, fertilizer supplies in Hebei Province for January–May 1984 stood at over 2 million tonnes, reportedly exceeding demand by 190,000 tonnes. But breaking down this aggregate supply into varieties reveals a phosphate surplus of 240,000 tonnes and acute shortages of ammonia fertilizers. Such imbalances are not uncommon.

Photo courtesy of China Features

China's biggest phosphate fertilizer plant, with a designed annual capacity of 100,000 tonnes, in Yunnan Province.

A variety of payment plans . . . and illegal schemes

Government efforts to control the price of chemical fertilizers have also met with mixed success. To its credit, the main goal of pricing policy appears to be to promote fertilizer use. In keeping with this policy, farmers may sell cash crops in exchange for fertilizer. Grain sales, too, are awarded with access to fertilizer purchases. Because fertilizer is in such demand, it proves a very useful incentive tool.

For cash-paying customers, the government encourages fertilizer use by maintaining a low standard price. There are actually two price schedules for chemical fertilizers. One is set by the State and includes urea, compound fertilizer, ammonium nitrate, and ammonium sulfate. These commodities represent major imports and are maintained at uniform prices throughout the country. The second price schedule covers indigenously produced fertilizer. It presents a problem for central control since production costs vary according to region and production methods. Theoretically, the State Council sets prices for these products and no price changes may be made without the Council's approval. The government also offers subsidies to encourage fertilizer use in remote areas where production and transport costs are higher. In practice, the system occasionally breaks down, leaving room for significant price variations. For example, price differences occur when shipping fertilizer across provincial borders. On some occasions shipping costs are included in the selling price; at other times not.

As Chinese agriculture has shifted in recent years from a collective system to the household responsibility system, demand for and thus the value of fertilizer has soared. In order to meet and, farmers hope, surpass agricultural production quotas, farmers apply more fertilizer than in the past. The creation of greater local incentives to use fertilizer has been a most welcome result of the responsibility system.

But the rising demand for fertilizer has also had negative side effects. Control of the fertilizer supply is now seen as a route to wealth and power. The rise in the value of chemical fertilizer has led to a flurry of illegal activity as deliveries are diverted or stolen and false blends are marketed. Fertilizer is being hoarded during periods of slack demand and sold at premium prices when supplies are short. Numerous reports of such illegal activity began appearing in the Chinese press in 1983. Following the government's call to promote non-nitrogen fertilizer, farmers frequently complained that inferior phosphate fertilizer was marketed as a quality product at high prices. Some of these fraudulent blends were actually harmful to crops. The *Economic Daily* reported such activity in at least six provinces.

Other crooked practices include the diversion of State-allocated deliveries to free markets. Farmers become understandably perturbed when fertilizer they were to receive shows up in local markets. There have been complaints of Communist Party cadres using their connections to get personal deliveries of fertilizer in times of short supply. Preferential treatment of factory staff and their relatives using "back door" arrangements is also a problem. Such untoward activities were not unknown prior to the advent of the responsibility system, and they will probably continue as long as demand for fertilizer exceeds supply.

Imported nitrogen facilities dominate domestic production

As with consumption, China's domestic production of chemical fertilizer has come a long way since 1949. At the time of the founding of the PRC the nation had only two chemical fertilizer plants, producing a total of 5,700 tonnes of nitrogen per year. Today China is the world's third largest producer of fertilizer, behind the US and the Soviet Union. China's fertilizer industry is the country's largest chemical industry with over 1,200 plants producing 13.8 million tonnes of chemical fertilizer in 1983, and 7.4 million tonnes in the first half of 1984. Output of chemical fertilizer has grown at an average annual rate of 28 percent over the past 34 years. But domestic production still falls short of demand, with imports required to make up more than half of total consumption.

Nitrogen: 80 percent of domestically produced chemical fertilizer is in the form of two types of nitrogen fertilizer: ammonium bicarbonate, a fertilizer unique to China, and urea. Ammonium bicarbonate accounts for slightly over half of all nitrogen fertilizer production. The nitrogen industry has grown at an average annual rate of 16.4 percent since 1976. More than half of domestic production comes from small plants producing ammonium bicarbonate. These small plants (some producing 5,000–20,000 tonnes per year) draw on local reserves of coal, natural gas, and residual oil for feedstocks, and distribute their product locally—usually within a 50-mile radius.

During the 1970s, China imported 13 large modern plants to produce urea, most of them supplied by the American company M. W. Kellogg. In 1983 these 13 plants produced about 3.5 million tonnes of urea. In other words, about 1 percent of China's fertilizer plants produce about

Photo courtesy of China Features

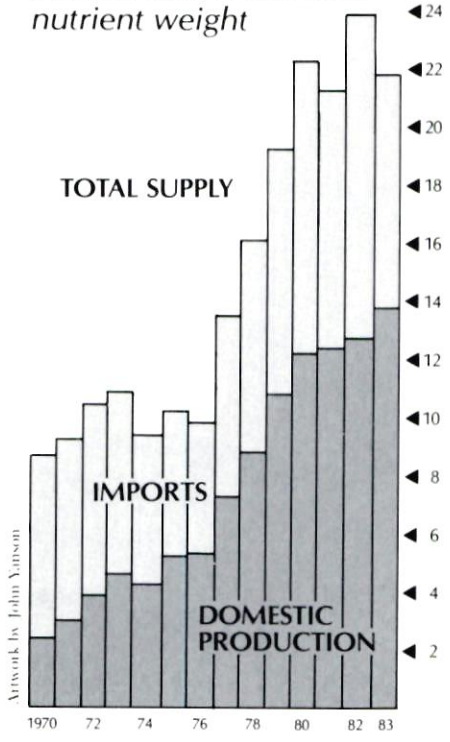
Peasants apply fertilizer to a vegetable field in a suburb of Nanchang, Jiangxi Province.

25 percent of annual nitrogen output and more than half the nation's urea output. The Chinese want to move to more efficient large-scale production, but are constrained by transportation and distribution problems. The smaller local plants use much more energy relative to output than the large factories, but they continue to play an important role in supplying local areas with nitrogen fertilizer. Still, Chinese officials have been closing the most inefficient small plants; several hundred were shut down between 1981 and 1983. The result was to move China's chemical fertilizer industry into the black in 1982 for the first time in 17 years. In 1978 a total of 1,533 plants sustained an aggregate loss of ¥610 million; in 1982 1,250 plants had net profits of ¥100 million.

Four additional imported plants are expected to come onstream by 1987. These plants were imported in 1978, but construction was suspended the following year as part of China's broad economic retrenchment. Construction is once again underway and two of the plants, the Xinjiang General Petroleum Plant in Xinjiang Province and the Zhenhai Chemical Fertilizer Works in Zhejiang Province are currently in trial operation. They have the capacity to produce 300,000 tonnes of ammonia and 520,000 tonnes of urea per year. A third plant in Ningxia will have similar capacity.

Chemical Fertilizer Supply 1970-83

Million tonnes effective nutrient weight



Artwork by John Yanson

SOURCE: State Statistical Bureau and *China's Customs Statistics*

The last of the four plants is in Lucheng County, Shanxi. When completed, this will be one of the largest compound fertilizer plants in the world, with a capacity of 900,000 tonnes of nitrophosphate and 300,000 tonnes of ammonia per year. At present, China's only compound fertilizer plant, the Nanjing Chemical Industry Corp., produces just 30,000 tonnes per year. The new plant, situated near Shanxi's vast coal reserves, will require 1 million tonnes of coal and 450,000 tonnes of phosphate concentrate per year. Equipped with its own special railway and power generating unit, the plant is expected to come onstream by the end of 1987. China is importing equipment for the factory from West Germany's Lurgi Corp. and Japan's Toyo Engineering Co. at a cost of $250 million.

As significant as these imported plants are, China has not realized their full potential. Because of shortages of raw material feedstocks, especially natural gas, these plants operate at only about 70–80 percent of their productive capacity. Recent indications that China may be accelerating the development of its natural gas industry raise hope for improvement on that score.

Phosphate: In 1983 China produced 2.86 million tonnes of phosphate fertilizer, an increase of 12 percent over the previous year. Like the nitrogen industry, the phosphate fertilizer industry depends to a large extent on production from small plants. Indigenous phosphate rock makes up 95 percent of the raw phosphate used in fertilizer processing. China's known reserves total 11.8 billion tonnes, ranking the country fourth in the world behind the US, the Soviet Union, and Morocco.

Under the Sixth Five-Year Plan renewed emphasis on phosphate fertilizer was reflected in the expansion or construction of eight mines. The principal mines are Wangji in Hubei Province, Kaiyang in Guizhou, Kunyang in Yunnan, and Yunfu in Guangdong. The Wangji and Kunyang mines have phosphate deposits totaling 200 million tonnes each. The Yunfu Iron Sulfide Mine, in Zhaoqing Prefecture, will produce enough iron sulfide for 4.8 million tonnes of phosphate fertilizer. This mine, equipped with four shipping berths, is conveniently located near the Zhu and Xi rivers and should be completed in 1985.

Additional projects include a phosphate fertilizer plant built with Romanian equipment and technology at Tongling in Anhui Province, and a fertilizer base at Wengan and Fuquan in Guizhou. The Tongling plant, expected to begin production in 1986, will have a capacity of 140,000 tonnes of solid phosphate ammonia per year. With the added production from these projects, China expects to expand its phosphate fertilizer industry by 21 percent over the 1982 level by the end of 1987.

Potassium: China's production of potassium fertilizer remains very low: only 29,000 tonnes in 1983. This accounted for less than 5 percent of the already low domestic consumption. The Chinese paid relatively little attention to potassium as a plant nutrient until 1980. Once they did, they boosted supply through a dramatic increase in imports. China does have large potassium deposits in its western provinces, however, which it is only beginning to exploit. A large plant is under construction in the Qaidam Basin in Qinghai Province. It will have 200,000 tonnes per year capacity upon completion of the first stage of construction in 1987.

Transport and technology hinder domestic production

Domestic fertilizer production faces serious constraints. Despite the government's weed-out program, small-scale plants producing ammonium bicarbonate are still inefficient by modern standards. While the fertilizer industry as a whole made a profit in 1983, the government claims some 300 enterprises still lost a total of ¥63 million. These decentralized plants, however, do help tackle one of the industry's major problems: distribution. Transportation problems, endemic to the present Chinese system, make distribution of the large plants' output difficult. Small fertilizer plants located near raw materials and the fields where their output is used avoid this problem.

On the other hand, ammonium bicarbonate is an extremely unstable product. It breaks down quickly, and

must be applied to the soil almost immediately. Estimated losses due to volatilization run as high as 1 million tonnes per year. The clearest evidence for large fertilizer losses in China is the fact that domestic production plus imports exceeds actual consumption by several million tonnes.

Technology has been another constraining factor. China's technical capability has been limited to building ammonia plants in the 10,000–150,000 tonnes per year range. Several plants of roughly this size have been built recently. For example, a plant in Kaifeng, Henan, using natural gas feedstock has an annual capacity of 160,000 tonnes. Another in Qiqihar, Heilongjiang, completed in 1983, has a capacity of 130,000 tonnes of ammonium nitrate.

For larger plants, China was dependent on imports until last year. In 1984, however, the Chinese built two plants, each with an annual capacity of 300,000 tonnes of ammonia and 520,000 tonnes of urea. One was built by the Nanjing Chemical Industry Company in Jiangsu and the other by the Jinzhou Heavy Machinery Plant in Dalian, Liaoning. These plants indicate that the Chinese are no longer dependent on imported technology for large-scale plants, but they do not signal the end of foreign plant imports altogether. The large complex fertilizer plant in Shanxi (which uses some West German and Japanese equipment) will be the most likely model for future imports.

The phosphate industry has been constrained by the remote location of mines in relation to ports and sources of sulfur (used in processing phosphate rock). At present the Chinese phosphate industry depends on hydroelectric power (thermal phosphoric acid) and coke (fused calcium magnesium phosphate) to transform the local rock into a usable form. New rail lines in Yunnan and Hubei will facilitate more rapid development of the phosphate mines at Kunyang and Wangji. Similarly, the Yunfu Iron Sulfide Mine will benefit from its favorable access to transport facilities.

Another problem the Chinese have encountered with phosphate is difficulty in extraction. This is caused by low-grade sedimentary or colloidal deposits. About 80 percent of China's deposits are of this nature and therefore not suitable for direct application to the soil.

Constraints on the potassium fertilizer industry once again focus on transportation. The large fertilizer plant in Qinghai will have to depend on an already overtaxed rail system to bring its product to farming areas. In short, infrastructure and technology constraints will continue to plague the growing Chinese fertilizer industry. The government will slowly phase out small plants (many of which date from the Great Leap Forward of the late 1950s) in favor of large capacity plants. There will still be a net shortfall in the supply of chemical fertilizer because of continued demand growth and some displacement of product from the small plants. As a result, controlled growth of imports can be expected.

A prodigious but cautious importer

Pinning down the exact volume of China's fertilizer imports is a daunting task. Figures for the early 1980s range from 8–12 million tonnes per year. Nitrogen accounted for the bulk of China's imports in 1983, with urea making up 58 percent of that category, up from 34 percent in 1981. Urea's share in nitrogen imports is expected to continue to grow. Half of the urea imports in 1983 came from Eastern Europe, with the Middle East supplying a large amount as well. In value terms, the US is the most important supplier; in 1983 and the first half of 1984 China bought more than 30 percent of all its chemical fertilizers by value from America.

Another significant aspect of imports has been the marked increase in phosphate and potassium imports following China's 1982 decision to encourage their use. In 1981 China imported 335,000 tonnes of phosphate fertilizer. In 1984 it contracted for imports of approximately 2 million tonnes. The US is the principal supplier, accounting for more than 95 percent of diammonium phosphate imports. Imports of potassium increased as well over this period, as domestic production failed to keep up with product demand.

In recent years China's fertilizer imports have remained a fairly constant percentage of total supply. This can be traced to a desire to avoid overreliance on imports and will mean that further increases in fertilizer imports will be linked with domestic production increases. China also displays caution by spreading its imports among many different countries, with the exception of its dependence on the US for phosphate imports. In 1983, 24 countries each exported more than ¥10 million in chemical fertilizer to China.

Moving slowly toward fertilizer self-sufficiency

China's demand for fertilizer will continue to grow both in response to agricultural modernization and the incentive effects of the responsibility system. The Chinese obviously would prefer to satisfy this demand with domestic production. But despite significant advances, domestic capacity is not likely to keep pace with new demand for the near future.

New phosphate mining operations and plants will greatly increase China's domestic production, particularly those operations equipped with modern transportation facilities. In the short run, though, imports should play an increasingly important role because China's transport system is still inadequate to take full advantage of the country's newly developed fertilizer production facilities.

