# THE RECONSTRUCTION OF THE HUNGARIAN IRON INDUSTRY
1970—1990

**Changes in the Production and Location of the 200-year-old Hungarian Iron Industry**

by
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The Hungarian iron industry, although modest by world standards, plays an important role in the country's economy. It mostly meets home demands, although there is a significant exchange of assortments in rolled articles. Export of rolled articles steadily reaches 1—1.1 million tons yearly on present production level. The majority of export goes to Western European markets. The industry thus greatly contributes to the country's income of convertible exchange. Intensive investments in the development of industry during the past fifteen years has served the structural modernization of industry as a whole, and brought about the boom of new dynamic branches of industry (petroleum refining, petrochemical industry, aluminium processing, public vehicle programme etc.). Under these conditions the rate of metallurgic investments has reached very low values in international comparison. For example 4.6 per cent of all industrial investments in Hungary was earmarked for matallurgy between 1968—1972. The corresponding rates in some countries with significant metallurgy are given below:

| | | | |
|---|---|---|---|
| Japan | 17% | Czechoslovakia | 8.5% |
| Italy | 10.9% | Romania | 8.4% |
| West Germany | 9.9% | Poland | 6.9% |
| USA | 9.1% | Austria | 9.4% |

As a consequence of this the introduction of new technologies spreading worldwide was lagging and the productivity of this branch of industry remained under the level of international average. These problems, together with the increasingly sharp competition on the world market from the mid-seventies, and the rearrangement of the international division of labour in metallurgic production demanded long-term decisions on the directions of development of Hungarian iron industry. Plans have been conceived and decisions have been born on the reconstruction of iron industry determining the development of this industry. The core of the decisions: the realization of a significant technical renewal besides quantitative growth.

The reconstruction of iron industry makes its impact on the changes in the regional division of labour, and it also has manifold economic geographical implications. E.g. production share of the Danube Iron Works (DIW) with its site at Dunaújváros increases, while that of the two large works in Northern Hungary decreases.

At the beginning of our study we give a short outline on the 200-year-old past of the Hungarian iron industry. The emergence of plant sites, the inner structural problems of the industry, the technical level, regional links, raw material supply, external trade connections, and transformation of existing links with the natural environment may be better understood in the interconnections of historical evolution.

## I. Historical outline, plant sites

Hungarian iron industry has plants on the following sites:

1. Miskolc – Diósgyőr. Lenin Metallurgic Works (LMW, the former DIMÁVAG). This full-cycle iron-and-steel complex has the longest history among plants operating today: its ancestor was founded in the Garadna Valley near the present plant site in the last third of the 18th century. This first iron furnace had its location chosen to utilize the water power of the Garadna Stream and the forests of the Bükk Hills (charcoal). Iron ore came on carts from iron pits within the distance of 50 kms. At a somewhat lower point, at the confluence of the Szinva and Garanda streams, a forge, also working on water power, was processing the crude iron. More iron furnaces were built later in the valleys of Garadna and Szinva, but they could not compete with the plants in the northern part of historic Hungary (today's Eastern Slovakia), due mostly to unfavourable location. Consequently iron manufacture was stopped temporarily in 1875. The major disadvantages in the location of furnaces were the poor grade of nearby ores and the extremely high cost of transport due to the lack of railways. After iron smelting with coke had become widespread disadvantages grew still graver with the lack of coking coal. However, steel manufacture started with no local crude iron, and the function of the reservoir, created in the age of early iron manufacture, now changed. The dammed water later became the spare souce of cooling water for the new site. The most important factor of location was, however, the local lignite, which was used for generating producer gas. Steel has been continously produced in open-hearth furnaces since 1879, but not since 1910 has this technology become predominant. Soon electric steel production gained ground, too. Coke-fed blast furnaces were only installed in 1926 and 1931, with a volume of 300 cu. metres each. Necessary crude iron had formerly been transported from charcoal-burning iron furnaces working in the area of one-time Hungary. Today's large works has always been, apart from a short period following its foundation, a state-owned plant, and it has greatly influenced the structure of production and its manufacturing profiles. This plant has always been the centre of Hungarian high-quality steel production. Manu-

facture of high-quality steel was required by both the construction of railways, bridges, and by defence purposes. The only plant producing wagon wheel-pairs was also set up here (which has been closely co-operating up to this day with the MÁVAG wagon plant located in Budapest). The majority of manufactured rails has always been turned out by this plant. An important steel foundry and stamp-forgery has also been established, basically to meet state demands. A fairly broad specialization on rolling has formed in the capitalist age, especially with roughing and intermediate rolls train sizes. Among them, roll stands for high-alloy steel were also installed. The plant was also specialized for rolling rough, intermediate and thin sheets right after World War I. Among manufacturing plants a refractory brick-producing works using imported raw material was also set up.

Before World War II raw material supply of the LMW was ensured from nearby iron mines at Rudabánya and Slovakia, as well as from Sweden. From the beginning of the 1950s imported Soviet iron ore became the main source of crude iron production. Coke requirement of the blast furnaces has always been satisfied by imported sources (Czechoslovakian and Polish before World War II, also Soviet following it).

Magnesite and fire-clay has been arriving from Czechoslovakia, Austria and partly from the area of today's West Germany. Slagforming limestone and dolomite originate from nearby quarries. The big works at the karstic Bükk Hills, together with the neighbouring plants suffers from water shortage, consequently the re-use of water following purification became necessary.

The full metallurgic cycle stayed on here, but the roughing mill and the railway points manufacturing section was transplanted to Budapest and Gyöngyös respectively, while the unit producing wagon wheel-pairs was linked to the neighbouring machine works.

2. Ózd Metallurgic Plants (OMP), Salgótarján Steel Products Plant (SSPP), Borsodnádasd Sheet–Iron Plant (BSIP) and the December 4 Wire Works (at Miskolc).

Before World War II the OMP, the Salgótarján and Borsodnádasd plants belonged to the framework of the Rimamurány–Salgótarján Iron Works Ltd., were under common direction, and formed a technologically tight cooperating plant group. The December 4 Wire Works, founded later at Miskolc, is linked partly to the OMP, from the viewpoint of technology. Among all metallurgic works in their present locations the OMP may go back the longest way in the past: it was inaugurated in 1847. Originally it was specialized exclusively to steel and rolled steel production. It became a plant with full production cycle by its 4 coke-fed blast furnaces built during the first decade of the 20th century. Its location was determined by the discovery in the area of coal deposits suitable for generating producer gas. Crude iron was obtained from the charcoal-fed furnaces of the company farther to the north. Similar causes and conditions were instrumental in setting up a smaller steel plant and a rolling mill at Borsodnádasd in 1864. The two plants were connected by a narrow gauge railway line, opened in 1873, still operational today.

The motives for the foundation of a steel plant and a rolling mill at Salgótarján, put into service in 1871, were similar. The plant, independent during the first years, merged with those of Ózd and Borsodnádasd.

