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**TECHNOLOGY, MANAGEMENT, AND INDUSTRIAL RELATIONS OF U.S.
INTEGRATED STEEL COMPANIES: THE PROCESS OF RESTRUCTURING**

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TECHNOLOGY, MANAGEMENT, AND INDUSTRIAL RELATIONS OF U.S. INTEGRATED STEEL COMPANIES: THE PROCESS OF RESTRUCTURING

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U.S. integrated steel companies entered the age of restructuring after the 1982-83 steel depression. The core of restructuring was rebuilding the production process. The companies reduced their huge excess capacity, carried out modernization in downstream process, and reorganized industrial relations. I think that their experience is instructive for understanding the nature of restructuring of the Japanese steel industry and other manufacturing industries in the 1990's.

I Introduction

In this article I will analyze the production process and the competitive position of integrated steel companies in the United States in 1980's and 1990's¹⁾. The meaning of this analysis is the following:

(1) This is research into the precedent of restructuring. It is thought that the steel industry—to be exact, the integrated steel sector—was the American industry which had declined most dramatically. However, the industry carried out restructuring in the 1980's and the first half of the 1990's. Its financial performance recovered. Now, the Japanese steel industry is restructuring. To clarify the nature of restructuring in Japan, we should learn from the experience of the U.S. steel industry. Rebuilding the productive forces is the essential requirement of rebuilding competitive manufacturing power. Therefore, the center of restructuring is rebuilding the production process.

(2) Some people have analyzed the semiconductor industry or the automobile industry in order to understand the nature of manufacturing in advanced capitalist economies. I think this is insufficient. Manufacturing in advanced capitalist economies is composed of not only mechanical, assembly, and growth industries but also processing, primary material, and mature industries like the U.S. steel industry. Without analysis of the latter, we cannot understand the various sides of American industry.

(3) There is a question about restructuring as a historical phenomenon. Restructuring of the steel industry is a common occurrence in the advanced capitalist economies. It should be examined whether it is historically inevitable. I would like to attempt an answer to this question, though I cannot immediately show whether it is sufficient.

1) The U.S. steel industry consists of two groups. One is the integrated sector, and the other is the minimill sector. I refer to minimills where necessary for understanding the structure of competition. Figure 1 shows technologies and material flow of the integrated production system.

II The Circumstances Leading Up to Restructuring

1. The Declining Process of the U.S. Steel Industry in the Postwar Years

(i) The Import Problem and Makeshift Measures

The status of the U.S. steel industry in the world market has declined since World War II. From 1951 to 1980, the U.S. share of raw steel production declined 31.5 points, and the share of steel exports declined 13.3 points²⁾.

However, the major market for the U.S. steel industry was the domestic market, even in the age of prosperity. The export ratio was 4% in 1951, and 4.9% in 1980³⁾. This shows that the scale of the U.S. steel industry and the scale of the domestic market just after the war were overwhelmingly bigger than any other country. It also means that the U.S. steel industry has been influenced by trends within the domestic market and by imported products.

A symptom of decline appeared in the area of foreign trade. The U.S. steel trade saw an excess of imports in 1959. After World War II, steel industries of Japan and Western Europe recovered rapidly. From the mid 1960's, they began to export large amounts of sheet and strip steel (including tin plates) produced at greenfield seaside steel plants. Integrated companies in the U.S. avoided competing directly. They took the following measures⁴⁾. 1) They insisted that foreign companies were dumping products on the U.S. Market and receiving subsidies from their governments. In response they demanded protective trade policies from the federal government. The Voluntary Restraint Agreement (VRA) was executed in 1969-71, and 1972-74, and the Trigger Price Mechanism was in effect in 1978-82. An increase in imports was suppressed by cutting the U.S. market off from the world market. 2) Managers of integrated companies feared that imports would increase each time there was a strike. They thus concluded the Experimental Negotiation Agreement (ENA) with the United Steel Workers of America (USW) in 1973. In this agreement, the union agreed to refrain from nationwide strikes in return for a continuous pay raise. As a result, there were no more large-scale strikes. Labor costs, however, rose beyond the international trend. 3) The effectiveness of these measures was guaranteed by a cooperated increase in steel price. As they faced no strong competitors just after World War II, integrated companies in the U.S. formed a domestically administered price system lead by U.S. Steel Corporation. Steel price was set by the full-cost principle. The companies secured profits in return for a higher steel price than the world standard. But steel imports gradually increased. Imported steel's share in the U.S. market has been 15% or over since 1977 (Table 1).

2) American Iron and Steel institute (AISI), *Annual Statistical Report*, various years. Paul Tiffany, *The Decline of American Steel*, New York, Oxford Press, 1988, Trans. by Mikio Kato et al., Tokyo, Nihon Keizai Hyoron Sha, 1989, p.176.

3) AISI, *op. cit.*

4) About the import problem and corporate behavior in 1960's and 1970's, see Scheuerman, William, *The Steel Crisis*, N.Y., Preager, 1986.

Table 1. Steel Mill Products and Raw Steel Data

(1000t)

| Year | Steel Mill Products | | | | | Raw Steel | | |
|------|---------------------|---------|---------|----------------------|--------------------------------------|------------|----------|----------------|
| | Net Shipments | Exports | Imports | Apparent Consumption | Imports as % of Apparent Consumption | Production | Capacity | Operating Rate |
| 1975 | 79957 | 2953 | 12012 | 89016 | 13.5% | 116642 | 153100 | 76.2% |
| 1976 | 89447 | 2654 | 14285 | 101078 | 14.1% | 128000 | 158300 | 80.9% |
| 1977 | 91147 | 2003 | 19307 | 108451 | 17.8% | 125333 | 160000 | 78.4% |
| 1978 | 97935 | 2422 | 21135 | 116648 | 18.1% | 137031 | 157900 | 86.8% |
| 1979 | 100262 | 2818 | 17518 | 114962 | 15.2% | 136341 | 155300 | 87.8% |
| 1980 | 83853 | 4101 | 15495 | 95247 | 16.3% | 111835 | 153700 | 72.8% |
| 1981 | 88450 | 2904 | 19898 | 105444 | 18.9% | 120828 | 154300 | 78.3% |
| 1982 | 61567 | 1842 | 16663 | 76388 | 21.8% | 74577 | 154000 | 48.4% |
| 1983 | 67584 | 1199 | 17070 | 83455 | 20.5% | 84615 | 150600 | 56.2% |
| 1984 | 73739 | 980 | 26163 | 98922 | 26.4% | 92528 | 135300 | 68.4% |
| 1985 | 73043 | 932 | 24256 | 96367 | 25.2% | 88259 | 133600 | 66.1% |
| 1986 | 70263 | 929 | 20692 | 90026 | 23.0% | 81606 | 127000 | 64.3% |
| 1987 | 76654 | 1129 | 20414 | 95940 | 21.3% | 89151 | 112200 | 79.5% |
| 1988 | 83840 | 2069 | 20891 | 102662 | 20.3% | 99924 | 112000 | 89.2% |
| 1989 | 84100 | 4578 | 17321 | 96843 | 17.9% | 97943 | 115900 | 84.5% |
| 1990 | 84981 | 4303 | 17169 | 97847 | 17.5% | 98906 | 116700 | 84.7% |
| 1991 | 78846 | 6346 | 15845 | 88345 | 17.9% | 87896 | 117600 | 74.7% |
| 1992 | 82354 | 4288 | 17075 | 95141 | 17.9% | 92949 | 113100 | 82.2% |
| 1993 | 88401 | 3968 | 19501 | 103934 | 18.8% | N.A. | N.A. | N.A. |

Apparent Consumption = Shipments - Exports + Imports

Sources: Compiled from AISI, *Annual Statistical Report*, various years.

Some figures are quoted from *Tekko-kai (Steel World)*, May 1994, p.70.

(ii) The Disintegration of the Technological Base

Integrated companies failed in technological innovation while they were relying on makeshift measures. Their technological base was the integrated production system, which included processes such as iron ore and coal mining, ironmaking, steelmaking, rolling, finishing, sales, etc. The core of this system was the integrated steel plant. Since U.S. Steel Corporation was established in 1901, integrated companies in the U.S. have built a oligopolistic system based on the integrated production system. Many steel plants in the U.S., however, were scaled down in the 1970's compared to those in Japan. The economies of scale, which were the basic requirement for the apparatus system, were lost. Facilities became too old to be used. Moreover, the balance between processes was destroyed by halfway investments.

