

Steel Plant Engineering & Construction Division, Creating a “Solution Business” for Customers*



Masakazu Fujioka
General Manager,
Iron- & Steelmaking
Technologies Dept.,
Steel Plant
Engineering &
Construction Div.



Toshikazu Kaihara
General Manager,
Rolling & Processing
Technologies Dept.,
Steel Plant
Engineering &
Construction Div.



Takashi Mikuriya
General Manager,
Plant Control
Technologies Dept.,
Steel Plant
Engineering &
Construction Div.

Synopsis:

Kawasaki Steel's Steel Plant Engineering & Construction Div. is expanding its hardware business, beginning with overseas full turnkey projects besides the sales of the company's own technologies, and software business, by taking advantage of the strengths in product technology, equipment technology, and operational technology which the company has cultivated as an integrated iron and steel maker. In the fields of iron- and steelmaking and rolling, the division has carried out a number of major hardware projects and supplied technologies for operational guidance, etc., among software-related items. In the fields of facilities and material handling, the division began with warehouses for large-scale, heavy items, by making use of experience in iron and steel manufacturing, and has accumulated knowledge in the livestock feed and material handling industries. Goals for the future include strengthening of the sales of environmental and energy saving technologies for steel plants and total engineering that incorporates operational technology in distinctive hardware. In the field of facilities and material handling, the division aims to establish a “solution business,” which solves customers' problems from a broad perspective.

1 Introduction

The engineering industry has earned profits in the hardware sector by supplying and constructing equipment and plants. These days, however, competition is becoming increasingly fierce due to postponements of large-scale hardware projects, widespread use of the

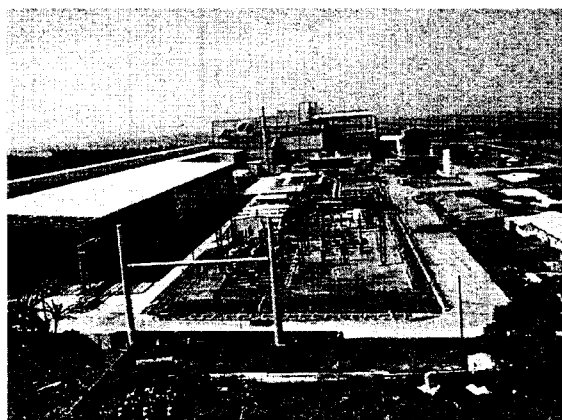


Photo 1 Complete package plant of EAF-BAR mill in the Philippines, Bacnotan Steel Industries Inc.

Internet, globalization, etc., and profit outlooks for the hardware sector are becoming less optimistic. Against this background, the industry is eyeing the software section, such as operation, maintenance and solutions business. For example, an engineering company earns profits by supervising operations and maintaining plants constructed by the company through the use of the Internet. The number of such examples is increasing on a daily basis.

Bearing these new movements in mind, the authors look back on the progress of the company's Steel Plant Engineering & Construction Div. (the “division”). At present, the activities of the division are weighted heavily on hardware and there have been many successes in turn-key-based projects, such as the construction of an integrated electric furnace and bar mill plant for Bacnotan Steel Industry Inc. (BSII) of the Philippines (**Photo 1**) and the construction of a cold rolling mill line for The

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Siam United Steel (1995) Co., Ltd. of Thailand. These results of the division in hardware derived on the company's know-how, operational experience, operational technology, equipment technology, etc. which the company has acquired as an integrated iron and steel maker. This includes (1) assurance of optimum performance of equipment, (2) assurance of completion of equipment construction within construction periods, (3) assurance of equipment operation by the supply of know-how, etc., and (4) quality assurance of products in addition to the competitiveness in hardware and construction itself. As a matter of course, the "software" business, such as equipment diagnosis and operational guidance, is also a major activity of the division. Enhancing both the software business and hardware business, it seems that putting the energies of plant engineers into proposal-type business, which is more customer-oriented than ever before, will become a new focus of plant engineering. Specifically, operation and maintenance ("O&M") is being emphasized in the field of steel plants, and solutions business is being stressed in the field of facilities and material handling.

In view of these new directions in the engineering industry, the present circumstances and future prospects of the division are described below.

