Process of the Establishment of Tokai Iron & Steel Co., Ltd*

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I. State of the Japanese Iron and Steel Industry around the Establishment of Tokai Iron & Steel

The Japanese economy that experienced the severest period of disorder in its history after the World War II, began to grow steadily after 1955, and the growth is still going on at the same pace with that of other advanced countries. This was accompanied by a remarkable growth of the iron and steel industry, in which division Japan came to be ranked third in the world after 1963. Looking back upon its growth after the War, it could be said that the iron and steel industry as one of the basic industries has achieved something to well satisfy the nation's expectations. It includes, apart from the expansion of production scale, switchover from production for the military to that for peacetime consumption, finding of new sources of raw materials and fuel in the greater part of the world, and a remarkable reduction of cost through modernization of facilities and adoption of the latest techniques. All this made it possible for the industry to satisfy the national demand, and also to compete in the international arena. This remarkable growth of the iron and steel industry, needless to say, owed much to the great demands from the rapidly growing Japanese industry as a whole in the postwar years. But it could also be attributed to the efforts made by the iron and steel industry itself to rationalize itself so as to be able to satisfy the iron and steel demand.

In 1950, the former Japan Iron & Steel Co., Ltd. was dissolved in compliance with the Anti-Monopoly

Law, and several new iron and steel companies came into being. The plan to rationalize the iron and steel industry started the next year (1951), and there have been three stages of its execution up to present. Characteristics of each stage will be reviewed briefly hereunder.

In the first stage (1951–1955), it was planned to improve and modernize old facilities installed before the War. This was because, although most of iron works had by that time recovered from the damages done during the War, a great deal of the old facilities were still left. In an effort to improve and replace these obsolete equipment, it was specially planned to restore balance in the manufacturing divisions of Fuji

Fig. 1. Annual output of iron and steel of Japan (Unit : 1 000 Mt)

Table 1. Annual output of iron and steel in Japan (1955–1964) (unit : 1 000 Mt)

Year	Pig iron			Crude steel			Rolled steel products		
	Output	Growth rate (%)	Rate to former year (%)	Output	Growth rate (%)	Rate to former year (%)	Output	Growth rate (%)	Rate to former year (%)
1955	5 217	100.0	100.0	9 408	100.0	100.0	6 991	100.0	100.0
1956	5 987	114.8	114.8	11 106	118.0	118.0	8 288	118.5	118.5
1957	6 815	130.6	113.8	12 570	133.7	113.2	9 511	136.0	114.8
1958	7 394	141.7	108.5	12 118	128.8	96.4	9 271	132.6	97.5
1959	9 446	181.1	127.8	16 629	176.8	137.2	12 402	177.4	133.8
1960	11 896	228.0	125.9	22 138	235.3	133.1	16 516	236.2	133.2
1961	15 821	303.3	133.0	28 268	300.5	127.7	21 054	301.1	127.5
1962	17 972	344.5	113.6	27 546	292.8	97.4	21 560	308.3	102.4
1963	19 936	382.1	110.9	31 501	334.8	114.4	24 839	355.2	115.2
1964	23 778	455.8	119.3	39 799	423.0	126.3	28 577	408.8	115.0

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Iron & Steel Co., Ltd. This was because the Company had inherited a greater part of old equipment of the former Japan Iron & Steel Co., Ltd., when the latter was divided into two splinter companies. The rolling division lagged in production capacity behind the iron- and steel-making divisions.