In the longer term, foreign companies may find China more willing to import potassium than other types of fertilizer. Even with the completion of the Qaidam potassium plant in Qinghai, domestic supply will fall far below a demand that has only recently begun to grow.

The brightest prospect for China's production potential is a project currently being negotiated with the Atlantic Richfield Co. that could significantly affect fertilizer supply by the end of the decade. This project would be based on ARCO's large natural gas discovery in the South China Sea about 70 miles south of Hainan Island. The two sides are discussing building a pipeline to send the gas to a proposed giant fertilizer plant on Hainan, which might have an annual urea capacity of up to 7 million tonnes. Fertilizer companies from Japan and numerous Western countries reportedly have expressed interest in building the plant. While still on the drawing board, if this new fertilizer plant materializes in the 1990s, it would push China well toward its goal of consuming 20 million tonnes of nitrogen fertilizer per year by 2000. 完

事历

INTERNATIONAL CONFERENCE ON CHINA'S PETROLEUM INDUSTRY February 11-14, 1985, Shanghai. Discussions on both onshore and offshore topics. *Contact: Petroleum News*, P.O. Box 6233, Washington, DC 20015. Tel: (202) 726-6150.

SINOCHEM 85/INTERNATIONAL AND HONG KONG AREA CHEMICAL INDUSTRY EXHIBITION April 3–9, 1985, Shanghai. Includes petrochemical equipment and technology. *Contact:* Mr. Y. B. Shaw, Gen. Mgr., Hong Kong Expositions Ltd., 607 Wayson Commercial Bldg., 28 Connaught Rd. W., Hong Kong. Telex: 75388 EXPO HX or 72062 HAPS HX.

PETROEX: PETROLEUM AND MINERAL EXPLORATION AND DEVELOPMENT EXPOSITION/1985 April 17–24, 1985, Beijing. *Contact:* Mr. David L. Yowell, Society of Exploration Geophysicists, P. O. Box 702740, Tulsa, OK 74170-2740. Tel: (918) 493-3516.

PORT DEVELOPMENT & COASTAL TRANSPORTATION EXPO/CHINA '85 May 22–27, 1985, Guangzhou. Offshore transportation portion will include helicopters, lifesaving boats and equipment, offshore base facilities and supporting vessels. *Contact:* Mr. Andrew Kay, China Promotion Ltd., Rm. 2503, Int'l Building, 141 Des Voeux Rd., Central, Hong Kong. Telex: 76270 CHOCH NX.

INTERPETRO CHINA 85/INTERNATIONAL PETROLEUM EQUIPMENT & TECHNOLOGY EXHIBITION September 4–10, 1985, Shanghai. *Contact:* Mr. Hsing Wang, Int'l Transworld Exhibition Center, 501 Fifth Avenue, New York, NY 10017. Tel: (212) 867-1150.

OIL & GAS 85/INT'L OFFSHORE SERVICE, SUPPLY & DEVELOPMENT EXHIBITION November 11–14, 1985, Hong Kong. Supported by China Nat'l Offshore Oil Corp. *Contact:* Ms. Suzanne Faske, The Seatrade Group, 17 Battery Place, Suite 1102, New York, NY 10004. Tel: (212) 422-6470.

Calendar prepared by Susan Baugh.

OFFSHORE CHINA '85/THE 3RD OFFSHORE OIL EXHIBITION & CONFERENCE November 26–30, 1985, Guangzhou. Includes supply and transportation, telecommunications, and supply base operations and maintenance equipment. *Contact:* Mr. Walter Keats, Middle West Consultants Ltd., 630 Green Bay Rd., P.O. Box 350, Kenilworth, IL 60043. Tel: (312) 256-7887.

MARINTEC CHINA 85/SHANGHAI & MARINTEC OFFSHORE CHINA December 2–8, 1985, Shanghai. Offshore technology exhibits will focus on rig, vessel, and platform fabrication equipment. *Contact:* Mr. Ron Akins, Cahners Exposition Group, 7315 Wisconsin Ave., P.O. Box 70007, Washington, DC 20088. Tel: (301) 657-3090.

2ND SPE INTERNATIONAL PETROLEUM EQUIPMENT & TECHNOLOGY EXHIBITION March 14–21, 1986, Beijing. *Contact:* Mr. Douglas L. Ducate, Society of Petroleum Engineers, P.O. Box 833836, Richardson, TX 75083-3836. Tel: (214) 669-3377.

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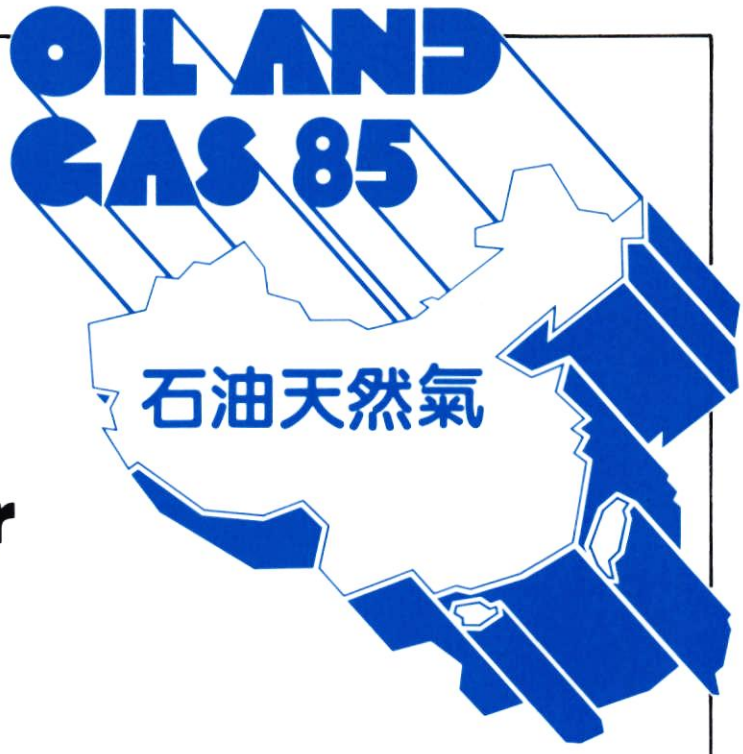

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China's Patent System Emerges

Interpretation will hold the key to the law's success with the foreign business community

Ellen R. Eliasoph

A new era of encouragement and recognition of scientific creativity in China began when the National People's Congress adopted the Patent Law of the People's Republic of China on March 12, 1984. When the law goes into effect on April 1, 1985, China will join the ranks of nations that recognize the products of mental labor as a form of individual wealth giving rise to proprietary rights and having measurable economic value. This is particularly notable in a nation that, until very recently, has tended to treat the products of mental labor as shared wealth, and has practiced a system of the free use of technological inventions by all units across the country. In recent statements that reflect the nation's current spirit of reform, patent officials have expressed their hope that the Patent Law will prove useful in encouraging and protecting "competition between rivals" and in aiding China's application of the "law of value" to its economic development.

The new law also represents a major advance in China's effort to create a legal framework for the protection of industrial and intellectual property, an undertaking essential to its drive to encourage the importation of foreign technology. Early milestones in this area were China's adoption of a Trademark Law in 1983 and its entry into the World Intellectual Property Organization in March of that year. In December 1984 China took another significant step by signing the Paris Convention for the Protection of Industrial Property. Work is also underway on the drafting of a copyright law, a project that may take several years.

Although the Patent Law will not become effective until April 1, China's patent officials have already turned their attention to practical issues involved in administering the new law. They appear to be giving special attention to several aspects of the law that are of particular concern to foreigners.

The Patent Law Implementing Rules, scheduled for promulgation prior to April 1, will detail procedures involved in applying for, transferring, protecting, and defending patent rights. But ultimately, the manner in which the law and the implementing rules are interpreted and applied will have the greatest significance for the law's successful implementation. China's patent law officials have proved very willing to discuss their ongoing deliberations and respond to requests for clarification regarding both substance and procedural aspects of the law, and in so doing they have shed light on what the future might hold.

Scope of patent protection and the problem of exclusions

China's Patent Law provides for the patentability of inventions, utility models (often referred to as "petty inventions"), and industrial designs that conform to the requirements set forth in the law. The law requires that inventions and utility models have the qualities of "novelty," "inventiveness," and "practical applicability." Industrial designs have only one requirement for patentability: the design may not be identical or similar to any design that has been publicly disclosed in publications in China or abroad, or publicly used in China, prior to the date of the patent application.

Article 25 of the law specifically excludes patents on the following classifications of products and inventions: 1) scientific discoveries; 2) the rules and processes of mental activities; 3) methods of diagnosing and treating diseases; 4) foodstuffs, beverages, and flavorings; 5) pharmaceuticals and substances derived from chemical processes; 6) breeds and varieties of animals and plants; and 7) substances derived from nuclear processes. The Article further stipulates, however, that patent rights may be granted to the "processes for producing" products listed in items 4, 5, and 6.

The publication of these general exclusions left many observers longing for more detail. As patent practitioners know, the true scope of protection provided by a patent law is often found not in its wording but in its interpretation. Discussions with Chinese patent authorities on the subject have been encouraging, for they exhibit a keen appreciation of the role that interpretation will play in their system of exclusions, and have even gone so far as to hint at the interpretations they may adopt in some specific areas:

Pharmaceutical and Chemical Substances: There is little unexpected or unusual about the exclusion of pharmaceutical products and substances derived from chemical processes. Most developing countries, and even some developed countries, deny patent protection to the creators of pharmaceutical products. China's patent officials have explained their view that pharmaceutical products, like foodstuffs and bev-

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erages, are essential to people's health and well-being, and should therefore be manufactured on a widespread basis and sold at the lowest possible price (i.e., without any premium payable to the patent holder).

In addition, China's patent officials point out that in the area of chemical substances, the granting of patents could discourage others from trying to invent new processes for creating chemical substances, and thus inhibit development of the country's chemical industry. A backward chemical industry, they add, can easily be dominated by foreign enterprises.

From the perspective of certain process-reliant industries, such as the petroleum and petrochemical industries, China's protection of chemical *processes* is highly encouraging. But industries involved primarily in the development and marketing of new chemical products—the agrichemicals industry, for example—may find process protection alone inadequate. However, many believe that the existing provisions of the law, if flexibly applied, could afford some protection similar to that obtainable under substance *per se* protection. For example, some chemical products are actually formulations—simple physical mixtures of various ingredients—as opposed to "substances derived from chemical processes." Will "chemical formulations" be entitled to protection under the "process" rubric, even though the end products might not themselves be eligible for patent protection? Alternatively, the direct patenting of new "methods of use" of chemical substances, which is not excluded by the terms of Article 25, would afford even stronger protection.

China's patent officials are quick to point out that the limitations relating to chemical substance protection may be relaxed over time, as China gains more experience with a patent system. In fact, they have already taken significant steps to demonstrate their flexibility in this regard. Although as of this writing legislative confirmation is not yet available, patent officials have recently stated that China will grant patent protection to chemical formulations and methods of use. While this is certainly encouraging, the precise scope of this protection awaits development and clarification through practice.

Microorganisms: The stated ineligibility of "breeds and varieties of animals and plants" for patent protection has left open the question of whether microorganisms derived from biotechnology will be patentable in China. Chinese patent officials have indicated that China *does* intend to grant patent protection for microorganisms and the processes for producing them. They add that, now that it has joined the Paris Convention, China will consider adhering to the Budapest Treaty, which establishes an international procedure for making the microorganism deposits required in connection with certain microbiological patent applications.

Computer Software: Although prior to the promulgation of the Patent Law Chinese officials had repeatedly stated that software would be ineligible for patent protection, the law does not in fact contain such an exclusion. Some puzzled observers simply assumed that Article 25's exclusion of "rules and processes of mental activities" was meant to encompass computer software.

Chinese patent officials have recently confirmed that, in general, computer software will not be patentable, but will instead be covered by China's forthcoming copyright law or a special computer software protection law. They add, however, that computer software integrally related to the operation of computer hardware for which a patent application is made will be patentable, as is the practice in the United States. Chinese officials anticipate that the precise scope of this protection will be delineated on a case-by-case basis.

Administration and enforcement agencies

During the initial period following the promulgation of the Patent Law, there was some confusion as to which agencies would be responsible for its administration and enforcement. The references in Articles 19 and 20 to "the patent agency designated by the State Council of the People's Republic of China" and the reference in Article 60 to "the patent administration authorities" mystified many observers. Who are these "agencies" and "authorities," and what powers will they have?

The authority to review patent applications and grant patent rights is held by the China Patent Office, which is headquartered in Beijing and has already established numerous offices throughout the country. In addition, the Patent Office has published guidelines for the establishment of patent administration offices (as contemplated by Article 60) by each individual province, autonomous region, self-governing municipality and, in some cases, industrial ministries, bureaus, special economic zones, and "open cities." The responsibilities of the patent administration offices will include the processing of domestic patent applications and the handling of patent disputes occurring within their respective jurisdictions. The Patent Office has also made provisions for the establishment of patent service organizations by these various regions and agencies for the handling of day-to-day patent document services, patent agency work, and other tasks.

The China Council for the Promotion of International Trade (CCPIT) was the first organization to be granted the authority to handle foreign-related patent matters. In 1980 CCPIT established the CCPIT Patent Agency, located in Beijing, which formally opened in 1984. In March 1984 CCPIT and a Hong Kong co-investor jointly established The China Patent Agency (Hong Kong), Ltd., to assist foreigners in handling China patent matters through Hong Kong. And in August the Shanghai Patent Office was officially designated the second patent organization responsible for the handling of foreign-related patents in China.

CCPIT and the Shanghai Patent Office are clearly the "agencies" referred to in Articles 19 and 20 of the laws; i.e. those that have been designated by the State Council to handle patent matters in China on behalf of foreigners who do not "have a regular residence or place of business in China" (Article 19), and to handle applications by Chinese individuals and units for foreign patents (Article 20). Foreigners resident in or having a place of business in China have an option, if they wish, to apply for a patent through the local patent administration authorities in the same manner as a Chinese individual or entity, instead of working through CCPIT or the Shanghai Patent Agency.

It will be interesting to observe the extent to which the various authorized agencies compete for foreign

patent applications. Chinese patent officials anticipate both regional and interagency competition, and have confirmed that both the Shanghai Patent Office and the Shanghai branch of CCPIT will accept foreigner's patent applications in China.

Rights of priority for foreign applicants

The Patent Law adopts a first-to-file rule for handling situations in which two or more applicants file competing claims for a patent on an identical item. Article 29, however, contains an exception to the first-to-file rule. The Article provides that a foreign applicant has the right to claim priority for a patent application filed in China within a specified time period following the first filing of an application outside China for a patent on the invention, utility model, or design in question. Thus, a foreign applicant granted priority under China's Patent Law may have the date on which its patent application was filed in a foreign country regarded as the date of filing in China. This priority right is, however, available only to nationals of countries that have entered into an international convention or a bilateral agreement with China (for example, the 1979 Agreement on Trade Relations between the US and the PRC), providing for the mutual recognition of priority rights, and to nationals of countries that grant a similar right of priority to Chinese nationals on the basis of reciprocity.

