China’s machinery and equipment industry, now one of the world’s largest, has undergone many ups and downs since its beginnings in the 1860s. Several wars and the Cultural Revolution (1966–1976) caused downturns in production, while the onset of Mao Zedong’s Great Leap Forward in 1958 caused a spike in production at the cost of quality. Today it is the second largest industry in the country.

China’s machinery and equipment industry has grown from three government-sponsored military factories established in the 1860s to become the second largest industry in the country. It generated profits of US$22.5 billion in 2004 on total output of US$395 billion, contributing 16.2 percent of the country’s industrial gains. Ranked fourth in the world, the machine-building industry is one of the main locomotives behind China’s impressive economic growth.

History of Development

By 1933, China’s machine industry included 226 machine-building factories, 63 plants for manufacturing electrical equipment, and 34 shipbuilding and locomotive repair plants, all of which accounted for 2 percent of China’s total industrial gross output. Japan, which occupied Manchuria and north China from 1931 to 1945, expanded the industry substantially to support its war effort. By 1940, the number of machine factories had more than tripled to 968.

Interest in mechanical engineering grew during the War of Resistance against Japan (1937–1945, known outside China as the Second Sino-Japanese War). The China Mechanical Engineering Society was established, and engineers began experimenting with materials, internal combustion engines, and substitute fuels in the simple laboratories of the National Bureau of Industrial Research. In the interior areas under the control of China’s nationalist Guomindang government, private industrialists and the state combined efforts to build many machine factories. Unfortunately, only 77 remained in operation by 1947.

Production was disrupted in 1945 when the Soviet army occupied Manchuria and dismantled half the machine factories. From 1946 to 1949 civil war between the Guomindang and the Communists created further disruptions, and by the founding of the People’s Republic of China in 1949, the machinery industry accounted for only 2.7 percent of total gross industrial output, a minimal increase from 1933.

In its early development plans, the Communist government gave the machine-building industry high priority, acknowledging its importance for national defense and technological advancement. By 1952, pushed by the needs of the Korean War (1950–1953) and aided by Soviet technical assistance, the machine industry had recovered to its 1947 level. In its First Five-Year Plan (1953–1957), the state allocated 2.6 percent of total investment in industrial capital (RMB¥6.9 million) to machine building. Imports
of machinery and transport equipment were encouraged. But the Western policies of isolating China limited it to importing technology from the Soviet Union and Eastern Europe.

In 1956, China ratified the Long-term Program for Science and Technology to encourage the development of precision machines, jet engines, and other high-performance equipment. The Ministry of Mechanical Industry established academies and institutes on its own and in partnership with universities. In 1958, the Soviet Union signed an agreement to aid China in major scientific research projects, including the design and manufacture of large-scale equipment, precision machines, and precision instruments. From 1950 to 1965, China sent more than 16,000 students to the Soviet Union and Eastern Europe for training.

The launch of the Great Leap Forward in 1958 led to a sharp rise in machinery production, but much of it was unusable because quality had been sacrificed in the frenzy to increase domestic output. By 1960, imports of machinery and transportation equipment reached a peak of US$840 million. Nevertheless, the disaster of the Great Leap Forward, coupled with the withdrawal of Soviet assistance after the breakdown of relations in the early 1960s, created a setback from which the industry took years to recover.

With Soviet ties severed and imports at a low of $100 million in 1965, China turned to advancing its science and technology on its own. Engineers focused on developing high-quality equipment and digesting the technology earlier imported from the Soviet Union and Eastern Europe. But progress was slow. During the 1950s, the machinery industry had applied more energy to manufacturing products and equipment than to research and development. This meant that basic technologies and machining techniques remained backward.

Nevertheless, the machine industry continued to grow. The value of its output reached RMB¥9.7 billion in 1965, more than doubling its 1957 value of RMB¥3.5 billion. And in 1966, it contributed 12 percent of total gross industrial output. By the early 1970s, China was producing high-precision machine tools, large equipment such as 30,000-ton hydraulic presses, 300,000-kilowatt hydro-power generators, oil-refining equipment, and fertilizer production equipment.