In the ironmaking process, many outdated and small blast furnaces remained. Although some large furnaces were constructed, average production was below half that of Japan (Figure 2), and productivity ranged from less than 2,000 tons per day to 8,000 tons per day⁵⁾. In the steelmaking process, the integrated companies were slow to adopt two important technologies –the basic oxygen furnace (BOF) and continuous casting (CC)– made practicable after the war. Introduction of the BOF was almost completed by the beginning of the 1980's, but continuous casting was not adopted smoothly. The U.S. fell behind not only Japan and the European Community, but also South Korea and Brazil (Figure 3). In the rolling process, production capacity was adjusted by closing outdated mills, but it was still insufficient. Large-scale automatically controlled strip mills set up in the 1960's or the 1970's and outdated mills set up in the 1930's existed together.

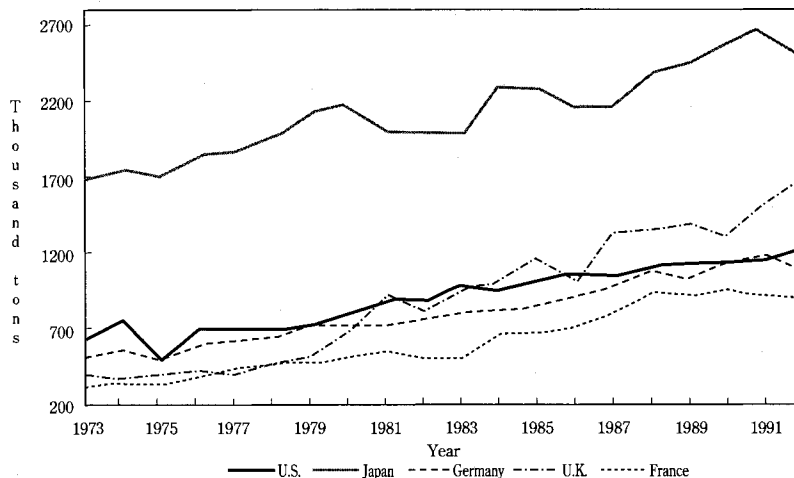


Figure 2. International Comparison of Pig Iron Production per Blast Furnace in Blast

Sources: Compiled from Marcus et al., *World Steel Dynamics*, "Steel Strategist #20", 1994.

5) AISI, *Steel at the Crossroads*, 1980, Trans. by Japan Iron and Steel Exporters' Association, 1980, p.64. In this article, "ton" means short ton (= net ton) unless I state otherwise. 1 short ton = 0.90719 metric ton.

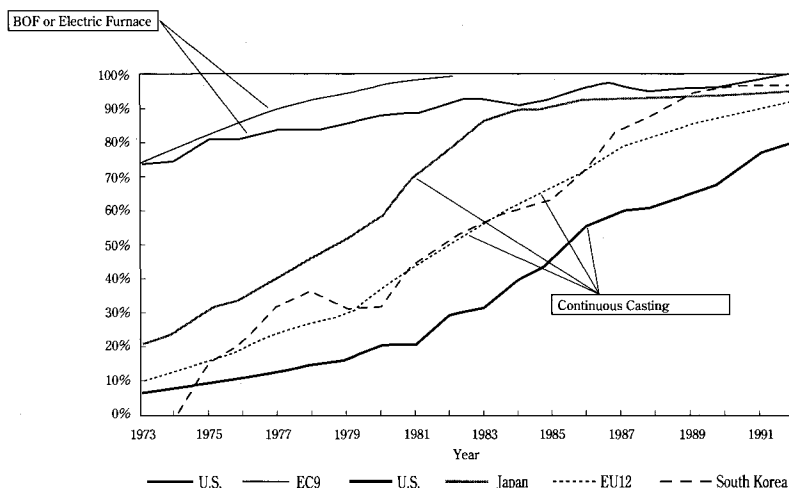


Figure 3. International Comparison of Adaptation Rate of BOF a Continuous Casting

In Japan, the rate of BOF or Electric Furnace is 100% since 1978.

Sources: Compiled from Tekko Tokei linkai, *Tekko Tokei Yorán (Handbook for Iron and Steel Statistics)*, various years.

U.S. integrated companies were also slow in adopting energy-saving technologies such as coke dry-quenching equipment, etc. Even if they were adopted, they would have had little effect, because plants were outdated and small. In Japan, on the other hand, these technologies were rapidly introduced after the first oil crisis. Furthermore, the integrated steel plants in Japan advanced to all-on-line computer control in the latter half of the 60's. The plants in the U.S., however, only advanced batch processing in each process, because production capacity was uneven between the processes. The integrated production system was rotting from its core⁶. Productivity stagnated and production cost rose. The high dollar rate also worsened the situation. The difference in the production costs between the U.S. and Japan or Western Europe increased (Figure 4).

(iii) The Weakening Relationship Between Technology and Market

Integrated companies also faced problems in the market. The steel industry has played an important role as a primary material industry in various phases of the economic history of the U.S. The most important relationship between technology and the market which grew since 1920's was that in which the U.S. steel industry supplied sheet and strip steel to the automobile, container, construction, appliance, home electric machinery industries. In the 1920's, strip mill was put into practice by the American Rolling Mill Co (Armco). As a result, development of the above-mentioned industries was guaranteed in view of the availability of materials. From

6) See Kawabata, Nozomu, "America Tekkogyo no Restructuring (Restructuring of the United States Steel Industry) (I)," *Kikan Keizai Kenkyu (Quarterly Journal of Economics)*, Vol.15, No.2, September 1992.

that time on, the shipment of sheet and strip steel and its percentage of all steel mill products kept growing. Shipments averaged 46,502 thousand tons between 1971 and 1981, and the percentage reached as much as 49.6% (Table 2). Moreover, because the annual average production capacity of hot strip mill was 2,300 thousand tons⁷⁾, such mill was suitable for mass production at integrated steel plants. Integrated companies have played an important part in the U.S. mass consumption lifestyle through the production of steel sheet and strip.

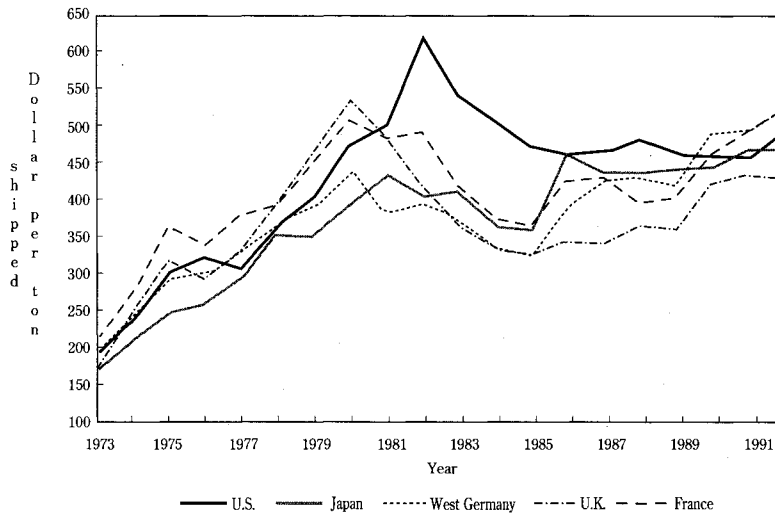


Figure 4. International Comparison of Total Cost of Steel Mill Products

Sources: Compiled from Marcus et al., *WSD*, "Steel Strategist #20."

Table 2. Shipments of Sheet and Strip Steel in the U.S.

(1000 t)

| Steel Products | Year | Average 1971-81(A) | Average 1982-92(B) | Increasing Rate from(A) to (B) |
|------------------------------------------|------|-----------------------|-----------------------|-----------------------------------|
| Tin Mill Products | | 6303.7 | 4040.6 | -35.9% |
| Hot Rolled Sheets | | 14212.2 | 12648.3 | -11.0% |
| Cold Rolled Sheets | | 16479.7 | 13128.0 | -20.3% |
| Galvanized Sheets & Strip | | 5642.6 | 8528.0 | 51.1% |
| -hot dipped | | 5257.3 | 7104.5 | 35.1% |
| -electrolytic | | 385.4 | 1423.5 | 269.4% |
| All Other Metallic Coated Sheets & Strip | | 828.1 | 1151.6 | 39.1% |
| Electrical Sheets & Strip | | 667.5 | 461.4 | -39.9% |
| Hot Rolled Strip | | 1165.6 | 632.6 | -45.7% |
| Cold Rolled Strip | | 1202.6 | 871.4 | -27.5% |
| Total Sheets & Strip (A) | | 46502.2 | 41461.9 | -10.8% |
| Total Other Products | | 47206.5 | 34616.0 | -26.7% |
| Total Steel Mill Products(B) | | 93708.7 | 76077.9 | -18.8% |
| (A)/(B) | | 49.6% | 54.5% | + 4.9 points |

Total sheets and strip include tin mill products.