In the last decade of the 19th century, when the company switched to SM steel production, and was planning to build coke-fed blast furnaces to satisfy the increased crude iron demand, it found the Salgótarján and Borsodnádasd sites unsuitable for development, primarily because of environmental reasons (lack of water, of space). It happened this way that a new steel mill and the blast furnaces mentioned above were built at Ózd. 10 open hearth furnaces were built between 1893 – 1908, while between 1906 – 1912 4 coke-fed blast furnaces of 330 cu. metres capacity were put into operation. In line with these installations smaller-scale modernization was carried out in the plants producing refractory matter. Puddling furnace and basic Bessemer steel production at the other two sites was discontinued, and part of the rolling equipment was also moved to Ózd. The creation of SM steel production was followed by the installation of roughing, intermediate and thin rolling mills. Before World War II rolls trains were powered partly by steam, partly by electricity. Unlike the state-owned Diósgyőr Iron Plant, the Rimamurány Co. has from beginning specialized mainly in mass steel manufacture, consequently it has been equipped for rolled steel production in intermediate and thin rolling mills. The works at Ózd shipped steel and rolled article as raw material to the Borsodnádasd Sheet Iron Plant and the Salgótarján Sheet Products Plant for reprocessing the rolled steel (slabbed wire and band).

After 1881 BSIP gradually shifted to manufacturing commercial sheet iron, and installed hot and cold rolling mills.

Following the merger of 1881, furnaces for basic Bessemer steel were installed in the SSPP, and further processing of manufactured steel was carried out roughing, intermediate and thin section rolls trains. This plant was working for only a short period and it stopped in 1902. The greatest part of rolling mill equipment was moved to Ózd. To harness human and material resources thus freed new production systems were adopted: manufacture of cold-rolled band-steel and hot-processed metalware (cart axletree, various hand tools for agriculture and industry, like shovel, pitchfork, hammer, plough etc). were introduced. Beyond these, galvanized and barbed wire production was also started, which was followed by springs, stranded wire, nails and the factory gradually turned into a metalware-producing firm. Steel needed for the metalware section was supplied by a smaller open-hearth furnace.

The Miskolc Wire Works, the present December 4 Wire Works was founded after World War I partly to reprocess the products of the Ózd rod rolling mill. Among products of the factory those better known are: the stranded wire used in mining, and a great variety of metalware e.g. fencing wire net, cables etc.

Before World War II iron ore needs of the OMP were supplied mostly by Swedish, and in part by Slovakian and Rudabánya ores. The state of coke supply is similar to that of the LMW. After the turn of the century

smaller thermal power stations were installed at Ózd, Miskolc and Salgótarján that provided electricity for the electric motors gradually substituting steam driving.

3. The third, lesser metallurgic centre was set up at the southern boundaries of the capital in 1911. Three small-output open hearth steel furnaces were built in the Weiss Manfred Plant, primarily for manufacturing military hardware. Electric steel furnaces were also installed during World War I. These were completed by the rolling mills and the iron and steel foundry, the large forging section and the stamping factory. Besides the Miskolc metallurgic works the second larger alloy steel manufacturing site has grown up at Csepel, based on an electric steel mill. After World War I the varied profile complex was switched over to manufacturing consumer metalware and production equipment, and in 1920 the construction of a single tube-works began within the new boundaries. Later on a machine-tool factory and a bicycle factory made metallurgic production complete.

In addition to black metallurgy Csepel has traditionally had small-scale copper electrolysis and copper rolling. A small aluminium electrolysis plant with a yearly capacity of a few thousand tons was working between 1936 – 1944, but was destroyed in the bombings. The iron, steel and other non-ferrous scrap metal waste of the capital plays an important role in the raw material supply of Budapest metallurgy. A strong demand of the capital's manufacturing industry for high-quality steel is also an important factor in the location of this metallurgic complex. The reason for the expansion in the 1920s of the machine industry may be found, first of all in the transition of the political-geographical environment. The tense political atmosphere among the successor states of the Austro – Hungarian Monarchy did not have a favourable effect on the international division of labour. Consequently all states strived for a selfcontained manufacturing industry. The continuance of raw material shipments (e.g. Slovakian iron ore) was due to the mutual recognition of Hungary and Czechoslovakia of the proprietary rights of the capitalist industrial and mining enterprises' affiliated firms, sections etc. beyond state boundaries.

Pre-war plants, mentioned above, of the Hungarian iron industry were completed by a ferro-alloy factory in Zagyvaróna (part of present Salgótarján), completed in 1939, where mostly alloys like FeSi, and then FeW, FeV, FeMo etc. are smelted. Si is obtained from domestic mines, while other alloyingmaterials are imported. Before World War II Hungarian iron industry had very modest production figures. Production of steel in 1942 was 0.784m tons, that of crude iron and rolled articles stood at 0,448m and 0.376m tons respectively in 1941. Some 20 – 25 per cent of rolled steel article output went regularly for export... The low standard of internal consumption, too, was reflected in these, something that may primarily be explained by the backwardness of the machine industry.

At the same time there were shortages in several iron products – e.g. in sheet metal. Therefore the necessity for building a fullcycle metallurgic works arose well at the beginning of the 1930s, what in that political

state the capitalist government wanted to base primarily on Yugoslavian iron ore and partly on the metallurgic coal around the town of Pécs.

The site planned in the south of Hungary, around the town of Mohács. This question was put off by World War II. Apart from some small investments no expansion was made during the war.

## II. Developments between 1945–1975

What may be seen from the short historic outline is that the producing units of the Hungarian iron industry in the mid-1940s were technically obsolete plants, mostly with 40–60 years of work behind them. In addition to this, there were large unequalities between the different production phases. Because of the awareness of capitalist market instabilities production capacities of finishing rolls trains well exceeded those of blooming mills. Output capacity of rolling mills was even above steel production capacities. Amid such conditions did the momentous development of black metallurgy begin in Hungary, that had just taken the socialist road of development. Reconstruction in the second half of the 1940s increased the demand for steel, whose satisfaction was temporarily facilitated by the processing of scrap metal stockpiled during the war. In Ózd and Miskolc capacities of old furnaces were increased for the expanded steel production. Earlier chiefly the blast furnaces at Ózd provided the crude iron supply of steel mills, 60 kms apart from each other, at Ózd and Miskolc. Increased steel production at Ózd, however, absorbed the output of the four blast furnaces. To put an end to the resulting crude iron shortage, it then became necessary to build blast furnace No 3 at Miskolc with a capacity of 760 cu metres (1952). This was preceded by the installation of two small-capacity iron ore concentrating plants: one at Miskolc, the other at Ózd. With the completion of the new blast furnace at Miskolc there was a temporary crude iron surplus, which was used to meet the crude iron demand of the Csepel Steel Works (the former Weiss Manfred Plant on the southern outskirts of Budapest).

At the same time the manufacturing range of the rolling mill was revised; among the changes the relocation of the Miskolc roughing mill to Budapest was of greater significance (1950). The railway points manufacturing plant was moved to Gyöngyös. The sheet rolling mill in the new site at Budapest has increased its output several times.