The outbreak of the Cultural Revolution (1966–1976) brought scientific research to a halt. Government agencies were paralyzed, universities and colleges were shut down, and many scientists and technicians suffered persecution. Imports of advanced technology stopped. But in 1972, with the PRC’s admission to the United Nations and the establishment of diplomatic relations with Japan and a number of Western countries, technical imports from advanced capitalist economies began. In 1973, imports of machinery and transportation equipment from

Heavy machinery plant in Beijing. In the early days of the People’s Republic of China the Communist government gave the machine-building industry high priority. PHOTO BY JOAN LEBOLD COHEN
noncommunist countries reached US$501 million, or 63 percent, surpassing for the first time those from Communist countries (US$296 million).

**Modern Development**

China’s technical imports accelerated after economic reforms began in 1978. The industry had focused on the industrial and defense sectors in the past but now paid more attention to the agricultural and consumer goods sectors. Emphasis shifted from importing complete sets of equipment to importing single techniques, and from building new enterprises to updating existing ones. Advanced technologies were imported through joint ventures, wholly foreign-owned enterprises (legal since 1980), and cooperative enterprises. With the increase in advanced imports and joint ventures, China’s mechanical products and technology improved. The industry acquired numerical-controlled machine tools and industrial robots. By the late 1980s, 85 percent of China’s mechanical products were being produced domestically. By 1996, there were nearly 5,300 officially approved foreign-funded ventures, with a total direct investment of approximately US$5.5 billion.

The industry grew at an average annual rate of 16 percent from 1984 to 1989, and 24 percent from 1990 to 1995. Growth slowed to 10 percent in 1997 and again in 1999. But China’s overall economy experienced phenomenal growth in the early twenty-first century. Real gross domestic product rose by 9.5 percent annually from 1990 to 2004. China’s expanding industrial sector provided the fuel for much of that growth. And as manufacturing grows, so does the need for machinery. In 2007, the output of China’s machinery industry grew by 32 percent to a record high of RMB¥1 trillion (US$146 billion), according to the China Machinery Industry Federation (CMIF). It was the fifth consecutive year that growth surpassed 20 percent. China had succeeded in transforming itself from a net machinery importer to a net exporter.

Considerable technological advancement has been accomplished through imports and indigenization. Advanced manufacturing methods have been widely adopted in areas such as casting, forging, welding, heat treatment, and surface protection, while microelectronic technology has been spreading along with the Computerized Integrated Manufacturing System.

A significant portion of China’s growing share of world trade can be attributed to the machinery and equipment industry. In 2004, total imports for the country reached US$561.4 billion, and exports climbed to US$593.4 billion. The machinery sector accounted for 45 percent of this trade. Machinery imports rose 31 percent in 2004 and exports 42.9 percent, according to the Ministry of
Commerce. Overseas trade in machinery and transportation equipment surpassed all other sectors except manufactured goods.

**Strengthening and Innovation**

In 2003, the government recognized the need to revitalize China’s traditional industrial “rustbelt” of the northeast. The three northeastern provinces of Liaoning, Jilin and Heilongjiang produced China’s first steel, machine tools, locomotives, and planes after 1949. But many of the state-owned machine factories there became outdated and less competitive after China shifted away from a planned economy. The government responded in 2003 with a plan to open the aging state-owned industries to private investment. The importance of this move to the government could be seen in the proportion of investment. In 2004, US$486.2 billion was invested in the northeast area, according to the National Bureau of Statistics, a far larger sum than the US$182.8 billion spent in the central region or the US$166.1 billion that went to the west.

The importance of strengthening the industry was also reflected in the spending of two of the country’s top machine-tool manufacturers, both located in Liaoning province. Dalian Machine Tool Group invested US$65 million in an upgrade that is expected to bring annual sales of US$1.2 billion in 2010. Shenyang Machine Tool Company spent approximately US$67 million on a new production line and another US$107 million on upgrading its factory to generate sales of nearly US$750 million. Moreover, both companies have moved operations into Germany, one of the world’s top machine-building countries, giving them access to highly sophisticated technologies.

Clearly, China is building a significant machine and equipment industry, with its top enterprises making inroads into European and U.S. markets. And the industry is striving for innovation. According to the CMIF, the industry has bolstered its innovative capacity in the agriculture, construction, and power sectors with the development of a number of domestically produced, high-end equipment, such as cranes. Research is also under way on an electricity transmission project that is expected to produce the highest voltage, longest transmission distance, and highest transmission capacity in the world. Creative breakthroughs are also being made in energy-saving pollution-reduction equipment, infrastructure equipment, and high-end digital-control machine tools, the CMIF reported.

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**Further Reading**