In order to encourage foreign patent applicants to file as soon as the law takes effect on April 1, 1985, foreign applicants will be allowed to claim a right of priority in China with respect to any invention, utility model, or industrial design for which an initial patent application was made outside China on or after October 1, 1984—that is, within the six months immediately preceding the effective date of the law. CCPIT has already begun accepting and processing foreigners' patent applications, both those being filed under a claim of priority and those that are not, in preparation for formal filing when the Patent Law enters into force.

What happens after filing—questions remain

Although it is encouraging to watch the system for implementation of the Patent Law swiftly take form and to obtain some preliminary indications as to how the law may be interpreted, a number of questions remain. The forthcoming Patent Law Implementing Rules may address some of these questions, but others will have to be resolved through practice, or left to be addressed in supplementary legislation. Some of the issues of major concern to foreign businessmen include the following:

Compulsory licensing: The Patent Law generally provides that once a patent is granted, no individual or entity may practice the patent unless authorized by the patentee pursuant to a written licensing contract. However, the law contains certain exceptions to this rule. Article 51 of the law provides that a patentee has an obligation to manufacture its patented product or use its patented process in China, or to grant licenses to others to do so. Article 52 provides that if, upon the expiration of three years from the date on which a patent right is granted for an invention or utility model, the patentee has "without valid justification" failed to fulfill the obligations prescribed in Article 51, the Patent Office may grant to another entity a compulsory license to practice the patent.

Whether this compulsory licensing provision is viewed as reasonable or not will depend on the interpretation given the phrase "without valid justification." For example, will the time required by a chemical company to obtain necessary safety and environmental impact approvals prior to marketing be considered "valid justification" for a delay? Will the lack of proper infrastructure such as, for example, a constant source of electricity, be considered a "valid justification" for not working a patent?

The Patent Office may also grant a compulsory license to a patentee holding a patent on an improvement of a previously patented invention or utility model patent, if the practice of the improvement is dependent upon the practice of the earlier patent. In such a case, the patentee may apply for and obtain the right to practice the earlier art, and the prior patentee will have a reciprocal right to apply for and obtain a compulsory license enabling it to practice the improvement of the invention or utility model in question. Foreign business representatives have expressed the hope that these provisions will be given a narrow interpretation in order to avoid the anomalous situation in which a later patentee of a minor improvement can easily obtain a compulsory license to practice the prior art.

Royalties: Although the Patent Law generally provides a patentee with the right to require its licensees to pay a royalty, it contains no guidelines governing the amount of the royalty that the patentee—be it a Chinese–foreign joint venture enterprise, another Chinese entity, or a foreign entity—may charge. This omission raises particular problems for the interpretation of Articles 54 and 57 of the Patent Law, both of which relate to compulsory licensing. Article 54 provides that an applicant for a compulsory license to practice another's patent "shall submit proof of its inability to conclude a licensing contract with the patentee on the basis of reasonable terms." Article 57 provides that the unit or individual obtaining a compulsory license "shall pay the patentee a reasonable use fee," the amount of which is to be decided by the parties through consultation or, failing that, through Patent Office adjudication. But the Patent Law is silent on the meaning of the term "reasonable." In response to requests for explanation, patent officials have indicated only that China's forthcoming regulations concerning technology transfer may contain relevant guidelines, but that, in general, royalty rates should be determined through negotiation by the parties involved.

Handling of infringement cases: Article 60 of the Patent Law provides patentees and "interested parties" with two alternative methods for challenging patent infringement: commencement of proceedings before the patent administration authorities or the institution of court action. The statute of limitations for infringement actions is two years, commencing from the date on which the patentee or interested party "knew or should have known of the acts of infringement."

Any given patent administration authority may entertain a dispute arising solely within the scope of its jurisdiction, i.e., within the province, municipality, ministry, or bureau concerned, and will have the power to investigate the facts and resolve disputes by means of "administrative mediation." In addition, these authorities will have the power to issue

injunctions and order compensation. Decisions rendered by the patent administration authorities may be appealed to the People's Courts.

Article 60 of the law also provides that in cases arising from a claim of infringement of a process patent, the defendant shall be required to supply proof of the manufacturing process used. Under the patent laws of many nations, the burden of proof in process infringement cases rests with the plaintiff and is often exceedingly difficult to meet. Article 60's reversal of the burden of proof, cited by Chinese officials as an important element of the "strong" protection to be afforded by China's Patent Law, has, accordingly, been hailed by foreign manufacturers as a laudable development. While welcoming the procedural advantage provided by Article 60, foreign manufacturers point out that, if it is to play an effective role in counteracting international counterfeiting and pirating, this reversal of the burden of proof must apply not only to domestic manufacturers, but also to importers of allegedly infringing products.

But at this early stage, even the more basic question of whether the importation of an infringing product or a product manufactured through the unauthorized use of a patented process will constitute an infringement under the Patent Law remains open. This is due to the fact that the Patent Law contains no positive definition of the term "infringement," an omission that observers have noted with concern. The omission leaves open many questions as to what sorts of infringement claims will be cognizable in China. Will the Chinese authorities entertain claims of contributory infringement? Inducement to infringe?

Chinese patent officials have held out little hope that the Patent Law Implementing Rules will contain further clarification of this issue. Rather, they expect that complicated questions involving the importation of infringing products and the interpretation of the term infringement will be resolved over the course of a long period of practice and through the case-by-case handling of disputes.

Foreign-owned and Chinese–foreign joint venture enterprises

Article 6 of the Patent Law provides that the right to apply for a patent for a job-related invention or creation made by the personnel of a foreign-owned enterprise or Chinese–foreign joint venture enterprise within China's territory shall belong to the enterprise and that the patent right, once granted, shall be owned by the enterprise. Foreign companies investing in wholly owned enterprises or Chinese–foreign joint venture enterprises may be concerned with the conditions under which they can obtain assignments of the patent rights acquired by these enterprises.

Article 10 provides that both the right to apply for a patent and the patent right itself may be assigned, and that assignments by Chinese units or individuals to foreigners must be approved by "the relevant competent department of the State Council." Since China's joint venture legislation provides that Chinese–foreign joint venture enterprises are "Chinese legal persons," it is generally assumed that the State Council approval required by Article 10 will apply to assignments of patent rights by all such enterprises. Although the legal status of wholly owned foreign enterprises remains unclear, it is possible that they, too, will be subject to Article 10. Many foreign observers hope that the Patent Law Implementing Rules will clarify the conditions for the granting of the requisite State Council approval, and that such conditions will not be reasonably restrictive.

The Patent Law contains no positive definition of the term "infringement." This omission leaves open the basic question of whether importation of an infringing product or a product manufactured through the unauthorized use of a patented process will constitute an infringement.

Disseminating patent information

Since patent officials expect that the reach of the Patent Law and the application of its provisions will be elucidated over time and on the basis of actual cases, regular and timely public dissemination of information about the patent system, patent grants, and patent case decisions will be crucial to the system's effective operation. It is therefore encouraging to note that channels for this dissemination are rapidly being established.

The Patent Law provides for the publication of the text of a patent application after it has undergone preliminary examination, and again when it has been approved. Presumably, these publications will appear in a patent gazette similar to those of other nations. Chinese patent officials have already stated that they intend to publish such a gazette.

Patent officials have also confirmed that they intend to publish rulings, interpretations, and supplementary explanations of the Patent Law from time to time. Indeed, the Patent Office has already issued two Patent Office Circulars relating, respectively, to the priority period for foreign applicants and to the responsibilities of the patent administration authorities. Both circulars were published in Chinese-language patent and technical periodicals, which are beginning to proliferate at a rather astounding rate. A sample of the various titles available from the Patent Documents Publishing House alone—not to mention the host of other publishing houses—includes *Patents of China*, *World Inventions*, *Foods and Fermentation*, *Electromagnetic and Radiation Meteorological Surveying and Prospecting*, and *Weapons and Ammunition*.

The compilation of patent documents and data and the training of personnel are both well under way. The China Patent Office is setting up a patent data service center, which reportedly has already collected over 20 million reference items from all over the world. Thousands of patent personnel have received short-term course training. It appears that news of the system is spreading fast: *China Daily*, China's English-language newspaper, recently published the letter of a patent enthusiast from Inner Mongolia, who praised the China

Patent Office for having "trained several thousand people through correspondence courses"!

A good beginning

At the time of its promulgation in March 1984, China's Patent Law evoked a generally favorable reaction from foreign commentators. Since then, Chinese patent officials have worked energetically to explain the law and establish a system for its implementation.

Of particular importance is the thoughtful, flexible attitude that China's patent officials have demonstrated in the course of explaining the new patent system. This has encouraged observers and potential patentees to anticipate that China's patent system will be well-administered, reliable, and—once the necessary experience is acquired—sophisticated. The Chinese, for their part, are eager to begin. After all, practice is the best test. Perhaps this is why a Chinese patent official chose to end a recent discussion with a group of foreign business representatives by asking, simply, "What decision will you make on April 1, 1985? Will you stand by for awhile? Or will you come in right away to file patent applications in China?" 完

The Patent Law of the People's Republic of China

CHAPTER 1 GENERAL PROVISIONS

Article 1. This Law is formulated in order to protect patent rights for inventions and creations, encourage inventions and creations and further their popularization and application, promote the development of science and technology, and meet the needs of socialist modernization.

Article 2. The "inventions and creations" referred to in this Law mean inventions, utility models, and industrial designs.

Article 3. The State Patent Office of the People's Republic of China shall accept, handle, and examine patent applications and grant patent rights in respect of inventions and creations that conform to the provisions of this Law.

Article 4. If an invention or creation for which a patent application is made involves national security or major interests of the State and should be kept secret, the application shall be handled in accordance with the relevant regulations of the State.

Article 5. Patent rights shall not be granted in respect of inventions and creations that violate the laws of the State or the morals of society, or that jeopardize the public interest.

Article 6. The right to apply for a patent for a job-related invention or creation made in the course of performing the tasks of the unit concerned, or made primarily through the use of the material means of such unit, shall belong to such unit; the right to apply for a patent for a non-job-related invention or creation shall belong to the inventor or designer. Upon approval of an application, if the application was made by a unit owned by the whole people, the patent right shall be held by such unit; if the application was made by a collectively owned unit or an individual, the patent right shall be owned by such unit or individual.

The right to apply for a patent for a job-related invention or creation made by personnel of a foreign-owned enterprise or Chinese–foreign joint venture enterprise within the territory of China shall belong to such enterprise; the right to apply for a patent for a non-job-related invention or creation shall belong to the inventor or designer. Upon approval of an application, the patent right shall be owned by the enterprise or individual that applied for it.

The owners and holders of patent rights are uniformly referred to herein as "patentees."

Article 7. No unit or individual may suppress the applications of inventors or designers for patents in respect of non-job-related inventions or creations.

Article 8. Unless otherwise agreed, the right to apply for a patent for an invention or creation made by two or more units through cooperation, or by one unit that has been entrusted by another unit to perform a research or design task, shall belong to the unit that made, or the units that jointly made, the invention or creation. Upon approval of the application, the patent right shall be owned and held by the unit(s) that applied for it.

Article 9. If two or more applicants apply separately for a patent for the same invention or creation, the patent right shall be granted to the applicant that applied first.

Article 10. The right to apply for a patent, and the patent right itself, may be assigned.

If a unit owned by the whole people assigns a right to apply for a patent or a patent right, the matter must be approved by the higher-level competent authority.

If a Chinese unit or individual assigns to a foreigner a right to apply for a patent or a patent right, the matter must be approved by the relevant competent departments of the State Council.

The parties to an assignment of the right to apply for a patent or of a patent right must sign a written contract, which shall become effective upon being registered with and publicly announced by the Patent Office.

Article 11. Except as provided in Article 14 of this Law, following the grant of an invention patent right or utility model patent right, no unit or individual may practice the patent without the permission of the patentee; that is, no unit or individual may manufacture, use, or market the patented products, or use the patented process, for production or business purposes.

Following the grant of an industrial design patent right, no unit or individual may practice the patent without the permission of the patentee; that is, no unit or individual may manufacture or market products using the patented industrial design, either for production or business purposes.

Article 12. Except as provided in Article 14 of this Law, any unit or individual that practices another person's patent must sign a written licensing contract with, and pay a royalty to, the patentee. The licensee shall not have the right to permit any unit or individual other than those specified in the contract to practice the said patent.

Article 13. Following the publication of an application for an invention patent, the applicant may require that units or individuals that practice its invention pay an appropriate fee.

Article 14. The relevant competent departments of the State Council and the people's governments of the provinces, autonomous regions, and municipalities directly under the central authorities shall, on the basis of the State plan, have the power to decide whether to permit designated units to practice important invention and creation patents held by units owned by the whole people that fall within their own system or within their jurisdiction. The units practicing such

The Patent Law was adopted at the Fourth Session of the Standing Committee of the Sixth National People's Congress on March 12, 1984. Translation by Paul, Weiss, Rifkind, Wharton & Garrison.

patents shall, in accordance with State regulations, pay a royalty to the units holding the patent rights.

Patents of Chinese collective units or individuals that are of great significance for the national or the public interest and need to be popularized and applied shall be handled in accordance with the provisions of the preceding paragraph after being reported to the State Council by the relevant competent departments of the State Council for approval.

Article 15. Patentees have the right to affix patent markings and patent numbers on their patented products, as well as on the packaging of such products.

Article 16. Units that own or hold patent rights shall reward the inventors or designers of job-related inventions or creations; after an invention or creation patent is practiced, the inventor or designer shall be rewarded in accordance with the scope of its popularization and application and the economic benefits obtained.

Article 17. An inventor or designer has the right to state in the patent documents that he himself is the inventor or designer.

Article 18. When a foreigner, foreign enterprise, or other foreign organization that does not have a regular residence or place of business in China applies for a patent in China, the matter shall be handled on the basis of this Law in accordance with any agreement entered into between the country to which he or it belongs and China, any international treaty participated in by both countries, or the principle of reciprocity.

Article 19. When a foreigner, foreign enterprise, or other foreign organization that does not have a regular residence or place of business in China applies for a patent and deals with other patent matters in China, he or it shall entrust the patent agency designated by the State Council of the People's Republic of China to handle such matters on his or its behalf.

When Chinese units or individuals apply for patents and deal with other patent matters in this country, they may entrust a patent agency to handle such matters on their behalf.

Article 20. When a Chinese unit or individual intends to make application in a foreign country for a patent on an invention or creation accomplished in this country, it or he shall first apply for a patent at the Patent Office and, after approval by the relevant competent departments of the State Council, it or he shall entrust the patent agency designated by the State Council to handle the matter on its or his behalf.

