IIM Metallurgy Materials Engineering

NEWSLETTER
THE INDIAN INSTITUTE OF METALS
(DELHI CHAPTER)

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Chairman, Delhi Chapter

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INTRODUCTION

This News Letter is containing brief on 12th Executive Committee Meeting for the year 2010-11 held on 26.3.2011.

The News Letter contains the following Write-ups:

1. Indian Steel Industry Growth – Some Personal Reflections by Shri S C Suri, Vice Chairman, IIM DC & Chairman, Technical Publication Committee
2. Structural Mills in Indian Steel Plants – An Overall Technical Perspectives by Shri K K Khanna, Member IIM-DC
3. Linking Science & Technology for Global Solutions – A technical presentation by Dr. (Mrs.) Malti Goel, Member, IIM-DC
6. Visit to JSL Stainless Ltd., Hisar – A review
7. The News Letter also contains National and International news relating to ferrous sector

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Chapter News

Mr. P K Chatterjee, Chairman, Building Committee briefed the EC meeting on the progress of the lecture hall of IIM DC. He informed that the project is likely to be completed within the budgeted amount. It was also informed that the lecture hall is likely to be ready by the end of April 2011. The report of MMMM 2011 was placed before the EC. In general, it was felt that MMMM 2011 was well organized. It was also decided that IIM-DC may proceed and finalize the details of MOU between IIM-DC and ITEE.

Indian Steel Industry Growth – Some Personal Reflections

S C Suri
Vice Chairman, IIM-DC &
Chairman, Technical & Publication Committee

Introduction

It is a historical fact that the Iron & Steel industry in India began several centuries ago, much before presently advanced countries became even aware of the methods of smelting Iron & Steel. The use of iron in weaponry has been known at the earliest times in India. The famous iron pillar in Delhi has attracted considerable attention in view of its uniqueness and state of its excellent preservations for over 15 centuries. The early process of iron smelting gave wrought iron which was soft and malleable but did not harden as it did not have enough carbon. Indian wootz, steel was used in making Damascus Blade which became famous in Europe.

Iron making by primitive methods was carried on till recently in south and central India, Bihar, Orisa and UP. Iron and steel making was practiced in India for centuries as a hereditary craft and was not systematized into a technology for propagation. The judgment and skills of the operators were the only means of control in melting of iron.

The Foundation of the Present Day Indian Steel Industry

The foundation of the present day Indian steel industry was conceived and nurtured by illustrious visionary like Jamshedji Tata and M. Visvesvaraya in the post independence era. Pandit Jawaharlal Nehru laid great stress on industrialization for economic resurgence and chose to make the steel industry one of the corner stones of such resurgence. The steel industry in India has come a long way since independence when there were only three steel plants producing a total of 1.2 MT of steel in the year 1948. The three steel plants were Tata Iron & Steel Co. Ltd. (TISCO) at Jamshedpur, Indian Iron & Steel Co. Ltd (IISCO) at Burnpur and Visvesvaraya Iron & Steel Ltd (VISL) at Bhadravati.

As a young engineering student, I fondly recall the privilege of taking my practical training at IISCO, Burnpur. Immediately after my post graduation in metallurgy, I had the privilege of taking my practical training at Tata Steel in Jamshedpur and subsequently in different steel plants in UK. There is a common saying "Once a steel-man always a steel-man". My earlier training in the steel sector and subsequent professional career in steel sector bears an ample testimony to this fascinating segment.

Steel Growth in 50s and 60s

The passage of steel industry and its growth since 1947 has not been easy one in the initial stages. The demand for growth was considerable requiring massive capital inputs and imported technology for construction of the plants. The foreign exchange requirement being large, aid from other countries together with their tied technology had to be resorted to. The capital market in India was not developed and did not permit access to funds from the public at large. Steel manpower was also in short supply. The Government policy was confined to the production of steel through the Blast

Furnaces route in the public sector only. Thus large business houses capable of investing in major plants in the steel sector could not enter the field. It is however an unbelievable fact that three steel plants as Bhilai, Rourkela and Durgapur were constructed and became operational in a span of three years. This happened at a time when India was trying to build up a steel capacity with no back-up support in the late 50s and early 60s.