Sources: AISI. *Annual Statistical Report*, various years.

7) Adams, Walter and Hans Mueller, "Steel Industry," in *The Structure of American Industry*, 6th edition, Ed. by Adams, N.Y., Macmillan, 1982, p.90.

However, this relationship was weakening. Importation of Japanese cars, mainly compact or subcompact cars, increased rapidly. The number of cars produced in the U.S. dropped sharply, from 12,900 thousand in 1978 to 8,010 thousand in 1980. The "Big 3" automobile producers developed new light and compact models as a countermeasure. As a consequence, the amount of steel used for one passenger car decreased from 1,288.6 kg for a 1976 model to 1,004.0 kg for a 1982 model⁸⁾. Quality of products also became a serious problem. For example, Ford rejected 9% of the show steel (exposed and difficult-to-draw parts) from domestic steelmakers in the first quarter of 1982⁹⁾. Moreover, in the container industry, steel fell behind aluminum in the growing beverage can raw material market, losing half of that market. Shipments of sheet and strip steel dropped sharply in 1980 and 1981. The volume of shipments declined to that of the mid 1960's, and the operating rate of hot strip mills fell to 57.5% in 1980¹⁰⁾.

On the other hand, the demand for pipes and tubing increased suddenly. This was because of the steep rise in crude oil prices and the domestic oil drilling boom. Domestic production of pipes and tubing, however, did not catch up with demand. Pipes and tubing became the biggest reason why steel imports increased. The share of imported pipes and tubing reached 40.1% in 1981¹¹⁾. Moreover, the shipment of other products stagnated due to deteriorating demand and competition with minimills and foreign companies.

2. The Steel Depression and Collapse of Domestically Administered Price System

(i) The Steel Depression of 1982-83

The world and U.S. economy fell into a serious depression from the middle of 1981 until the end of 1982. This depression affected the steel industry after a brief time lag.

Demand declined severely and stayed at a lower level. The apparent consumption of domestic steel mill products dropped by 27.6% from 105,444 thousand tons in 1981 to 76,388 thousand tons in 1982 (Table 1). This was the worst rate of decline in the Postwar years. Raw steel production also dropped by 38.3% from 120,828 thousand tons to 74,577 thousand tons. The operating rate in 1982 dropped to 48.4%. At this time, the rate of decline in global demand was 9.8%, the decline in global production was 8.8%, and the average operating rate in the capitalist economies was 69.6%¹²⁾. We therefore know that the steel depression in the U.S. was more

8) Motor Vehicle Manufacturing Association of the U.S. (MVMA), *Motor Vehicle Facts and Figures*, various years.

9) Berry, Bryan H., "Steelmakers and Automakers Team Up to Improve Quality," *Iron Age*, February 1987, p.25.

10) On the container industry, see Nappi, Carmine, "Metal Demand and the American Container and Packaging Industry: 1970-90," *Materials and Society*, Vol.10, No.3, 1986. The shipments and share of imported steel are from AISI, *Annual Statistical Report*. The operating rate is from Marcus, Peter et al., *World Steel Dynamics*, "Steel Strategist #17", Paine Webber, 1991.

11) AISI, *Annual Statistical Report*.

12) The demand and production are from *Tekko Tokei Yoran (Handbook for Iron and Steel Statistics)*, 1990. The operating rate is from Marcus et al., *op. cit.*

serious than elsewhere. Demand did recover to 92,893 thousand tons on average between 1982 and 1992. However, it was 13.6% less than the 107,466 thousand tons on average between 1971 and 1981.

The fact that the steel mill products market stopped expanding reflected the conversion of the U.S. industrial structure. In Table 3, demand for products (by kind) in 1971-81 is compared with that in 1982-92. If semi-finished goods like ingots, blooms, billets, slabs, and wire rods are not considered, the main kinds of products whose demand decreased conspicuously were plates, pipes and tubing, wire and wire products, and tin mill products. The demand for structural shapes, pilings, and bars also stagnated. The decline of plates, wire and wire products, structural shapes and pilings, and bars chiefly reflected trends in the machinery industry and the construction and contractors' products sector. One cause was that the computer and electronic parts industry became a growing sector and that steel consumption ratios of machinery declined. But the other cause was the loss of competitiveness in the machinery industry and the consequent production decrease. The decline of machinery manufacture and material production is no longer just a problem of the steel industry. I think that it also reveals the overall ill practices of the U.S. manufacturing. The decrease in demand in the construction and contractors' products sector was caused by the fact that the Reagan administration neglected social capital that was too old to be used.

The market for sheet and strip steel, the strategic commodities of the integrated companies, also diminished. Tin mill products continued to be pushed out of the beverage container material market by aluminum and plastic bottles. Moreover, the production of food cans, which used a large amount of steel, became sluggish.

Table 3. Change of Apparent Consumption of Steel Mill Products (1000 t)

| Steel Mill Products | Average 1973-81(a) | % | Average 1982-90(b) | % | Increasing rate of demand from(a) to (b) |
|--------------------------------------|-----------------------|--------|-----------------------|---------|---------------------------------------------|
| Ingots, Blooms, Billets, Slabs, etc. | 2667 | 2.5% | 3470 | 3.7% | + 30.1% |
| Wire Rods | 3321 | 3.1% | 4828 | 5.2% | + 45.4% |
| Structural Shapes and Pilings | 6936 | 6.5% | 6233 | 6.7% | - 10.1% |
| Plates | 10115 | 9.4% | 6684 | 7.2% | - 33.9% |
| Rails and Accessories | 1857 | 1.7% | 918 | 1.0% | - 50.6% |
| Bars and Tool Steel | 16669 | 15.5% | 14081 | 15.2% | - 15.5% |
| Pipe and Tubing | 10506 | 9.8% | 7023 | 7.6% | - 33.2% |
| Wire and Wire products | 3355 | 3.1% | 1779 | 1.9% | - 47.0% |
| Tin Mill Products | 6242 | 5.8% | 4386 | 4.7% | - 29.7% |
| Sheets and Strip | 45800 | 42.6% | 43493 | 46.8% | - 5.0% |
| -surface treated sheets | (8847) | (8.2%) | (12640) | (13.6%) | + 42.9% |
| Total Steel Mill Products | 107466 | 100.0% | 92893 | 100.0% | - 13.6% |

In this table, turn plates and tin free plates are included in surface treated sheets.
Sources: Compiled from AISI, *Annual Statistical Report*, various years.

The depression was accompanied by a fall in the prices of crude oil and other primary commodities. Traditionally, low prices of energy and mineral resources lead to profits in the steel industry. U.S. steel companies, however, vertically integrated mineral resources, chiefly in the U.S. and Canada. This was a disastrous move. They could do nothing but accept coal and iron ore at a cost higher than that of foreign companies that imported coal and ore from developing countries. While the price of domestic coal remained competitive, when the cost of production and transportation was factored in, the cost of domestic captive iron ore exceeded that of the ore used in imported steel (including not only various costs but also profits of mining industry)¹³. The operating rate of iron ore production capacity in North America in 1982 dropped to 44%. Moreover, the decrease in the price of oil terminated the domestic oilfield development boom. The apparent consumption of pipes and tubing decreased by as much as 64.3% from 1981 to 1983¹⁴.

(ii) The Collapse of the Domestically Administered Price System

The integrated production system was attacked from both the price side and the cost side. Moreover, imports increased under the high dollar policy of the Reagan administration. The Trigger Price Mechanism was suspended in 1982, and the VRA was concluded with 20 countries since 1984. But the integrated companies could no longer monopolize the domestic market. Only minimills were able to compete with imported steel in the wire rod and bar market because their production costs were low. Integrated companies could no longer rely on the adjustment of the operating rate and the full-cost pricing principle. The domestic real price of steel mill products fell due to discount sales (Figure 5). All steel segments of the seven largest companies

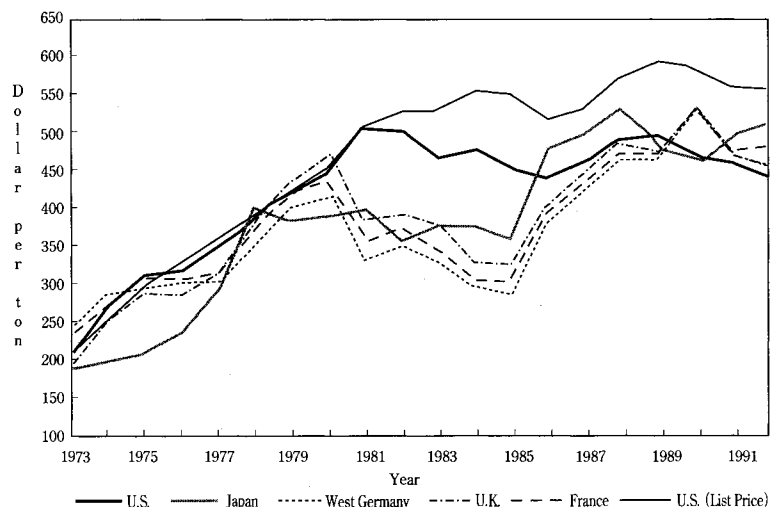


Figure 5. International Comparison of Real Price of Steel Mill Products

Sources: Compiled from Marcus et al., *WSD*, "Steel Strategist 20".

