

## For the Sake of the Global Environment and Energy

# Changing Times and Takuma's Technology

Takuma has always been creating energy, supporting industry as well as the latest technology, capable of enhancing people's affluent lives and saving the environment, while also looking ahead of the present to the future.

### Social Situation of Japan

The Japanese state of technology, centering on the mechanical industry, remained low right after the long national isolation policy and in terms of domestic boilers, rough copies of foreign products only emerged sporadically.

### Social Situation of Japan

The postwar depression following World War I and the Great Kanto Earthquake became the so-called Great Depression and with its economic situation facing a serious crisis, Japan was going into the Sino-Japanese and Pacific Wars in search of new opportunities on the continent. Under the policy of prioritizing military demand, the industrial world expanded to establish production facilities, which was the primary catalyst for the increased demand for boilers.

### Social Situation of Japan

Although progress with the postwar reconstruction was very slow, since the 1950 commotion in Korea fuelled demand for special procurement, our national mining and manufacturing production rapidly recovered to enter a period of high economic growth. A shift in fuel was also promoted from coal to oil and boilers became increasingly diversified.

### Social Situation of Japan

Thanks to technical innovation enabled through the introduction of overseas technologies, people's living standards have been enhanced. The concentration of urban population from those who were formerly in the farming community has increased, meaning improved infrastructure and environment have become critical issues. In addition, the rapid development of heavy and chemical industry has generated significant industrial pollution.

### Meiji to Taisho Periods 1868-1926

### Takuma's Activities

#### Hardware

In 1910, the founder of the company, Tsunekichi Takuma, learned about boilers himself, taking the opportunity afforded by the starting sale of the Okamoto boilers, which played a role in the motor power of sawmill machines. In 1912, he introduced the first Takuma boiler that he himself had designed.

### Early Showa period to the Pacific War 1926-1945

### Takuma's Activities

Acclaimed for the high quality of the "Takuma boiler", which was superior to foreign-made products, as well as its actual performance, Tsunekichi Takuma was commended by the government as one of the ten great inventors of Japan during the Meiji and Taisho periods (1868-1926). In 1938, Tsunekichi Takuma founded Takuma Boiler Manufacturing Co., Ltd., with the spirit of "service to the nation through boiler manufacturing", which reflected the company's commitment to contribute to society through boilers. This was the beginning of our company.

#### Hardware

The Company manufactured and sold lime fuel boilers for small- and medium-sized industries and marine boilers designed in-house.

### Postwar Reconstruction 1945-1960

### Takuma's Activities

#### Hardware

In 1949, the Company exported a bagasse firing boiler, which used pomace of sugarcane as fuel for the first time in postwar history. Subsequently, in 1953, the Company developed and delivered the first waste heat recovery boiler, using high-temperature effluent gas emitted from various plants, ahead of the rest of the industry. In 1959, the Company commenced the manufacture and sale of small-scale through-flow boiler, "clayton" via technology introduced from overseas.

### Rapid Growth and Pollution Issues 1960's

### Takuma's Activities

#### Hardware

Takuma has developed into a custom-made plant manufacturer, which designs plants freely to meet customer needs and makes a wide range of product lines available, including compact package boilers, as well as medium- and large-scale boilers by proactively introducing overseas technologies. There have been active product exports to foreign countries and we also exported wood waste boilers for the first time during this period.

#### Environmental Facilities

In order to hygienically treat waste levels which have risen with the advent of the mass-consumption society, the Company started developing modern waste incineration facilities designed in-house and in 1961, delivered a continuous waste incineration plant to Osaka City as a nationwide first. Moreover, in 1965, Takuma also delivered the first waste incinerator for treating solid industrial waste generated from the automobile industry.

#### Water Treatment Facilities

The Company rapidly sensed the issue of public water pollution and in 1962, entered the water treatment market by purchasing a water treatment manufacturer, having made deliveries of small-scale sewage treatment equipments and vertical multistage incinerators.

### Social Situation of Japan

The energy crises, which hit the country twice, caused significant damage given the national reliance on imported oil and energy at levels of 99% and 75% for overseas supplies respectively. This period saw the economy experience negative growth in real terms for the first time in postwar history and heralded the end of the era of high economic growth. Based on the energy conservation policy, companies have started striving sincerely to rationalize energy consumption and save resources.

### Energy Crisis 1970's

### Takuma's Activities

Takuma establishes its position as a manufacturer of environmental health devices as well as of boilers, providing a wide range of waste incineration plants and water treatment equipment. In 1972, the Company renamed its company to the present Takuma Co., Ltd.

#### Hardware

In the industrial world, there has been rapidly increasing demand for enhanced energy conservation efficacy through heat recovery. In response, we have delivered numerous waste heat recovery boilers to handle various processes. In 1972, the Company delivered a boiler fuelled by oil palm waste to Malaysia, which saw it highly acclaimed as the world's leading palm firing boiler manufacturer. Takuma also developed a water heater for hot-water supply and air heating for business use called the "Vacotin heater". This heater features a non-bursting risk when the inside of the container is below atmosphere pressure, meaning it can be handled even by individuals who are not licensed boiler engineers. This helped it gain broad market acceptance.

#### Environmental Facilities

In order to improve the durability of waste incinerator, Takuma developed a bulk waste grinder and built a grinding and sorting plant, which separates combustible from noncombustible waste. This was then applied to valuable resource recovery plant technology in the resource saving movement following the energy crisis. In addition, the Company also delivered a series of industrial waste treatment plants where waste heat boilers were installed, to set a precedent for waste heat recovery plants.