As a young student, I had the privilege of visiting Bhilai Steel Plant which was still under construction. The size and magnitude of iron and steel making operation are still fresh in my mind. The impressions one has after visiting a steel plant is really amazing. It is vastly different from the classroom impressions of iron and steel making operation. Steel touches every fabric of our daily life and hence these fond and vivid impressions. There were several challenges in creation of additional steel capacity. With passage of time there was increasing dependence of steel plants on imported coking coal. The lack of power supply and high power tariff structure affected the electric arc furnace steel industry adversely. The requirement of scrap for the electric arc furnace had to be met through imports in view of limited generation of scrap within the country. The administered-price of steel also impeded the generation of adequate surplus for investments into expansion and modernization of existing steel plants.

The Liberalized Steel Regime

The liberalized policies since 1991 have however resolved many of these problems mainly by allowing entry of the private sector in large scale steel manufacturers through access to financing from India and aboard and by allowing free import of technology.

The Present Growth Scenario

Indian Steel Industry has now entered the phase of high growth. The demand side as well as the supply side of the steel industry has been growing very fast. This has induced steel makers from India and other countries to create additional capacities. Global community is seeing huge steel business ahead in India. India is now one of the lucrative destinations for building steel plants. Fast pace of capacity augmentation and modernization of existing plants has resulted in several welcome changes.

The Indian Steel Scenario – Demand Side

There have been several rosy forecasts of steel production and demand in India at different intervals. These forecasts were ambitious and they failed to materialize. However there are some welcome signs now. The steel demand has grown from 8 MT in 1980-81 to 60 MTin 2009-10 registering an annual growth rate of 7% during the past 29 years. The trend of steel demand during the period has shown a significant break in 1993-94. Subsequent increase was seen during 1993-94 to 2002-03 when demand grew by 8.3% per annum despite some difficult years due to the financial crisis in the later part of the decade.

Since the beginning of the new millennium the demand growth has picked up in India along with the surge in the world steel demand where China has played key role. Accordingly new developments have taken place such as globalization of steel industry and its consolidation etc. Demand of finished steel has registered about 10.1% of annual growth from 2002-03 up to 2009-10 and this trend is expected to continue in the coming years. The domestic demand forecast for finished steel products for the period 2019-20 vary between 180 to 200 MT.

Supply Side

In India the supply has always being driven by demand. High demand has induced many steel makers from India and abroad to go for new projects and expansions. As per the latest assessment the crude steel capacity is likely to touch a level of about 135 MT per annum by 2015-16. In India it is

an established fact that the steel demand drives the supply hence as long as the demand is there. It is expected that the further capacity will be created to match the demand.

Conclusion

It is felt that India has the inherent potential to produce lowest cost steel in the world. This is due to low labour and iron ore costs considerations. Being however a long gestation activity, planning for steel production has to be perspective. We have to ensure that the brown-field expansion programmes and the green-field capacity creation for steel get the adequate attention and the push it deserves. The demand as well as the supply side of the Indian steel industry seems to be buoyant and hence it can be argued that by 2020 Indian steel industry will be a huge one and next only to China.

Structural Mills in Indian Steel Plants- An Overall Technological Perspective

K K Khanna
Member, IIM DC &
Former Director & Board Member, SAIL

The rolling of sections in rolling mills began in the early years of the nineteenth centuries. Samuel Leonard of Pittsburgh has been the first to roll such products in USA in 1819. However, the pass designs for rolling the angles have undergone progressive improvements over the period. In 1881, an angle design patented by J.L. Lewis featured a "Butterfly" design. The butterfly layout for rolling angles has been the most commonly used design. Similarly the pass designs for rolling the beams have undergone progressive improvements over the period. The pass designs for rolling the beams favoured quick initial shaping by the narrow width of the passes. The beams are also rolled by diagonal method. Channels were first produced by rolling off the lower flanges of beams, as is sometimes practiced today. The first four passes were identical with those used for rolling standard beams and in the next few passes, the bottom flanges were rolled away. Tees are also made on structural mills. However, many tees are now made by slitting beams and re-straightening the products.