Beyond achieving a balance in crude iron and steel output and the revision of manufacturing range the completion of the new pipe factories at Csepel (1949 and 1952) and of the intermediate rolls train at Miskolc (1955) formed the third important event in the industry. With the installation of the two large-capacity rolling mills just mentioned the difference between the productive capacities of the blooming rolls trains and of the finishing rolls trains rose to some 400 000 tons. This prompted a highly active international cooperation in rolled articles, whose chief part was the importing, mainly from Czechoslovakia, of blooms suitable for further rolling. As one may see it, the spatial pattern of iron industry did not

change during the first years of post-war reconstruction. Production of metallurgic primary material remained concentrated in the two large works of northeastern Hungary, only a few reprocessing plants were relocated from the region. Raw material supply, however, has been altered altogether. The share of Rudabánya iron ore at this time already fell to a value around 10 per cent. Since the beginning of the 1950s the bulk of imported iron ore – ever increasing in quantity and share – has been coming from the Krivoy Rog iron mines of the Soviet Union. The importing of Slovakian iron ore was stopped because of the growing demands of the iron industry there. Poland's role in the supply of blast furnace coke has increased, and the Soviet Union has emerged as a major supplier. On the whole we may state that in line with post-war production expansion northern Hungarian iron industry has increasingly lost contact with nearby raw material bases. Growing distances in rail transport are an absolute location disadvantage. The fact, however, that this region of Hungary is situated closest to the Soviet Union, provides a relative location advantage for the two metallurgic plants of the Sajó Valley, stemming from the short supply route (inside Hungary) of iron ore and blast furnace coke.

Soon, however, limits of quantitative growth, set by site location, were shown up in force. Expansion of the plant buildings of the LMW is restricted by the narrow Szinva Valley. Even graver problems are posed by the supply of industrial water. Following the drainage of the Garadna and Szinva streams, as well as the karst water of the Bükk Hills, construction of a surface intake works on the River Sajó became necessary. However, these measures were insufficient to solve the water supply, and the introduction of water recycling was inevitable.

Expansion of iron industry at Ózd and Miskolc was coupled by a rapid increase in the number of those employed. This resulted in the swift growth in the population of the two towns – especially of Miskolc, with their subsequent reconstruction development. To improve the supply of technical experts the Heavy Industrial University was founded at Miskolc. The improvement of the road network and the setting up of a good system of bus lines enabled largescale commuting from nearby settlements, which is second in size in the country after the Budapest agglomeration.

With the expansion of production an ever increasing traffic in materials has developed between the metallurgic plants of northern Hungary and Budapest where the metal processing and the machine industry of this country is concentrated. This traffic in materials on the one hand, and mass imports from the Soviet Union, made the Miskolc – Budapest rail line one of the most heavily frequented transport line in Hungary. This is the reason why the Budapest – Miskolc double-track line was electrified first in the railway electrification programme, that started in the early 1960s.

Steel and rolling production capacity expansions mentioned so far met only partly the ever increasing steel demand. A general shortage of

steel and assortment shortage in rolled articles appeared in the first half of the 1950s. Within the latter the shortage of sheet was especially grave, because steel-sheet rolling mills working at Ózd, Borsodnádasd and Budapest could only satisfy a small part of the growing demand of the machine industry. The shortage in thin sheet varieties was especially serious. It was in this situation that the building of a new, full-cycle iron works was decided. The site was chosen to be on the right bank of the Danube, 70 kms south of Budapest. The function of the works is to produce steel sheets (hot and cold rolling) exclusively. An entirely new town was built on the site: today's Dunaújváros. Raw material supply of the new plant was provided by water-transported Soviet iron ore, by black coal from around the town of Pécs and by Czechoslovakian, Polish, and Soviet black coal and coke – with all the latter shipped by rail. The Danube also provides abundant industrial water. The necessary slag-forming limestone is brought from quarries near the village of Polgárdi, some 50 kms away.

It was in 1954 that the first discharge of crude iron was seen from blast furnace No 1. of the DIW, and it was soon followed by the installation of the first open-hearth furnace (1954). From this time on crude iron supply of the Csepel steel mill has been coming from the DIW.

In the second half of the 1950s blast furnace No 2. was completed, as was the construction of the SM-factory with a total of 4 furnaces of 150 tons capacity each, that were later rebuilt for a capacity of 180 tons each. The hot-rolling mill and the Iron Ore Concentrating Plant of the DIW were also installed.

Now all three full-cycle iron works had their own ore dressing plants. Both in the OMP and in the LMW onesmall iron concentrating plant each was installed following World War II, because Soviet ore was taking an ever larger share of the ore supply of the blast furnaces. The Krivoy Rog ores with their loose (powdery) structures are in need of concentration.

Important changes in furnace technology have also taken place during the second half of the 1950s. At Ózd and Miskolc heating in steel production was shifted from lignite-generated producer gas to oil. The LMW was first to introduce in 1959 natural gas blow-in iron smelting, and the injection of liquide hydrocarbons was also started at this time in all the three plants. This resulted in significant coke-saving.

Hungarian blast-furnace coke production first started at Dunaújváros in 1956, and the second line of coking chambers was installed in 1958. This raised domestic blast furnace coke production to 650 000 tons, that satisfied about half of the demand of the time. The coking factory used black coal from Pécs, but owing to its 13 – 14 per cent high ash content, it was always mixed with imported low-ash coal to improve quality. Produced chamber gas is processed in the neighbouring chemical plant section, while the dry gas (about 300 m cu. metres per year) contributes to the communal supply of Dunaújváros, besides meeting plant needs, and some of it even reaches Budapest through pipeline.

Steel manufacturing equipment of the OMP was modernized between 1961 – 1965. One reason why this became necessary was that the equipment of the steel mill have completely worn out and were dangerous to life. The entire steel mill was dismantled and 8 März-type, natural gas-heated open-hearth furnaces were installed, capable for a charge of 110 tons each, that replaced the twelve earlier SM furnaces with their 40 – 50 ton capacities. An oxygen factory was built in the mid-1970s, and the blowing in of oxygen was introduced to intensify steel production.

The most important development in the LMW at this stage was the construction of a new, Soviet-made blooming mill, with a capacity of 1 million tons, to replace the old one. This eliminated in this plant the difference in the producing capacities of the rolling mills giving out the final product and of the blooming mill, and even an extra capacity of a few thousand tons has emerged, enabling rolling on order.

1965 saw a great event in Hungarian iron industry: the cold rolling mill of the DIW was installed, making the production cycle of the plant complete. Moreover, the steel works has shifted to natural gas firing, and input charges for SM furnaces were increased, too. The construction of the new Borsod Iron Ore Concentrating Plant near Miskolc, between the two large plants was started to satisfy the demands of the close-lying OMP and the LMW with good quality concentrated iron ore, and it was to replace the two small, uneconomical plants.