13) Barnett, Donald and Louis Schorsch, *Steel*, Cambridge, Ballinger, 1983, pp. 302-303.

14) Marcus et al., *op. cit.*, "Steel Strategist #18", 1992, p.128. AISI, *Annual Statistical Report*.

fell into the red in 1982. The domestically administered price, which mediated monopolistic accumulation of U.S. integrated steel companies, crumbled. This meant the excess facilities had to be cut back under world market pressure.

In short, the structure of capital accumulation of the integrated companies in the U.S. after the war had its technological base in the integrated production system, whose core was the integrated steel plant equipped with a strip mill. Integrated companies supplied sheet and strip steel to the automobile and other industries, and acquired costs and made profits through the domestically administered price system. This structure has now broken up due to world market competition.

With the breakup, though, the stagnated character of the domestically administered price system also collapsed. Integrated companies were now able to modernize specific plants and equipment from the viewpoint of world market competition. This signaled the beginning of the age of restructuring.

III Various Aspects of Restructuring

1. The Reorganization of the Integrated Production System and Specified Modernization

(i) The Reduction of Production Capacity

Integrated companies that had overcapacity were forced to adjust their investments and production capacity through the 1980's. Specifically, they carried out a thorough reduction of production capacity and dismantled outdated plants and equipment, concentrating production on efficient ones. As a result, they gradually withdrew from the upstream process, concentrating on and investing in the downstream process, especially the production of sheet and strip steel.

In 1980, there were altogether 43 integrated steel plants in the U.S. The number decreased to 24 in 1988. Among the plants that were closed, only 6 plants had a capacity of more than 4 million tons per year, and 13 plants had a capacity of 1-4 million tons¹⁵⁾. We therefore know that the plants that closed were the smaller ones.

Many raw material properties were sold off. The iron ore production capacity in North America fell by 49,056 thousand tons (35.0%) between 1980 and 1988¹⁶⁾. Captive coal mines also gradually diminished. Although many coke furnaces were destroyed, the ones that were left were not easily renewed. In addition to the production capacity problems, there were also serious environmental problems. Under the 1990 New Clean Air Act these furnaces were forced to decrease the amount of pollutants they released.

Ironmaking was cut substantially. The production capacity of pig iron decreased by 37,093 thousand tons (33.0%) between 1981 and 1990¹⁷⁾. In particular outdated

15) Adams and Mueller, *op. cit.*, 6th ed., 1982, p.79, 8th ed., 1990, Trans. by Shigeki Kanada et al., Tokyo, Sofu Sha, 1991, p.50.

16) Marcus et al., *op. cit.*, "Steel Strategist #18," p.128.

17) Marcus et al., *op. cit.*, "Steel Strategist #20," 1994.

small blast furnaces were dismantled, and production was concentrated on comparatively large blast furnaces. In steelmaking, the raw steel production capacity decreased by 37,600 thousand tons (24.4%) (Table 1)¹⁸. Integrated companies either dismantled or suspended all open-hearth furnaces by 1991. Some converters and electric furnaces were also abandoned. In rolling process, the production capacity of hot strip mills dropped by 9,932 thousand tons (12.3%)¹⁹. Although this was large decrease, it was not as large as that of ironmaking and steelmaking. More equipment survived in the downstream process.

(ii) The Importance of the Market for Surface Treated Sheets

Capital investment was carried out according to the structural change in demand for steel mill products. Although demand on the whole fell, the percentage of sheet and strip steel in relation to all steel products rose from 42.6% in 1971-81 to 46.8% in 1982-92 (Table 3). Integrated companies had no choice but to place more importance on this market than before.

Focus was especially on the market for surface treated sheets. The demand for surface treated sheets increased by 3,793 thousand tons (42.9%) for the same period. The main reason was the effect of change in the automobile industry. Automobile production dropped to 6,990 thousand in 1982. However, it recovered and remained above 10,000 thousand for six years since 1984²⁰. During that period of recovery, automobile makers not only made car bodies lighter, but also heightened their corrosion resistance. They started to use galvanized sheets for the outer and inner panels of bodies. Among these, the ratio of sheets requiring highly developed technologies such as electrolytic galvanizing and electrolytic zinc alloy-coating rose. In 1984, General Motors followed Ford and Chrysler in abandoning the "buy American" steel procurement policy. They imported electrolytic galvanized sheets from Japan²¹. High-grade sheet and strip steel was also in demand in the construction industry.

Steel sheet and strip steel helped the integrated companies not only recover demand but also profitability and competitiveness. On one hand, minimills became more and more advantageous in bar, structural shape and piling, and wire and wire product markets. Minimills featured such as cheap equipment cost, low wages, flexible production, etc. On the other hand, the integrated companies were monopolistic suppliers in sheet and strip steel market. Moreover, the margin widened as the degree of processing of the sheets increased. The margin per metric ton when extra drawing quality sheets are manufactured in efficient steel plants is 88 dollars for hot rolled sheets, 110 dollars for cold rolled sheets, and 160 dollars for hot-dipped galvanized sheets²². To secure the surface treated sheets market, integrated companies invested in specific plants and equipment.

18) This table also includes the capacity of minimills.

19) Marcus et al., *op. cit.*, "Steel Strategist #20," 1994.

20) MVMA, *op. cit.*

21) *Nihon Keizai Shinbun (Japan Economic Newspaper)*, June 9, 1984.

22) Jose Guilherme de Heraclito Lima, *Restructuring the U.S. Steel Industry*, Boulder, Westview Press, 1991, p.115.

(iii) Capital Investment in the Downstream Process

Because the downstream process technology in particular influenced the shape and quality of products, capital investment was concentrated on downstream processes like steelmaking, rolling, and finishing. The continuous casting mill was quickly introduced. In 1988, the rate of raw steel cast using the continuous casting mill was 61.3% in all of the U.S. and 46% among the U.S. integrated companies. In 1993, it became 85.7% in all of the U.S.²³. Ladle-refining and vacuum degassing for high purity steel production were also adopted one after another.

In the rolling process, integrated companies did not invest much in plate mills, bar mills, structural shapes and piling mills. They instead concentrated their investment in hot strip mills – the key equipment in sheet and strip production – cold strip mills, hot dipped continuous galvanized lines (CGL), and electrolytic galvanized lines (EGL) (Table 4).

Technological collaboration was established between these companies and automobile makers. Examples include the cooperation between NUMMI (a joint enterprise of GM and Toyota) and LTV, and between Honda and Inland Steel. Such linkups

Table 4. Investment in Equipment by Integrated Companies in the Latter Half of 1980's

| Year equipment | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | Beginning of 1990's |
|---------------------------|-------|-------|-------|-------|-------|---------------|-----------------------------|
| Relining of Blast Furnace | — | — | — | 2 | 4 | 5 | |
| Continuous Casting | New 4 | New 1 | New 1 | New 1 | — | New 1 Re 4 | New 6 |
| Secondary Refining | — | New 1 | New 1 | New 1 | New 1 | New 4 | New 1 |
| Hot Strip Mill | — | Re 1 | Re 2 | Re 2 | Re 1 | — | Re 2 |
| Cold Strip Mill | — | — | Re 1 | New 1 | Re 1 | Re 5 | |
| Plate Mill | — | Re 1 | — | — | — | — | |
| Bar Mill | — | — | — | — | — | — | Some Bar and Wire rod mills |
| Shapes Mill | | | | Re 1 | | | |
| EGL | New 5 | — | — | Re 1 | — | New 1 Re 1 | Re 3 |
| CGL | — | — | — | — | — | New 1 Re 2 | |

“Year” means when the construction starts. “New” means new mill. “Re” means remodeled mill. Sources: Sakonji, Tadamasu, “Beikoku Tekkogyo no Genjo to Kadai (The Present State and Problems of the U.S. Steel Industry),” *Tekko-kai (Steel World)*, April 1990, p.17.

