

THE MYSORE IRON & STEEL WORKS AS A MAJOR PRODUCER OF STAINLESS STEEL IN INDIA

J. R. MILLER

Executive Vice-President, Ramseyer & Miller Inc., New York (U.S.A.)

MR. CHAIRMAN :

THIS SYMPOSIUM ON THE PRODUCTION OF alloy and special grades of steel seems to me to reflect the confidence with which your Government and fellow-countrymen consider India's future. It bespeaks a determination that a self-sustaining Indian economy shall be built to supply an ever-increasing portion of the material needs of the country. The steel production goals which have been set in the new Five Year Plan are a challenging objective which will engage most of the energies of India's steel producers and engineers. Only a small part of the actual work has been begun, but already future steps are being examined, as exemplified by these discussions. At a time when one may hear, if he is so inclined, much concern expressed for the future, the optimism which motivates a gathering such as this is very reassuring. May I express my deep appreciation, Mr. Chairman, for the invitation to be present and to address your meeting ?

The subject allotted to me is 'the setting up of an alloy steel industry at the Mysore Iron & Steel Works'. If justification exists for attaching some merit to any comments I may make on that subject, it apparently arises from the fortunate experience that was mine a year ago to participate in an overall study of the steelworks at Bhadravati. A full report was submitted containing a series of recommendations for the expansion of the works. Among these recommendations was one dealing with the production of alloys — particularly stainless steels. It was suggested that the Mysore Iron & Steel Works ultimately become the main centre of stainless steel production in India.

The subject of a central source for India's stainless steel is closely related to the country's overall steel production requirements, present and future. I must, therefore, digress for a time and develop some figures on that question.

In 1948 India's steel capacity was approximately one million tons. This, divided among a population of say 350 million people in 1948, could provide only about 7 pounds per person. At the same time *per capita* steel consumption in South American countries varied from 10 to 150 pounds; while in the United States the figure was 1300 pounds per person. The Planning Commission, therefore, provided within the First Five Year Plan steps to bring India's steel capacity to about 2.5 million tons. The Tata Iron & Steel Works would have 1.3 million tons; Indian Iron & Steel about 400,000 tons; and Mysore would be raised to 100,000 tons. These, together with a new 500,000-ton plant — the Hindustan Steel Company Limited — totalled 2.3 million tons of ingots, to which was added a small amount of re-rolled production from scrap.

Even though the Tata and Indian Iron & Steel Company expansions were only partly completed and the Mysore development not even begun, it became clear as early as 1954 that the steel expansion objectives would have to be increased. There were, however, considerably different views given on the size of the expansion; opinions varied from 3 million to 15 million tons. Mr. T. T. Krishnamachari's estimate of 6 million ingot tons was adopted as a basis for the Second Five Year Plan.

In preparing our report on the Mysore Iron & Steel Works, my associates and I

found it necessary to evaluate the market conditions of South India. This required that we look into the present and future steel requirements of the country as a whole. We could find no completely objective analysis of India's steel needs for this particular phase of its economic development. This, in part, explained the wide variation in the many estimates we received from different people — Government officials, steelmen, engineers, and economists — with whom we discussed the matter. Therefore, we developed such an analysis, based upon economic and other conditions related to the overall programme for India's expansion, in our report.

It was necessary to establish as a starting-point some factor — some future objective which the Indian people and their Government had set for themselves — that could be related to the steel requirements of the country. This was not difficult since the First Five Year Plan in 1952 stated definitely that one of the aims of its development programme was to double the real *per capita* income in India by 1977 — that is, in 25 years. This factor — *per capita* income — bears a close relationship to steel consumption. The Economic Commission for Latin America of the United Nations showed in an exhaustive paper presented at a conference in Bogota in October 1952, that the correlation factor is quite high — 0.898. This information was particularly valuable for our purposes since many of the Latin American republics included in the Bogota study have national development problems similar to India's. Among these common problems are included: relatively low levels of industrialization; a need to expand their total economies; shortages of basic industries, especially steel, often notwithstanding the existence of large sources of local raw materials; and finally, but by no means least, insufficient foreign exchange.

Given the high correlation between *per capita* income and steel consumption, the

next step was to refer to the experience of some country that had already passed through its early stages of industrial expansion. I chose the United States from 1889 to 1913, a 24-year period in which a great advance of national growth occurred marked by a rise in the country's steel consumption from 2 million to 30 million tons. An increase in *per capita* income of 88 per cent, accompanied by a *per capita* ingot production of 485 per cent, indicated that for that particular early level of industrial expansion a doubling of *per capita* income could be reflected by an increase of 5.5 times in steel production.