Article 21. Prior to the publication or public announcement of a patent application, Patent Office personnel and the persons concerned shall be responsible for keeping the contents of the patent application confidential.

CHAPTER II CONDITIONS FOR THE GRANTING OF PATENT RIGHTS

Article 22. In order to qualify for the grant of patent rights, inventions and utility models must possess the characteristics of novelty, inventiveness, and practicability.

"Novelty" means that prior to the date of application, no identical invention or utility model has been publicly disclosed in domestic or foreign publications, been publicly used in this country or been made known to the public by other means, nor is there an identical invention or utility model in respect of which an application has been filed at the Patent Office by another person and recorded in the patent application documents published after the date of said application.

"Inventiveness" means that, in comparison with the technology existing prior to the date of application, the invention concerned possesses conspicuous, substantive, distinguishing features and represents a marked improvement, or, in the case of utility models, the utility model concerned possesses substantive distinguishing features and represents an improvement.

"Practicability" means that the invention or utility model concerned is capable of being manufactured or used, and, in addition, is capable of producing positive results.

Article 23. In order to qualify for the grant of a patent right, an industrial design must be different from or dissimilar to industrial designs that have been publicly disclosed in domestic or foreign publications or have been publicly used in this country prior to the date of application.

Article 24. An invention or creation for which a patent application is made shall not forfeit its novelty by virtue of the occurrence, within six months prior to the date of application, of one of the following events: 1) it is displayed for the first time at an international exhibition hosted or recognized by the Chinese government; 2) it is disclosed for the first time at a prescribed academic or technical conference; or 3) another person reveals its details without the consent of the applicant.

Article 25. Patent rights shall not be granted in respect of any of the following items: 1) scientific discoveries; 2) the rules and processes of mental activities; 3) methods of diagnosing and treating diseases; 4) foodstuffs, beverages, and flavorings; 5) pharmaceuticals, and substances derived from chemical processes; 6) breeds and varieties of animals and plants; and 7) substances derived from nuclear conversion processes.

Patent rights in respect of the processes for producing the products listed in items 4 to 6 of the preceding paragraph may be granted in accordance with the provisions of this Law.

CHAPTER III APPLICATIONS FOR PATENTS

Article 26. When application is made for an invention or a utility model patent, the application, a written description and an abstract thereof, a patent claim and other such documents shall be submitted.

The application shall state the name of the invention or utility model, the name of the inventor or designer, the name and address of the applicant, and other items.

The written description shall contain a description of the invention or utility model that is sufficiently clear and complete as to enable technical personnel in the technical field to which the invention or utility model belongs to carry it out; if necessary, drawings shall be appended to the explanation. The abstract shall briefly state the important technical features of the invention or utility model.

The patent claim shall, on the basis of the written description, state the scope of patent protection requested.

Article 27. When application is made for an industrial design patent, the application, pictures, or photographs of the industrial design, and other such documents shall be submitted, and, in addition, the products for which the said industrial design is to be used and the categories to which they belong shall be described.

Article 28. The day on which the Patent Office receives the patent application documents shall be the date of application. If the application documents are sent by mail, the date of mailing, as indicated by the postmark, shall be the date of application.

Article 29. If a foreign applicant files an application in China within 12 months of his or its first patent application in a foreign country in respect of the same invention or utility model, or within six months of his or its first patent application in a foreign country in respect of the same industrial design, the applicant may be entitled to enjoy a right of priority in accordance with any agreement signed between the country to which the applicant belongs and China, any international convention to which both countries are party, or in accordance with the principle of the mutual recognition of the right of priority; that is to say, the date on which the application was first filed by the applicant in the foreign country shall be the date of application.

When an applicant claims a right of priority and one of the events listed in Article 24 of this Law occurs, the term of the priority right shall be calculated commencing from the day on which the event occurs.

Article 30. An applicant claiming the right of priority shall submit a written statement at the time of application indicating the date of the application filed in the foreign country and the country in

which such application is being handled, and, in application, shall within three months submit copies of the application documents certified by the authority in such country that is responsible for handling the application; an applicant that does not submit such written statement or fails to submit the documents within such time limit shall be deemed not to have claimed a right of priority.

Article 31. An application for an invention patent or a utility model patent shall be limited to a single invention or utility model. Two or more inventions or utility models that are generated from a single general inventive concept may be submitted together in one application.

An application for an industrial design patent shall be limited to a single industrial design used for one type of product. If two or more industrial designs are used for products of the same category that will be sold or used in sets, they may be submitted together in one application.

Article 32. An applicant may withdraw his or its patent application at any time prior to the granting of a patent right.

Article 33. An applicant may amend his or its patent application documents; however, such amendments may not exceed the scope in the original written description.

CHAPTER IV EXAMINATION AND APPROVAL OF PATENT APPLICATIONS

Article 34. After the Patent Office receives an application for an invention patent and, upon preliminary examination, finds it to be in conformity with the requirements of this Law, it shall publish the application within 18 months from the date of application. The Patent Office may, upon an applicant's request, publish his or its application at an earlier date.

Article 35. Within three years from the date of application for an invention patent, the Patent Office may, upon the request of the applicant made at any time, carry out substantive examination of the application. If, absent valid justification, the applicant fails to make a request for substantive examination within the time limit, the said application shall be deemed to have been withdrawn.

When the Patent Office considers it necessary, it may of its own accord carry out substantive examination of an application for an invention patent.

Article 36. When making a request for substantive examination of an invention patent application, the applicant shall submit reference materials relating to the invention that predate the date of application.

When an applicant requests substantive examination in a case where application for an invention patent for the invention in question has already been made in a foreign country, the applicant shall submit the materials that have been assembled and investigated by such country in the course of examining such application, or materials containing the results of such examination. If, absent valid justification, the applicant fails to submit such materials, the application shall be deemed to have been withdrawn.

Article 37. If, upon substantive examination of an application for an invention, the Patent Office finds that an application does not comply with the provisions of the Law, it shall so notify the applicant, and require the applicant to present his or its views and amend the application within a specified time limit; if, absent valid justification, the applicant fails to respond within the time limit, the application shall be deemed to have been withdrawn.

Article 38. If, following the presentation of views or the amendment of its application by an applicant for an invention patent, the Patent Office still finds that the application fails to comply with the provisions of this Law, it shall reject the said application.

Article 39. If, upon substantive examination of an application for an invention patent, no reason for rejection is discovered, the Patent Office shall make its approval decision, announce it, and notify the applicant.

Article 40. After the Patent Office receives an application for a utility model patent or an industrial design patent and, upon preliminary examination, finds it to be in conformity with the requirements of this Law, no further substantive examination shall be conducted, and the Patent Office shall immediately announce its findings and notify the applicant.

Article 41. Within three months of the date of announcement of a patent application, any person may, in accordance with the provisions of this Law, file with the Patent Office an opposition to the said application. The Patent Office shall deliver a copy of the opposition to the applicant and the applicant shall submit a written response within three months after the date of its receipt of such copy; if, absent valid justification, the applicant fails to submit a written response within the time limit, the application shall be deemed to have been withdrawn.

Article 42. If, upon examination, the Patent Office finds an opposition to be well grounded, it shall make a decision to reject the application and shall notify both the opponent and the applicant.

Article 43. The Patent Office shall establish a Patent Re-examination Board. If an applicant disagrees with a decision of the Patent Office rejecting his or its application, the applicant may, within three months after the date of its receipt of notification of the rejection, request the Patent Re-examination Board to conduct a re-examination. After the Patent Re-examination Board has completed its re-examination, it shall make a decision and notify the applicant.

If an applicant for an invention patent disagrees with a decision for the Patent Re-examination Board rejecting his or its request for a re-examination, the applicant may, within three months after the date of its receipt of notification of the rejection, bring suit in the people's courts.

The decision made by the Patent Re-examination Board in respect of a re-examination request made by an applicant concerning a utility model or industrial design shall be final.

Article 44. If there is no opposition to a patent application or, upon examination, the opposition is found to lack justification, the Patent Office shall make a decision to grant a patent right, and shall issue a patent certificate and register and announce the relevant matters.

CHAPTER V TERM, TERMINATION, AND INVALIDATION OF PATENT RIGHTS

Article 45. The term of an invention patent right shall be 15 years, calculated commencing from the date of application.

The term of a utility model or industrial design patent right shall be five years, calculated commencing from the date of application. The patentees may, prior to the expiration of such term, apply for an extension of three years.

Where a patentee enjoys a right of priority, the term of the patent right shall be calculated commencing from the date of his or its application in China.

Article 46. Commencing in the year in which a patent right is granted, the patentee shall pay an annual fee.

Article 47. Should either of the following circumstances occur, a patent right shall be terminated prior to the expiration of its term: 1) The annual fee is not paid as prescribed; or 2) The patentee makes a written statement renouncing the patent right. The termination of a patent right shall be registered and announced by the Patent Office.

Article 48. Following the grant of a patent right, any unit or individual that believes the grant of such patent right to be inconsistent with the provisions of this Law may request the Patent Re-examination Board to declare such patent invalid.

Article 49. The Patent Re-examination Board shall undertake an examination of the request for declaration of invalidity of the patent right, make a decision, and notify both the person making the request and the patentee. A decision to declare a patent right invalid shall be registered and announced by the Patent Office.

A person who disagrees with a decision made by the Patent Re-examination Board declaring an invention patent right

invalid or sustaining an invention patent right may, within three months after receiving notification of such decision, bring suit in the people's courts.

The decision made by the Patent Reexamination Board in respect of a request to declare a utility model patent right or industrial design patent right invalid shall be final.

Article 50. A patent right that is declared invalid shall be deemed to have been nonexistent from its inception.

CHAPTER VI COMPULSORY LICENSING TO PRACTICE A PATENT

Article 51. A patentee has an obligation to manufacture his or its patented products, or use his or its patented process, in China, or to grant licenses to others to manufacture such patented products, or to use such patented process, in China.

Article 52. If, upon the expiration of three years from the date on which its patent right was granted, an invention or a utility model patentee has, without valid justification, failed to perform the obligations prescribed in Article 51 of this Law, the Patent Office may, upon the application of a unit possessing the means to practice the patent, grant a compulsory license to practice such patent.

Article 53. In a case where a patented invention or utility model is technically more advanced than an invention or utility model that was patented earlier, and the practice of the later invention or utility model is dependent upon the practice of the prior invention or utility model, the Patent Office may, upon the application of the subsequent patentee, grant a compulsory license to practice the prior invention or utility model.

When granting a compulsory license in accordance with the provisions of the preceding clause, the Patent Office may also, upon the application of the prior patentee, grant a compulsory license to practice the later invention or utility model.

Article 54. A unit or individual applying for a compulsory license in accordance with the provisions of this Law shall submit proof of its ability to conclude a licensing contract with the patentee on the basis of reasonable terms.

Article 55. The decisions of the Patent Office granting compulsory licenses shall be registered and announced.

Article 56. A unit or individual that obtains a compulsory license shall not enjoy an exclusive right to practice the patent in question, nor shall it or he have the right to permit others to practice the said patent.

Article 57. A unit or individual that obtains a compulsory license shall pay the patentee a reasonable use fee. The amount of the fee shall be decided by the parties through consultation; if the parties cannot reach an agreement, the Patent Office shall adjudicate the matter.

Article 58. A patentee that disagrees with a Patent Office decision concerning compulsory licensing, or adjudication concerning the use fee for a compulsory license, may, within three months after receiving notification of such decision or adjudication, bring suit in the people's courts.

CHAPTER VII PROTECTION OF PATENT RIGHTS

Article 59. The scope of the protection to be afforded an invention or a utility model patent right shall be determined by the contents of the patent claim. The written description and the drawings appended thereto may be used to interpret the patent claim.

The scope of the protection to be afforded an industrial design patent right shall be determined by the patented products that incorporate the said industrial design as depicted in pictures or photographs.

Article 60. With respect to any acts of infringement arising from the practice of a patent without the permission of the patentee, the patentee or interested parties may request the patent administration authorities to handle the matter, or may directly bring suit in the people's courts. When handling such a matter, the patent administration authorities shall have the right to order the infringer to cease the acts of infringement and to make compensation for losses incurred. A party that disagrees with such an order may bring suit in the people's courts within three months after its receipt of notice thereof; if, by the expiration of such period, such party has neither brought suit nor complied with the order, the patent administration authorities may apply to the people's courts for compulsory enforcement.

When an infringement dispute occurs, if the patented invention is a manufacturing process for a product, the unit or individual that is manufacturing the similar product shall furnish proof of the manufacturing process used in the manufacture of its product.

Article 61. The statute of limitation for a patent infringement claim shall be two years, calculated commencing from the day on which the patentee or the interested parties knew or should have known of the acts of infringment.

Article 62. None of the following shall be deemed to constitute infringement of a patent right: 1) Use or sale of a patented product after it has been manufactured by the patentee or with the patentee's permission, and sold; 2) Use or sale of patented products in the absence of knowledge that they have been manufactured and sold without the patentee's permission; 3) Continued manufacture or use, within the original scope of its activities, by a party that, prior to the date of the patent application, had already manufactured the same products, used the same process, or made the necessary preparation for such manufacture or use; 4) Use of the patent in question by a foreign means of transport that is temporarily passing through the territorial land, water, or air space of China, where such use is required by the foreign means of transport as part of its own installations and equipment, and is conducted in accordance with an agreement signed by the country to which the foreign means of transport belongs and China or an international treaty in which the two countries participate, or in accordance with the principle of reciprocity; or 5) Use of the patent in question solely for the purpose of scientific research and experimentation.

Article 63. Cases involving the palming off of another person's patent shall be dealt with in accordance with Article 60 of this Law; if the circumstances are serious, the criminal liability of the persons directly responsible shall be investigated in accordance with the provisions of Article 127 of the Criminal Code.

Article 64. A person who, in violation of the provisions of Article 20 of this Law, applies for a patent in a foreign country without authorization, disclosing important state secrets, shall be given administrative sanctions by the unit in his locality or by the higher-level competent authority; if the circumstances of the case are serious, his criminal liability shall be investigated.

Article 65. A person who usurps the right of an inventor or designer to apply for a non-job-related patent, or another right or interest prescibed by this Law, shall be given administrative sanctions by the unit in his locality or by the higher-level competent authority.

Article 66. Patent Office personnel and relevant State personnel who engage in self-seeking misconduct shall be given administrative sanctions by the Patent Office or by the relevant competent authority; if the circumstances of a case are serious, criminal liability shall be investigated in accordance with the provisions of Article 188 of the Criminal Code.

CHAPTER VIII SUPPLEMENTARY PROVISIONS

Article 67. When applications for patents are made and other procedures are carried out at the Patent Office, fees shall be paid as prescribed.