In the second stage (1956–1960), each iron and steel company made efforts to install new equipment and diversify its products. As a result, at the end of the second stage (1961), the output of pig iron and crude steel turned out to be 2.8 times that of 1942, the year that recorded the highest pig iron and crude steel production before the end of the War. (1942 : 4 256 000-t pig iron, 1943 : 7 650 000-t crude steel)

In the fall of 1960, The Japan Iron & Steel Federation forecasted that the demand for crude steel in 1970 would be as much as 48 000 000 tons in view of the continuously growing demand for iron and steel all through the second stage, and also taking into account the income-doubling plan of the Ikeda Cabinet. With this background, the iron and steel industry has been carrying on through three stages of planned modernization and expansion up to present. In the first and second stages, existing steelworks modernized their equipment to the maximum point. In the third period, therefore, emphasis was put on the construction of new powerful mills of international level. Steelworks newly constructed in this stage are Sakai and Kimitsu Works of Yawata Iron & Steel, Fukuyama Works of Nippon Kokan, Mizushima Works of Kawasaki Steel, Wakayama Works of Sumitomo Metal Industries, and the works of Tokai Iron & Steel, which is the topmost subsidiary of Fuji Iron & Steel established in Aichi Prefecture with the co-operation of the local economic circles of the Chūbu district in central Japan. These steelworks are all large-scale and integrated, with an eye to higher efficiency through mass production.

II. Reasons Why the Chūkyō (Nagoya) District Was Chosen as the Site for the Steelworks of Tokai Iron & Steel

Tokai Iron & Steel Co., Ltd. was established on September 1, 1958 on the joint investment by Fuji Iron & Steel Co., Ltd. and the economic circles of the Chūbu district. Its capital stock was 2 500 000 000 yen (authorized capital: 10 000 000 000 yen) at the time of its establishment. This was doubled subsequently in August 1961, then in August 1962, and once again in January 1964, to make present capital of 20 000 000 000 yen (authorized capital: 80 000 000 000 yen). Fuji's share of the capital was 51.5% at first, but is now 52.1%. The reasons why Fuji picked up this maritime industrial area as the site for the new integrated steelworks were as follows :

(1) In the Chūbu district, industries related to iron and steel had developed to a great extent for some time, but there was no integrated steelworks that could supply sufficient iron and steel. Only small amount of iron and steel was produced in that area, and most of ordinary steel materials for which demand

Table 2. Output and consumption of ordinary steel products in around the Chūbu district (unit : t)

Year	Calendar year		Fiscal year		Production amount
	Consumption amount	Ratio to former year (%)	Consumption amount	Ratio to former year (%)	
1960	1 016 270	100.0	1 101 801	100.0	357 582
1961	1 514 944	149.1	1 640 175	148.9	654 366
1962	1 741 270	114.9	1 799 006	109.7	606 655
1963	2 309 547	132.6	2 499 005	138.9	898 908
1964	2 771 856	120.0			1 317 086*

* This amount is in calendar year. (Furnished by Nagoya Office, Kozai Club)

is greatest, were brought from other industrial areas. As is shown in Table 2, the total amount of ordinary crude steel manufactured in the district was only 360 000 tons in 1960, while the demand for ordinary steel materials was presumed to be 1 100 000 tons.

(2) Traditionally in Japan, there was a tendency for steelworks to be constructed in seaside areas near raw material sources. However, after the last war and especially in recent years, the Japanese iron and steel industry has come to depend for its raw materials greatly on very distant places as North America, Australia, India, Malaya, South America and South Africa. This has reduced the difference of raw materials freight among different works within Japan. For this reason, sites for integrated steelworks are shifting toward steel-consuming areas so that freights of finished products to consuming areas may be reduced. The Chūbu district has the very promising hinterland of Chūbu industrial area and the good seaports of Nagoya and Yokkaichi. Moreover, there is much room for new industrial areas to create through reclamation in Ise Bay.

(3) A space large enough only for a steelworks is not enough for an industrial combine integrating such various industries as oil, electric, chemical, mechanical and shipbuilding industries. The Chūbu district is large enough for above-mentioned industries to be combined functionally. At the same time, the district is much favoured with such conditions for iron and steel production as abundant supply of industrial water and labour, convenient means of transportation and existence of related industries.