#### Water Treatment Facilities

Takuma introduced sludge heat treatment technology, capable of substantially reducing sludge moisture, and commenced the sale of the same. The Company constructed a cascade sludge incinerator with boilers, which was designed to provide sludge combustion treatment as a national first.

### Social Situation of Japan

Right after the Plaza Accord in 1985, the Japanese yen appreciated swiftly and Japanese speculation accelerated, signalling the start of the bubble era. On the other hand, the appreciation of the Japanese yen invited a decline in machine industry exports, as well as the development of high-tech industry, including communication devices, semiconductors, and computers.

### The Appreciation of the Japanese Yen and the Bubble Economy 1980's

### Takuma's Activities

#### Hardware

Takuma delivered a variety of boilers, including high efficiency and low-pollution coal firing boilers and wide-ranging solid fuel firing and various waste heat boilers using alternative fuels to oil. The Company has delivered waste heat recovery boilers for marine diesel engines, as well as cogeneration plants that use boilers to recover the heat from gas turbine emissions. Since this period, in response to the demand for energy cost reduction, we have launched an industrial in-house power plant engineering business.

#### Environmental Facilities

In accordance with the increased volume of urban waste and diversification of its quality, Takuma has developed a series of new combustion equipment and delivered energy from waste plants with waste heat boilers for the waste incinerators nationwide. The Company also has developed ash-melting facilities for volume reduction of incineration ash and rendering substances harmless, of which the initial set was delivered in 1981. Takuma also focused on its industrial waste treatment plant business and commenced the supply of facilities to special waste treatment companies as well as in-house waste treatment within factories.

#### Water Treatment Facilities

As total control of water quality got underway, Takuma introduced filtration technology, which made continuous treatment available as an advanced form of water treatment technology. We have launched the marketing of the "Uniflo Sand Filter", which is a packaged product featuring the aforementioned technology.

### Social Situation of Japan

The burst of the bubble economy triggered a series of bankruptcies of financial institutions and company collapses. Each company promotes the reinforcement and streamlining of management culture, in a fight for survival. At the same time, there has been intensified international awareness of the need to protect the global environment, which has helped popularize the phrase "earth-friendly".

### The Burst of the Bubble Economy and the Beginning of the Heisei Period 1990's

### Takuma's Activities

Instilling the phrase "Value technology, people, and the earth", as our company motto, Takuma made it its own mission to generate technologies that contribute to the protection of the global environment.

#### Hardware

Takuma delivered the first boiler using refuse-derived fuel (RDF) as an alternative to oil. The Company also launched the marketing of cogeneration facilities, which included packaged products of imported gas turbines.

#### Environmental Facilities

Takuma proactively addressed mechanism elucidation for the generation of dioxins, which are released into the air from waste incineration facilities, as well as developing reduction technology for the same. The Company contributed to establishing such technology and implemented construction of countermeasures to combat dioxins at waste incineration plants nationwide. While constructing grinding and sorting recycling plazas nationwide, the Company also introduced technology in the form of a new and highly efficient municipal solid waste treatment, with low-pollution and recycling efficiency and delivered the pyrolysis gasifying and melting system. As for raw garbage, as well as night soil and sludge, we have introduced biogasification technology, which generates methane gas, used it as fuel, and conducted a demonstration test.

#### Water Treatment Facilities

Takuma has launched compact and hygienic compost facilities, which allows for the effective utilization of sewage sludge as compost.

### Social Situation of Japan

Economic recovery, which uses the market mechanism by introducing the ability of the private sector into the field of public services, has been promoted. Thanks to the rapid spread of the Internet and mobile telephony, globalization has also advanced. The sense of values has become increasingly diversified, amid further progress in price reductions and recovery in the sale of high-value added products. Due to inflating oil prices and in order to control greenhouse effect gas emissions, various technologies, including biomass, the utilization of waste as fuel and that of unused energy have been developed, one after another, and products with such technologies have been launched onto the market.

### Structural Reconstruction and Globalization 2000's-

### Takuma's Activities

Aiming to achieve further leaps in the areas of renewable energy and environmental conservation, Takuma promotes the supply of a wide range of technologies for the energy utilization of waste as well as biomass and rendering substances harmless. The Company also promotes the establishment of overseas subsidiaries, developing Takuma's technology worldwide as well as its domestic activities.

#### Hardware

Takuma has launched the "Micro Turbine Cogeneration Package", which is a packaged product featuring a compact, high efficiency and low-pollution micro turbine and waste heat recovery equipment. The Company also develops an innovative new compact through-flow boiler, which satisfies the requirements of high efficiency, low NOx and low CO.

#### Environmental Facilities

Takuma delivers a new-generation energy from waste plant, using its unique technology with high efficiency and low environmental load performance. The Company develops and delivers various products, such as plasma melting facilities, which seek to reduce ash volume, render substances harmless and reuse, as well as a highly efficient new dry type exhaust gas treatment system, using a sodium-based chemical.

#### Water Treatment Facilities

Takuma has commercialized a frozen-concentrated system for the water purification of sludge, using cryogenic thermometry. A verification test of the sewage sludge gasification system, which utilizes fuels by gasifying sewage sludge, is underway.