The advancing industrialization resulted in a growing demand for beams. The development of the Universal Mill Stand at the end of the 19th century enabled beams to be manufactured with parallel flanges. Universal Mill Stands have two driven horizontal rolls that influence the web cross-section and two vertical rolls that act on the flange of the beam. All the four rolls are adjustable. These days beams are produced on a variety of mill types: 3-high or 2-high mills, universal reversing mills, continuous or semi-continuous mills. Over the course of the years, both the rolling technology and the mills themselves have changed significantly. Modern Mill Stands are equipped with hydraulic adjustment systems and automation that offer a large number of benefits. In 1968, subsequent to feasibility studies conducted with British Iron and Steel Research Association, Algoma Steel Corporation designed and built a continuous casting facility that could produce beam blanks of sections ranging from 850 square mm to 1400 square mm. With the development of production of beam blanks on continuous casters- the feed stock that then enters a universal beam mill, it became possible to deliver numerous heavy sections.

The state-of-art-technology heavy beam and section mill:

Section Mills essentially produce beams as well as other sections such as channels, angles, shipbuilding sections, special sections and sheet piling sections. Typical Heavy Section Mills cover web heights up to 600mm, 700mm or 1000mm, for extremely heavy beams and column sections up

to a web height of 1100mm. The product range of Medium Section Mills starts with a section height of 100mm and flange width of 50 mm and generally extends up to a web height of 450mm and flange width of 240mm. The sections below the product range of Medium Section Mills are rolled in Light Section Mills. The mill concepts can differ, depending on the rolling programme and the desired capacity. Continuous mill train is employed where the rolling programme is limited to smaller sections and a very high capacity is required. Semi-continuous mill with reversing roughing stand and continuous finishing mill train has the advantage that less stands are required compared with a continuous mill and a reversing roughing stand offers a greater flexibility with respect to the starting material. Another option is to go for tandem reversing mill with or without separate finishing stand. Most of the newer medium section mills are being built with the tandem reversing concept.

Typical, heavy beam and section mill consists of a reheating furnace, a 2-high reversing breakdown stand [on which the leader pass for the subsequent universal (roughing) rolling is produced], a cropping saw, cross-transfer system, a tandem reversing mill comprising a universal roughing stand, an edger and a universal finishing stand. Depending on rolling programme, these stands can be fitted with universal rolls or two-high rolls. After rolling, these sections are cooled on a cooling bed and straightened on a roller straightener. The collected section layers then pass through cold saws where the cooling bed lengths are cut into finished lengths before these are stacked and tied ready for shipping. These days, with the development of various online "Rolling" process models, particularly in conjunction with the fully–hydraulic adjustable mill stands and the associated technological control systems, it has become possible to optimize the rolling process and improve the quality of the rolled sections. The above described mills having a universal roughing stand, and edger and a separately installed finishing stand, has the disadvantage that during one reversing pass,only one working pass can be carried out so that a correspondingly large number of reversing passes are required for rolling a section. This disadvantage can be overcome, by having mill configuration of a 2-high reversing roughing stand with a compact three stands tandem group using the X-H® rolling method patented by SMS Meer, Germany. In X-H® rolling method, all 3 stands are in operation during each pass, where by the first universal stand has an X draft and the second universal stand an H draft corresponding to the shape of the finished section. The benefits of X-H® rolling method includes higher productivity, higher rolling temperature, lower roll wear, larger product lengths possible, and compact arrangement and therefore shorter layout.

The reversing breakdown stand, universal roughing stand and universal finishing stand can be designed both as a conventional stands with closed – top housing and in compact cartridge stand (CCS). With CCS mill stands, the total investment is lower and operating costs are reduced as compared to the conventional stands. The characteristic feature of the CCS stand is the simultaneous changing of rolls and mill guides within 20 minutes. The other benefits are of CCS stands include high stand rigidity, possibility of installing rolls with different barrel lengths, high adjustment precision, close rolling tolerances on the finished product, automatic roll gap control over the section length, automatic zeroing of the rolls under load (roll kissing), automated determination of actual mill stand modulus after roll change, exact presetting of the roll gap, automatic overload protection etc.

[Section Mill- Break down stand & Compact stand group of CCS design]

These days, there are even uninterrupted production lines right from liquid steel to completely

finished product. The process leads to higher productivity, consistent product quality, and cost savings. The Endless Casting Rolling [ECR®] process is based on the direct connection of the two-strand, high-speed caster with the rolling mill through an in-line equalizing roller-type tunnel furnace, making it possible for non-stop direct rolling of the bloom coming from the caster, for an uninterrupted production cycle.

