

# A History of Japanese Industry (5): Industrial Development between Two World Wars (1914-1936)

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## Industrial structure

In the years between 1908 and 1913, factory production became the principal production pattern and outpaced household production in terms of value. But Japan essentially remained an agricultural country as its agricultural production still exceeded industrial production, with primary production (agriculture, forestry, fisheries and stock farming) accounting for 45% of the country's total production against 19% for secondary production (manufacturing, mining and utilities) (see Table 1).

Japan became an industrial nation following World War I in 1928, when value-added secondary production eclipsed primary production for the first time. In 1930, secondary industry accounted for 30% of national income produced, while primary industry dropped to 20%. Yet, the number of people working in primary industry, mostly farmers, still accounted for about half the people holding jobs, while those in secondary industry accounted for only 20%. The boost in industrial production before World War I was practically achieved by light industries such as the textile and food industries. Production by light industries accounted for 70% while that by the metal, machinery and chemical industries accounted for only 15-20%. Japan exported light industry products such as raw silk, cotton yarn, cotton cloth, tea, coal and copper, and imported heavy industry products such as steel, machinery and processed metal goods.

After World War I, construction of hydroelectric power stations across the country boomed and the coal, iron-steel and shipbuilding industries developed. Various new industries including the electric machinery, automobile, machine tool, chemical and rayon industries emerged and a large number of companies was founded.

The metal, machinery and chemical

industries grew rapidly. Between 1914 and 1936, production by the chemical and machinery industries surged 15-fold and that of metal industry soared 40-fold, against the six-fold increase for light industries. Production by the metal, machinery and chemical industries accounted for 48.7% of total industrial production in 1936, and outstripped that by light industries which stood at 37.8% (see Table 2).

The textile industry was still the leading industry category, with production accounting for 28.5% of the nation's total. In exports (Table 3), light industries remained dominant with cotton yarn and cloth and silk yarn and cloth accounting for a combined 35%. Cotton yarn replaced raw silk as the leading export item in 1931 and Japan outstripped Britain as the largest cotton yarn exporting nation in 1933.

Though Japan saw its heavy industries develop fast between the two world wars, the country was far from being an exporter of heavy industry products. It only managed to produce heavy industry products for domestic use, and its exports were still essentially textile products.

## Industrial infrastructure and consumption

In the process of industrial revolution, steam engines were installed at major factories of manufacturing industries, and steam replaced water as the



Japan takes a giant step toward modernization as the success of a hydropower station at Komahashi in 1907 sees to a swift rise in the development of hydropower.

Photo: Tokyo Electric Power Company

main power source. Small factories, however, still relied on water power as introducing expensive steam engines was not commercially viable.

In 1907, Tokyo Electric Light Co. built a hydropower station in Komahashi and succeeded in transmitting electric power to Tokyo 80 kilometers away, marking the first long-distance power transmission in Japan. This was followed in 1915 by the success of long-distance transmission of ultra-high pressure electric power to Tokyo from a hydropower station built at Lake Inawashiro, Fukushima Prefecture, 228 kilometers away.

A boost in hydropower generation and long-distance power transmission enabled mass supply of cheap electric power and prompted wide use of electricity as the main power source at factories. Electricity used at factories as a power source accounted for 56% of total electric power consumption in Japan in 1913, against 44% for lighting. In 1917, the ratio of electric power to total power sources used at factories

topped that of steam power.

The steam/electricity ratio at Yawata Steel Co. stood at 80.3% versus 19.7% in 1912 but the position was reversed in 1921, with electricity accounting for 51.8% against 48.2% for steam. The diffusion of small electric motors at small factories and the mass supply of electricity for factory use enabled the establishment of a large number of new small companies. Steam motors accounted for 80% of total factory motors in 1912, but electric motors outnumbered steam motors 54% to 46% in 1922. The transition from handlooms to electric-powered looms progressed at small textile factories. In 1909, only 14% of small factories hiring five to nine workers used power, but the ratio jumped to 44% in 1919 and to 77% in 1930.

Japan's railway network was vastly improved after most private railways became state-owned in 1902-03. Railways replaced steamships as the main long-distance traffic means. Electric tramways replaced horse tramways and rickshaws as short-distance traffic means. Taxis began to become common on the streets of large cities in 1912. After World War I, urban districts saw a rapid diffusion of electric lighting, gasing and tap water, replacing oil lamps, charcoal and firewood cooking stoves and wells, respectively. In 1918, 3,869 registered automobiles were running, and the number jumped to 126,248 in 1936. Buses, tram cars and *entaku* (taxi that operated in central Tokyo for a ¥1 fare) were becoming an important part of people's daily life. Cinemas emerged one after another in the entertainment districts of large cities, and radios, phonographs, cameras and electric fans found their way into homes.

