

Japanese Steel Industry Licensing

Steelmakers have achieved enormous growth since World War II; licensing may help solve new problems.

BY EIJI UMENE*

When World War II ended, the Japanese steel industry was nearly destroyed, but in 1973 the production of crude steel reached 120 million metric tons. This represents remarkable progress. To make this development possible, the Japanese steel industry built its plants on the seashore and installed modern facilities. The industry utilized the most advanced technology available, eagerly licensing technology from the United States and European countries. Most involved basic patents, know-how, equipment, etc. In some fields, the technology now is the most advanced, even among highly industrialized countries. Japanese steel companies now export technology and grant licenses to European countries and the United States, South America, and even the Soviet Union.

Exchange of technological information in the steel industry

Information on technology is actively exchanged in the steel industry. Consequently, technology transfer has been actively pursued in the industry, not only in Japan but throughout the world. Of course, we have iron and steel institutes in Japan. There are similar organizations in the United States, Germany, England, and many other countries.

About eight years ago, the International Iron & Steel Institute was organized with its headquarters in Brussels, Belgium, and information on new technology is actively acquired through this organization. Incidentally, I am chairman of the committee on technology of the IISI.

A special characteristic of the steel industry is its willingness to introduce new technology developed by other industries and incorporate it into steel industry processes, or to develop new, improved processes. Examples include new bricks, tonnage oxygen, argon and hydrogen gas, vacuum technology, various weighing and measuring methods, analytical method, etc.

Therefore licensing has been actively promoted by industry, including my own company, Nippon Steel Corp.

Licensing means to introduce the technology and know-how from other parties and also to grant licenses to the other countries, including western Europe, the United States, and the Soviet Union. In the steel industry, licens-

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ing means granting of the basic patent and know-how of the individual technology, technological assistance, and construction of equipment for the client.

Some of the problems steel industry faces

In 1974, the crude steel production in the world was

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710 million metric tons. According to the projections by experts of the IISI group, steel production in 1980 will reach 930 million tons. In 1985, it will reach 1,140 million tons.

During the oil crisis, business around the world has been in a slump. The downturn has caused the experts of WISI to review the forecast of steel production in the world for 1980 and 1985. What will be the problems if demand continues high in the future?

The first problem is how to finance the expansion of the facilities of the steel industry to meet the increasing demand.

The second would be procurement of raw materials to make this much steel, particularly procurement of good coking coal for blast furnaces.

The third problem would be environmental protection. This is a growing problem in our community.

The fourth problem is how to acquire adequate additional good-quality labor forces.

Let's examine each of these problems.

How to finance steel expansion

It is well known that the BF (blast furnace)-BOF route is the popular method of making hot metal and steel, but it is also well known that the cost to build such an integrated steel mill is very high. It would cost at least US \$400 to make one ton of annual steel production capacity. It is sometimes said that US \$700 to \$800 is required just for building one ton of annual capacity in the case of an integrated steel mill.

You can see how much money will be required to build steel plants to meet ever-increasing demand. Therefore, it is very important to develop some drastic, much simplified processes to make iron and steel. Otherwise it will be very difficult to get enough money to finance the needed facilities.

Some experts are talking about many mills and others are talking about continuous steel making. They claim the plants would be much more compact and the investment cost would be drastically reduced. But we must wait and see how soon these new technologies will be sufficiently

developed so that people can employ them for their new facilities.

We now see a trend of joint investment for new steel mills as in Brazil, Australia, and South Africa where more than two companies have organized joint venture companies and shared in huge investments.

Raw material problem

In case of the blast furnace and BOF route, the so called "integrated steel mill", the most important thing is how to acquire enough good-quality coal to make coke. This is very critical problem. In case of direct reduction and electric furnace route, the most important factor is how cheaply we can obtain natural gas or oil which we can convert into reducing gas.

People also began understanding the importance of the quality of pellets to be charged into direct reduction shaft furnaces. If there is a specific characteristic required as a material to be charged into direct reduction furnace, and if the demand for this kind of pellets will increase, then how to get this kind of pellets continuously will be a very important problem.

I think it is very important to develop new technology of coke making, whether it will be the modification of the existing coke ovens to protect the environment or make good coke out of poor coal, or maybe it will be formed coke development which will be very helpful from the use of poor coking coal and from environmental protection point of view.

Since the steel industry is very big, it would cost much to conduct research and development to improve processes or to develop new processes. In many cases, experts are talking about joint research and development and we could name some examples, such as development of formed coke processes in many different countries. People are also talking about joint research and development of the nuclear steel-making processes. For the future steel industry, the most important thing is the procurement of reducing agent or fuels such as oil, natural gas and coal, and to develop new processes so that we may utilize more effectively the available reducing agent or fuels to meet ever-increasing demands. This may bring about development of new processes. The raw material situation is one of the most important problems the industry must resolve.

Environmental Protection

The steel industry has become very large and individual plants have grown. Some produce 8 to 16 million tons a year for one unit.

People working in the steel industry must be very careful not to destroy or pollute the environment. Those factors we are talking about are SO_x gas, NO_x gas, dust, water quality and noise. SO_x/NO_x gases may come out of the sintering plant. We are asked to reduce the amount of SO_x and NO_x gas put out by sintering plant. In Japan, we have organizations for joint research and development on both SO_x and NO_x .

The entire industry is jointly tackling these problems to bring about a solution as early as possible.

We believe it may be a good idea to seek out a license of technology already developed by a third party.

Thus, we could save time and money and the third party could develop better technology as a specialist in a particular field.

A very important problem is handling waste solid materials, such as blast furnace dust, BOF dust, and blast furnace/BOF slags. The amount of these solid wastes can no longer be ignored, and there is much effort to find the best way to treat them. In Japan, it is becoming more important to find the solution.

Labor forces

Fortunately, we in Japan have enough good-quality labor for the steel industry. In other countries, particularly in Europe, we have heard that many foreign workers (gast-arbeiters) are being employed. The percentage of foreign workers has been increasing and sometimes it has caused social problems in these countries.

We have never brought foreign workers to Japan but have tried to improve the working conditions, mechanize the processes, and automate them through computerization, thus saving labor.

Main emphasis also should be on severe working conditions—high temperatures, work place, mentally-distressing areas, and labor-intensive work area, including brick laying, packaging, loading and unloading operations.

Increasing the ratio of continuous casting is a way to save labor, compared to conventional ingot-mold casting. In some Japanese plants, they have developed so-called "no-man control" of continuous casting operation. Through these improvements and technological development, we save manpower.

Conclusion

The world we live in is rapidly changing in many respects—politically, socially, economically, and technologically. It is very important for management people to find the ways and means of meeting the rapidly changing situation. In this respect, I believe the importance of research and development is increasing more and more. It means spending more money and training specialized people to conduct such research and development. The choice is whether one should do R&D oneself, or jointly with other people to obtain already developed and much-needed technology. From that point of view, it is more and more important to exchange technological information.