23) AISI, *Annual Statistical Report*. Adams and Mueller, *op. cit.*, 8th ed., Trans. by Kanada et al., p.59.

not only solve individual problems, they improve the manufacturing process as well. Integrated companies are also participating in the development and design stages of new models. Results are beginning to show. For instance, the above-mentioned rejection rate by Ford fell to 2% at the end of 1986²⁴). The rejection rate of sheets for automobiles made by U.S. Steel was 5% in the first half of the 1980's, but is now 0.3-0.4%²⁵).

However, rolling mills constructed in the 1930's are still used in production, and continuous casting mills and rolling mills are not sufficiently connected. Automated control of the gauge and shape is not performed satisfactorily, and as a result, products are inferior in quality to products made in Japan. Moreover, integrated steelmakers could not invest in modernization of their efforts, because they had lost technological leadership and manufacturing know-how in their age of stagnation²⁶). They also had trouble raising investment money during a period of financial crisis. Integrated makers tried to overcome these difficulties through international joint ventures, which I will analyze later.

Let's summarize the results of the above-mentioned reorganization. I would like to compare the average results of 1971-81 with those of 1982-92 (Table 2). As a result of the decrease in demand, the shipment of sheet and strip steel decreased by 10.8%. However, their percentage in the overall shipment of steel mill products rose from 49.6% to 54.5%. Within sheet and strip steel, tin mill products and unplated sheet and strip steel decreased by 11-46%. Galvanized sheets used chiefly for automobiles and construction, however, increased by 51.1% and other metallic coated sheets increased by 39.1%. Unplated sheet and strip steel has rapidly been replaced by surface treated sheets. At the same time the market as a whole has been diminished.

2. Changes in the Competition Structure through Mergers, Divestitures, and Bankruptcies

(i) Mergers and the Deregulation of Antitrust Policy

Changes in demand and the collapse of the domestically administered price system intensified the competition between domestic companies. To rationalize facilities and personnel, large-scale horizontal mergers were attempted. In September 1983, a plan to establish LTV Steel through the merger of Jones & Laughlin (a subsidiary of LTV) and Republic Steel was announced. LTV had been making efforts to rationalize their steel business since the 1970's. The purpose of this merger was to reinforce the steel business given that steel plant construction was impossible.

24) Berry, *op. cit.*, p.25.

25) Yoshida, Kenichiro, "Nihon no Tekkogyo wa USS ni Manabe (Japanese Steel Industry Should Learn from USS)", *Ekonomisuto (The Economist)*, September 13, 1994, p.45.

26) Sei, Shoichiro, "Aimai na Hacchu, Mugen no Yokyu ni yoru Hinshitsu, Gijutsu Suijun no Kojo (Progress of Quality and Technology through Vague Order and Limitless Request)," in *Jidosha Sangyo no Kokusaika to Seisan Shisutemu (Internationalization and Production System of the Automobile Industry)*, ed. by Chuo University, The Institute of Economic Research, Tokyo, Chuo University Press, 1990. Haraguchi Hideki, "Beikoku Genchi Kojo no Buhin Chotatsu to Hinshitsu Kanri (Procurement of Parts and Quality Control at Transplants in the U.S.)", *Nikkei Mechanical*, February 3, 1992.

The Department of Justice insisted that this plan would contravene antitrust laws. However, the Department of Commerce, the Office of the U.S. Trade Representative, and President Reagan all criticized the Department of Justice. They demanded that competition with foreign companies be considered in addition to the domestic competition when judging the economic power concentration ratio. Eventually, the merger was authorized on the condition that the two steel plants be separated. This event promoted deregulation in antitrust policy.

(ii) Chapter 11 and Reconstituted Mills

Several companies whose performance worsened carried out reorganization procedures in accordance with Chapter 11 of the Bankruptcy Code. Other companies opted for rebuilding through divestitures from integrated companies. Such companies are called "reconstituted mills." There are now as many as 17 such companies and they hold 30.2% of domestic steel mill products market²⁷). The fact that LTV went bankrupt two years after the merger demonstrated the serious condition of integrated companies.

In the rebuilding process under Chapter 11, cutting costs and enormous debts was attempted. This included wage cuts, work rule reinforcement, the disposal of defective properties, the reduction of interest costs, etc. These measures decreased LTV's total pretax costs for cold-rolled coil per metric ton by 89 dollars²⁸).

Labor cost especially became an issue. It included pay, work rules, and unfunded pension liabilities. I will discuss pay and work rules later. Unfunded pension liabilities meant companies were unable to contribute sufficiently to corporate pension funds due to financial difficulties. LTV and Republic Steel, before their merger, were among the top unfunded companies in the U.S. This was one of the direct causes of LTV's bankruptcy. At that time, LTV's pension payments and health and life insurance premiums rose to 470 million dollars per year. Pension liabilities were transferred to the Pension Benefit Guaranty Corp. (PBGC), and the pension payments were cut down. As a result, LTV's labor cost per hour decreased by 3.5 dollars²⁹). By March 1987, in the entire U.S. 3.1 billion dollars in pension debts were transferred to PBGC, 80% of which came from steelmakers. In 1992, 8 of the top 50 companies with the largest unfunded pension liabilities were steelmakers, and their unfunded guaranteed benefits were as much as 4,933 million dollars³⁰). PBGC's financial problem is becoming as serious as the Federal Deposit Insurance Corporation's, which economists often talk about.

When individual plant was separated, several types of management forms were born. Rouge Steel and Geneva Steel are owned by investors' groups. Wierton Steel is owned by an employee stock ownership plan (ESOP). So far, many such mills

27) Marcus et al., *op. cit.*, "Steel Strategist #20," p.33.

28) U.S. International Trade Commission, *U.S. Global Competitiveness: Steel Sheet and Strip Industry*, Washington, DC, 1988, pp. 11/68-69.

29) *Ibid.*, p.11/51.

30) PBGC, *News*, November 22, 1993.

are raising profits by cutting debts and labor costs. But they are also carrying capital investments.

Excessive capacity has been diminished through the reorganization of technology, product mix, and forms of enterprises. But competition to survive has become keen because oligopolistic cooperation between integrated companies hasn't been reconstructed. The six largest makers' share of shipments was 61.8% in 1981, but it diminished to 46.7% in 1992³¹⁾. If some reconstituted mills keep their old equipment, competition to survive will grow keener and keener. It is a question of whether they will be able to become specialists or regional companies that are not involved in destructive price competition.

3. The Two Directions of Diversified Business Reorganization

(i) Some Cases of Business Reorganization

From the 1970's till the 1982-83 steel depression, some integrated makers diversified their businesses to resource related industries and munitions³²⁾. Symbolic event was the acquisition of Marathon Oil by U.S. Steel. But resource related industries collapsed because of the fall in the prices of primary commodities in the 1980's. Moreover, as the decline of the steel business caused financial crises for some companies, they had no choice but to reorganize their diversified business. I will not look at Bethlehem Steel and Inland Steel, which had been originally passive about diversification. Other large companies divided into those that withdrew from the steel industry and those that specialized in the steel industry³³⁾.

An example of the former was National Steel. It had already established a holding company, National Intergroup Inc. (NII), in 1983. Previous business groups became subsidiaries, each assuming respective management responsibility. In 1984, NII sold off 50% of the stocks of National Steel (NSC) to Nihon Kokan (NKK). It sold off 20% more to NKK in 1990, and management rights were transferred to NKK. In addition, the savings and loan association and the metal distribution sector were sold off. Currently, NII's main businesses are an integrated aluminum production, crude oil distribution, service company purchased in 1985, and a medicine distribution company purchased in 1986.

An example of the latter was Armco. In 1985, it announced it would concentrate on the steel industry again. It sold off its financial, aerospace, strategic materials, and manufacturing and engineering businesses one after the other. It also reduced its oil field equipment business and transformed it into a joint venture with USX. This series of measures were defensive ones against financial crisis. Otherwise Armco would not have parted with its profitable business like aerospace. LTV was another

31) Calculated from AISI, *Annual Statistical Report*, various years, and *Tekko Kai (Steel World)*, March 1983, p.83, March 1994, p.68, April 1994, p.73.

32) These cases of diversification were not conglomeration. See, Kawabata, "America Tekkogyo no Restructuring (II)," *Kikan Keizai Kenkyu*, No. 16, Vol. 4, March 1994.