## Coal, steel and shipbuilding industries

The coal, steel and shipbuilding industries advanced further during this period. Coal was a key export item along with raw silk, tea and copper, and exports of coal surpassed domestic consumption until 1897, but the wide use

of steam engines, which became the main power source for ships, railways and factories, spurred domestic consumption of coal. Domestic coal production increased to 22,290,000 tons in 1914 and to 30,110,000 tons in 1924 from 10,720,000 tons in 1904. Transportation work in coal pits became more efficient with the introduction of electric power and electric coaches in place of manpower and steam power. The introduction of cranes, mine conveyors and electric drills, coal cutters and coal blast mining also helped boost production. Coal production tripled from 1919 to 1928 and totaled 41,800,000 tons in 1936.

Production of pig iron and steel also grew fast, from 450,000 tons and 770,000 tons, respectively, in 1917 to 2,000,000 tons and 5,220,000 tons in 1936.

Private open-hearth furnace steel companies emerged successively in the Keihin, Hanshin and Tokai areas under the Steel Industry Promotion Law enacted in 1917. Total production by private steel companies outpaced that by government-run Yawata Steel Co. in 1928, because the open-hearth furnace steelmakers, which used cheap Indian pig iron and U.S. scrap iron, were able to produce steel at cheaper costs than Yawata Steel, which, being an integrated steelmaker, used ingot iron as material. Production by open-hearth furnace steelmakers accounted for more than 61% of total steel production in Japan in 1933. Japan's steel production had reached 390,000 tons in 1915 and topped steel imports which stood at 390,000 tons. In 1934, exports of steel, totaling 490,000 tons, surpassed imports totaling 390,000 tons. Japan then could already meet a substantial part of its domestic steel demand with its own production, but was still unable to produce thin steel plates for use in automobiles or special steel for use in machine tools.

Production of steel ships, mostly built at the Yokosuka Naval Shipyard as well as by Ishikawajima, Mitsui and Kawasaki Shipbuilding companies, overtook imports. World War I triggered a shipbuilding boom in Japan,

and production of ships surged to 600,000 tons in 1919 from only 50,000 tons in 1915, which made the country the third largest shipbuilder in the world, after the U.S. and Britain. During World War I, Japanese shipbuilders exported ships to the U.S., Britain and France, and enjoyed brisk business. But the end of the war resulted in a surplus of ships, depressed ship prices and plunged the shipbuilding market into a recession. Shipbuilding at Japanese dockyards plummeted and Japan slipped back to the No. 8 spot in world shipbuilding rankings.

During the shipbuilding recession that lasted until around 1933, diesel engines began to be used for ships for higher efficiency. Shipbuilding companies launched production of diesel engines as well as general machinery, automobiles and aircraft. The automobile division of Ishikawajima Shipbuilding Co. developed into Isuzu Motor Co., while Mitsubishi Shipbuilding Co. and Kawasaki Shipbuilding Co. evolved into Mitsubishi Heavy Industries Co. and Kawasaki Heavy Industries Co., respectively.

## Machinery industry

### *Electric machinery*

Tokyo Electric Light Co. built a hydroelectric station with a capacity of 15,000 kilowatts and capable of transmitting 55,000 volts of high-voltage electricity in Komahashi in 1907, installing the most up-to-date equipment, including a waterwheel made by Escher Wyss of Switzerland, a generator and underground cables made by Siemens of Germany, and a transformer made by General Electric of the U.S. Installation work was commissioned to foreign engineers.

Kodaira Namihei, an engineer who supervised the building of the power station, felt the need for Japan's independent development of electric machinery. He was scouted by the Hitachi mine of Kuhara Mining as chief of the machinery repair division, where he devoted his time to domestic development of electric machinery and mining machinery as well as production of

transformers and electric motors.

Kuhara Mining established a factory in Hitachi in 1910 and spun it off as an independent entity called Hitachi Works in 1920 with Kodaira at the helm. Shibaura Works, which evolved from Tanaka Works in 1904, tied up with General Electric in 1910 and introduced GE technology. Mitsubishi Shipbuilding Co. built a machinery factory in 1923 and made it an independent entity called Mitsubishi Electric Co. in 1921. Mitsubishi Electric introduced technology from Westinghouse, with which it established a partnership in 1923. Fuji Electric Machinery Co., founded in 1919, likewise concluded a tieup with Siemens and introduced its technology. Only Hitachi sought to develop technology on its own, without relying on foreign companies.