Among investments of national importance during the years between 1966 – 1970 the installation of a new, 50ton electric steel furnace in the LMW may be included, that had been made in the Krasnoyarsk Heavy Machine Factory. In the 10 years following the production start of the blast furnaces in the DIW there was a surplus of crude iron, and for that reason left-over open-hearth pig was exported (there was a partial possibility to produce a yearly quota of 80 – 100 000 tons of foundry grey pig iron). With increasing steel demand the steel mill of the DIW gradually shifted to the oxygen blow-in technology, to intensify the output of the steel-producing furnaces. All this was made possible by the oxygen plant completed in the mid-1960s.

With that the former disproportionate capacities of crude iron and steel production, including the demands of Csepel, have now approximately regained their balance. The modernization of the cold band-rolling mill of the SSPP, with the installation of new roll stands and annealing furnaces is also worth mentioning in this period.

An outcome of the modernization in steel production described above was that the output of crude iron and steel producing installations now resulted in the disappearance of the earlier surplus production capacities of the finishing rolls trains, and steel production could even be stepped up by the intensification.

Four new profile rolling mills were constructed between 1971 – 1975. For specification they are: the high-alloy, intermediate, and thin rolling mills of the LMW, the rod and wire rolling mill of the OMP, and finally the wire rolls train of the Csepel Iron and Metal Works. Development was

also started on expanding the capacity of the 1700 mm semi-continuous hot-rolling mill of the DIW. These developments represented a total of 1.2 million tons of new rolling capacity in the given period. At the same time some 200 000 tons of obsolete rolling capacity was closed. They were the old high-alloy rough, intermediate and thin rolls trains of the LMW, with the rod and thin rolling trains of the Csepel Steel Works. Thus net growth of rolling capacity expansion was 1 million tons. The new production capacities modified the structure of Hungarian rolled steel production towards reinforcing steel, rolled wire and sheet products, in line with the demands of construction and machine industries. This was also contributed to by the output increase in the rolling mill of the DIW at Pestlőrinc. This is explained by the fact that the Budapest-located Pestlőrinc Rolling Mill meanwhile became a section of the DIW, and presently has a yearly output of 200 000 tons of rough and intermediate rolls sheet product. Apart from rolling mill developments, and with the purpose of adaptation to the new economic demands (increased hydrocarbon shipments and consumption), a pipe-factory manufacturing spiral-welded, largediameter (800 – 1000 mm) pipes was completed in the second half of the 1960s, that was increasing its production output rapidly in the 1st half of the 1970s.

It may be seen from those described above, that a significant difference in production capacity has emerged between the finishing rolls trains and the blooming mills at Ózd and Dunaújváros, and much cheaper and up-to-date continuous casting units are being built for the reduction of this difference. In the DIW two, vertically arranged units for casting rectangular blocks were installed, while in the OMP six radial units were put into service. These equipment have also contributed to the increased productivity of the rolling mills, and to the improvement of the economic efficiency of the companies concerned.

## III. Development of the Iron Industry between 1975 – 1980.

At the beginning of the 1970s Hungarian iron industry got into a state that it was unable to increase the capacity of its working producing sections without large-scale modernization of the installation of new manufacturing units. Output of most units well exceeded originally planned nominal production capacities. With some metallurgic phases (like iron works and steel mills) the possibility still existed to raise the level of production e.g. by increased capacities of blast furnaces, oxygen intensification of steel mills and by other small-scale complementary developments. In the case of rolling mills this solution could not be applied. Holding in view of meeting the progressively increasing home demand and because of the need to replace existing equipment operating at extremely low technical levels the most important aims of development policy of the 5th five-year plan were directed at the rapid production increase of the rolling mills. The above-mentioned rolls trains producing rod section articles and continuous casting units were installed within this programme.

70 per cent of the 12 thousand million Ft materialized investments in metallurgy between 1971–1975, nearly 8.5 thosand million Ft were devoted to the development of rolling mills and continuous casting units.

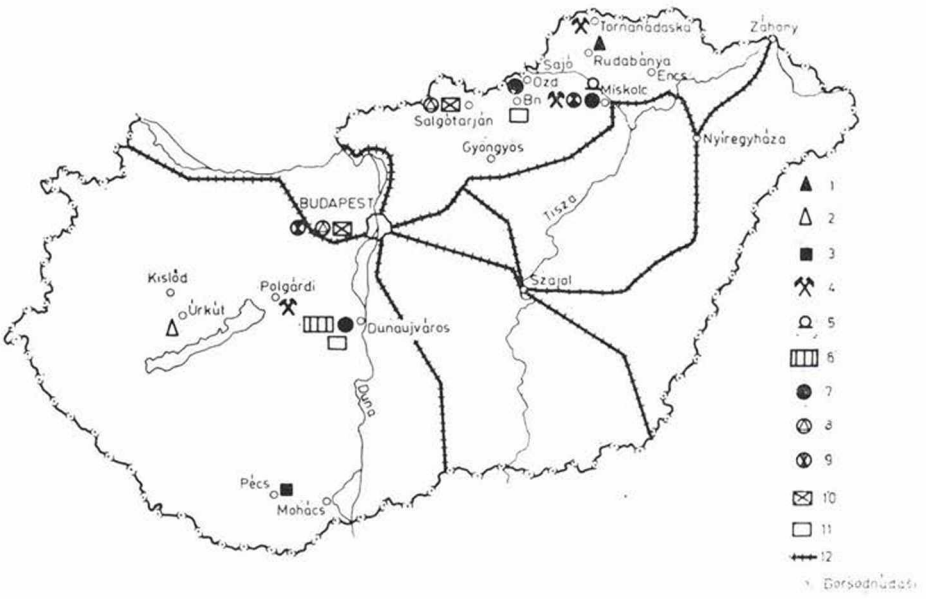


*Fig. 1.* The iron and steel industry of Hungary

1. iron mine; 2. manganese mine; 3. metallurgical coal mining; 4. limestone quarry; 5. iron ore agglomerating plant; 6. production of coking coal; 7. full-cycle iron and steel works; 8. production of steel; 9. production of electric steel; 10. steel rolling mill; 11. steel sheet rolling mill; 12. electrified railway trunk line.

It has to be noted that to meet home demands in rolled articles the import of these products had to be stepped up. Import of finished rolled articles on long-term contract from the Soviel Union has reached 650 000 tons by 1975. At the same time a 50 000 ton import from Czechoslovakia of chiefly reprocessed secondary and tertiary articles became necessary.

A significant amount of import came from capitalist markets (120 thousand tons per year). From domestic production and increased imports from socialist countries, some export to western markets became available, due to the desired exchange of assortments. During the fourth five-year plan with commitment to rolling mill development the possibility of an intensive growth in the capacities of metallurgic phases (crude iron and steel production) was missing. The result of this was an emerging tension between the producing capacities of steel and rolling mills towards the end of the fourth five-year plan.