The difference between a country's consumption and production is usually accounted for mainly by its imports and exports. We assumed that by 1977 both imports and exports of steel would represent only a small percentage of the steel consumed in India, so that for practical purposes production and consumption would be equal. It seemed reasonable to conclude, therefore, that if India's *per capita* income doubled, as projected by the Government in the First Five Year Plan during the 25 years from 1952 to 1977, and if India's pattern of development followed the early experience of a modern industrial country such as the United States from 1889 to 1913, then the amount of steel consumed per person would increase 5.5 times.

Since we were dealing with *per capita* figures, it was also necessary to take into account the effect of growth in population. Although much attention has been given to this major problem in India, there has been no indication that the present rate of population increase of about 5 million persons per year will diminish to any extent. Therefore, the 1952 population of 360 million may be expected to grow by 125 million more in 25 years. This represents a 35 per cent rise in population.

With these factors applied to an actual consumption of 1,280,000 tons of finished

steel products in 1952 we can estimate India's steel consumption requirements for 1977:

$$\frac{1,280,000 \times 5.5 \times 1.35}{0.72 \text{ (yield)}} = 13,000,000 \text{ ingot tons approximately.}$$

We may now draw a curve of steel consumption against time, using the actual 1952 figure of steel ingot consumption of 1,780,000 tons and the estimated figure of 13,000,000 tons for 1977, like this (FIG. 1).

The estimate of steel ingot requirements in India for any year can be read off the curve directly. For 1963, two years after the end of the Second Five Year Plan, 6,700,000 ingot tons are indicated. This, of course, is an estimate and it would be very surprising indeed if experience in 1963 confirmed it precisely. It will not; the correlation is not

100 per cent, and there are other factors involved such as the rate of the country's overall industrial development, the availability of capital, and the progress achieved in other sectors of the Planning Commission's programme: industrial, agricultural, and otherwise. But the analysis shows that those people who have been thinking of the next phase of India's steel plant expansion in terms of 3 million or 15 million ingot tons are far from the mark. It shows, also, that the magnitudes which Mr. Krishnamachari and the Planning Commission have established for steel capacity in the next Five Year Plan are both reasonable and logical.

Within that magnitude, the pattern for the next phase of India's steel expansion has, accordingly, been defined with regard to size, location and product-mix. The in-

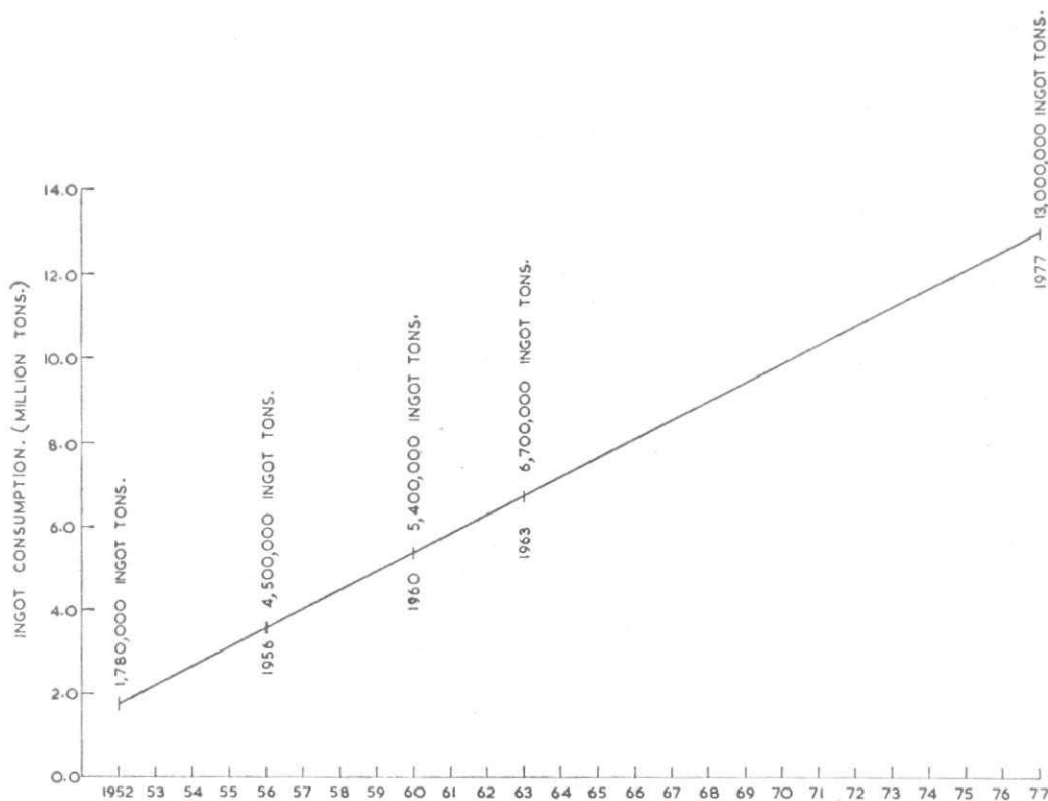


FIG. 1 — ESTIMATED INDIAN ANNUAL INGOT CONSUMPTION, 1952-1977

creased tonnage will come from additions to existing plants as well as by the erection of new plants. By 1961 your Government projects Tata with 2,000,000 ingot tons, Indian Iron & Steel with 1,000,000 tons, and Mysore with 100,000 tons; three new plants are also to be ready — The Hindustan Steel Company Limited in Orissa, the plant in Madhya Pradesh, and a third at Durgapur — each one of these capable of producing 1,000,000 tons of ingots a year.