Japan then was far behind Western countries in technological levels, and 65% of the electric machinery equipment and waterwheels, 59% of the hydroelectric generators, 97% of the steam turbines and 87% of the thermal generators installed between 1923 and 1927 were imports.

The development of electrochemistry industry, including soda and ammonium sulfate, as well as the artificial silk (rayon) industry after 1932 boosted production of electric machinery and raised the technological level of the industry. As domestic production of electric machinery advanced, 79% of waterwheels, 86% of hydroelectric generators, 77% of steam turbines and 79% of thermoelectric generators installed between 1933 and 1937 were domestic products. Domestic production of communications equipment, home appliances and other light electric appliances also made progress, and all automatic exchangers were supplied by Hitachi Works, Nippon Electric Co., Fuji Communications Machinery or Oki Electric Co. Tokyo Electric, which monopolized the electric bulb and vacuum tube markets, embarked on the production of radios, electric home appliances and communications equipment. Electric bulbs accounted for 70% of the company's total production in 1927, but the ratio dropped to 40% in 1935 as the

company expanded production of radio components, vacuum tubes, electric home appliances and communications equipment. Tokyo Electric and Shibaura Works merged into Tokyo Shibaura Electric Co. in 1939, while Hitachi Works acquired Kokusan Kogyo Co. in 1937 to create a light electric appliance division. The two mergers marked the birth of general electric machinery makers in Japan.

### Auto industry

The tram car network in Tokyo, devastated by the Great Kanto Earthquake (1923), was replaced by a bus network, which prompted imports of buses. Ford Motor Co. and General Motors Corporation seized the opportunity to expand bus, truck and passenger car markets in Japan by introducing an installment system. Ford and GM established wholly owned subsidiaries in Tokyo and Osaka, in 1925 and 1927, respectively, and launched assembly of cars. The U.S. auto giants monopolized the Japanese car market and owned a total of 132 repair and assembly factories as of 1929. The main components, such as engines, brakes and transmissions, were all imported from headquarters in the U.S., as the Japanese subsidiaries were not able to manufacture them due to the absence of technology to cast cylinders and make special steel. Japan then had already initiated its own auto industry, with three companies—Datsun Motors, Ishikawajima Shipbuilding Co. and Tokyo Gas & Electric Co.—producing cars on a small scale with government subsidies provided under the Military Auto Vehicle Support Law. But, as of 1929, there were only 437 registered Japanese cars against 30,600 U.S.-made cars.

### Machine tools

Domestic production of freight and passenger coaches for railways started around 1900, followed by production of steam locomotives in 1914. Japan Rolling Stock Co. debuted Japan's first electric locomotives in 1915, and Kawasaki Shipbuilding and Mitsubishi Shipbuilding companies also embarked on production of locomotives and

coaches soon afterward.

Suspension of imports of machine tools during World War I and fast growth in domestic demand accelerated domestic production of the item. Yet, Japan still imported as many machine tools as it domestically produced in the years 1914–1933 and had to rely on imports from Western countries for high-performance machine tools, measuring instruments, and chemical industry machines.

### Chemical industry

Fertilizer constituted the bulk of chemical products in Japan before World War I. Nippon Nitrogen Fertilizer (founded in 1908) and Nippon Artificial Fertilizer (founded in 1910) were producing carbide, nitric calcium. Ammonium sulfate, dyeing materials and soda were still all imported. Japanese chemical companies sought transfer of technologies for producing these chemical goods from German and British companies, only to be rebuffed. When imports of these products were suspended during World War I, Japan was unable to fill the supply shortfall with domestic production at short notice. Two newly established chemical companies—Electric Chemicals and Nippon Soda—managed to succeed in domestic production of these items under a government-sponsored pioneer program.

Demand for rayon grew fast after artificial silk was imported in 1912 to be mixed with silk and cotton yarns. Subsequently, the establishment of Teikoku Artificial Silk in 1918 and, Toyo Rayon, Nippon Rayon and Kurashiki Rayon in 1926, rapidly boosted domestic production of rayon, from 1,360,000 pounds in 1924 to 261,820,000 pounds in 1936, making Japan the second leading rayon producing country after the U.S. ■

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