33) On the business reorganization, see *Moody's Industrial Manual*, various years, *Annual Reports* of some integrated companies.

example. After the steel depression, LTV's steel and energy businesses continued to have substantial deficits. Those deficits exceeded the surplus of its aircraft, missile, and electronics businesses. Debt was enormous even after application for Chapter 11. In July 1991, LTV had no choice but to announce its plans to sell its aircraft, missile, and electronics businesses. LTV's measures were also defensive.

U.S. Steel took a middle position. Its performance picked up in 1984 and 1985 due to the large profits of Marathon Oil. Meanwhile, it expanded its oil business by purchasing Husky Oil and Texas Oil and Gas. It even changed its name to "USX." USX had four subsidiaries with self-supporting accounting systems. They were U.S. Steel, Marathon Oil, Texas Oil, and Diversified Business. In 1986, USX, however, fell into a deficit of 1,833 million dollars as a result of the sharp decline in oil prices and disputes between management and labor. Making use of the fall in stock prices, the corporate raider Carl Ichan became number one on the stockholder list. He proposed separating the steel business from other businesses, but this was rejected in the stockholders meeting. Stockholders however were very dissatisfied about the sluggish stock prices. In response, USX sold off its agriculture chemical and transportation businesses. It also separated its stocks into energy stocks and steel stocks in 1991. Dividends were paid according to the performance of each. In 1993, 69.2% of USX's sales and all its profits came from non-steel business. It was ranked the eighth largest oil company in the U.S. by Fortune magazine³⁴).

(ii) Business Reorganization and Industrial Restructuring

The two above-mentioned patterns of reorganization are closely related to the characteristics of the 1982-83 steel depression. Equipment shutdowns, property clearances, and reevaluation of assets mediated the reduction of excessive capital in steel, raw materials, and resource industries. The pressure of excessive capital divided the reorganization of individual enterprises in two directions. It also promoted a thorough rationalization and reorganization of industrial relations. Corporate pension plans were terminated, and labor unions were asked to make concessions, which I will discuss later. It is in these terms that we have to understand the restrictions on the reorganization process of integrated companies. It was affected not only by changing management methods in the U.S., but also by the transformation of the structure of the U.S. industry through world competition. In other words, industrial restructuring was the essential change, and demands of stockholders or creditors which led to sudden financial restructuring were of secondary importance.

4. Industrial Relations in the Age of Concession and Uncertainty

(i) The Attack by Management and Concession Bargaining

After World War II, the management of the integrated companies and the USW executive observed the U.S. "national bargain"³⁵). Robert Reich's "national bargain"

34) *Fortune*, April 18, 1994. USX, *Annual Report*, 1994.

35) Reich, Robert B., *The Work of Nations*, N.Y., Alfred A. Knopf, 1991, Chapter 5. But Reich also says that this bargain hasn't been applied for black people, women, and poor countries.

meant accepting the legitimacy and perpetuity of big business in exchange for prosperity. The big companies enjoyed economies of scale and achieved high profits through high prices. A part of them was given to middle management employees and production workers. The labor unions avoided striking as much as possible. In the steel industry, which saw comparatively intense confrontation between labor and management, it looked as if the national bargain was entered into with the ENA of 1973. One precondition was steady domestically administered prices.

The situation changed completely after the 1982-83 steel depression. To carry out restructuring, management fiercely attacked workers' vested interests. Figure 6 shows the transition in the number of steel industry employees. The average number of employees between 1982 and 1992 decreased by as many as 267,314 persons (58.3%) compared to that between 1971 and 1981. The number of employees decreased by 64.3% between 1981 and 1992, though the raw steel production capacity decreased by only 26.7% (Table 1). Both reduction in production capacity and modernization caused large-scale layoffs and unemployment. Not only wage-earning employees but salaried employees were made the target of rationalization, and the number of both decreased. Between 1972 and 1986, among the industries in the U.S. categorized by a SIC code (4 digits), the steel industry had the highest decrease in employment³⁶). This industry was one of major causes of the unemployment problem in the U.S. in 1980's. The skills of steelworkers cannot be used in other industries. Therefore, when an un-

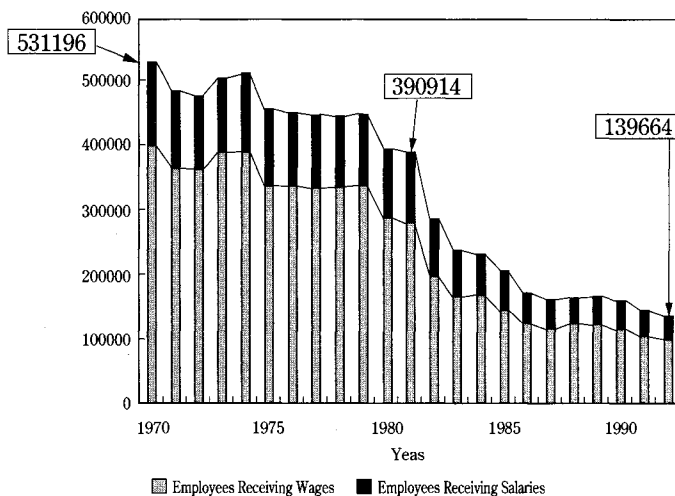


Figure 6. Number of Employees in the U.S. Steel Industry 1970-1992

Sources: AISI, *Annual Statistical Report*, various years.

36) U.S. Department of Commerce, *U.S. Industrial Outlook*, 1989, p.21.

employed steelworker finds another job, his salary is 50-75% lower than previously³⁷⁾.

To cut labor costs, integrated companies formed out orders for maintenance, shearing, pickling, etc. to subcontractors. The USW argued that subcontracting robbed union members of their jobs. Eventually, the companies made it a principle to have union members do work they were capable of doing.

The working conditions of workers who remained at their job worsened. Management urged the USW to choose between concessions or layoffs in the labor agreement revision negotiations of 1983 and 1986. The USW, whose union membership was decreasing, was not able to counterattack. It accepted the concessions. After the 1980 negotiations, the ENA no longer applied. The 1983 and 1986 labor agreements included reduction of wages or salaries, suspension of cost-of-living adjustments (COLA), and encouragement of early retirement³⁸⁾. Working hours were also extended. Since the latter half of the 1950's until the middle of 1980's, the average number of working hours per week in the steel industry had been 35-39 hours. From 1987, it exceeded 41 hours. Moreover, in 1989 the total working hours per year reached 2,140, while it was only 1,500-1,900 hours in the European Community nations³⁹⁾.

In 1986, integrated companies abandoned multi-employer bargaining. They tried to pay according to the performance of each company. LTV and Wheeling-Pittsburgh Steel annulled the labor agreements by using Chapter 11. They forced union to make further concessions. Companies also introduced profit sharing or gain sharing. The percentage of labor costs taken up by allowances other than wages for hours worked and paid holidays was only 0.5% in 1981. However, it rose to 10.4% in 1988⁴⁰⁾.

Industrial relations in the 1980's were the attacking phase of management. They sought not only to reduce pay, but to improve productivity and rebuild the industry by having workers, supervisors, and managers cooperate with each other. But the latter goal was not necessarily achieved. On the other hand, the USW was not able to stop the falling union membership, which decreased sharply from 1,100 thousand in 1979 to 650 thousand in 1990⁴¹⁾.

(ii) Searching for a New Framework

From the latter half of 1980's both the management and the labor unions began to search for a new framework for industrial relations. The result took the

37) Nihon Tekko Renmei Koyo Iinkai (Japan Iron and Steel Federation, Committee for Employment), *Beikoku Tekkogyo ni okeru Koyo Kanri no Jokyo (Employment Management in the U.S. Steel Industry)*, Tokyo, 1990, p.106.

38) On labor contracts in 1983 and 1986, see U.S. ITC, *op. cit.*, Kobayashi, Hideo, *Gendai America Rodoshi Ron (A Study on Modern American Labor History)*, Kyoto, Keibun Sha, 1987, Nihon Tekko Renmei Koyo Iinkai, *op. cit.*, Japan Council of Metalworkers' Unions, *IMF-JC Kinzoku (IMF-JC Metal)*, various issues.

39) AISI, *Annual Statistical Report. Tekko-kai Ho (Steel World News)*, February 1, 1992, p.5. According to these statistics, steelworkers in Japan worked on average 2,125 hours in 1989, which is less than workers in the U.S. But I don't think labor statistics in Japan are accurate. See Kawahito, Hiroshi, *Karoshi Shakai to Nihon (Karoshi Society and Japan)*, Tokyo, Kaden Sha, 1993.

40) AISI, *Annual Statistical Report*.

41) Nihon Tekko Renmei Koyo Iinkai, *op. cit.*, p.109.

form of labor agreements between the USW and each company in the latter half of the 1980's and the early 1990's⁴²).