2 Iron- and Steelmaking Technology

In the field of iron- and steelmaking engineering business, Iron- & Steelmaking Technologies Dept. of Steel Plant Engineering & Construction Div. has the noteworthy history of various overseas plant construction projects on the full-turn-key contract basis, starting with Philippine Sinter Corp. in the Philippines and Companhia Siderurgica de Tubarau in Brazil. Kawasaki Steel's ample construction experience, O&M know-how cultivated in both Chiba and Mizushima Works were provided to those two projects, resulting in smooth start-up and keeping excellent operation performance until today. Especially the furnace life of No. 1 BF at the Companhia Siderurgica de Tubarau is expected to be the world top level of 20 years. These accomplishment led to various overseas big projects such as EAF-Shape Mill of Tung Ho Enterprise Corp. in Taiwan, No. 2 Steelmaking Plant of Shanghai Baoshan Iron & Steel (Group) Corp. (hereinafter referred to as Baoshan Iron & Steel Complex) in China, Sinter Plant of Bhilai Works of Steel Authority of India, Ltd. and EAF-Bar Mill of Bacnotan Steel Industries Inc. in the Philippines.

Another notable engineering business is the supply of Kawasaki Steel's original technologies which have already spread to steel mills in the world. In ironmaking area, typical technologies such as Pulverized Coal Injection (PCI), Top-gas-pressure Recovery Turbines ("TRT") and Sinter Ignition Burner have been supplied to Baoshan Iron & Steel Complex in China, Ergil Demir ve Celik Fabrikalari TAS in Turkey, Stelco in Canada and

Panzhihua Iron & Steel Group Co. in China. In steel-making area, technologies of Hot Metal Pretreatment, K-BOP, LD-KGC, Sub-lance, KTB (Kawatetsu Top Blowing), Mold Width Change, and Mold Electro-Magnetic Brake/Flow Control mold (FC mold) have been supplied to many overseas steel mills. Hot Metal Pretreatment technology, satisfying customers requirement with excellent performance, was provided one after another to mainly Asian big steel mills such as China Steel Corp. in Taiwan, Pohang Iron & Steel Co., Ltd. in Korea and Baoshan Iron & Steel Complex in China, starting with introduction of Hot Metal Desulphurization to Cia Siderurgica Paulista in Brazil. Well known technologies of LD-KGC and KTB, introduced to 23 converters of 10 steel mills and more than 30 units to RH degasser in the world respectively, made a big hit. These above technologies are typical verification of superiority that Kawasaki Steel can supply necessary and satisfactory operation know-how as well as equipment itself.

Moreover Kawasaki Steel has also supplied the software in the form of technical assistance to Baoshan Iron and Steel Complex in China for No. 2 BF design and LTV Steel Corp. in USA for continuous caster construction and cooperated with owners on Engineering, Procurement and Construction (EPC) and O&M. Various kinds of technical assistance for operation to increase yield and productivity, to reduce production cost and to improve steel quality have been provided worldwide and have attained the excellent performance improvement. Responding to recent needs of operational technical assistance for steel quality of value-added steel production like IF steel, Kawasaki Steel has now developed the solution-type business in cooperation with Rolling Technology Section, considering value-added steel production process as integrated technology.

There will be strong needs to expand production capacity of value added steel like stainless steel from now on, even though big projects like integrated mill construction will not be expected under the current circumstance of excess production capacity in iron- and steelmaking areas of the world. Moreover new projects will be also expected in the upstream area, considering the probability of continuing about 8 million ton slab supply shortage caused by obsolescence of upstream equipment in U.S.A and so on.