Article 68. The rules for the implementation of this Law shall be formulated by the Patent Office and shall go into effect after being approved by the State Council.

Article 69. This Law shall go into effect on April 1, 1985. 完

会员动态

GE TARGETS ENERGY AND TRANSPORT

The General Electric Company, in response to its burgeoning business ties with China, is initiating a new, more focused approach to the China market. As a decentralized corporation, GE's many strategic business units have dealt relatively independently with the Chinese. GE has now organized a new affiliate to serve as a focal point for all GE business activities with China. The General Electric (USA) China Co. Ltd. has its headquarters in Hong Kong and offices in Beijing and Shanghai, and is headed by its President, Richard Abington.

GE, whose business with China began in 1908, is currently concentrating its efforts on the transportation and energy sectors, both essential to China's modernization. Since 1980, the firm has sold a range of products and services worth more than $300 million. The 1983 sale of 220 locomotives to the Ministry of Railways for about $240 million has been the company's largest deal in China yet, and one GE hopes to replicate in the near future. In the energy field, GE is selling China two heavy-duty gas turbines for more than $23 million, which will provide power for increased oil production at Karamay and Daqing. Both turbines will be built in Schenectady. For future gas turbine orders, the two sides have a manufacturing associate agreement whereby GE will supply the moving parts and China the stationary parts.

Last November, General Electric signed a joint venture memorandum of understanding with the Wuxi Electrical Apparatus Co. in Jiangsu Province to distribute factory automation equipment, including programmable controllers. Institutes in Shanghai and Tianjin will also be involved in the venture.

GE has also recently sold China engines for commercial aircraft and helicopters, medical diagnostic equipment, plastics, motors, and cables. The company's new China affiliate seems to be starting with plenty of business already at its door.

PORT OF NEW ORLEANS GAINS A SISTER

The Port of New Orleans has chosen Shanghai, China's biggest commercial and industrial center, as its port of entry to expanded relations with the PRC. In agreeing to become sister ports last June, the two great harbors pledged to pursue friendly relations and technical cooperation. The relationship makes sense: New Orleans and Shanghai are both located near the mouths of extensive inland river systems, share other geologic and climatic characteristics, and have ambitious expansion plans.

Shanghai will send two groups of four to five port personnel for training in New Orleans in April. One group will study dredging and other engineering practices while the other examines planning and budgeting operations. Assistant Executive Port Director Herbert Haar, who visited Shanghai last November to set up the training program, says New Orleans is also learning from its Chinese partner. Colonel Haar took part in the first American port delegation to China in 1980 and professed surprise and approval at the changes Shanghai has experienced in the intervening years. "There's new equipment in the port facilities, younger port managers, and more local initiative in port management. The whole spirit was more dynamic in 1984."

The value of US–China trade through the Port of New Orleans increased after 1974, but has dropped considerably since the peak year of 1981. This is due to a decline in grain shipments in 1983 and 1984, which account for a big part of China-bound US exports through New Orleans. Port officials are confident, however, that the trend toward expanding trade will re-establish itself. In the meantime, they are not letting the slowdown hinder good relations with their new sister Shanghai.

FLUOR ENTERS JOINT VENTURE WITH SINOPEC

The Fluor Corporation of Irvine, California, is positioning itself to be a major supplier of engineering and construction services to Chinese industry, especially the pivotal energy sector. Since 1978, Fluor has successfully marketed its services to China's petroleum, chemicals, coal, and metals industries. Last fall, the company went a step further by entering into a joint equity venture with the international branch of China National Petrochemical Company (SINOPEC). Their agreement includes the design and construction management of new petrochemical projects, technical upgrading of oil refineries, and management services for other petroleum-related projects. Fluor and SINOPEC will share equally the profits from the Beijing-based joint venture.

In other recent oil-related deals, Fluor won its bid to perform an engineering study for one section of the World Bank's Daqing Oil Reservoir Development project. And the China National Technical Import Corp. has hired Fluor to design the renovation of an oil pipeline between Tieling and Dalian in Liaoning Province.

Fluor is also helping China develop its massive coal resources. In 1982 the Ministry of Coal hired Fluor to design the expansion and modernization of Liaoning's Fushun mine, China's largest open-pit coal mine. The firm also has a contract to provide basic engineering for the Huolinhe mine in Inner Mongolia.

Fluor's first contract in China came in 1978 to provide engineering services to the world's largest copper mine at Dexing in Jiangxi Province, and the firm continues to work with the China Nonferrous Metals Import–Export Corp. The driving force behind Fluor's China operations is Chairman David Tappan, who was born on Hainan Island and attended school in Shanghai. He served as National Council Chairman in 1981 and 1982 and continues to serve on the Board of Directors. —Tom Engle

Profitability & The Port of New Orleans

Success. No matter what language you use, it comes out profitable. At the Port of New Orleans our marketing, pricing and sales professionals work hard to help you reach your market at the lowest possible cost. We can help you slice costs and paperwork and choose the most effective ways to move cargo. We want to spell success in your language. *Soon.*

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And offices in Australia • Europe • Latin America.

The China Investment Guide 1984/85, by China International Economic Consultants, Inc. New York: Longman, 1984. Distributed in the US by Longman Group USA, 500 North Dearborn Street, Chicago, IL 60610. 608 pp. $65.

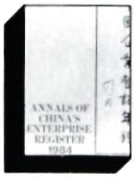
Potential investors will find this authoritative and up-to-date handbook on China's investment climate a valuable aid in their initial investment considerations. Compiled by China International Economic Consultants, an official PRC investment consulting organization, the *China Investment Guide* provides information through June, 1984. China's recently announced economic reforms have outdated little of the information in this book, although some statements on the roles of the Ministry of Foreign Economic Relations and Trade and the foreign trading corporations are no longer accurate.

The *Guide* is composed of six parts, each with its own table of contents. Part 1, an "Overview of Investment Potential," contains an excellent general survey of China and its economy, a description of commerce and foreign trade, and a discussion of prices, markets, raw materials, and labor.

Investment profiles for China's regions and industries are provided in Part 2. Each SEZ is described briefly, with more lengthy coverage on each of the 14 coastal cities and Hainan Island. Province and municipality descriptions include geography, products and resources, infrastructure, industry and agriculture, priority areas for foreign investment, and foreign investment control organizations. Sector reports contain basic information on each industry, along with good outlines of plans for investment and technology import priorities.

Central government organizations, trust and investment corporations, consultancy companies and major specialized corporations that act as channels for investment are described in Part 3. Part 4, "Making the Investment," focuses on joint ventures, although other forms of investment are described. Joint venture negotiations are discussed and procedures for setting up a joint venture are outlined. Part 4 includes several joint venture case studies and a list of the 190 joint ventures established in China from 1979 through 1983. Oddly, some of the foreign partner names on this list appear only in Chinese.

Patent and trademark protection and bilateral investment and taxation treaties comprise Part 5. The volume concludes with a 233-page section containing the texts of major Chinese laws and regulations affecting foreign trade and investment.



Annals of China's Enterprises Register (Special Edition), 1984, edited by the State Administration for Industry and Commerce of the People's Republic of China. Hong Kong: China Book Publishing House, 1984. Distributed by Far Eastern Economic Review, G.P.O. Box 160, Hong Kong. 1073 pp., including advertising. $80, plus $12 for surface mail, $25 for airmail.

Publication of this bilingual directory by China's State Administration for Industry and Commerce testifies to China's willingness to open up to the outside world. The directory contains registration information on 500 national, provincial, and municipal corporations that conduct business with foreign countries. The entry for each corporation generally includes the enterprise's name, address, cable and telex numbers, scope of business, registered capital, chief officers, business license number, and business certificate number. There is some unevenness in the information provided. While some of the entries are more extensive—including branches or affiliated organizations and descriptions of activities—others omit some of the basic information. Data included is current as of January 20, 1984.

The first part of the *Annals* covers the national organizations arranged by sector: monetary, trust, investment, and leasing; industry; communication and transportation; construction engineering contracting; import and export business; consultation, tourist, and service; agriculture, forest, and fishery; and culture, science, and publishing. The second part contains local branch offices of national corporations dealing with foreign trade and other related corporations, arranged by province and municipality. The list of organizations in the table of contents, which is not alphabetized, offers the only access to the entries. Despite some omissions, both of data and organizations, this is a most useful collection of organizational information.

PRC Laws for Chinatraders & Investors: Practice & Interpretation, edited by C. W. Chiu. Hong Kong: Institute of Contemporary Chinese Economic & Legal Studies, Ltd, 1983. Distributed by David K. Choi, Sole Agent for CELS, 405 N.E. 111th Street, Vancouver, WA 98665. 660 pp. $55.

This compilation of Chinese legal materials has some major problems, the most glaring being the awkward English and the numerous typographical errors found in the introductory materials and many of the legal documents. In a few cases the poor English-language translation distorts the meaning. Nevertheless,

Books and business guides submitted for possible review in The China Business Review *should be sent to the National Council's book editor, Marianna Graham.*

some legal texts appear to be standard English translations. The book's arrangement is also curious. Both standard purchase and sales contracts, which appear within the section "Customs Duties," and shipping regulations, under the section "Port Control," are placed within the major heading "Customs and Duties." Since the book has no index, the unwary reader may miss relevant regulations classified under unlikely headings in the table of contents

Despite its major failings, the book does offer some useful information. First, it brings together not only the laws and regulations, but also the notices, decisions, and stipulations that interpret them. Many of these do not appear in other Chinese law collections. Second, the volume contains an interesting collection of forms and documents used in China's trade and foreign investment. The book can, then, be used to supplement—but not replace—other collections of Chinese legal materials.

The topics covered in this volume are customs and duties; banking, foreign exchange, and joint ventures; oil and other energy resources; and trademarks. Volume II will cover shipping insurance and arbitration, while Volume III will focus on taxation, SEZs, and labor.

Foreign Trade, Investment and the Law in the People's Republic of China, edited by Michael J. Moser. New York: Oxford University Press, 1984. 341 pp. $34.50.

This excellent collection of 12 essays, with an introduction by Michael Moser, introduces China traders and investors to the legal environment in which they will be doing business. Drawing upon research and practical experience, the authors, all specialists in Chinese law, analyze and elucidate current commercial legislation. Topics include the regulation of foreign trade; the tax system, including the tax situation relative to each type of trade and investment; technology transfer through licensing; foreign investment; investment in the SEZs; offshore oil exploration and development; contract law; banking and finance; trademark law; representative offices; and the patent law. Each essay concludes with a list of legislation and an index.

Legal developments through March 1984 are covered in this book. New laws and regulations have subsequently been passed, and new reforms, including the opening of the 14 cities, will further change the legal setting described here. Although China's legal framework is still evolving, the reader will find a wealth of useful information in this book.

China Facts & Figures Annual, Vol. 6, 1983, edited by John L. Scherer. Gulf Breeze, FL: Academic International Press (Box 1111, 32561), 1983. 480 pp. $64.50.

CHIFFA 1983 once again provides an impressive collection of facts and statistics gathered from a wide range of sources, all of which are cited. Topics covered are basic data (for 1981); government; party; military; demography; economy; energy; industries; culture and communications; health, education, and welfare; and special topics, including an essay on youth in China today by Stanley Rosen. A detailed table of contents provides the only key for accessing information. Statistics are generally from 1980, 1981, and 1982. Reports on government leadership, foreign affairs, and legal developments, and a calendar of events are provided for 1982.

Directory of Officials and Organizations in China 1968–1983, by Malcolm Lamb. Armonk, NY: M. E. Sharpe, 1984. 717 pp. $60.

This research directory is intended for analysts of political and organizational developments in China. Listings for party, state, military, and major provincial and municipal organizations report organizational and personnel changes during the period October 1968 through January 1983. The result is a record of the evolution of each organizational unit. An alphabetical name index, with Chinese characters, provides references to organization records, so that a researcher can identify the past positions held by China's leaders.

Agricultural Statistics of the People's Republic of China, 1949–82. International Economics Division, Economic Research Service, US Department of Agriculture, 1984. Statistical Bulletin No. 714. Distributed by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. 71 pp. $3.

This publication presents 63 tables of agricultural statistics compiled from official Chinese statistical yearbooks. A bibliography lists these sources, and explanatory notes define the terms used in the tables and the statistical concepts applied to the data. Both national and provincial statistics are provided. Tables report population; land use; crop production, area, and yield; livestock inventory and slaughter; agricultural mechanization; fertilizer production and use; and import and export of agricultural commodities.

China Outlook and Situation Report. International Economics Division, Economic Research Service, US Department of Agriculture, Washington, DC. Annual. Distributed by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. 32 pp. $3.75.

This report on the Chinese agricultural situation is published annually, in June, by the Economic Research Service of the USDA as one of a series of regional reports. The report reviews the agricultural policy and performance, inputs, production, and foreign trade for the previous year, as well as projecting production and trade for the current year. The 1984 edition of the report contains two special articles: one on the dramatic growth of rural income, another on grain marketing and imports. Statistical tables are included.

Planning and Statistical Systems in China's Agriculture, by Francis C. Tuan and Frederick W. Crook. International Economics Division, Economic Research Service, US Department of Agriculture, 1983. Foreign Agriculture Economic Report No. 181. 89 pp. $5.50.

Drawing heavily upon materials and information obtained by USDA officials visiting China, this report describes China's agricultural planning process and statistical reporting systems, focusing on the year 1980. Translations of China's 1981 agricultural statistical reporting forms and reporting schedule are included. Despite changes in China's agricultural policies and organizational structure during the past several years, the authors note that the basic features of the planning and statistical systems have changed little and most of the processes described are still in effect.

COMMENTARY

评论

The US Role in China's Energy Program

The future level of China's energy exports will play an important role in trade relations among Pacific Rim nations. Recognizing this, the Japanese have given generous development assistance to China's energy sector. Their goals are twofold: to help meet Japan's future energy needs, and to permit China to finance future purchases from Japan through hard currency earned from energy exports. There is no question that the US should join Japan in vigorously supporting the development of China's energy resources.

China's push to develop energy resources will benefit both the United States and our Pacific Rim neighbors. An important key to China's economic growth will be her ability to earn foreign exchange to pay for needed foreign goods and technology. Oil exports in particular have become an important source of foreign exchange for China. The enormous investment in exploration now being made by foreign firms off China's southern and eastern coasts offers hope that these oil exports will grow substantially, and provide a stable source of hard currency. Expanded Chinese oil exports would also enhance the energy security of the entire Pacific Rim region.

Without sufficient oil and coal, China may have to turn to other exports to earn foreign exchange. In such a situation, China would almost certainly rely in part on textiles and apparel to bolster export earnings, which would increase pressure on China's trade partners to accept greater textile imports. This would complicate delicate trade relations by raising difficult choices for the domestic textile industries throughout the Pacific Rim.