Structural Mills in Indian Steel Plants

Steel Authority of India (SAIL)'s steel plant at Bhilai has rail and structural mill installed in the year 1960. The mill has 2-Hi reversing roughing stand (950mm diameter), two numbers of 3-Hi reversing intermediate stands (800 mm diameter)and 2-Hi reversing finishing stand (850mm diameter) followed by seven number of hot saws, cooling beds, straightening machine, testing & finishing facilities including on-line ultrasonic and eddy current testing facilities for rails. The mill is pre-dominantly being used as rail mill. Though the mill has rated capacity of 750,000 tonnes of rails/structures per year, annual production has touched 950,000 tonnes of rails and 50,000 tonnes of structures. The product range includes beams [250-600mm], channels [250-400mm] and angles [200x200mm]. This mill has produced the country's longest rail tracks of 260 metres. Bhilai Steel Plant is India's sole producer/ supplier of rails to Indian Railways. SAIL's steel plant at Bhilai has also merchant mill installed in the year 1960[capacity-500,000 tonnes per year]. The mill is a semi-continuous, cross-country type, single-strand mill. Recently three conventional stands have been replaced by housing less stands. The product range includes channels [70-140mm] and angles [60-90mm].

SAIL's steel plant at Durgapur has 26" cross country medium section mill installed in the year 1960[capacity-200,000 tonnes per year] with one no. 2-Hi reversing roughing stand, two numbers of 3-Hi intermediate stand, and one no. 2-Hi reversing finishing stand. The product range includes channels [125-200mm], angles [90-130mm] and beams [116-225mm]. SAIL's steel plant at Burnpur has 34" conventional medium structural mill installed in the year 1939 [capacity-250,000 tonnes per year] with one no. 2-Hi reversing roughing stand, one on. 2-Hi reversing intermediate stand and one no. 2- Hi reversing finishing stand. The product range includes channels [200-400mm], angles [130-150mm] and joist [200-400mm], Z pile & Z section.

As a part of expansion of facilities at SAIL's steel plants, heavy universal section mill [capacity-600,000 tonnes per year] at Burnpur is being installed by SMS Meer, Germany led consortium. The mill configuration includes a 2-high reversing roughing stand with a compact three stands universal tandem group (UR-E-UF) using the X-H® rolling method patented by SMS Meer, Germany. The product range at Burnpur includes beams [IPE 240 – 750mm, HEA 200 – 450mm, HEB 200 – 450mm], channels [200-400mm], and angles [150-200mm] and special section i.e. Sheet Piles and Z section. Towards expansion, another universal rail mill [capacity-1000, 000 tonnes per year] at Bhilai is being installed by SMS Meer, Germany led consortium. The mill configuration includes a two numbers of 2-high reversing roughing stands with a compact three stands universal tandem group (UR – E – UF) using the X-H® rolling method patented by SMS Meer, Germany. The mill will be equipped with the state–of –the -art technologies for rolling, testing & finishing facilities including on-line ultrasonic and eddy current testing facilities for rails. The mill has been provided with welding of rails to produce 260m long rails. In addition to this, a medium structural mill [capacity-1000, 000 tonnes per year] at Durgapur is under installation by Siemens VAI, Austria led consortium. This mill is a continuous mill with 16 numbers of stands in H/V configuration- six (6) nos. stands of the roughing group have been configured as V/H whereas ten (10) nos. stands of intermediate/finishing group have been configured as Universal / Convertible. The product range at Durgapur includes beams [100-300mm], channels [100-300mm], and angles [90-200mm]. With these expansion facilities, annual capacity of structural products in SAIL's plants will increase from 1,8million tonnes to 4.4 million tonnes [144% increases].

Rashtriya Ispat Nigam Ltd (RINL)'s Steel Plant at Visakhapatnam has Medium Merchant & Structural Mill (commissioned in the year h 1992) with capacity of 850,000 tonnes per year. The mill is a single