So much for the matter of India's overall steel requirements, except to mention one point. There are undoubtedly a number of different ways in which an objective analysis, such as the one just outlined, could have been selected. If the method chosen has any advantage over possible alternative approaches, it is because the procedure developed takes into account the simultaneous growth of all phases of the nation's economy. Expansion in fields outside the steel industry, such as power, agriculture, transportation, manufacturing, etc., is inherent in the 1889-1913 U.S. *per capita* income versus *per capita* steel production relationship which we have used. In addition, a broadening in the range of steel products and materials within the industry itself is implied, among which special steel is most certainly included. The market analysis which has been described should, therefore, lend itself to a general extension to cover alloy and stainless steel requirements.

Let us again use the experience of a highly industrial country, but since alloy steels constitute a special procedure and not a fundamental aspect of a developing steel industry, we need not go back 65 years to 1889. We can use more recent data. Prior to World War II, from 1925 to 1940, total alloy steel production quite uniformly represented between 5 and 6 per cent of the total U.S. steel production. Since the end of the war this percentage has risen to about 8 per cent. The use of stainless steels did not pass 50,000 tons until 1934 when it amounted to 0.2 per cent of total steel output. The

relative proportion of stainless steel increased very slowly but steadily; it reached 0.3 per cent of the total in 1936, went from 0.4 to 0.7 per cent during the war, dropped to 0.6 per cent in 1947 and stayed there until 1950 when it jumped to 0.9 per cent. Since then it has fluctuated between 0.9 per cent and 1.0 per cent. Stated another way, it can be said that in recent years stainless requirement in a highly industrialized area has tended to equal about 10 per cent of the total special steels output.

Let us assume then that for India, alloy steels may equal 5 per cent of its total steel production. Ordinary alloys are used generally in equipment, machinery and structures, and the demand for them is closely determined by the level of the economy. Since we are here at a relatively early stage of India's industrialization, it seems proper that the prewar figure of the data just cited be used. On the other hand, special high grade and stainless steels in India will serve special equipment specifications of more recent development and certain personal consumer preferences. We should use the current percentages for high grade steels, that is, about one-tenth of the general alloy production. We find, therefore, that there would appear to be a comparative statistical potential justification within the 6,000,000 ingot ton goal of India's present planning for the production of about 300,000 tons a year of alloy steels, including 30,000 tons of stainless steel.

Please note the phrase 'comparative statistical potential justification'. One dares to suggest figures of the magnitude just given only under the impact of the optimistic surge which this meeting reflects and the rapid advances which are foreseen for India in all its planning for industrialization. For there is no actual real statistical justification for those figures based on India's own experience. Total alloy and special steel imports — and except for a few isolated cases this is a good measure of current consumption of these specialities — have been

5138 tons in 1952, 3930 tons in 1953, and 7554 tons in 1954. An increasing proportion of stainless steel — almost all sheets — is included in these tonnages; 26 per cent in 1952, 36 per cent in 1953 and 43 per cent in 1954. Only a year and a half ago the Iron and Steel Controller estimated India's special steels requirements for 1957 at only 9158 tons of which 47 per cent — 4265 tons — was stainless steel, including 4000 tons of sheets.

Why then do I speak of 30,000 ingot tons of stainless steel production? It depends on so many things: the success of the 6,000,000-ton objective of the Second Five Year Plan, the establishment of a full complement of secondary industries to utilize or transform those ingots into consumer products, the parallel advance of other phases of India's economy — power, transportation, agriculture, etc. It is because, having followed developments in India's steel economy very closely since 1949, and having worked with some of the men — engineers, public officials, and production men — who have been operating the country's steel industry and planning its future growth, I believe that the steel capacity objective of the Second Five Year Plan will be attained; perhaps not by 1961, but possibly 2 or 3 years thereafter. The prerequisites for such an expansion in the country's overall steel production exist, as well as the determination to see it successfully accomplished. Included in those prerequisites are also the basic requirements for a proportionate development in alloy and stainless steels.