(4) In the Chūbu district, there was long-established light industries as textile, ceramic, lumber and miscellaneous processing industries. The development was speeded up by abundant supply of electric power after about 1935. Later, heavy and chemical industries such as special steel, textile, mechanical, automobile, vehicle, shipbuilding and synthetic chemical industries began to develop gradually. Among them, automobile industry showed a specially remarkable rate of growth. In 1955, the industrial composition of the area within the jurisdiction of the Nagoya Branch of The Ministry of International Trade and Industry, was 56.5% for light industries and 43.5% for heavy and chemical industries. These figures show that heavy and chemical industries are much

Fig. 2. Map of the southern Nagoya industrial area, and location of Tokai Iron & Steel Co., Ltd.

behind those in other industrial areas. It was pointed out that the construction of an integrated iron- and steel-works would help the development of local heavy and chemical industries, and would thus revise the above-mentioned industrial map of the district in favour of the more promising heavy and chemical industries. This was also expected to lead the economy of the Chūbu district to grow, and contribute to the development of the national economy, as well as that of the iron and steel industry.

III. Review of the Process of Establishment

The economic circles of the Chūbu district were in 1954 planning to construct an integrated steel-works on Ise Bay. The aim of the plan was to speed up the development of industries in the area through advancement of industrial composition, that is, through the growth of heavy and chemical industries. At the request of the economic circles, Taihei Kogyo Co., Ltd. surveyed southern Nagoya industrial area, Kuwana City area and Yokkaichi City area for the purpose. It was concluded as a result that those three areas were suitable for the construction of an integrated iron- and steel-works

with an annual crude steel manufacturing capacity of 1 000 000 tons. Based on this survey result, the local economic circles led by the Chūbu Economic Association invited iron and steel companies to construct a works in the region.

This invitation was discussed carefully by Fuji Iron & Steel Co., Ltd., that, for the reasons mentioned in the former chapter, decided to establish Tokai Iron & Steel Co., Ltd. with the co-operation of local interests.

Following the establishment of the Company, the above-mentioned three areas were examined again for ten months for their suitability as the site of a steelworks. They were investigated and compared scientifically from all standpoints. Though they all proved to be suitable as site for a steelworks, in June 1959 the construction site was picked up in the second section of the southern Nagoya maritime industrial area. At first it was feared that it might be difficult to get industrial water in this area, compared with other two areas, Kuwana and Yokkaichi Cities. At the same time, however, the Aichi waterway, then under construction, was expected to be completed around the time of completion of Tokai's steelworks, and it became known that industrial water could be obtained from the waterway. This was one of the important factors that played a decisive role in choosing the place as the steelworks site.

In July 1959 after the selection of the site, the Company concluded "basic agreements as to the establishment of an iron- and steel-works" respectively with Aichi Prefecture, Nagoya City, the Nagoya Harbour Control Union and three townships in the area (Ueno, Yokosuka and Chita). Provided in the agreement were mutual co-operation in the establishment of the steelworks, other duties and rights of each party to the agreement.

In accordance with the agreement, the Nagoya Harbour Control Union started the bowling of the plant site in February 1960, a little behind schedule because of compensation problem which was later settled peacefully. The reclamation of the foreshore went on satisfactorily. On July 23, 1960 when about 108 000 m² space was filled up, a commencement ceremony of mill construction was held, attended by about 1 000 guests.

IV. Basic Ideas of the Layout of Steelworks

The layout of the works was studied after the establishment of Tokai Iron & Steel with the co-operation of Fuji, while the examination of the plant site was going on. The final layout was made at the end of May 1960 when the works site was selected and the reclamation of the foreshore started.

The layout is significant in that it aims at not only satisfying the growing national demand under the Government's long-term economic policy, but also realizing a mill that could fully meet the national expectation through the strengthening of competitive power in the international market. Therefore, the basic idea of the layout was that everything should be up to the world level to make it a powerful integrated

iron- and steel-works. Prime importance was laid on high productivity in all the aspects of capital, labour and equipment. The location of each plant or equipment was decided from this basic point of view, so that all the works between and within plants might be on the line and all the facilities might be used in the most effective way.