China is now focusing greater resources on, and enlisting foreign assistance in, developing its onshore oil reserves. It is doing so partly as an insurance policy against the risk of only marginal offshore discoveries. Virtually all of China's past and current oil production has come from onshore fields. Despite technical challenges, output has stabilized in recent years. But existing oil fields in eastern China will require large investments to maintain current production levels, as will the relatively undeveloped fields in the far west. These western fields—thought to hold more than half of China's possible land reserves—hold the key to long-term land-based oil production increases. Just as US firms, with the encouragement of the federal government, have taken a very active role in China's offshore oil program, the US public and private sectors should vigorously support China's onshore program.

The US government already has several programs underway to assist China's energy development. Under a recently renewed technical agreement with China, the US Geological Survey (USGS) has helped Chinese petroleum geologists, through the use of LANDSAT remote-sensing techniques, to assess regional structure and petroleum geology in the western Qaidam Basin. Prior to this cooperative project, Chinese geologists had only performed manual analyses of the Qaidam Basin to ascertain its basic structural characteristics. They were impressed by the detail and accuracy of the LANDSAT analysis, and consider it a useful method of evaluating promising basins in rugged regions of the far west.

China would like to continue using these LANDSAT techniques, and recently purchased specialized equipment for LANDSAT applications from US firms. Organizational changes within the USGS complicate the cooperation program, however, by limiting the ability of key USGS staff to work with China on energy exploration.

The US Department of Energy (DOE) also hopes to play a positive role in China's energy program through a technical cooperation agreement now under negotiation involving fossil fuels' extraction and processing techniques. DOE, along with private sector experts, could also help to strengthen China's energy conservation techniques and renewable energy sources. Although the Reagan Administration's cuts in DOE's conservation and renewable energy program have hurt the US government's ability to be useful in this area, efforts to enlist private sector expertise should be encouraged.

The successful conclusion of a bilateral agreement on fossil fuels extraction and processing techniques, and continued USGS cooperation on LANDSAT applications will help China develop a more efficient and productive energy sector. I will be working to ensure that desired US assistance is available and problems are resolved in each of these areas.

—Representative Al Swift

Congressman Al Swift, US Representative from Washington State, is the chairman of the House Special Subcommittee on US Trade with China.

Since its creation in June 1983, the Special Subcommittee on US Trade with China has held hearings on a wide number of topics including technology transfer policy, offshore oil development and regional energy security, nuclear energy cooperation, telecommunications trade, science and technology cooperation, China's developing legal structure, and China's trade relations with other Pacific Rim nations. Reports from published hearings are available free of charge from the subcommittee. (Tel: 202-225-2927).

中外貿易

Jennifer Little
Research Assistant

The following tables contain recent press reports of business contracts and negotiations exclusive of those listed in previous issues. Joint ventures, licensing arrangements, and other forms of business arrangements are included if classified as such in Chinese and foreign media reports. For the most part, the accuracy of these reports is not independently confirmed by *The CBR*.

National Council members can contact the library to obtain a copy of news sources and other available background information concerning the business arrangements appearing below. Moreover, member firms whose sales and other business arrangements with China do not normally appear in press reports may have them published in *The CBR* by sending the information to the attention of Jennifer Little.

中外貿易

CHINA'S IMPORTS THROUGH NOVEMBER 25

Foreign Party/ Chinese Party	Product/Value/ Date Reported
Agricultural Commodities	
Cherry Valley Farms (UK)	Will supply ducks and duck-breeding know-how. 10/6/84.
Agricultural Technology	
Chia Tai-Zhuhai Co., Ltd. (a US–Thai group)/ Zhuhai Special Zone Agricultural Development Corp.	Signed a contract to construct a synthetic fodder factory. Investment: $1 million. 9/84.
Japan Tobacco & Salt Public Corp./China General Tobacco Corp.	Will cooperate in factory modernization. 9/84.
Simon-Barron Ltd. (UK)	Won an order to design, supply, and commission processing equipment for two animal feed mills. $693,000 (£550,000). 9/26/84.
Otenz Exports (New Zealand)	Dairy machinery. 9/28/84.
Nu Pulse Co. (New Zealand)	Will cooperate to produce dairy equipment. 9/28/84.
France-Embryon (France)	Technology and equipment for cattle embryo transplantation. 10/25/84.
Chemicals and Chemical and Petrochemical Plants and Equipment	
Japan Urea & Ammonium Sulfate Industry Assn./ SINOCHEM	Signed agreement to ship 70,000 mt of urea and 60,000 mt of ammonium sulfate by March 1985. $21.3 million. 9/12/84.
Mitsui Toatsu Chemicals, Mitsubishi Gas Chemical, Mitsubishi Petrochemical, Nitto Chemical Industry, Ube Industries, and Showa Denko (Japan)/ SINOCHEM	Will supply 100,000 mt of urea by Sept. 1985. 9/12/84.
Toyo Engineering (Japan)/ China National Chemical Construction Corp.	Signed a contract to jointly build a high-impact polystyrene plant in Jilin. 9/17/84.
John Brown Plastics Machinery (UK)/China Great Wall Industry Corp.	Awarded a contract for plastics injection moulding equipment. $3.8 million (£3 million). 10/3/84.
John Brown Plastics Machinery (UK)	Received a contract for a plastic sheet extrusion line for a Tianjin factory. $5 million (£4 million). 10/3/84.
Monsanto Co. (US)/ TECHIMPORT	Seven Prism separators for ammonia plants. 10/15/84.
Bruckner Maschinenbau (W. Germany)/Hefei Plastic Products Factory, Anhui	BOPP plastic film equipment. $2.8 million (8.6 million marks). 11/12/84.
Barmer Maschinenbau (W. Germany)/Suxian Plastic Factory, Anhui	An extruding plastic film production line. $335,000 (DM1.12 million marks). 11/12/84.
Construction and Construction Materials and Equipment	
Onoda Cement (Japan)	Will modernize a cement plant in Handan, Hebei. 9/84.
Atco (Australia)/State Bureau of Urban and Rural Construction and Environmental Protection	Signed a memorandum of understanding to supply portable buildings for Tibetan herdsmen in Qinghai. $833,000+ (Aus$1 million+). 10/84.
Daiwa House Industry Co. (Japan)	Won a contract to build 10 restaurants and a pre-fab hotel in Shanghai. 10/2/84.
Ile de France/Beijing Municipality	Signed an agreement on exchange of urban planning materials and technology cooperation. 10/12/84.
Mitsubishi Heavy Industries (Japan)/TECHIMPORT and Dalian General Forklift Truck Factory	Signed an agreement to provide forklift truck manufacturing expertise. 11/6/84.
Consumer Goods	
Seiko Insruments and Electronics Ltd. (Japan)/ Dalian Watch Industry Co.	Signed a contract to provide wristwatch casing production facilities and know-how. $1.22 million (J¥300 million). 10/8/84.
Matsushita Electric Industrial Co. Ltd. (Japan)/ Shashi Refrigerator Factory, Hubei	Refrigerator production equipment and technology. $2.5 million. 10/8/84.
Mitsubishi and Sharp (Japan)/Changchun Washing Machine Factory, Jilin	Signed a contract for a washing machine production line. 10/29/84.
Sing Yee Rattan Work Co. Ltd. (HK)	Started operation of the Yongqiao Rattan Work Enterprise Co. Ltd., a wholly owned venture located in Fujian. Investment: $383,000 (HK$3 million). 11/5/84.
Electronics and Electrical Equipment	
Tandberg (Norway)	Signed an agreement to start a factory in Ningbo to produce language lab equipment. 8/21/84.

NA = Not available.
NOTES: Contracts denominated in foreign currencies are converted into US dollars at the most recent monthly average rate quoted in *International Financial Statistics (IMF)*. Contracts concluded over two months ago are also included if they were not reported in the last issue of *The CBR*.

Solid State Logic (UK)/ China Record Co.	Won an order to supply recording studio systems. $315,000 (£250,000). 8/23/84.
Mohawk Data Sciences (US)	Will supply a photo identification system. $1 million. 9/10/84.
Fortune Systems Corp. (US)	Has sold over 100 workstations. 9/24/84.
Allen-Bradley Co. (US)/ EQUIMPEX and Great Wall Machinery Co.	Signed a 3-year agreement to distribute its industrial automation products and systems. 9/24/84.
IBS Comsery Corp. (Japan)/China State Shipbuilding Corp.	Signed an agreement to develop software to handle Chinese characters. 9/26/84.
IBS Comsery Corp. (Japan)/Changsha Institute of Technology	Will exchange information on development of software for scientific applications. 9/26/84.
Control Data Corp. (US)/ Nuclear Energy Institute, China Academy of Sciences and Shanghai Design and Research Institute for Electricity Generation	Shipped two CYBER-825 computers. 10/84.
FSI Corp. (US)	Semiconductor manufacturing equipment. $75,000. 10/84.
Pax Electronica Japan Corp.	Is shipping IBM-compatible personal computers. 10/84.
Fussa Electronic Industry Co. (Japan)	In-circuit test equipment for audio and video products. 10/84.
Charles River Data Systems (US)/Tianjin Electronic Computer Factory	Signed a contract to ship 275 Universe 68 computer systems. $5 million. 10/15/84.
Automated Systems HK Ltd./Zhongshan University, Huanan Teachers College, and Guangdong College of Technology	Three DEC VAX 11/750 minicomputers. $500,000. 10/23/84.
Digicon Geophysical Corp. (US)/Ministry of Petroleum	Concluded an agreement for sale of seismic computing equipment and software. $18 million. 10/29/84.
Sperry Corp. (US)/Petroleum Processing Research Institute, China Petrochemical Corp.	Received an order for a dual processor mainframe. 11/84.
Xidex International (US)/ Shanxi Provincial Electronics Industry Corp.	Signed a three-year agreement to provide hardware, raw materials, and technical support for a floppy disk assembly facility. 11/1/84.
Gilcron Co., subsidiary of ITT Corp. (US)/China Polytechnologies Corp.	Signed a contract to sell Gilcron products. 11/1/84.
IBM Corp. (US)	Has set up a subsidiary in Beijing and will give 100 computer work stations to Chinese universities. $1.7 million. 11/11/84.
Canon Inc. (Japan)	Signed a five-year contract to provide three Tianjin firms with photocopier production technology and equipment. $8.3 million (J¥2 billion). 11/13/84.
Chinam Associates (HK)/ Huainan Semiconductor Tube Factory, Anhui	Equipment to make crest diodes. $170,000. 11/12/84.
Taishan Trading Co. Ltd. (HK)/Wuhu Semiconductor Tube Factory	Production equipment for transistors. $420,000. 11/12/84.
Singer Products Co. Inc. (US)/Shenyang Storage Battery Factory	Signed a contract to provide equipment and technology to modernize the Shenyang plant. 11/21/84.

Electronics (Consumer)

Polaroid FE Ltd. (US)/ Tianjin Film Factory and Baoding Film Factory	Plan to cooperate to produce three varieties of instant film. 9/84.
Hitachi (Japan)/Shaanxi Color TV Picture Tube Factory	Signed a contract to provide technical aid to increase the factory's production. 9/84.
Matsushita Electric Industrial Co. Ltd. (Japan)/Liaoning No. 8 Radio Factory	Signed a contract for a color TV production line. 10/1/84.
Cima Co. (Japan)/INDUSTRY and Shenzhen Camera Factory	Concluded an agreement to supply 35mm single lens reflex camera production lines, as well as parts and components. 10/9/84.
Grundig (W. Germany)	Will sell 70,000 televisions to Guangzhou. $13.2 million (DM40 million). 10/11/84.

Food Processing

Harry Langerman (US restauranteur)	Will open three fast food restaurants, one near the Great Wall entrance. 9/3/84.
Brewers & Bottlers Equipment Corp. (US)	Will liquidate a former Carling brewery for shipment to China. 10/8/84.
(Japan)/All-China Federation of Supply and Marketing Cooperatives	Will construct a meat-based foodstuffs research center in Beijing. 10/19/84.

Foreign Aid

EEC Commission	Aid for improvement of photographic advertising. $252,000 (350,000 ECUs). 10/19/84.

Machinery and Machine Tools

Krohne Messtechnik (W. Germany)	A magnetic flowmeter. 9/84.
Flow Systems (US)	Waterjet cutting systems. 9/17/84.
EUMUCO (W. Germany)/ China No. 2 Heavy Machinery Factory	An automated forging line. 10/84.
Ricardo Co. (UK)/Weifang Engine Factory	Was commissioned to upgrade production of diesel engines. 10/84.
ISKRA (Yugoslavia)/ Chengdu Electric Welders Factory	Are cooperating to develop and produce electric welders. 10/84.
Hirst, Holden and Hunt Ltd. (UK)	Welding machines. $17,500 (£22,000). 10/11/84.
Hughes Tool Co. (US)/ TECHIMPORT	Received a contract to expand the Jianghan Rock Bit plant in Hubei. 11/1/84.

Medical Equipment

Chance Pilkington (UK)	Light sensitive spectacle glass. 7/84.

Minerals and Metals

Australian Mineral Development Laboratories	Signed contracts to provide in-stream analysis systems for two iron ore concentrating facilities. $330,000 (Aus$400,000). 9/84.
Round Oak Steel Works and London Works Steel (UK)	May sell their used plants. 9/11/84.
Fluor Corp. (US)	Won a contract to manage the planning of the Jining No. 2 coal mining project.
Technomin Australia NL/ China National Nonferrous Metals Industry Corp.	Will undertake joint mineral exploration in Gansu. 9/25/84.
Continuus-Properzi (Italy)/Sichuan Cable Works and Taiyuan Electrolytic Copper Plant	Won contracts for two CCR copper-rod lines. 10/84.
(Japan)/MINMETALS	830,000 tons of rolled steel products, bringing the total for the second half of 1984 to 3.25 million tons. 10/9/84.
Schloemann-Siemag AG (W. Germany)/ TECHIMPORT	Won a contract for a hot-strip mill for the Baoshan Steel complex. 10/17/84.

Mining Equipment

National Mine Service Co. (US)/Ministry of Coal	Received an order for a computer-based coal mine safety monitoring system. 9/12/84.
(Poland)	Will sell 50 coal-mining machines and furnish three medical aid stations for mine sites and seven gas-detector systems. Agreed to collaborate on the manufacture of coal mining machines from 1987–1989. 9/18/84.

Perard Torque Tension (UK)	Shipped a rock drilling and loading machine. 10/6/84.
Goodyear Tire and Rubber Co. (US)	Is negotiating to supply tires for a strip mining project in Nei Monggol. $4.3 million. 10/10/84.
Wabco Construction & Mining Equipment, division of Dresser Industries (US)/China National Coal Development Corp. and Occidental Petroleum Corp.	Signed a contract for 107 mining trucks, parts, service, and training. $80–90 million. 11/15/84.