Presently the most promising theme in iron- and steel-making engineering business is environment and energy saving technologies. Since the first oil crisis, Kawasaki Steel has developed and improved various environment and energy-saving technologies which is highly and widely evaluated. In future, such technology needs like TRT, STAR Furnace for stainless dust Treatment (**Photo 2**), Z-STAR Furnace and various coke oven related technologies will be increased in the world. At the same time Kawasaki Steel has also established industrial waste treatment technology and has already recycled more than 90% of dust, slag and sludge generated in the steel



Photo 2 Overview of smelting reduction furnace (STAR furnace) at Kawasaki Steel Chiba Works

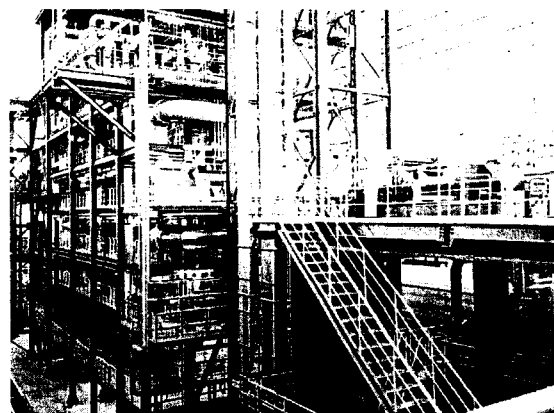


Photo 3 Continuous annealing line of Siam United Steel (1995) Co., Ltd. in Thailand

works. These technologies can and will greatly contribute to satisfying customers needs.

In addition to the above promising technology area, Kawasaki Steel, focusing on O&M and solution business, intends to head for customer-oriented equipment and technology supply of conventional turn-key project, original technologies and operation know-how regarding mainly high quality steel production mixed with technical assistance.

3 Rolling Technologies

In the field of rolling, the division's technical assistance began with the construction of plating plants on a full-turn-key basis in countries which aim to establish a self-sustaining steel industry and to increase the ratio of domestically-produced steel products. Beginning with hot-dip galvanizing lines for structural steels, the division has established the foundations for the construction of rolling equipment abroad through the construction of seven electrolytic tinning lines ("ETLs"). These results were incorporated into larger-scale construction projects, which to the construction of a complete package of a cold rolling mill plant for Taiwan's Ton Yi Industrial Corp. (1995), two ETLs for China's Jiangsu Ton Yi Tinplate Co., Ltd and Fujian Ton Yi Tinplate Co., Ltd, and a complete package of tin-mill black plate ("TMBP") manufacturing equipment whose main portion is the tin CAL (Photo 3) for Siam United Steel's cold rolling mill plant (November 1998). Furthermore, the electrical steel rolling equipment and two annealing lines in the No. 3 cold rolling mill plant of Baoshan Iron & Steel Complex were started up in July 2000. In September 1998, the company was awarded contracts each for a cold rolling mill plant based on reverse mills, one by Egypt's EL Obour for Metallurgical Industries and the other by Morocco's Maghreb Tubes, and the plants are now under construction. These three rolling mills feature roll coolant systems designed on the basis of the company's experience with operations. These roll coolant systems

are also being used to modernize the tandem cold mill for TMBP of China's Shanghai Baosteel Yichang Steel Strip Co., Ltd. (the order was received in April 1999).

For advanced technologies, in the 1990s the company furnished Germany's BREGAL Bremer Galvanisierungs GmbH, France's Sollac, Canada's Stelco, and other European and American steel companies with a total of 16 lines of its metallurgical technology of CGL for automotive steel sheets, and the equipment technology and operational technology of KM-CAL type annealing furnaces and pot equipment for hot-dip galvanizing lines, including their control technology. Since their development, the KM-CAL annealing furnaces for automotive steel sheets and TMBP have been supplied to a total of 15 lines of Ton Yi Industrial Corp., SUS and other steel companies. Also, a CBR mill, which provides a unique forming method of electric-resistance-welding (ERW) pipe, was supplied to Brazil's ACESITA and a 4-roll mill, which provides a precise chance-free method for rolling bar steel, was supplied to Sanyo Special Steel Co., Ltd. in Japan.

Furthermore, the technical assistance provided by the company covers all technologies developed and further refined at its works, such as stainless steel rolling, steel pipe rolling, plate rolling, shape rolling, hot rolling, cold rolling, surface treatment, tinplate and the production control system. This unique type of technical assistance is called the "passing-the-results-to-users" method. Improvement targets for quality, operation and maintenance are individually set after discussions with users and the degree of achievement is linked to compensation. Problems of users are solved after close consultation with the company. In an example of Korea's Dongkok Steel group, such technical cooperation evolved into an all-encompassing relationship of technical cooperation in plate rolling, shape rolling and cold rolling. Moreover, in ETLs and cold rolling mill plants constructed abroad by the company, the division is continuously providing users with assistance in operation and maintenance, as well as in equipment modernization

in order to help them adapt to changes in the markets.