In the execution of this layout, layouts of several existing steelworks were studied for reference. At the time (1961), however, most of them had some kind of difficulties in the mutual location of plants and process of manufacturing iron and steel. For this reason, with some exceptions of a few foreign works, the whole layout was made quite independently and uniquely, that is, completely apart from those of existing steelworks.

The more concrete basic ideas of the layout are as follows:

(1) Prime consideration was said to inter-relations between facilities with an eye to continuous flow of work in operation.

(2) All the equipment were made large-scale and specialized in order to increase productivity on one hand and the dependability of finished products on the other.

(3) Importance was placed on the rationalization of transportation means and the minimization of railway extension.

(4) Horizontal movement was aimed at in planning the transportation of raw materials and finished products.

(5) It was planned to minimize energy spent for transportation, particularly to eliminate double transportation.

(6) Effective use of the plant site was sought in order to prepare for the future diversification of products.

(7) Centralization and integration of administrative divisions was sought for efficient control and operation of all the divisions of the works.

(8) Minimization of the costs of plant construction and operation.

The plant site is about 3 300 000 m² at the time of completion of the first plan, which is expected to grow ultimately to 3 600 000 m². The total works site should be 5 400 000 m² when the slug pool is included. Another 190 000 m² is secured adjacent to the works site for related plants and a reservoir.

Fig. 3 is the actual layout based on the above-mentioned basic ideas. Particularly great efforts were made in deciding the location and mutual relations of the steelmaking plant, hot rolling mill and cold rolling mill. The cold rolling mill that undertakes the final stage of production was first constructed because of the physical factors of the reclaimed land and in view of the economic necessity to attain the highest possible investment efficiency. This order of mill construction presented two difficult problems to solve. First, the hot rolling mill had to be located functionally in relation to the cold rolling mill and at the same time be consistent with the basic concept of the layout. Second, the relation of the hot rolling mill and the

Fig. 3. Layout of Tokai Iron & Steel Co., Ltd.

LD converter plant had to be considered in the overall placement of plants, because the hot rolling mill with the slabbing mill was to extend 800 m. Besides, there was a requirement that 330 000 m² space be reserved by the products shipment pier for the future production of rolled products other than sheets. After examination of a number of layouts, the final one was picked up because it was considered to satisfy most of the extremely complicated requirements and to conform to the aforementioned basic ideas to a great extent.

As a result, the plant layout of Tokai's works is characterized by:

(1) Separation of the pier for unloading of raw materials (iron ore, coal, etc.), and that for shipment of finished products. The result is a continuous L-shape flow of production process (raw materials→pig-iron making→steelmaking→rolling→finished products).

(2) Integration of warehouses for rolled products.

(3) Use of trackless carriages such as lift cars in the shipment of finished products.

(4) The railway is laid only to transport molten pig iron and hot lump of great weight. Therefore, its length is 11 km in the first stage, and only 35 km even in the final stage of development. (Annual output of crude steel in the final stage: 6 000 000 tons)

(5) Centralization of control organs such as the administrative centre, energy centre and calculation centre, in the central part of the plant site. In Table 3 is compared Tokai Works in the stage of 6 000 000-t crude steel production (with four blast furnaces), with Muroran, Kamaishi and Hirohata Works of Fuji Iron & Steel Co., Ltd. in their future plans. From this table one may easily realize how much consideration was paid in designing the Tokai Works to the

Table 3. Comparison of steel plants of Tokai Iron & Steel and Fuji Iron & Steel in their future plan

Item	Tokai		Muroran	Kamaishi	Hirohata
	1st period	2nd period			
A: amount of product of steel ingot (1 000 t)	1 500	6 000	2 760	840	2 730
B: area of the factories (10 000 m ²)	331	397.2	297.9	89.37	331
C: total length of extension of railway (km)	11	35	103	73	92
D: number of employees (person)	3 400	10 000	9 500	7 600	11 400
Direction of flow of raw materials and products
Transported quantity per ton-ingot (t)	5	5	8	11	9
A/B	1.5 t/3.31 m ²	5 t/3.31 m ²	3.1 t/3.31 m ²	3.1 t/3.31 m ²	2.7 t/3.31 m ²
A/C	135 t/m	171 t/m	27 t/m	11.5 t/m	30 t/m
A/D	441 t/person	600 t/person	290 t/person	117 t/person	240 t/person

rationalization of inter-unit transportation, efficient utilization of land space and the elevation of labour productivity.