Packaging

Swematex International (HK), subsidiary of Swematex (Sweden)	Won a contract for a turnkey textiles packaging plant to be located in Shanghai. $1.5 million. 10/9/84.
Nozaki & Co. (Japan)	Won a contract for three plants to produce laminate-reinforced, unfolded cement bags. $8.2 million (J¥2 billion). 10/9/84.
Cerutti (Italy)	Will supply a six-color rotogravure machine for printing to a flexible packaging plant. 10/13/84.
Acigraf (Italy)	An etching and polishing line for a flexible packaging plant. 10/13/84.

Petroleum

Wimpol Ltd. (UK)/CNOOC	Will provide platform design consultation. 9/24/84.
Wimpey Offshore Engineers & Constructors (UK)/CNOOC, Bohai Oil Corp.	Won a contract to provide training for maintenance of the Chengbei oil field. 9/13/84.
Thorn EMI Security (HK), subsidiary of AFA-Minerva (UK)	Fire and gas detection systems for an offshore oil exploration platform. 10/8/84.
Allied Colloids (UK)	Won a contract to improve oil production at Daqing. 10/16/84.
Fluor Corp. (US)/ TECHIMPORT	Signed a contract to complete a study of a prototype facility which will separate the mixture of oil, gas, and water that flows from most wells. 11/9/84.

Ports

Port of New Orleans (US)/Bureau of Shanghai Harbor Administration	Will train Shanghai port personnel. 11/23/84.

Power

Ansaldo Componenti (Italy)	Has been commissioned to carry out a review of the steam generators for the Qinshan power plant. 9/84.
US Bureau of Reclamation	Signed a technical cooperation agreement to provide assistance in the design and construction of the Three Gorges Dam. 9/6/84.
Singer Co. (US)/ TECHIMPORT, Ministry of Water Resources and Electric Power, and Shiheng Coal Power Plant	Received a contract for a simulator to be used to train personnel to operate a fossil fuel power plant. 11/8/84.

Scientific Instruments

Iwasaki Electric (Japan)/ Nei Monggol Electronic Meter Factory and Nei Monggol Import Service Corp.	Assistance for oscilloscope production. 9/84.
Kohritsu Rika Co. Ltd. (Japan)/INSTRIMPEX	Established the Japanese Environmental Monitors Technical Service Center in Beijing. 9/24/84.
CISE (Italy)/China Nuclear Energy Industry Corp.	Will supply a laser system. 10/84.
Hitachi Ltd. (Japan)/ EQUIMPEX and Dalian Instrument Factory	Reached an agreement to provide industrial measuring instrument know-how. 10/23/84.

Shipping

Sansui Corp. (Japan)/ China Shipbuilding Industry Corp.	Technology for ship cleaning equipment. 9/84.
John J. Kincaid Ltd. (US)/ Dalian Shipyard	Engine components. $214,000 (£170,000). 9/10/84.
Lloyds Bank International (UK)/China Shipbuilding Trading Co.	Signed a business cooperation agreement. 9/21/84.
(Sweden)	A gift of a ship for surveying fishery resources. $10 million+. 11/2/84.

Telecommunications

Spar Aerospace, Ltd. (Canada)/INSTRIMPEX	Has signed a follow-up order for four earth stations and single channel per carrier electronics. $3.8 million (C$5 million). 10/1/84.
English Electric Valve Co. (UK)	Will supply parts in conjunction with the Marconi radar contract. $315,000 (£250,000). 10/10/84.
Marconi Japan Radio Co. Ltd. (Japan) and Infa Corp. (HK)/CITIC and Fushun Radio Factory	A production line and technology to produce two-way radios. $850,000. 10/22/84.
Ministries of Radio and Television (E. Germany)/ Ministry of Radio and Television	Signed a broadcasting exchange and cooperation agreement. 10/25/84.
L.M. Ericsson Telefon AB (Sweden)	Received an order for the construction of telephone lines in Beijing. $46 million (SwK400 million). 10/25/84.
Electronics Missiles & Communications Inc. (US)	Signed agreements to supply television transmitting equipment and other television equipment. 10/26/84.
NASA (US)/Chinese Broadcasting Satellite Corp.	Has reserved places on NASA space shuttles in 1988 for launching two direct broadcast satellites. $200,000. 11/2/84.
Matra Corp. (France)/ Ministry of Astronautics Industry	Signed a technical exchange protocol to train Chinese engineers in the design, production, and assembling of satellites. 11/7/84.
Telefonbau U Normalzeit (W. Germany)/Shanghai Telecommunications Works	Signed a contract for telephone equipment. 11/9/84.

Textiles and Textile Plants and Equipment

NA (US)/Refractory Material Factory, Shoudu Iron and Steel Works, Beijing	Signed a contract for a fireproof fiber carpet production line. 8/84.
Yamato Sewing Machine Mfg. (Japan)/Shandong Sewing Machine Factory	Sewing machine production technology. 9/84.
Babcock Textile Maschinen GmBH (W. Germany)/MACHIMPEX	15 long-hoop steam agers. 10/84.
Barmer Maschinen Fabrik AG (W. Germany)/Ministry of Textile Industry	Technology and spinning equipment for polyester yarns. 10/84.
Zimmer, subsidiary of Davy McKee (W. Germany)/Guangdong International Leasing Corp.	Received an order for a new high-speed polyester spinning plant to be located near Guangzhou. $5 million (DM15 million). 10/1/84.
New Zealand Wool Board/China Textile Academy, Beijing	Signed a 10-year cooperation agreement to establish wool processing facilities at the academy and to cooperate on the development of knitting yarns and fabrics. 11/14/84.

Tourism

SARA (Sweden)	Will open a 250-room hotel in Xian. 9/20/84.
(Singapore)	Will train 200 Chinese hotel personnel gratis. 10/1/84.
Accor (France)	Signed a contract to manage the Yueyang Hotel in Beijing. 10/15/84.

Hop Ming Investment Co., a company formed by Ryoden Machinery Co. and other partners (HK)	Agreed to expand the Jingjiang Hotel in Shanghai. 11/6/84.
Transportation	
Globe Battery Division, a div. of Johnson Controls (US)	Equipment and technology for an automotive battery plant in Shanghai. $5 million. 8/84.
DHC (Canada)/CAAC	Signed a contract for five Double Otter light airplanes. 9/84.
Sea Trade Publications (Far East) Ltd. (UK)/China Communications and Transport Assoc.	Signed an agreement to publish a quarterly magazine, *China Transport*. 9/21/84.
Nissan Motors Co. Ltd. (Japan)/Beijing Everbright Industrial Co.	Limousines for the Capital Everbright Taxi Co. Ltd. 9/26/84.
Hitachi (Japan)/Beijing Automobile Accessories Laboratory	Was commissioned to redesign the carburetor for the Beijing jeep. 10/84.
Motor Industry Research Assoc. (UK)/China Second Automobile Works	Signed a contract to provide design consultation for construction of an automobile proving ground at Xiangfan, Hubei. 10/1/84.
Sikorsky (US)/CAAC	CAAC has contracted for four helicopters and pilot and technical training programs for offshore oil support. 10/1/84.
Toyota Motor Corp.	Won orders for 20,000 trucks and commercial vehicles and some passenger cars. $122–$163 million (J¥30–40 billion). 10/2/84.
Bombardier Inc. (Canada)	Is discussing the transfer of snowmobile production technology. 10/8/84.
GKN Forgings (UK)/China First Auto-Truck Co., Changchun	Have agreed upon draft technical consultancy proposals to modernize the plant. $189,000 (£150,000). 10/17/84.
Haden Drysys (UK)/ Beijing Jeep Corp.	Won an order for the design and construction management of paint finishing lines. $504,000 (£400,000). 10/17/84.
Mitsubishi Motor Corp. (Japan)/China National Automotive Industry Import & Export Corp.	Negotiating sale of 10,000 medium and heavy trucks. $120 million (J¥30 billion). 10/23/84.
Mitchell Aerospace (US)	Sold an ultralight agplane. 10/29/84.
Marubeni Corp. (Japan)/ Hainan Island Investment & Trust Corp.	Won an order for 150 passenger cars. $714,000 (J¥175 million). 10/30/84.
Hermann Berstroff Maschinenbau (W. Germany)/Anhui Tire Factory	A cold-tire pressing-out machine. $1.26 million (DM3.8 million). 11/12/84.
Toyota (Japan)/Anhui Government Service Corp.	30 limousines. $230,000. 11/12/84.
Daimler Benz (W. Germany)/Everbright Industrial Corp. for the Ministry of Metallurgy and Ministry of Petroleum	400 second-hand heavy duty trucks. 11/12/84.
American Steamship Co. and Bay Shipbuilding Corp. (US)/Shanghai Bureau of Maritime Administration	Have agreed to study China's coal transportation systems and develop self-unloading carriers. 11/23/84.
Miscellaneous	
(Turkey)	Signed a protocol for banking cooperation. 8/8/84.
Ambassador Foundation (US)/Chinese People's Assoc. for Friendship with Foreign Countries and Soong Ching Ling Foundation	Signed a memorandum on establsihing the Golden Bridge cultural exchange center in Beijing. 11/12/84.

中外贸易 CHINA'S EXPORTS THROUGH NOVEMBER 25

Foreign Party/ Chinese Party	Product/Value/ Date Reported
Agriculture	
Mitsubishi Corp., Mitsui & Co., and Marubeni Corp. (Japan)	150,000 tons of corn. 10/9/84.
(USSR)	160,000 metric tons of soybeans. 10/24/84.
Construction	
(Nepal)/China International Water and Electric Corp.	Signed a contract to build an office and shopping complex. $3 million (51.7 million rupees). 11/3/84.
Electronics	
John Brockman Associates Inc. (US)/Shanghai Software Consortium	Will market the software developed by the Shanghai firm. 9/3/84.
Foreign Aid	
U.N. Relief and Works Agency	Aid for Palestinian refugees. $50,000. 9/21/84.
(Lesotho)	Drought relief. $75,000. 10/17/84.
(Ethiopia)	1,000 tons of maize for drought relief. 10/31/84.
(Mali)	Donation to buy maize. $158,000. 11/5/84.
Minerals and Metals	
(Austria)	Signed a memorandum to purchase enriched uranium or fuel elements, to be later processed and stored by the Chinese. 7/24/84.
Hopewell Holdings Ltd. (HK)/Guizhou Provincial Economic Assoc. Office	Signed a letter of intent to purchase 1.4 million tons of Chinese coal for the Shajiao Power Plant in Shenzhen. 9/24/84.
Petroleum	
(Japan)	Will buy between 58 and 63 million barrels of crude oil in 1985. 9/24/84.
Power	
General Water Irrigation Engineering Bureau (Turkey)/MACHIMPEX	Two 31,000 kw/unit hydropower generating units. 11/12/84.
Shipping	
American Ranger Shipping Co. (US)/China Marine and Seaman Service Corp.	Signed a one-year agreement to provide a cargo ship and crew. 11/5/84.
Textiles	
(Iraq)	China will provide 200 workers for an Iraqi cotton mill. 10/28/84.
Trade Agreements	
(Thailand)	Signed a trade protocol to set a 1985 trade target for $350–$400 million. 11/8/84.
(Tunisia), (Burkina Faso), and (Bulgaria)	Signed scientific, economic, and technological cooperation agreements in October and November.
(Nepal)	Signed a trade agreement with Xizang. 9/16/84.
Miscellaneous	
Pergamon Press (UK)	Will publish the works of Deng Xiaoping in English for distribution outside China. 10/9/84.