Steel needed for manufacture – in the form of intermediate products – were imported through various combined operations from both socialist and capitalist countries, first of all from the Soviet Union and Yugoslavia, and even today a significant amount of external steel supply is needed for the individual factories. A few figures given below demonstrate the state of Hungarian steel supply:

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 |
|---|---|---|---|---|---|---|
| Processed steel | 4100 | 4200 | 4400 | 4557 | 4635 | 4700 |
| Hung. steel production | 3673 | 3652 | 3722 | 3877 | 3910 | 4020 |
| Missing steel | 427 | 548 | 678 | 680 | 725 | 680 |
| Share of the individual iron works in the imported steel: | | | | | | |
| Danube Iron Works | 257 | 320 | 370 | 370 | 386 | 385 |
| Csepel Iron and Metal Works | 50 | 90 | 125 | 120 | 160 | 160 |
| Lenin Metallurgic Works | 65 | 83 | 120 | 125 | 144 | 100 |
| Borsodnádasd Sheet Iron Plant | 25 | 25 | 33 | 35 | 35 | 35 |
| Salgótarján Metallurgic Plants | 30 | 30 | 30 | 30 | – | – |
| Total | 427 | 548 | 678 | 680 | 725 | 680 |

Import of various intermediate products (blooms and hot-rolled sheet rolls) were reduced to steel in the tables.

Supply is worst with the rolling mills of the Danube Iron Works, the Csepel Iron and Metal Works and the Lenin Metallurgic Works. Steel supply of the Ózd Metallurgic Plants is well satisfied by the extra 300 000 tons obtained as a result of the steel works intensification carried out in 1976–1977; the factory even has some surplus steel which is sent in cooperation to other Hungarian plants.

Besides imports the cooperation between Hungarian firms in steel and rolled steel intermediate products has an important role in the steel supply of metallurgic companies. Its final extent can only be seen clearly during the preparations of the yearly plans, and it depends on external purchase possibilities. The cooperation consists of 80–100 items in a year, whose tabular demonstration would pose some difficulty, so description here is restricted to major shipments.

All firms take part in the domestic cooperation regardless of having a shortage or a surplus of steel. The cooperated sale of steel may be carried out in the form of ingots, blooms, hot-rolled sheet rolls and even in finished products.

*Major shipments between the individual plants in 1979–1980*

The *Danube Iron Works* has two hot-rolls trains (one of them at Dunaújváros, and the other at Budapest). There is no steel production in the section at Budapest: in the Pestlőrinc Rolling Mills of the DIW.

Ingots and continuously cast flat billets for the yearly production of 200 000 tons of wide thick sheet are brought here in part from the Soviet Union (75 000 tons), partly from Yugoslavia (120 000 tons) and to a lesser extent from Romania (30 000 tons). All steel produced in the Danube Iron Works (1 200 000 tons) is processed at Dunaújváros. Of the present yearly sheet production of 1 280 000 tons in the Danube Iron Works, 20 000 tons of hot rolled split sheet rolls are shipped to the Borsodnádasd Sheet Iron Plant, 30 000 tons to the Salgótarján Metallurgic Plants, while 55 – 60 000 tons go to the Csepel Iron and Steel Works.

*Lenin Metallurgic Works.* Raw steel produced by the firm amounts to 1 million tons per year. Total amount of steel to be processed within the complex (rolled articles, forged products and cast steel) is 1 250 000 thousand tons. The major part of the missing 250 000 tons is purchased from the Soviet Union and Romania (130 – 140 000 tons). The 110 – 120 000 tons still missing is transported to the LMW from the Ózd Metallurgic Plants.

The function of this firm is to supply Hungarian forgeries, working outside of metallurgic complexes, with alloyed and unalloyed blooms. A yearly amount of 65 – 70 000 tons of intermediate steel product is produced here for this purpose.

*Ózd Metallurgic Plants.* Concerning steel supply this firm is in the most favourable situation. Its yearly steel output is 1 400 000 tons. Internal consumption amounts to 1 200 000 tons (it only manufactures rolled rod and sectional articles). Its steel surplus of 200 000 tons is given over to other Hungarian plants. Its chief customer is the LMW, where 110 – 120 thousand tons of ingots and rolled or continuously cast blooms are shipped in a year. It provides the Csepel Steel Mill with 40 – 50 000 tons of rolled blooms, while the Borsodnádasd Sheet Plant receives a yearly supply of 20 – 25 000 tons of flat steel from here. The OMP has important long-term commitments in other finished goods, too (different rolled wires). This firm supplies the Salgótarján Metallurgic Plants and the December 4 Wire Works the lion's share of required rolled wire – the basic material of drawn wire production. The OMP's yearly output of rolled wire is 370 000 tons. Out of this it sends 135 thousand tons to the SMP, 60 thousand tons to the December 4 Wire Works and about three thousand tons to the Csepel Electrode Plant Section (part of the Csepel Iron and Steel Works). Cooperation commitments of the firm increase as a function of the growth in rolled wire production.

*Borsodnádasd Sheet Iron Plant*

Yearly electric steel output stands at 10 thousand tons. From this amount it processes 7 thousand tons in its own steel foundry, while 3 thousand is sent to the OMP in small ingots. The 90 000 tons of flat steel needed for the yearly sheet output of 80 000 tons 30 thousand is provided by Soviet clearing shipments, while 35 thousand is bought from the OMP and 30 thousand from the DIW.

Sheet manufacture in the firm is to stop in the first years of the sixth five-year plan, and an iron foundry with a yearly production capacity of 25 thousand tons will be established on the area thus freed.

*Csepel Iron and Steel Works*

In steel supply this firm has the greatest difficulties. Yearly steel output stands at 230 thousand tons. Total required steel for the various local metallurgic sections, however, (steel foundry, forgeries, wire rolling mill, cold band mill), weldless and longitudinally welded pipe manufacture) reaches 530 thousand tons. The missing 300 thousand tons are brought in from various sources. 160 thousand tons are bought by clearing and other steel-buying operations, while 140 thousand tons are purchased domestically.

The major suppliers are the following:

| | |
|---|---|
| – Rolled blooms from OMP | 40 000 tons |
| – Rolled rods from LMW | 10 000 tons |
| – Rolled rods from OMP | 10 000 tons |
| – Split band from DIW | 50 000 tons |
| Total | 110 000 tons |

This amounts to 140 000 tons after reducing it to steel.

*Major development targets in the fifth five-year plan of the iron industry*

To create capacity uniformity in the above-mentioned technological phases of metallurgy and processing the main task in the present plan period is the development of crude iron and steel production. This purpose is also being served by the government decrees announced during the past years.

- 1975: Decision of the Council of Ministers to intensify the SM steel mills of the OMP.
- 1977: Decision of the Council of Ministers to build a combined steel mill in the LMW with a producing capacity of 1.0 m tons/year and to dismantle the obsolete SM steel mills.
- 1977: Decision of the Council of Ministers to construct an oxygen converter steel mill in the Danube Iron Works with a producing capacity of 1.2 m tons.

Of the three steel mill investments the expansion of the SM section of the OMP has been completed. The new steel production bases of the DIW and the LMW are under construction. Through developments 2.5m tons of new steel output capacity per year will be installed. In line with expanded production the SM steel mill of the LMW with a yearly output capacity of 800 000 tons will be taken out of production, and output of the existing SM steel mill of the DIW will be reduced to one half. Production increase will thus be only 1.0 million tons per year. In 1981 – 1982

steel output capacity in Hungary will reach 4.7 – 4.8 m tons a year, and harmony will again be achieved between phases of steel production and processing.