V. Brief Description of Construction of Integrated Iron- and Steel-Works

As mentioned in describing the process of the establishment of the Company, the plan to construct an integrated steelworks was discussed from many angles partly to satisfy the request of both the Government's long-term economic plan and the economic circles in the Chūbu district. As to the types of products to be manufactured, it was decided to put emphasis on the manufacture of sheets, such as cold rolled sheets and galvanized sheets. This was because (1) in the Chūbu district, industries like automobile, vehicle and home electric appliances had developed to a great extent, the first named, in particular, being undertaken by several powerful corporations future prospects of which were apparently bright, and (2) world, as well as national trends indicated that the demand for steel sheets would increase rapidly.

The production capacity of equipment (five blast furnaces and others) was originally planned to be 5 000 000 t/yr in terms of crude steel production. Judging from the current situation, however, capacity of 6 000 000 t/yr now seems possible with only four blast furnaces. This is ascribable chiefly to increased pig iron output through the adoption of such latest techniques as raw material preparation, high-pressure blast furnace operation, heavy oil injection and oxygen enrichment. The construction plan will be carried out hereafter according to the trend of demand for iron and steel, and the prevailing national as well as world economic situation. However, under the present circumstances where only one blast furnace is actually in operation, it is difficult to maintain stable operation either from the technical standpoint, or from the consideration of the Company's business conditions. Therefore, the Company plans to proceed to the second stage of construction in autumn 1965 for completion in September 1967.

Main features of principal equipment are as follows:

Facilities Connected with Raw Materials

Raw materials are discharged by use of two unloaders of 1 500 t/hr capacity and one unloader of 350 t/hr capacity. Unloaded iron ore and coal are stored in their respective yards by the stacker, and then delivered by wheel reclaimers. Sintering equipment which is of the Lurgi type is a large-unit measuring 3.5 m wide and 182 m² in sintering area. The cooler is of the straight type.

Coke Plant

D.K.H. type of West Germany. Consists of four batteries (5 m high) of 25 chambers each. Each chamber accepts 19.6 tons of coal charging.

Blast Furnace Plant

Hearth diameter is 9.8 m and inner volume 2.021 m³. A system of high pressure operation with heavy oil injection is adopted. Charging is completely automatic. Slag is led into the slag pit to eliminate the use of slag pots. Hot metal from the blast furnace is treated with eight torpedo cars. The use of the conventional mixer has been abolished with the adoption of converter process. To produce pig iron, the plant is equipped with granulation facilities of six ton disposing capacity per minute, instead of casting machines.

LD Converter Plant

Equipped with two pure oxygen top-blown converters each with an inner volume of 237 m³. Capable of producing 150 tons of steel per heat. Scraps are put into the LD converters only by drivers of special dumpcars (loading capacity: 22 tons) without use of any cranes. The gas evolving in the converter is collected by the CAFL-IRSID method, and utilized as fuel for various furnaces.

Casting is done in the way that ingot treatment and transportation, maintenance of moulds are smoothly done. The mould yard is separated from the converter plant. These facilities are designed to dispose of large ingots weighing 25 tons each.

Slabbing Mill

78 inch, two-high reversible type with vertical rolls. Operated by C.P.C. (Card Programming Control) system. After shearing, slabs are carried by table roller to the slab cooler, where they are cooled

rapidly in seawater by revolution of drum. Slabs are then put on the slab-polishing conveyor. After both sides of slabs are polished continuously, they are forwarded by another table roller to the slab yard in the hot strip heating furnace.