中外贸易

DIRECT INVESTMENT/PROCESSING/ COUNTERTRADE THROUGH NOVEMBER 25

Foreign Party/ Chinese Party	Arrangement/Value/ Date Reported
JOINT VENTURES	
Agriculture	
Kobe Friendship Trading Co. Ltd. (Japan)/Tianjin Bohai Agricultural-Industrial-Commercial Corp.	Set up a fishing tools company in Tianjin. 8/84.
Yamada Co. Ltd. (Japan)/ Tianjin International Trust & Investment Corp.	Signed a contract to raise vegetables in Tianjin. 9/24/84.
Chemical and Petrochemicals	
Asean Resources (HK)/ Shenzhen Municipal Petrochemical Industrial Co.	Signed a letter of intent to set up an amino radical plant. 8/17/84.
Nicholas Kiwi Ltd. (Australia)/Ministry of Light Industry	Signed a memorandum of intent to take over a Beijing plant to produce shoe polish and cleaning products. 9/20/84.
Nikka Chemical Industrial Co. (Japan)/Jiangsu Chemical Construction Corp.	Have agreed to produce surfacants and other chemicals for the textile industry at a plant in Nanjing. (PRC:70%–Japan:30%). 10/2/84.
Fluor Engineering Inc. (US)/China Petrochemical International Corp. and Beijing Design Institute	Set up an engineering company to contract for petrochemical plant construction projects, the technical upgrading of oil refineries, as well as other technical services. (50–50). Agreement initialed 10/8/84.
M.W. Kellogg Co., subsidiary of The Signal Cos. (US)/China Petrochemical International Corp.	Is negotiating to set up a design, engineering, and construction management firm. 10/22/84.
Takahashi Seiki Co. Ltd. (Japan)/China Light Industry Foreign Economic and Technical Cooperation Corp. and Dalian Plastic Industry Corp.	Signed a six-year agreement to set up the T.O. Moulds Center Co. Ltd. in Nagoya, Japan. Investment: $391,000 (J¥96 million). 11/5/84.
Construction	
Thai-Asahi Glass Co. (a Thai–Japanese joint venture) and Pittsburgh Plate Glass Co. (US)	Are discussing the establishment of a float-glass manufacturing facility in Shekou. Investment: $86.96 million. 9/84.
First Enterprise Cooperation Ltd. (HK)/Shanghai No. 2 Building Materials Industry Co. and Shanghai Huajian Co.	Formed the Shanghai Dahua Decoration and Engineering Co. Ltd. for decoration, design, and installation for new and old buildings. 9/24/84.
NA (Macao)/Bank of China, Chengdu Branch, and three other companies	Set up the Sichuan Hua Xin Marble Corp. Ltd. to undertake marble and granite quarrying, purchase processing, and sales. 10/1/84.
Blossom Investment and Design Contracting Co. Ltd. (HK)/Xiamen International Trade and Trust Corp., Xiamen International Real Estate Corp., and Xiamen International Resources Corp.	Will build an international exhibition center in Xiamen. 10/13/84.
Gold Tag Trading Co. Ltd. and Tin Rich Co. Ltd. (HK)/Shanghai Housing Construction Corp.; Shanghai Minghang & Hongqiao Development Corp.; and BOC, Shanghai Trust Corp.	Signed a 15-year agreement to set up the Shen Lian Construction & Decoration Co. Ltd. to provide interior and exterior decoration services for high-rise buildings. 10/22/84.
Izumisoken Engineering Inc. (Japan)/China Shenzhen Building Technology Development Center	Reached a basic agreement to set up a joint architectural computing center in Shenzhen. 10/30/84.
Bear Valley Co. (Japan)/ Everbright Industrial Corp.	Opened the Everbright-Bear Valley Development Co. Ltd. to undertake large construction projects in Southeast Asia, China and Hong Kong. 11/12/84.
Shin Ho Co. Ltd. (HK)/ Everbright Industrial Corp.	Set up the Everbright-Shin (China) Housing Construction Investment Co. Ltd. to invest in the construction of high-rise apartment buildings for returned overseas Chinese. 11/12/84.
Fu Shen Enterprises (HK)/ Everbright Industrial Corp.	Opened the Everbright-Jianye Joint Development Co. and will build apartment houses in Shenzhen. 11/12/84.
Consumer Goods	
Millie's Group (HK)/ China Light Industry Millie Economic & Technical Cooperation Co. Ltd. (a HK–PRC joint venture) and Kunshan County, Jiangsu	Will run the Kunshan Leather Shoes Factory. Investment: $1.76 million. (HK:25%–CLIMETC:25%–Kunshan:50%). 9/24/84.
Bandai Corp. (Japan)/Ka-Ming (a Chinese co. in HK)	Established a joint company in Hong Kong to manufacture toys. 10/20/84.
Guo Ying Shoes Co. Ltd. (HK)/Shanghai No. 2 Leather Shoes Factory and Shanghai Investment & Trust Corp.	Signed a 10-year agreement to set up the Shanghai Xing Zhong Shoes Co. Ltd. to produce shoes. 10/22/84.
Electronics	
Sperry Corp. (US)/CITIC, China Computer Technical Services Corp., and Wuxi Computer Factory	Signed an agreement in principle to manufacture and market Sperry's MAPPER software system. 10/9/84.
System Design Consultant Co. (Japan)/Beijing Computer Software Service Center	Will jointly establish a software company, Japan-China Software Center, in Tokyo. Capital: $40,000 (J¥10 million). (PRC:49%–Japan:51%). 10/30/84.
Sun Associates (US)/ Shijiazhuang Radio Plant, No. 8	Set up the Sino–American New Star Computer International Inc. to import and sell computers, develop new technology, and provide technical and repair services. 10/21/84.
Lingnan Microelectronics Investment Co. Ltd. (UK)/ Lingnan Microelectronic Industrial Co., Guangdong	Will set up venture in Guangdong to produce large integrated circuits. (50–50). 11/1/84.
Powan Electronic Co. (HK)/Shanxi Arts and Crafts Factory, and Bank of China, Shanxi Branch Trust Dept.	Signed a 10-year contract to establish the Wah Pip Electronic Joint Organization to produce electronic watches, calculators, toys, and other products. 11/5/84.
Huayuan Investment Co. (HK)/Jiang Wei, a Chinese photographer	Set up the Guangcai Industry Co. Ltd. to develop and enlarge color photographs. 11/5/84.
Genisco Computer Corp. (US)/Hunan Computer Factory	Signed a contract to set up the Genisco-China Computer Graphics Terminals Corp. to produce computer terminals. Investment: $2.9 million. (50–50). 11/12/84.
Sanyo Electric Co. (Japan)/Huaqiang Electronics Co., Shenzhen	Will begin production of videotape recorders in addition to its joint venture TV production. 11/13/84.
Food Processing	
Kyotaru Co. (Japan)/ Beijing Hotel	Will open the Beijing Hotel Kyotaru Japanese restaurant. (PRC:60%–Japan:40%). 10/16/84.
China Air Catering Ltd. (HK)/CAAC, Shanghai Regional Adm.	Signed an 8-year contract to form the Shanghai Aircraft Catering Ltd. to provide airline catering services. 10/22/84.

AMS Group and Spaten Beer (W. Germany)/Ministry of Light Industry, Wuhan Brewery, and Everbright Industrial Corp.	Signed a 15-year agreement to establish the Sino-German Brewery Co. Ltd. Investment: $39 million (¥84.5 million). 10/29/84.
Machinery	
Scovill Yale Inc. (US)/ Guangzhou City and Ministry of Light Industry, Foreign Technical Cooperation Co.	Signed a letter of intent to run the Guangzhou Locks Factory. Investment: $3 million. (Guanzhou:40%-MoL:10%-US:50%). 9/24/84.
Singer Products Co. Inc. (US)/Shenyang Electrochemical Machinery Works	Are discussing a joint battery production equipment manufacturing agreement. 11/21/84.
Medical Equipment	
International Hydron Corp. (US)/Globe Biotechnology Development Corp., Shanghai	Have agreed in principle to form a company to manufacture soft contact lenses. 10/22/84.
Minerals and Metals	
Friendship Trading Co. (Japan)/Fushun Liaodong Magnesium Mining Corp.	Signed a 10-year contract to set up a company to develop a magnesite mine in Liaoning. (PRC:75%-Japan:25%). 9/24/84.
Fluor Engineering Inc. (US)/China Foreign Nonferrous Metal Engineering and Construction Co.	Signed an agreement to establish a joint engineering corporation to contract for domestic and foreign nonferrous metal and other projects. 10/10/84.
General Gold Resources and Hunter Resources (Australia)/China Rainbow Development	Will jointly prospect for gold in Australia. 10/23/84.
Japan Atomic Industrial Forum/Ministry of Nuclear Industry	Are discussing cooperative uranium refining venture in Hebei. 10/30/84.
Packaging	
Asean Resources Ltd. (HK)/Guangzhou People's Paper Mill	Signed a letter of intent to jointly produce coated box board. 8/17/84.
Cofa Co. Aussie Pty Ltd. (Australia)/China Light Industry Millie Economic & Technical Cooperation Ltd. (a Chinese-HK joint venture)	Signed a cooperative management agreement to run the Changzhou Wool Packing Bag Factory in Jiangsu to produce woven bags for packing wool. (Changzhou:70%-CLIMETC:30%). 9/24/84.
Zhao Ruicheng (US citizen)/Xiamen Special Economic Zone Development Corp. and Xiamen Shipping Electronic Instruments Plant	Signed a 15-year agreement to develop, produce and sell shipping containers for electronic instruments. Investment: $120,000. (PRC:80%-US:20%). 10/84.
World Industrial Co. (US)/Light Industrial Co. of Enping County, Guangdong	Signed a 10-year agreement to set up Enmei DET Co. Ltd. to produce plastic bottles. Foreign investment: $1.3 million. (PRC:65%-US:35%). 10/84.
Bank of Paribas (France) and Italian Commercial Bank/China National Packaging Corp.	Set up the China International Packaging Leasing Co. Ltd. to provide leasing services for packaging machinery, equipment and technology. 10/26/84.
Petroleum	
Magcobar Group of Dresser Industries (US)/ CNOOC	Signed a 10-year contract to set up the China Nanhai Magcobar Mud Corp., Ltd. to provide mud and technical services for offshore oil operations. Registered capital: $1 million. 9/24/84.
Far East-Levingston Shipyard + others (Singapore)/China Nanhai Oil Co.	Will set up the Nanhai Oil Equipment, Repair & Maintenance Shenzhen Co. to provide maintenance and repair services for vessels working near the Chiwan oil supply base. 10/8/84.
China Rising Investments Ltd. (HK)/Nanhai Oil Zhanjiang Base Service Co.	Have signed a 10-year agreement to set up the Zhangjiang Rising Development Co. Ltd. to provide housing, communications, food, and entertainment services for the oil base. HK investment: $1 million. 10/15/84.
Japan Drilling Co. Ltd. and C. Itoh & Co., Ltd. (Japan)/CNOOC	Signed a 10-year agreement to set up the Bohai-Japan Offshore Drilling Co. Ltd. located in Tanggu to undertake offshore oil drilling. Registered capital: $1 million. (50-50). 10/22/84.
Mitsui Cyanamid, Ltd. (a joint venture between American Cyanamid and Mitsui Toatsu Chemicals)/TECHIMPORT	Signed a contract to jointly develop crude oil recovery know-how at the Dagang field in Tianjin. 10/30/84.
Power	
Sovonics Solar Technology, a Standard Oil Co. (Ohio) and Energy Conversion Devices Inc. partnership (US)/	Signed a memorandum of understanding to build and market solar cells. 10/30/84.
Shipping	
Miyago Kamotsu Jidosha Unso, Seino Transport Co., and Asagami Marine Transport Warehouse (Japan)/Tianjin Municipality	Have set up a joint land and water transportation company for shipping between Tianjin, Hong Kong and Tokyo. 8/84.
NA (HK)/Ma'anshan Jiangdong Shipping Co., Anhui; Guangzhou Harbor Adm. Bureau; Guangzhou Harbor Shipping Co.; and Wuhan Datong Co. Ltd.	Established the Da An Shipping Co. Ltd. to run river and ocean shipping routes along the Chinese and Southeast Asian coast. 10/15/84.
Ma Wanqi (Macao businessman)/Zhuhai SEZ General Development Corp. and Ministry of Communications, Inland Waterway Adm.	Signed a 15-year agreement to set up the Huihai Joint Co. to develop Zhuhai inland waterway shipping. Registered capital: $4 million (¥10 million). 11/5/84.
Textiles	
Scovill Apparel Fasteners Group (US)/Shanghai and Ministry of Light Industry, Foreign Technical Cooperation Co.	Will run the Shanghai Apparel Fasteners Factory. (Shanghai: 40%-MoL:10%-US:50%). 9/24/84.
Yap Son's Trading Co. (HK)/Wuhan No. 1 Yarn Dyed Fabric Mill	Will jointly produce denim. $1.5 million. 10/8/84.
Tourism	
Kanematsu-Gosho Co. Ltd. and Daisei Corp. (Japan)/Tanggu-Bohai General Service Co.	Reached an agreement to jointly build and operate the Xingang (New Harbor) Hotel. 8/84.
Marubeni Corp., Kajima Corp., and Pacicon Corp. (Japan)/Haikou External Economic Development Corp. and Bank of China, Haikou Branch	Signed a 20-year agreement to build a 13-story hotel, shopping center, and amusement and health center. Investment: $35 million. 11/6/84.
Fu Xiang Co. Ltd. (HK)/ Foreign Supply Co., Dalian	Concluded a contract to set up the Dalian Fulihua Hotel. Investment: $15 million. 11/12/84.
Transportation	
Ek Chor Investment Co. Ltd. (Thailand)/Shanghai Tractor and Automobile Corp.	Signed an agreement to set up the Shanghai-Ek Chor Motorcycle Co. Ltd. to produce motorcycles. Investment: $19.7 million (¥50 million). 9/29/84.
Volkswagenwerk AG (W. Germany)/Shanghai Tractor-Automobile Co.; Bank of China, Shanghai Branch; and China Automotive Industry Corp.	Signed a 25-year contract to form the Shanghai Volkswagen Automobile Co. to produce Santana cars. $160 million. (50-50). 10/11/84.
Hong Kong Aircraft Engineering Co. Ltd./China National Aero Technology Import-Export Corp.	Set up the South China Aero Technology Ltd. to help modernize and find joint venture partners for China's aviation industry. (PRC:40%-HK:60%). 11/1/84.

Yip Shing Co. and Wah Luen Rubber and Metal Works Factory (HK)/ Shenzhen SEZ Development Co. and China Chemical Industry Construction Corp.	Signed a 10-year agreement to form the Shenzhen Rubber Enterprise Co. Ltd. to produce radial and bias tires as well as other rubber products. Registered capital: $943,000 (¥2.4 million). (50–50). 11/12/84.

Miscellaneous

Colomer Co. Ltd. (Spain)/ China Light Industry Millie Economic & Technical Cooperation Co. Ltd. and Nantong, Jiangsu	Will initial a contract to run the Nantong Sheepskin Tannery. Investment: $2.2 million. (Nantong:50–CLIMETC:50). 9/24/84.
Wolverine Inc. (US)/ Shanghai; Changzhou, Jiangsu; Ministry of Light Industry, Foreign Technical Cooperation Co.	Will jointly manage the Shanghai, Changzhou Pigskin and Oxhide Products Joint Assoc. Co. Investment: $5 million. 9/24/84.
NA (HK)/Yantai Municipal Trust & Trading Corp., Shandong	Set up a 30-year venture to promote development of Yantai. Registered capital: $2 million. 10/1/84.
Sanwa Bank (Japan) and Dresdner Bank (W. Germany)/Bank of China, Trust and Consultancy Co.; MACHIMPEX; INSTRIMPEX; and TECHIMPORT	Signed a contract to establish the China Universal Leasing Co. Ltd. in Beijing. Registered capital: $3 million. (PRC:54%–Foreign:45%). Contract signed 10/12/84.
W&S Productions (US)/ Nanhai Film Co.	Are collaborating on the joint production of the film "Peking Story". $650,000. 11/10/84.

LICENSING

Solartron (UK)/Tianjin Electric Instrument Factory	Signed an agreement to provide technology for dynamic analysis instruments for testing servo mechanisms on machine tools, aircraft, and other equipment. 8/23/84.
Trosvik Corp. (Norway)/ Shanghai Shipyard and Shanghai Offshore Petroleum Engineering Corp.	Signed an agreement for design technology for a semi-submersible drilling rig. 9/84.
C-E Natco (US)/EQUIMPEX and Guangzhou Heavy Duty Machine Works	Technology for production of separators, heaters, steam generators, offshore production systems, water treating, and gas sweetening equipment. 10/15/84.
Dow Chemical Co. (US)	Concluded an agreement for license for "Zetabound" plastic-clad tape. 10/15/84.
Lucas-Girling (UK)	Negotiating an agreement on manufacture of braking systems. 10/17/84.
Fanuc Ltd. (Japan)/ TECHIMPORT	Concluded a contract for technology to manufacture small machining centers. 11/6/84.
Kansai Paint Co. (Japan)	Has finalized an automobile paint licensing deal with a Shenyang paint factory. $1.2 million (J¥300 million). 11/13/84.

COMPENSATION TRADE

East China Sea Resources Corp. Ltd. (HK)/Changji Cotton Mill, Xinjiang	Spindles and open-end spinning equipment in exchange for the mill's products. 9/84.
Colomer Leather International Promotion Co. (Spain)/Xingtai Tannery, Hebei	A leather production line in exchange for hides. 10/30/84.

COPRODUCTION

Fritz Buser AG (Switzerland)/MACHIMPEX and Zhengzhou Textile Machinery Plant, Henan	Will produce flatbed textile printing machines under a three-year agreement. 11/12/84.
Waldrich Coburk Machine Tools Co. Ltd. (W. Germany)/Beijing No. 1 Machine Tools Plant	Signed a 10-year agreement to coproduce heavy-duty digital control milling-boring machines. 11/5/84.

The China Business Review
1984 Index

Compiled by Betsy Saik.

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中国通

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