REPORT ON AMERICAN IRON AND STEEL INDUSTRY

By 1950 Japanese Technical Steel Mission (1 st and 2 nd Group)

1 st Group....Steel making and Rolling

2 nd Group....Coke and Iron making

Synopsis (1 st Group):

I. The difference in the open hearth furnace design and layout.

The open hearth shop in our country is mostly designed after the German pattern and there are many great differences comparing to that of the United States as shown in the following Table.

(**a**) Raw matarial yard & Charging method

(*United States*)....The materials are prepared at a different building and brought on a ramp that leads directly in front of the furnace. It is charged by a floor running charging machine.

(*Japan*)....The raw material yard is located directly opposite of the teeming yard and is on the same open hearth building. The material to be charged is first loaded on the back of the charging crane. The suspension swivel type charging crane makes a 130° turn to charge.

(**b**) Pouring method

(*United States*)....The pouring of ingot is made on a car where the moulds are prepared at a different place. Top pouring.

(*Japan*)....The preparing and pouring of the ingot and stripping are done in the pit yard.

(**c**) Stack

(*United States*)....Most of the furnace have forced air and forced draft. The flues are built on the ground as much as possible and short as possible. Draft control is very easy.

(*Japan*)....Both air and draft are natural. The flues are very long and pass under the scrap yard to the stack.

Considering from the viewpoint of operation, there are many points of advantages in the American method, but to remodel immediately the present installation, it is necessary to make a proper study according to the local condition of the plant.

II. Specialization.

It is worth noting that the equipments, refractories flux, and even the consuming items are all made or manufactured at the factories which are specialized in that field and that the steel mills have remarkably increased their efficiency by the above. For instance, the steel company can choose and buy the most convenient and advantageous equipment or material into which the makers of open hearth furnace reversing valve, burner, lining materials, refractories, etc., have made an extensive study.

There are many engineering companies which have the staff of competent engineers who are always competing with each other in designing better equipment or making better improvement of the facilities in their line of industry. In the field of rolling mills the United Engineering Co., Mesta, Aetna-Standard Co., etc. are good examples.

We must free ourselved from the idea of self-supplying everything we need in one company and progress toward the direction of specialization.

III. Rolling Method.

It seems that the progress and development of the present rolling method in the United States are based on the mass production and quality imporovement. For instance, the method of rolling steel sheets on the strip mill might be a typical example.

The point that we must pay special attention to in the straight line rolling method is not rolling itself but the fact that the following operations or equipments are well balanced: such as the preparatory operation or equipment as slab conditioning and reheating furnaces or proc-

cessing of the rolled product such as shearing, annealing and heat treating, inspecting, etc.

We saw some instances where they were operating a very old and out of date facilities, but these plants were making secondary products that the other company could not compete and by which they cover the inefficiency of their old facilities.

Although there are many points that we can apply in our country, we believe that we must first consider our present condition and make improvements and changes and supplement new facilities.

IV. Improvement of yield and guarantee of quality.

These two problems are to be given very serious consideration. The scrutinizing of the arrangement of equipments and the flow of operation and inspection are all boiled down to these two problems. The complete set up of quality control, inspection by metallurgical department and laboratory that we have heard about are what ought to be brought into practice gradually.

The improvement of ingot yield and in quality by making semi-killed steel, the ensuring of 90% minimum accuracy in making various heats, the installation of automatic control and instruments as a guide for a constant and stable operation and the practical application of spectrometer, X-ray thickness gage and reflectscope have remarkably developed in recent years. These are only a few examples of what has been done in the United States in improving yield and quality.

We can see the endeavor and contrivance in the phase of operating such facilities as in the straight line system rolling mills, galvanizing and tinning process line, and effective using of high calory fuel by adopting high speed melting process in the open hearth. A study is being made on one of the pending problem of changing reheating system by a torched or complete combustion flame. The oxygen is playing an important role in refining of low carbon steel, cutting of heavy section billets and hot scarfing of billets for conditioning. The improvement of heat efficiency has been done through the development of circular soaking pit and rotary furnace. All of these are indeed due to the progress made day by day.

There are many problems that we can learn and be educated on the American method of operating and using of the facilities, but when we analyze these problems there are some which can be readily applied and which require a thorough study looking back on the production tonnage and the condition of the plant concerned.

We must not overlook the fact that the present system of high efficiency of the industry in the United States has taken a long time in its basic and experimental study and, if we wish to copy or to bring the equipment intact, it will be necessary to be careful not to make any wrong application of the idea.

We would like to remark that the copper content in the ordinary steel in the United States is about 0.04% to 0.06% and it is out of question. They are very fortunate on this problem. We have keenly realized the disadvantageous position of having a high copper content of 0.3% in our steel, which cause many trouble in hot and cold working of the steel. It is said that in the United States, if the copper exceeds 0.2% in the steel it is very difficult to produce high quality steel.