During the years of the fifth five-year plan, parallel to the mentioned developments in the steel mills, important furnace modernizations have been and are being carried out.

- The two, 760 cu metres capacity blast furnaces have been expanded to 960 cu metres.
- Blast furnaces of the OMP were rebuilt during the reconstructions to capacities of 600 and 500 cu metres.
- The furnace in the LMW with 760 cu metres capacity is to be increased to 960 cu metres. A new, modern blast furnace of 600 cu metres capacity will replace, in the sixth five-year plan, the two small furnaces, each with a capacity of 320 cu metres, although it may turn out that the construction of the new blast furnace will be postponed due to financial difficulties.

With the reconstruction of the blast furnace complexes crude iron output capacity will reach 2.8 – 2.9 m tons per year. Following capacity expansions, a number of technical development measures are taken, too. (Introduction of high throat pressure, increase of blast air temperature, intensification of hydrocarbon burning, replacement of blowers).

Thanks to these development measures, and through this surplus output of crude iron, harmony was also achieved between the output of the blast furnaces and the input of the steel works.

Beyond metallurgic developments, the increase in the production of secondary and tertiary products, that improve the product structure of the sub-branch is primarily worth mentioning in the fifth five-year plan.

The most important among these are the following:

- A new, precision, thin-wall tube welding section has been installed in the Salgótarján Metallurgic Plants. Production of welding wires with $CO_2$ protecting atmosphere and of arc-welding rods with powder lining was introduced. To improve interplant transport a workshop producing new-type roller conveyor tracks is being constructed.
- Production of highly reinforced steel wire for construction was expanded in the December 4 Wire Works. The introduction of stranded wire for concrete reinforcement meant an entirely new product on the domestic market. Output capacity of stranded wire and welded steel net production has also increased.
- New production lines for the production of open and closed profiles was put into operation.
- As new producing sections were put into operation at the DIW and at the Metallurgic Construction Engineering Company, there came a significant step forward in the field of the production of light steel structures.

During the years of the fifth five-year plan investments valued at some 26 – 27 thousand million Ft are realized. Of this the share of metallurgic investments runs to just 16 thousand million Ft. Five thousand million Ft are spent for replacement and for holding the industry at level. Some 4 thousand million Ft are earmarked for production development of secondary and tertiary products, while other non-producing developments get 1.5 – 2.0 thousand million Ft.

## IV. A short introduction of the iron industry's 6th five-year plan

Constructions that were started in the years of the fifth fiveyear plan will not be finished by the end of the plan period. A significant amount of uncompleted fixed asset stock has its completion date put in the years 1981 – 1985. The value of deferred completions is put at 22 – 23 thousand million Ft. This fact, now certain to happen, will have a limiting effect on the priorities and dimensions of new projects that must be started in the sixth five-year plan. Like in the fifth five-year plan, development of metallurgic phases and connected ancillary shops is a determinant trend in the next plan period. The most important task is the early completion of the above-mentioned two modern steel mills of the Danube Iron Works and the Lenin Metallurgic Works, and through these the expansion of steel production.

The production of steel requires extra crude iron and steel scrap. Furnaces are available in sufficient capacity for the expansion of crude iron production. There are difficulties, however, in the supply of burden and coke for the blast furnaces. Under favourable conditions total ore concentrate output of the Danube Iron Works and the Borsod Ore Concentrating Works will have reached a capacity level of 4.7 m tons by 1980. The output of these two plants can not be increased further, and even a gradual drop is foreseen in the production of the DIW, with eventual closure around 1985. 5.4 m tons of good quality ore is needed for the necessary 2.8 m tons of crude iron output in 1985 – richer in Fe and lower in dust than at present.

Similar difficulties arise in the supply of blast furnace coke. Domestic total output of coke will not exceed 900 000 tons in 1980. Under bilateral agreements an additional 1 230 000 tons of imported coke from socialist countries can be reckoned with. The existing coking plant of the DIW is capable of producing 760 000 tons annually. The coking blocks are in rather worn-out state. They should be reconstructed or replaced. Their reconstruction would involve a significant production shortfall and considerable investment means. Production could not be increased even after the reconstruction. The closure of the Budapest Gas Factory and the termination of byproduced household coke (with a subsequent shortfall of 190 000 tons) must also to be reckoned with in the near future. The safe supply of concentrate and coke for the iron and steel works are aimed at by government decrees, that call for the installation

– of a new concentrating plant with a yearly capacity of 2.0 m tons, and
– of a 1.0 – 1.3 m ton capacity coking plant

in the Danube Iron Works in the 6th five-year plan. Technological hardware of both plants will be shipped by the Soviet Union; the agreement between the two countries were signed recently.

These two large investments will cost 16 thousand million Ft. Technical preparatory works are now under way. The shipment of equipment will already start this year.

Large-scale reconstruction of the Borsod Ore Concentrating Works will also start in the 6th five-year plan. Coal demand of the new coking works, with its output of 1.0 tons per year, will be met by two supply sources. 670 000 tons of coal concentrate will come from the coal mines of Pécs and the Mecsek Hills, while 800 000 tons of it will be imported from the Soviet Union and Czechoslovakia. Expansion of Hungarian coal mines for the 1.3 m tons yearly coke production is under way, and import shipments are also agreed on. Another important charge component of steel production is steel scrap. Changes taking place in the technology of steel production (increasing share of electric and converter steel production, while that of SM steel keeps declining) present a tension in the supply of steel scrap. Encouragement of collecting domestic steel scrap and an early increase in scrap-metal processing capacities (cutting, faggot-compression, grinding) will be important tasks to be carried out. Expansion of refractory matter and alloying material production will also serve the development of the ancillary plants of this sub-branch.

To replace the extremely worn-out, scattered refractory matter plants, that were also harmful to health, and to meet rapidly growing demands, a modern, 170 000 tons per year capacity factory of aluminium silicate products was erected near Encs, in Borsod-Abaúj-Zemplén country in the sixth five-year plan. In line with the expanding production, the refractory matter plants of the LMW and the Ózd Metallurgic Plants, as well as the Budapest fire-clay section of the Magnesite Works will terminate their production. This will make possible a reduction in the environmental pollution of Budapest and the two metallurgic towns of Borsod-Abaúj-Zemplén. This is all the more urgent, because the Budapest fireclay factory is being surrounded by apartment blocks of the expanding city. Labour force thus being relieved will find employment in the plants of the three industrial cities and towns, already burdened with a severe shortage of labour, and turn out higher product values. The new plant will be operational in 1984; needed development costs run to nearly 5 thousand million Ft. Some 200 000 tons of raw material is needed for the yearly 170 thousand tons of final products. 50 per cent of it is imported (from Czechoslovakia and the Soviet Union), the other 50 per cent is domestically supplied) refractory clay mined at Felsőpetény, sand from Kisőrs, silicol from Sárisáp etc.). Of alloying materials the supply of FeMn is not solved. 22 thousand tons out of the present requirement (45 000 tons) is shipped by the Soviet

Union, while 23 thousand is imported from the West. Manganese ore, now being mined, is stockpiled, in the absence of domestic processing. Early construction of an FeMn factory is therefore an urgent task. Several variants have been discussed for the location of the new plant. The area of Kislőd, in Veszprém county, has lots of advantages in its favour. 44 per cent of the raw material supply (160 thousand tons of crude ore per year) would come as domestically mined ore, 6% from the Soviet Union (Nikopol), and 50% from Africa (Gabon). Of the combined amount of Hungarian FeMn production (66 thousand tons) and Soviet clearing imports (22 thousand tons) some 35 – 40 thousand tons of FeMn would be available for western markets, besides domestic consumption.