Hot Strip Mill

68 inch, completely continuous type, equipped with a scale-breaker, reversible roughing rolls and six finishing roll stands. The final rolling speed is 3 000 ft/min at maximum. A moving type downcoiler was adopted instead of fixed one, so that the maintenance might become easier. A.G.C. (Automatic Gauge Control) system was adopted through all the facilities to improve quality and accuracy of size of products. All the finishing stands are equipped with unique roll changing devices to shorten the time for roll change (about ten minutes). This raised the operation rate.

Cold Rolling Mill

The cold strip mill is 56 inch wide, four high tandem mill. The maximum rolling speed is 4 700 ft/min A.G.C. system is adopted. The plant is equipped with a group of Sendzimir galvanizing facilities, and Ferrosten type facilities for tinning. A set of galvanizing equipment for thick and wide steel is under construction.

Related Plants

The following plants are operating within the works site or in its vicinity :

i. Nagoya Plant of Fuji Sanki Pipe & Tube.

Producing small size tubes (middle size and other) by stretch reducer, from welded tubes made of hot coils from Tokai Iron & Steel.

ii. Tokai Plant of Kubota Iron & Machinery Works

Supplied with molten pig iron by Tokai Iron & Steel, it is producing mould stools.

iii. Tokai Factory of Harima Refractories

Manufacturing dolomite bricks for the LD converters. Also engaged in construction and repair of various furnaces.

These are the unique features of equipment of the Tokai Works. Tokai Iron & Steel has still other features unprecedented in the iron and steel industry of Japan.

One of them is the fact that jobs not connected directly to the manufacture of iron and steel, are done, by outside plants. This is possible because (1) the works is located close to the City of Nagoya, and can co-operate with the local business interests, and (2) there are many specialized manufactures having much experiences related to the manufacture of iron and steel. This was also a project to absorb the labour of fishermen who lost their jobs owing to the reclamation of the foreshore. This is doubly advantageous : first, it was possible to minimize the number of direct-hired workers and the cost of constructing auxiliary facilities, and second, the development of specialized manufactures in the locality could be stimulated.

When inviting Tokai Iron & Steel the economic circles of the Chūbu district were considering the creation of a great industrial combine embracing iron

and steel, chemical, oil refining, electric power, ship-building, mechanical, cement and petro-chemical industries in the first to fourth sectors of the southern Nagoya maritime industrial area (total area : 11.7 km²). In accordance with this plan, Tokai Iron & Steel has been supplying Tōhō Gas Co., Ltd. with tar from its coke plant since the start of its integrated operation.

Its plan to establish a special steel billet centre is also in line with the grand project to combine industries in the southern Nagoya maritime industrial area. This plan is now being discussed jointly by Fuji, Tokai, Daido Steel and Aichi Steel, special steel manufacturers. The idea of the plan is to supply Aichi and Daido with billets of special steel manufactured by the LD converter process from hot metal supplied by Tokai. When this idea is materialized, these two companies should be able to cut down their costs of production and improve the quality of the products. It is expected to contribute much to the modernization of special steel industry of Japan.

The third sector of the area is to accommodate various plants and factories now being blueprinted, including a large shipyard combine with a heavy machinery works by Ishikawajima-Harima Heavy Industries, and an advance station of Yahagi Iron & Steel. The strengthening of interrelations within the iron and steel division, according to this grand industrial combine project, is to be coupled with that of inter-industry co-operation involving the iron and steel power, petroleum and petro-chemical industries. This provides a vision of rapid industrialization centred on heavy and chemical industries in the central Japan economic region.

Tokai Iron & Steel is now carrying out an aggressive housing project for its employees over the hills of Chita Peninsula astride the three townships of Ueno, Yokosuka and Chita. The million square-meter housing area already embraces 75 buildings accommodating 1 516 families and 28 dormitory buildings for 1 590 unmarried employees.