The production of ordinary alloy steels generally involves neither major alterations in steel-making and rolling practice, nor any special equipment. The tonnage we are considering is sufficient for us to be seriously concerned with the attainment of the most favourable production costs. This means in a modern, high capacity plant of the size and capabilities planned for Tata, or the Indian Iron & Steel Company, or for the three new million-ton plants. Any or all of these will

be able to include within their operations, and without much difficulty, schedules for the production of ordinary alloys.

The manufacture of stainless steel, on the other hand, means special techniques and special equipment. It requires experience in electric furnace steel-making and the margin between cost of production and price is so great that extra charges for any increased cost inherent in low tonnage production can be absorbed. The Mysore Iron & Steel Works has been operating a small electric furnace suitable for stainless steel production, for many years. Their men now know how to make it. We believe it both advantageous and desirable that India's stainless steel production be ultimately established at Bhadravati.

Such a development would be particularly important to the Mysore Works after the completion of the present steel expansion programme; indeed, it might become the only justification for continuing its steel operations, say, ten years from now. Consider the planned capacities of each of the plants included in the current steel expansion programme: Tata Iron & Steel — 2,000,000 tons a year, Indian Iron & Steel — 1,000,000 tons, Hindustan Steel in Orissa — 1,000,000 tons, Madhya Pradesh — 1,000,000 tons, Durgapur — 1,000,000 tons, and Mysore Iron & Steel Works — 100,000 tons. The present Mysore capacity of about 30,000 tons is insignificant in comparison with the million-ton giants; even the ultimate 100,000 tons projected for the works is rather small.

The word 'ultimate' is used because, in our view, the plant location at Bhadravati is unsuited for an operation producing much more than 100,000 tons of ordinary carbon steel a year. When the Works were established in 1923 they were designed primarily to manufacture wood-distillation products from timber cut down in nearby forests. Within a few years the emphasis of the operation was shifted to iron and steel. Unfortunately, the forest reserves which

were adequate for the initial chemical operation were hardly sufficient for providing all the charcoal needed for even a very small integrated iron and steel plant. For more than a generation the Mysore Works has been dependent upon the receipt of coke and coal from a distance of over 1000 miles. This lack of a major basic raw material has held the plant's capacity down and those two factors taken together result in a comparatively high production cost at Bhadravati. When the new larger plants come into operation, Mysore's competitive position, costwise, will become even more unfavourable.

It may be said, of course, that Mysore enjoys a certain freight advantage within its own immediate market area. That is true; but in studying the distribution of India's steel market we have found that the total potential demand for that area will not exceed 120,000 tons for quite some time. And it is likely, too, that even after expansion the freight savings on shipments to local consumers will be more than offset by the increased difference in production costs in comparison with the more efficient million-ton plants.

One may properly ask, 'If these things are true, why do anything about increasing capacity at Bhadravati now?' There are several reasons. First, until the acute steel shortage in India is abated, every pound of steel which can be poured at the Mysore Works is important, to the country as a whole and particularly to the South Indian market. This means that the highest production possible at Mysore should be maintained at least through 1961, and perhaps five or more years thereafter. Second, a large community of people has grown up about the plant whose lives are dependent upon the continuation of the Works' activities. Third, a group of highly skilled steel workers is available near the plant which can be converted to stainless steel production without difficulty.

It is, therefore, important to the whole country that Mysore's present capacity be expanded to the 100,000 tons set in the

Second Five Year Plan. This figure corresponds rather neatly to the market potential of the area and also to an excess iron-making capacity now installed at the plant.

At the same time the programme established for Mysore should include provision for the gradual transformation of its steel activity from an operation producing plain-carbon steels to one making high-grade alloys primarily. The men working at Bhadravati are well trained and qualified to adapt themselves to the necessary changes in practice which will be involved. The necessary raw materials and alloy additions to produce special grades and stainless steels are readily accessible. And, the production of 30,000 tons of ingots — some 20,000-23,000 tons of products — will involve no important change in the personnel required at the plant.

A steel plant, producing stainless and special steels exclusively, is not a new idea. There are quite a number of such operations in Europe and the United States. The larger plants producing carbon steels are freed from the necessity of setting up separate departments with whatever special equipment is needed to produce a relatively small additional tonnage of special steel. From a production standpoint this has many obvious advantages which India can gain by concentrating its high-grade production — and particularly stainless steels — at Bhadravati.

The timing for such a development at the Mysore Works may be a subject of some debate. One view might be that the carbon steel expansion to 100,000 tons capacity should be completed first, with the stainless facilities to be provided later; a second idea could be to give the stainless expansion preference; while a third scheme might call for both programmes to be carried out at the same time. Regardless of which scheme is finally adopted, the provision of a centralized stainless steel operation at the Mysore Works would have a logical and advantageous place within the overall plans for India's iron and steel industry.