Beyond development of base and auxiliary material production and of metallurgic phases, further efforts are needed in the field of processing and of secondary and tertiary article production. Complete modernization of the Csepel Pipe Factory marks the start of a large-scale development programme. Equipment still working today are so worn-out, that their total replacement has become an urgent necessity. Construction of the new pipe factory is scheduled to start in the middle of the 6th five-year plan, on the southern premises of the Csepel Iron and Steel Works. Yearly capacity of this works is 200 000 tons. Of the old producing equipment the Large Pilger Rolling Mill will be reconstructed. Following the completion of these developments (around 1988) weldless steel pipe output will reach 255 – 260 thousand tons. A modern electric steel works will be located immediately next to the new pipe factory, with a yearly capacity of 365 000 tons, primarily for the purpose of base material supply for the pipe factory. The possible location of the Pipe Factory to Ózd is also being investigated. Planned costs for these two large installations will run to 17 – 18 thousand million Ft.

During the next plan period, among metallurgic plants in Borsod-Abaúj-Zemplén county a major development is taking shape in the

*Lenin Metallurgic Works.* Renewal of the obsolete and worn-out equipment will be the most urgent task. Among them:

- reconstruction of the big forging section
- reconstruction of the high-alloy steel forging section
- development of the iron foundry and the steel foundry
- modernization of the hot screw section and
- development of the drawing- tempering section.

In the Borsodnádasd Sheet Iron Plant work will start on a modern, 25 thousand ton/year capacity globular and flake graphite foundry. The target set for the Salgótarján Metallurgic Plants and for the December 4 Wire Works is the dynamic development of the production of secondary and tertiary products that are instrumental in altering the product structure of the sub-branch. These investments are smaller in size, considering their expenses, but articles produced here are higher in value and carry great weight in meeeting national economic demands.

Among the important developments a few are listed below:

*Salgótarján Metallurgic Plants*

- production development of wires for construction industry;
- expansion of welding wire production;
- reconstruction of nail production;
- production increase of drawn steel bars;
- introduction of the production of heavy store-room frames;
- modernization of galvanized wire production;
- other smaller plant reconstructions.

Planned expenditure forecast of the above-listed developments run to 1.2 – 1.3 000 million Ft.

*December 4 Wire Works*

- development of production of welded concrete reinforcing steel net;
- development of stranded wire production;
- expansion of high-tensile wire production;
- introduction of "Cord" wire production for the rubber industry (for car tyres).

Cost demands of these developments between 1981 – 1985 are close to 3 thousand million Ft.

In the *Ózd Metallurgic Plants* technological preparatory works for three great development projects are under way:

- installation of continuous casting unit No 2.;
- separation of the rod and wire rolling mill into two parts (rod and wire rolls trains);
- introduction of secondary and tertiary article production.

Yearly capacity of the continuous casting unit No 2 is 350 thousand tons; needed investment runs to 1 000 million Ft.

With the separation of the rod and wire rolls trains output of rolled steel articles is raised by 300 thousand tons. At the same time the old roughing section rolls train (supportin train) will be taken out of service. Calculated development costs run close to 3 thousand million Ft.

In the plants producing secondary and tertiary articles production of welded nets, reflattened reinforcing steel and pre-bent reinforcing steel is going to be introduced. Yearly capacity of this section stands at 150 thousand tons. Required cost is foreseen at 1.2 thousand million Ft.

New investments to be continued and started in the years of the 6th five-year plan would require a development cost of 45 000 million Ft. Obviously not all of these investments will be completed by 1985 but, like in the 5th five-year plan, a good many of them will be deferred to the years of the 7th five-year plan.

## V. Development plans envisaged for the 7th five-year plan

The value of deferred investments from the 6th five-year plan is nearly equal to the uncompleted investment value deferred from the 5th to the 6th five year plan (23 thousand million Ft). Their early completion is a prime target. Development policy objectives of the 7th five-year plan were set at the approval of "The long-term development plan of the iron industry until 1990" on 15 February, 1978.

This plan puts the yearly level of Hungarian steel production at 5 m tons, while that of rolled steel output at 3.9 m tons in 1990. Development policy objectives of the sub-branch in the 6th and 7th five-year plans are actually adjusted to this plan. Except for some small deferments the setting up of metallurgic phases will have been completed by 1985. Production capacity of blast furnaces will come close to 3 m tons, that of steel production to 5 m tons, while handling capacity of rolling mills will approach 4 m tons by 1990. The second large development stage in iron industry, that started in 1975, will be completed by 1990. Although steel production and processing will not be on the same level, the output of steel and rolled articles will certainly meet domestic demands by 1995, and beyond that it will provide for the national economy a significant amount of commodity supply for western exports.

Total amount of steel to be processed in this country at the end of the seventh five-year plan will rise to 5.5 m tons. At the same time the output of crude iron can not exceed 4.9 – 5.0 million tons. Missing steel is put at 550 – 650 thousand tons.

Two opinions have emerged in advising to meet steel demands after 1985:

*a)* Full-cycle, self-sufficient development of iron industry;
*b)* Steel production stays level for a long time at 5 m tons, and any further required steel will be obtained through imports of intermediate and finished articles.

Long debates have been held on the economy, advantages and disadvantages of both possibilities. Extension of socialist economic integration in the field of iron industry can not be neglected either. Participation in this large common programme is in the economic interest of this nation. In the case of self-sufficient development of Hungarian iron industry participation in ore integration is the course to follow. Its precondition for Hungary – and for other socialist countries – is to take part in the establishment of large-capacity iron mines, concentrating plants or pelleting works in the Soviet Union. Beyond the presently available supply of 2.5 m tons of Fe or 4.67 m tons of crude ore, and in exchange for the contribution in the investment an additional 500 – 600 thousand tons of Fe supply will be secured, depending on the extent of the contribution. With this choice accepted, a new blast furnace in the Danube Iron Works would have to be constructed, and expansion of the sintering works and of coke production would become necessary.

With the acceptance of the bloom integration alternative, we will have to participate – again through investment contribution – in the construction of a large iron and steel complex to be set up in the vicinity of Kursk in the Soviet Union. Following the completion of the giant plant, which is expected between 1990–1995, there will be the possibility for the long-term purchase of 500–600 thousand tons of continuously cast flat billets each year. Final stand has not yet been agreed on concerning the most expedient supply of these two articles, a base material, and an intermediate steel product.