As mentioned above, the division intends to expand overseas projects on a package-order basis, including plant construction with the aid of its comprehensive engineering ability by incorporating product technology into the cores of electromechanical integral-type hardware, obtained by packaging the technologies further refined at the works, and compact hardware further downsized based on operational experience.

Furthermore, there is still a large number of users who aim to raise their levels of quality, operation and maintenance, and the company will continue to meet the needs of these customers.

4 Plant Engineering and Construction Technologies

On the basis of technologies developed and further refined in the steel industry, the division aims to branch out into new further other plant fields than steel plants. These will mainly be logistic engineering businesses based primarily on high bays and the field of feed mills.

In the field of logistics, the division had much success in the 1980's, especially in high bays for special products, such as heavy and long items, as an extension of steel technologies. However, since the delivery of a high bay for hot coils in the No. 3 hot strip mill at the company's Chiba Works in 1995, equipment investments in heavy items have decreased and the division also has had little involvement with heavy items.

Since the 1980s, the division has had considerable results in the field of lightweight items of not more than 1 t. At the end of the 1990s the division received orders high bays for the Chiba Can Plant of Japan's Daiwa Chiba Can Corp., etc. and has since done much work with large-scale delivery centers.

In addition, in the field of food, the division has expanded orders for high bays for cold and frozen storage and has recently constructed a delivery center equipped with an Ise Tea high bay for the Agricultural Cooperative Society of the Mie Pref. Economic Association of Japan. The technical features of Kawasaki Steel in this field include rack design technology of high-reliability high bays based on its rich design experience, layout design technology backed by its sophisticated simulation technology for material handling in delivery centers, high-level tracking control, diagnoses of existing delivery centers based on detailed examinations of the material handling in delivery centers, solutions technology, and supply of optimum systems in a wide range from fully automated delivery centers to delivery centers where many manual interventions occur.

On the other hand, as an extension of the sale of steel silos, the division is engaged in the feed mills business with silos as the main equipment. In the first half of the

1990s, the division constructed two complete packages of feed mills in Japan, one for the Kushiro Livestock Plant of the National Dairy Farming Cooperative Society and the other for the Higashi Nihon Kumiai Livestock Co., Ltd. After that no new plant of this kind was constructed in any part of the country and the division is carrying out capacity expansion and equipment expansion for quality improvement. Furthermore, as an application of similar equipment to other flour and grain mills, the division is aiming to become involved in producing raw material receiving facilities for beer breweries, blended cement plants, etc.

Typical products of the division include a flake plant with a high-pressure iron pot for the steaming and boiling of corn under high pressure. This innovation makes it possible to manufacture high-quality products strictly to rigid specifications, helping customers to develop new products. Recently, with the needs of end users becoming more diversified, feed mill companies have been forced to adapt to small-volume production of varying in sizes and grades. However, further more installation of additional product tanks is not enough to solve the problem of installation cost and another costs. Furthermore, adaptability to HACCP and hygiene control have become major concerns, while labor savings and automation have become important issues due to the need for cost reductions. As measures for drastically solving these problems, the division has proposed a new equipment arrangement in which a high bay is introduced in a feed mill.

In the future, the division intends to use its solutions business in order to solve customers' problems from a broad perspective. Concretely, in the field of logistics, detailed investigations of delivery centers have already been conducted, simulation calculations have been performed on the basis of real, fine data, assistance has been offered for solving specific problems of customers, and results of such solutions have been incorporated into new designing. In feed mills, etc., operational diagnoses are conducted on the basis of operational experience with steel manufacturing. The division intends to further develop these movements into other businesses based on the handling of flours and grains.

5 Concluding Remarks

The division has achieved an impressive track record based on technologies and know-how developed and obtained on the owner side. The change from "hardware" to "software" described at the beginning of this paper is a change in business from the supplier side to the owner side. The division is planning to keep ahead of the times by further developing businesses that make the most of its strengths while vigorously investigating the increasing needs for O&M and solutions businesses.