Wage improved again as business recovered, and, most importantly, the USW declared that it would cooperate with management to improve productivity in return for employment security and participation in the company's decision making process. Such exchange conditions, which National Steel adopted in 1986, gained in popularity with the major integrated companies in 1993.

Management did win the right to eliminate certain restrictive work rules. In the U.S. steel industry, there were hundreds of job classifications in each mill. Wages were paid according to job classification, and layoffs and promotions were based on seniority. As technology progressed, certain job classifications became irrational from a technological point of view, and hindered productivity. In the agreements of 1993, the USW admitted that the combination of job classifications and the reduction in workers were necessary. However, the union gained no-layoff clauses and a seat on the company's board of directors.

The new framework tries to build up the idea that the interests of workers and managements are essentially consistency. This is mutually agreed upon by the USW executive and management, and is therefore, an idealistic, top-down reformation. However, it is not necessarily a realistic reformation at the shop-floor level. While more workers think that productivity improvements profit them, neither cooperative quality control nor team production have widely been introduced. A large-scale *kaizen* movement at the shop-floor level is not in place. Up to now, the major reason productivity has improved is the modernization of equipment and the elimination of redundancy through job-combinations.

5. The Beginning and Prospects of International Joint Ventures

(i) Technology and Industrial Relations of International Joint Ventures

Since 1984, international steel joint ventures have been established one after the other in the U.S. (Table 5). These international joint ventures focus upon the downstream process, they specialize in the production of high-level steel mill products, and many of them manufacture surface treated sheets for automobile industry. These characteristics agree with those of the modernization undertaken by the integrated companies mentioned above. Because it became difficult for integrated companies to make capital investments on their own, they utilized foreign technologies and capital. In the case of CGL and EGL, not only the "Big 3," but also Japanese automobile makers with factories in the U.S., demanded high quality. To acquire this new market, U.S. companies had to learn technologies and skills of Japanese companies. Japanese steel makers also had to keep up with the advance of the Japanese automobile factories into the U.S. They thus attempted to expand their share in the U.S. market while avoiding trade friction.

42) On labor contracts in 1993, see U.S. Department of Labor, *Monthly Labor Review*, various issues in 1993 and 1994.

Table 5. International Joint Ventures in the U.S. Steel Industry

| U.S. Company | Partner | Joint Venture Name | Type of Operation and Annual Capability | Investment (\$) and Share of Partner | Date |
|---------------------|-------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------|
| USX | Kobe Steel (Japan) | USS-Kobe Steel | Integrated bar and pipe mill for automobile industry | 300 million 50% | May 1989 |
| | | Protec Coating | CGL 540 thousand ton | 200 million 50% | March 1990 |
| | Pohang Iron and Steel (South Korea) | USS-POSCO Industries | Cold rolling mill, tin mill, galvanizing line 1400 thousand ton | 400 million or more 50% | April 1986 |
| Bethlehem Steel | NSC [NKK] | Double G. Coating | CGL and Galvalume line for construction 270 thousand ton | 100 million 50% | May 1992 |
| LTV | Sumitomo Metal (Japan) | L-S Electro Galvanizing (LSE) | EGL 400 thousand ton | 131 million 40% | January 1985 |
| | | L-S II Electro Galvanizing | Galvanizing, nickel plating, multi layer plating 360 thousand ton | 200 million 50% | June 1989 |
| | | | Sumitomo Metal invested in LTV. | 10% | June 1993 |
| National Intergroup | NKK (Japan) | National Steel (NSC) | Integrated steel mill 5350 thousand ton (raw steel) | NKK invested 439 million 70% | August 1984 |
| Inland Steel | Nippon Steel (Japan) | I/N Tek | Pickling line, cold rolling mill, and annealing line 900 thousand ton | 520 million 40% | July 1987 |
| | | I/N Kote | CGL and EGL for automobile 500 thousand ton (hot dipped sheet) 400 thousand ton (electrolytic sheet) | 550 million 50% | June 1989 |
| | | | Nippon Steel invested in Inland | 14% | 1990 |
| Armco | Kawasaki Steel (Japan) | AK Steel (Armco Steel) | Integrated steel mill (including CGL and EGL) 350 million ton | 525 million 50% | May 1989 |
| | Kawasaki Steel Rio Doce (Brazil) | California Steel Industries (CSI) | Hot and cold rolling mills, CGL 700 thousand ton | 275 million 50% | July 1984 |
| Wheeling-Pittsburgh | Nissin Steel | Wheeling-Nissin (WN) | CGL and aluminum-plating line 270 thousand ton | Nissin invested 670 thousand 67% | June 1984 |
| Nucor | Yamato Kogyo | Nucor-Yamato Steel | Mini mill (producing structural shape) | 175 million 49% | April 1986 |

In this table, "ton" means metric ton. Kawasaki Steel applied to Securities and Exchange Commission for listings of Armco Steel at January 26, 1994. Armco Steel was renamed to AK Steel. Armco's equity became few.

Sources: Compiled from Kurihara, Kazuo, "Beikoku Tekkogyo no Genjo to Kongo no Tenbo (The Present State and Prospects of the U.S. Steel Industry)," *Tekko-kai (Steel World)*, July 1989, p.15. Kenny, Martin and Richard Florida, *Beyond Mass Production*, N.Y., Oxford University Press, 1993, p.157, *Tekko-kai, Nikkan Tekko Shinbun*, various issues.

Joint venture companies have been introducing the latest production technologies. For instance, National Steel became the first integrated company to achieve 100% continuous casting ratio. USS-POSCO replaced all of its main facilities. Pickling and cold rolling are now controlled with computers. The company has also installed continuous annealing and temper rolling lines⁴³⁾.

Industrial relations in the joint ventures were also reorganized. Joint venture companies have been introducing new systems into the U.S. industrial relations, while recognizing the organization of the USW. Most joint ventures have adopted a no-layoff policy, profit sharing, job level reduction, team concept, etc. They have also introduced various management participation systems. Examples are L-SE's independently run employees committee and NSC's Cooperative Partnership⁴⁴⁾.

Companies that have greenfields for the downstream process have employed workers who could adapt themselves to new labor conditions. I/N Tek hired new employees from the 12,500 workers who had worked at Inland Steel's Indiana Harbor works. The company combined written tests, simulations, and interviews to choose employees from the 1,250 persons who applied. It did not merely look for general work ability, but looked for people who were able to analyze by themselves, self-starters and self-motivated, individuals capable of working with a group of people like themselves to maintain harmony in such an environment. In the end, the company hired only 120 people⁴⁵⁾. In such companies most workers accept the new industrial relations. However, these joint ventures don't have much influence on U.S. society because of the harsh selection criteria and the relatively small number of employees.

Having new labor relations is not necessarily the same thing as having a Japanese production system. For example, the labor union doesn't have a seat on the board of directors in the Japanese steel industry. Japanese workers are accepting personal valuation, but most of U.S. wage-earning workers are rejecting it. Japanese integrated companies have revised their systems in order to gain acceptance by U.S. workers. I think new industrial relations are parts of international labor reorganization rather than introduction of the Japanese system.

(ii) A New Phase of Competition in the Sheet and Strip Steel Market

As a result of such joint ventures being set up, competition in the U.S. sheet and strip steel market for automobiles has entered a new phase. The "Big 3" U.S. automobile producers are adopting "buy-American" policy again, but they procure sheet and strip steel from joint venture companies. Japanese automobile manufacturing plants in the U.S. are trying to procure high-quality surface treated sheets,

43) *Nikkan Tekko Shinbun (Daily Steel Journal)*, January 18, 1991. *33 Metal Producing*, June 1989, pp. 22-23.

44) *Nihon Tekko Renmei Koyo Iinkai, op. cit.*, pp. 149-160. *Nikkan Tekko Shinbun*, November 20, 1990. Kenny, Martin and Richard Florida, *Beyond Mass Production*, N.Y., Oxford University Press, 1993, Chapter 6.

45) *Ibid.*, pp. 179-180.

which have been imported from Japan, from joint ventures⁴⁶). On the other hand, several U.S. integrated companies are making use of joint ventures to smoothly withdraw from the steel business. NII is one such case. NKK, which grabbed NSC's management rights contrary to expectations, not only attain the opportunity to expand its business in the U.S., but also confronted restructuring difficulties.

IV U.S. Integrated Steel Companies in the 1990's

1. New Accumulation Structures and New Problems

At first restructuring of the U.S. steel industry began as an emergency measure to cope with financial crisis. The integrated companies have, however, invested in plants and equipment and reorganized industrial relations to recover competitive power. U.S. integrated companies are attempting to form new accumulation structure. Its core is a modernization of the downstream process, especially the surface treated sheet line for automobiles. However, there are various difficulties remaining, and new problems accompanying restructuring are arising.