VI. Brief Review of the Commencement of Production

As described before, the construction of the steel-works started with the cold rolling mill in September 1960. The mill was completed in October 1961 and put into operation immediately. In June 1961, the Aichi waterway was damaged at many points by heavy rains. This incident seemed to threaten the start of operation, but frantic restoration efforts of all those concerned made the waterway recover promptly from the damages, bringing no serious obstacle to the operation of the works. Since then, water has been supplied smoothly to the works from the waterway.

Following the completion of the cold reduction mill, the construction of the hot rolling mill was started in October 1960. It was completed in August 1963, and immediately put into operation. Until that time, the Muroran and Hirohata Works of Fuji Iron & Steel supplied hot coils to the cold reduction mill. Even thereafter, the Tokai Works had to rely

Table 4. Annual output of Tokai Works (unit : t)

Item \ Year		1961	1962	1963	1964	1965 (Plan)
Pig iron		—	—	—	421 008	1 200 000
Crude steel		—	—	—	456 244	1 400 000
Products	Hot rolled medium plate	—	—	5 661	11 217	
	Hot rolled sheet	—	—	8 100	24 440	
	Hot rolled hoop	—	—	10 220	31 250	
	Hot rolled strip	—	—	4 556	141 725	
	Cold rolled strip	3 123	47 430	118 628	192 036	
	Cold rolled plate	34 003	125 101	187 792	182 674	
	Galvanized sheet	—	9 708	56 233	58 805	
	Tinplate	—	—	—	—	
	Total	37 126	182 239	391 190	642 147	
Chemical products	Tar	—	—	—	16 045	
	Benzol	—	—	—	4 933	
	Ammonia sulphate	—	—	—	3 952	
	Total				24 930	

for sometime on the said two works of Fuji for the supply of slabs to the newly activated hot rolling mill.

Meanwhile, the construction of No. 1 blast furnace, coke oven, sintering equipment, converter plant, slabbing mill and other facilities encountered more hitches, including a delay caused by a soft ground, and a general stoppage which was necessitated in December 1962 by the prevailing depression. In spite of these difficulties, however, they were all completed about the time No. 1 blast furnace was blown in on September 5, 1964. It is a very rare case that all the facilities (ranging from raw material-handling facilities to slabbing mill) are completed and put into operation almost simultaneously.

There were piles of problems to solve before the start of operation. Quite a handful of pioneer workers had to undertake all such tasks as employing new workers, training them, and revising service regulations prior to the start of operation. All these problems were finally overcome, and the operation started smoothly.

In the present stage, the daily output of the blast furnace is on the level of 3 000 tons. The operation rates of rolling equipment such as slabbing and hot rolling mills are rather low, because they are built to match the output of two blast furnaces instead of one. What is more, a further reduction of output is being urged as a countermeasure to the trend of the market. For these reasons, the works has hardly achieved its

original goal as far as operation rate is concerned, but is maintaining high productivity in its devotion to the improvement of quality and reduction of cost.

Table 4 shows the annual output of Tokai Iron & Steel since its establishment until 1964.

VII. Future Prospect of Tokai Iron & Steel

As reviewed above, Tokai Iron & Steel completed its initial stage of construction as an integrated steel-works, and started its regular operation. Looking back into the process of establishment and construction, the original goal has been well achieved in spite of a number of difficulties en route. The next urgent problem is to solidify its foundation as an enterprise through the execution of its second-stage construction plan. Judging from the present situation of the Japanese iron and steel industry as well as from the general economic climate in and outside Japan, still more difficulties appear to be awaiting in the way of this newly-born steel corporation. In the meantime, the technical innovation is expected to be promoted rapidly, which calls on all those concerned to exert still greater efforts in the fostering of this company. These pioneer workers, of course, are fully aware of the situation, and are firmly determined to accomplish their task in the belief that by doing so they can serve the causes of not only the industry they are in, but of the national as well as local economy.