Although we have not yet come to the conclusion of the effect of copper on the weldability of steel, we think that it has a very great influence. It is necessary to make a thorough study on this problem and set up a measure for preventing it.

V. Noteworthy facts in plants in the United States.

a) Plant housekeeping

The plants are kept very nice and clean. They are always picking up scraps in the plant with a magnet on a tractor. They have janitors who are always cleaning up the brick and steel scraps. We saw at one on the open hearth shop where an automobile was running under the charging floor. There are some plants where they wash the glass windows with water every week.

b) Plant safety.

The plant highly esteems the workers' life and sacrifices every thing for the prevention of accident and takes every possible method on safety, for instance, insisting on sounding alarm by poster and installing safety apparatus on high speed machine.

c) Encouragement of new idea and invention.

There are many plants positively giving out prizes for a new idea and if this makes profit in actual use they are paying certain percentages of the profit every month which are postered in the shop. There are many prizes amounting to about $ 10.00 to $ 20.00.

Every company is calling upon the workers to make their operation much simpler by new inventions and ideas.

d) Working tools are well prepared.

They are saving time and labor by these convenient tools. We believe that we must import such tools.

e) Transporting car.

In and out of the plant, there are lots of small convenient truck, hauling heavy materials speedily, and high hoist trucks for repairing high spots in the outside of the plant.

f) Sanitation.

Lighting and air conditioning, exclusion of dust and dangerous gases, are done quite completely so as to make it as comfortable as possible for the worker.

g) Duty and privilege.

The worker seems to have the conception of working full time, which clearly reflects the characteristic of the country demanding duty and privilege.

h) High retirement Age.

We noticed quite a lots of old man in the field, which shows there are many skilled workers. The retirement age is 65 years, and, if he is skilled and healthy, he is requested to remain beyond his retirement age.

i) Good maintenance.

Due to good maintenance, the old equipments are still operating quite efficiently.

j) No idle equipment.

In spite of the work they do in the open hearth shops, the numbers of crane are very small. They have a charging machine and pit crane per 2 to 3 open hearth furnaces.

k) High efficiency.

All of the equipments and facilities are operating at very high efficiency. In the open hearth shop where there are ten open hearth furnaces only one furnace is under repair.

Synopsis (2nd Group):

I. In General.

A. In many places we were treated by new acquaintances just as we were old friends or even brothers which kept us always happy and encouraged.

B. i) We see many young men who are ranking high which tells that people are picked out just in accordance with their ability.

ii) Experimenced aged men work much more than in Japan which shows the experiences are respected duly.

iii) In general, people have the thought "Try it first". Numerous developments owe to this thought a lot; just talking means nothing.

iv) Operations in plants work better than in our country in duty hours.

v) Number of workers is distinctively smaller than in our plants. This is the result of chasing circle of high wage and mechanization.

vi) Specialization and classification of work go into every field thoroughly so as to bring up individual technique.

vii) Automatic control system is taking place of recording system widely which contributes not only to save labor but to keep operations uniform.

viii) We see very few idle machines in plants which can save number of spare units.

ix) Electric lighting system is excellent in plants.

x) Brick quality is observed to be more reliable than the oven structure itself.

xi) Environments in plant sites are good.

xii) People pay keen attention to the cost of products even for minor fraction of breakdown. This is not enough in our country yet. We still have some bad after-effects of emergency time production, during which the quantity was first and the cost was next, in other words, quantity went ahead of cost.

xiii) We recognized that many equipments are exposed outdoors wthout housing. This is spectacular contrast to ours.

II. Coal.

i) Mechanization of mining naturally caused high ash in run-of-mine coal which involved progress of "heavy-medium washing process", fine coal cleaning, its recovery and drying in sequence.

ii) Coal is washed in coal mine dominantly and not rewashed in industrial plants.

iii) Vibrating process is widely used for dehydration, conveying and screening.

III. Coke Ovens.

i) The life of coke ovens is much longer than in our plants. This is most important and we must make effort to follow this.

ii) Coking time is shorter and coking temperature is a little higher than in our plants.

iii) The pressure of fuel gas in collecting mains is kept much higher than in our plants to avoid air coming into ovens.

IV. Coke Oven By-products.

i) Not many plants have refining units of their own, but depend on big distillers outside.

ii) Unit plant area turns out more products than in Japan. In other words, whole area used for by-product recovery is much smaller than ours.

V. Blast Furnace.

i) After observing techniques from the start of iron making up to steel product finishing, we see that the technical difference between U. S. A. and Japan is getting bigger toward end products. In other words, we do not see radical difference in blast furnace technique, but do in techniques of fabricating steel products.

ii) We saw wide difference in iron making technique between eastern states and western states. In western states, people pay much attention for ore handling, preparation and sizing of charge materials to overcome drawbacks in fuel condition.

iii) Many plants are fabricating both iron and steel in the same sites.

iv) Pressure of hot blast for blast furnace is high.