2. Recovering Competitiveness

I wonder how much integrated companies have recovered their competitiveness. The labor productivity of major companies (man-hour per ton) rose by 1.88 times between 1981 and 1992. The yield of steel mill products rose from 78.0% in 1984 to 82.5% in 1990⁴⁷). The production cost of steel mill products per ton decreased from a peak of 620.1 dollars in 1982 to 471.8 dollars in 1992 (Figure 4).

However, those companies' position in the world market is still not clear. Production cost in the U.S., which is based on the actual operating rate, fell below that of Japan in 1992. But it may be a temporary phenomenon. If we compare the production costs of both based on a standard operating rate, we find that the cost of Japanese companies is lower than the cost of the U.S. ones⁴⁸). This is a subtle problem.

The industry went through a boom period between 1987 and 1989. Integrated companies attained record high profits in 1989. The recession hit them from 1990 to 1992, and after that their performance recovered once again. This recovery may be related to anti-dumping suits that integrated companies adopted as means of competing with foreign companies at a time when VRA ended at March 1992. I don't say that foreign companies posed no problems, but neither do I find positive proof that U.S. integrated companies have sufficiently recovered their competitiveness.

46) *Nikkan Tekko Shinbun*, November 18, 1990.

47) Marcus et al., *op. cit.*, "Steel Strategist #18," p.72, "Steel Strategist #20."

48) *Ibid.*

3. Competitiveness and the International Division of Labor

The change in competitiveness is related to the reorganization of the international division of labor. As a result of the modernization necessary for sheet and strip lines and the reduction of upstream process, steel manufacturers have begun to purchase semi-finished goods such as slabs. Semi-finished goods (except for wire rods) traded between AISI member companies amounted to only 16 thousand tons in 1982. However, it increased to 639 thousand tons in 1992. Importation of semi-finished goods increased from an average of 307 thousand tons between 1971 and 1981 to an average of 1,993 thousand tons between 1982 and 1992. Imported semi-finished goods come from Brazil (first on the list), the European Union, Canada, Mexico, etc.⁴⁹⁾.

Specialization of the downstream process is not being carried out smoothly through. In the steel industry, the continuity of the integrated production system is technologically important. This continuity also influences production costs. Therefore, vertical international division of labor such as that in the machinery industry is not easy. Moreover, to improve the quality of the final product, modernization of the upstream process is necessary. In one case, the quality of cold rolled sheets from Wheeling-Pittsburgh was the cause of the problems encountered by Wheeling-Nissin. For I/N Tek, the quality of hot rolled sheets from Inland Steel was also a problem⁵⁰⁾. Influenced by such occurrences, companies began to put efforts into relining blast furnaces from around 1987. The modernization of the integrated production system is still being pursued (Table 4).

However, it is not easy to rebuild the ironmaking process, which has been ignored. The output of each blast furnace run improved by 36.2% between 1981 and 1992. However, it continues to be far below that of Japan. Improvement is also slower than that of U.K. (Figure 2). Comprehensive modernization requires time and an enormous amount of capital. The financial difficulties are also immense. Among the joint ventures, NSC and AK Steel, who adopted the integrated process, are often in the red. Even now, there is an intermingling of tendencies to specialize in the downstream process and tendencies to maintain the integrated production system⁵¹⁾.

In the downstream process, there is the possibility that the production capacity of surface treated sheets will become excessive. The annual production capacity in the near future is expected to be 12,500 thousand tons for CGL and 4,500 thousand tons for EGL⁵²⁾. In addition, minimills adopted a new technology, thin slab casting, and entered the sheet and strip steel market. The situation of the automobile industry, on the other hand, is taken to be unstable because of the necessity of recycling, etc.,

49) AISI, *Annual Statistical Report*.

50) *Nikkei Sangyo Shinbun (The Nikkei Industry Daily)*, February 14, 1989.

51) There is a piece of news that U.S. Steel and Armco are considering whether to construct new works with electric furnaces. *Wall Street Journal*, August 5, 1992. *Nikkei Sangyo Shinbun*, April 14, 1993.

52) Sakonji, Tadamasu, *op. cit.* pp. 16-17.

brought about by environmental concerns. Production lines of joint companies were in full operation in 1994, but they might be confronted with the necessity of making adjustments in the next business cycle.

4. The Future of Industrial Relations

The future of industrial relations is also unclear. The declaration by managers that the layoff would be discontinued is based on an important assumption within restructuring. It is an assumption that they have already completed the reduction of the excessive production capacity. As the payments for pension and medical insurance to the retired workers are enormous, small-scale lay-offs do not necessarily reduce production costs. Only large-scale lay-offs improve the financial performance of the company. As managers thought that they would not have to carry out large-scale lay-offs again, they declared a no-layoff policy. They tried to obtain the cooperation of the labor unions through that declaration. Whether their judgment is correct or not will be decided by the next business cycle.

A new industrial relations are not yet a fundamental revolution. The shop-floor control based on job classification and seniority is still there. For instance, job-combination does not necessarily change semi-skilled workers into multi-skilled workers. It only allows management to control workers through the elimination of overly specialized or redundant job classifications. However, it does contribute to increased work desire and job safety in the plants. Some workers had been disgusted with the old system, in which there was a hostile atmosphere and supervisors disregarded the worker's opinions. Such workers welcome the new industrial relations as the antithesis of that situation. However, the new system will become routine with the passage of time, and at that time it will be a question of whether it has value or not.

The fundamental problem is that employment levels decreased with the reduction in production capacity and the promotion of automation. The number of worker under the new conditions of labor might never increase. No-layoff agreements do not necessarily defend the lot of workers in the future, though they might defend existing workers.

V Conclusion

The problem for the U.S. steel industry is no longer decline. It is restructuring with negative inheritance from the age of decline. I can draw out the following suggestions from my analysis.

- 1) In the U.S. steel industry, not only the control system and the management system, but also the basic production equipment and the factories had serious problems. The major point of restructuring was to adjust the production process and the product composition and to recover the economies of scale in the downstream

process – especially the production of sheet and strip steel. This is the logic of mass production. On the other hand, product lines are diversifying, and a rot of each product is coming smaller. But this is not necessarily characteristic of post mass production. Various problems with mass production – for example, necessity of economies of scale, the hierarchical order, the simplification of work, the mass consumption and the large amount of waste – still exist. We should look squarely at the reality of multi-product mass production.

2) U.S. integrated companies are modernizing their equipment. However, the problem is the speed and direction of modernization. It is not clear whether they can compete with companies in NIES and developing countries which are rapidly expanding their production capacity. Moreover, I wonder whether investment in equipment for high-level steel sheets for the automobile industry will guarantee a bright future. Some automobile makers are reviewing their specifications, and they now have no choice but to consider environmental and recycling issues. This is the problem facing the steel and the automobile industries in the future. There is also the problem of mass consumption system.

3) The dramatic reorganization of businesses like bankruptcy and divestiture brings forward the problem of corporate governance. Although industrial restructuring was inevitable, the style of business reorganization was another problem. In case of U.S. integrated steel companies, stockholders and creditors initiated restructuring based on the return on investment. It had certain effects. The huge excess capacity was amortized. Owing to this, integrated companies came to be able to react quickly to the trend of the world market. However, liquidity problems and bankruptcy happened at the same time, and restructuring triggered the disputes and lawsuits over the annulment of labor agreements. In this way management organizations were destroyed rather than activated. Restructuring aggravated distrust and hostility inside and outside enterprises. I can draw out a suggestion from those experiences for restructuring in Japan.

Some managers and economists praised the investment in plant and equipment and stable industrial relations in Japan until the end of the bubble economy. But now they say that return on investment or return on equity should be regarded as important. I think such change in management policies is too myopic. What we should learn from the experience of U.S. integrated companies is the necessity of mid-term and long-term visions for industry. They should include the social policies for industrial relations.

4) The transformation of industrial relations shows that some of the institutions of the enterprise that Reich called the “national bargain” fell into dysfunction. They included a coexistential relationship between management and executives of industrial unions, in which high profit and high wages were supported by a domestic oligopoly system. Moreover, they also included a pension scheme based on the profit of each company. They reflected the power balance between labor and management. Uneven technological innovation and competition in the world economy upset the old institutions. However, the new institutions are not yet stable. In the mature industries of other advanced capitalist economies, there may be similar kinds of

problems. We should continue to research the possibility of new institutions of the enterprise, using historical analysis and international comparison.

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