Deferred major investments from the 6th five-year plan should be considered with special attention. They are:

- modernization of the Csepel Pipe Factory;
- the Csepel Electric Steel Mill;
- development of the rolling mill of the Ózd Metallurgic Plants;
- continuous casting unit No 2 of the Ózd Metallurgic Plants;
- reconstruction of the large and the high-alloy forging shops of the LMW;
- development of the Borsod Ore Concentrating Works.

These large installations will be completed by the middle of the 7th five-year plan.

During the years of the 7th five-year plan the most important task will be the production and reprocessing of sheet articles. This objective is served, among others, by the following new investments planned to start at this time in the *Danube Iron Works:*

- installation of continuous casting unit No 3;
- continued reconstruction of the hot rolling mill;
- modernization of the cold band rolling mill.

Through these developments processing capacity of the Danube Iron Works will reach 2 m tons. This level should be sufficient to meet the sheet product demand of the national economy until 2000. Of the sheet output of the Iron Works the share of cold rolled broad strip and sheet will be 700 thousand tons, while that of hot rolled sheet rolls and plate will be 1300 thousand tons. In line with the growth in sheet production procisions must be made for the reprocessing of the hot-rolled broad strip. This aim is served by the construction of a 200 000 ton/year capacity long-seam pipe welding factory. The new plant will be capable of turning out high-quality pipes within the range of 168–213 mm. Production of cold bent open and closed sections is also on the increase. Required costs for the new pipe factory run close to 5 thousand million Ft.

An additional 15 thousand million Ft is needed for the continuous casting unit No 3, and for the development of rolling and processing sections in the DIW. In the *Lenin Metallurgic Works* the most important task will be the complete reconstruction of the obsolete rail support line. Thanks to this development handling capacity of the production line will be doubled, and at the same time technical conditions will be met for the produc-

tion of top quality iron rails and large-size bearers. Planned expenditure forecast is put at 3 thousand million Ft at present price level.

With these the long-term development of the LMW will be completed, and it will become the prime centre of Hungarian high-alloy, alloyed steel and rolled article production. Hardly any room will be left thereafter for further development in the factory.

In the *Ózd Metallurgic Plants*, with developments outlined above quantitative expansion may be regarded as completed. Quality improvement, increased production of secondary and tertiary articles will form the long-term objectives of this economic unit.

The same may be told of the cycle harmony of the Danube Iron Works and the black metallurgic producing sections of Csepel. The chosen road of the socialist economic integration will eventually decide the direction and extent of the development of Hungarian iron industry after 1990.

Planned costs for developments in the 7th five-year plan will run close to 50 thousand million Ft on comparable 1978 prices.

With iron industry expanding in size and with increased complexities involved in the processing, investment costs tend to follow a rising path. In the fourth five-year plan some 28 000 million Ft was devoted to investments in black metallurgy, while in the 5th the corresponding sum was 43 thousand million Ft (of this 16 000 million was deferred). To execute the projected works of the 6th five-year plan outlined above an investment sum, similar in size to that of the previous plan period, would be needed. To the seemingly somewhat great investment activity must be added the fact, that in per capita growth of steel consumption our country is well behind most socialist countries (due partly ot the dismantling of absolete equipment), and few countries are ranked behind Hungary in per capita consumption of steel. Another factor in the low per capita steel consumption is the comparatively small number of Hungarian manufactured goods that require much material, and Hungarian machine industry as a whole is not developed enough as yet either. With these developments outlined Hungary will reach about the 450 kg per capita level of yearly steel consumption in 1990.

With the completion of the reconstruction of the industry the second chapter of the economic geography of Hungarian iron industry ends. This phase started with the inauguration of the DIW, and was marked by the parallel quantitative and qualitative development of northern Hungarian metallurgic plants and of the DIW. By the end of this period the iron industry of the Sajó Valley has exhausted the direct resource advantages of its location (an area well provided with infrastructure, water), while it had earlier lost contact with the most important factors of location coal, iron ore). So in this traditionally heavy industrial region, that has grown in wealth by several branches of heavy chemical industry in the 1960s and 1970s (petrochemical industry, plastics etc)., for iron industry the only possible road to follow is technological development, the expansion of reprocessing activities. The other source of development for the northern plants is the emerging specialization among socialist countries in the pro-

duction of rolled articles. But location advantages of the DIW for plant expansion are far from being exhausted. There is ample space, the Danube provides abundant supply of water, and with improved conditions of inland navigation (with the completion of the Danube-Rhine-Main canal) transport conditions are bound to improve. With the increased output of the Mecsek coal mines the share of Hungarian coke will stay level for a longer period. Provided that conditions of global economics make it necessary, the Danube Iron Works will be the bearer of a possible further expansion in Hungarian iron industry.

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## РЕЗЮМЕ

### РЕКОНСТРУКЦИЯ ВЕНГЕРСКОЙ ЧЁРНОЙ МЕТАЛЛУРГИИ В ПЕРИОД С 1970 ПО 1990 ГОД. ПРОИЗВОДСТВЕННЫЕ И ТЕРРИТОРИАЛЬНЫЕ ИЗМЕНЕНИЯ В 200-ЛЕТНЕЙ ВЕНГЕРСКОЙ ЧЁРНОЙ МЕТАЛЛУРГИИ

В статье показана история развития венгерской чёрной металлургии за 200 лет. Рассматриваются географические мотивы выдора мест размещения предприятий, а также вопросы сырья, технического прогресса, производственные цели отношения собственности. Авторы уделяют также внимание производственной специализации крупных предприятий чёрной металлургии, а также вопросам кооперирования между ними и материально-техническим связям. Показаны также внешнеторговые связи венгерской чёрной металлургии и влияние её на развитие хозяйства и инфраструктуры Венгрии. Подробно рассматривается современное состояние венгерской чёрной металлургии. Показ осуществляемой теперь реконструкции чёрной металлургии Венгрии включает и анализ финансовых возможностей. Авторы различают три периода в истории развития венгерской чёрной металлургии. Для первого периода

было характерно параллельное развитие в долине реки Шайо двух предприятий чёрной металлургии с полным вертикальным циклом в Озде и Мишкольце. Начало второго периода было связано с пуском Дунайского металлургического комбината в Дунауйвароше. Этот период завершился во второй половине семидесятых годов когда на перечисленных выше металлургических предприятиях исчерпались воз, можности роста производства за счёт интенсификации. Осуществляемая ныне реконструкция чёрной металлургии Венгрии открывает третий период в истории отрасли. Начиная с этого времени количественный рост производства имеет место только на Дунайском металлургическом комбинате. Усиленное внимание уделяется в обоих районах развития чёрной металлургии техническому прогрессу (например осуществление производства, конверторной стали), а также повышение степени переработки исходных материалов, что станет важнейшей предпосылкой увеличения стоимости валовой продукции в чёрной металлургии долины реки Шайо.