strand continuous mill with 8 roughing stands, 6 intermediate stands and 6 finishing stands. This is high speed universal mill with computerized controls. Universal beams (both parallel and wide flange) have been rolled first time in India at Visakhapatnam using Universal Stands. The product range includes beams [IPE 100 -180, HE 96 -114mm], Channel 100 – 180mm and angles 75 -110mm. Rail and universal beam mill [capacity-1000,000 tonnes per year] installed in the year 2003 at Raigarh Plant of Jindal Steel & Power Ltd (JSPL) was used mill, upgraded & revamped by SMS Group, Germany. The mill stands have been changed to new stands and have been supplied by SMS Meer. The mill installation includes reheating furnace, primary& secondary de-scalers, one no.2-Hi reversible stand and three stands universal tandem mill (UR – E –UF), cooling beds, straightening machine, testing & finishing facilities including on-line ultrasonic and eddy current testing facilities for rails along with welding of rails to produce 480m rails. Though this mill has produced 120 metre long track rails, the mill is being pre-dominantly used as Structural Mill. The product range includes beams with web heights up to 1000 mm and channel upto 400mm. A medium & light structural mill is also being set up at Raigarh with a 0.7 million tonne capacity. The product range of this mill includes Channels [250-300mm] and Angles [130-150mm]. Apart from the above mentioned main & major steel producers, there are many small & medium capacity section mills installed with secondary steel producers [Sponge Iron & Scrap -Induction Furnace/Electric Arc Furnace –Rolling Mill Route OR Sponge Iron &Blast Furnace (hot metal) - Electric Arc Furnace-Rolling Mill Route]. Such secondary steel producers/rolling mills include the followings:

S.N.	Steel Companies / Plant	Location	Indicative Annual Capacity (T/Yr)
1.	Monnet Ispat & Energy Ltd.	Raipur	250,000
2.	Mid India Steel and Power Ltd.	Ghandidham	250,000
3.	Topworth Power and Steels Ltd.	Durg	300,000
4	Topworth Power and Steels Ltd.	Nagpur	250,000
4.	C.G. Ispat Pvt. Ltd.	Raipur	150,000
5.	Bansai Steels and Power Ltd.	Bellary	200,000
6.	Karantara Steels Ltd.	Mumbai	200,000
7.	S.K.S. Ispat & Power	Raipur	3x150,000+1x70,000
8.	Shri Bajrang Power & Ispat Ltd.	Raipur	150,000
9.	Usha Martin Industries Ltd.	Jamshedpur	250,000
10.	Balbir Rolling Mill Ltd.	Silvassa, Gujrat	80,000
11.	Sujana Metal Products Ltd.	Vishakapatnam	70,000
12.	Eagle Steels	Raigad,	50,000
13.	Bhuwalka Steel Industries Ltd.	Bandapura Bangalore	150,000
14.	Shyam Steel Industries Ltd.	Howrah,	230,000
15.	M S P Steel & Power Ltd.	Raigarh	90,000
16.	Shree Parasnath Re-rolling Mills Ltd.	Durgapur	100,000
17.	Vandana Ispat Ltd	Raipur	60,000
18.	Mahamaya Steel Industries	Raipur	100,000
19.	Prakash Industries Ltd	Raipur	2x150,000
20	IND Agro Synergy	Raigarh	100,000
21	Electrotherm	Ahmedabad	100,000
22	Global Smelters	Kanpur	150,000
23	Surya Alloys	Durgapur	150,000
24	Viraj Profiles	Mumbai	150,000
25	Bansal Alloys	Mandi Gobindgarh	150,000

Most of the mills in the secondary sector are cross country type mills – a design of nineteenth

centuries with certain level of automation and of annual capacity up to 300,000 Tonnes. Some of these mills roll up to 600mm beams. Further, induction furnace route also poses certain qualities constraints.

Integrating continuous casting and rolling for production of section products:

Continuous caster producing near-net shape beam blanks [first developed at TXI Chaparral Steel in Midlothian, Texas, USA in the early nineties], soaking furnace and rolling mill operating in conjunction with each other with the beam blanks being charged directly into the soaking furnace from the caster was the first integrated casting and rolling plant commissioned in 1999 by TXI Chaparral Steel in Virginia, USA. This mill was designed for a capacity of one million tones per year with a very broad product range including beams with web heights from 150 to 920mm, channels and sheet piling sections. In such a plant, a buffer zone in the furnace and the quick programme changing of the stands allow a size change to be carried out without having to interrupt the continuous casting operation. Also in this plant, no conventional heavy reversing roughing stand is required. The adaption of the beam blank to the desired chamber width is performed in a vertical edging stand. This beam blank is then rolled out in a horizontal stand near the edging stand to produce a leader pass for the universal rolling in the universal stand. The two stands operate as a reversing stand group. This method of operation offers substantial cost savings. In India, there is no such a mill complex which integrates its continuous casting and rolling mills.

Rail Mills

Rail Mills are designed as single purpose plants on which only rails can be produced. In some cases, rails are also produced on combined rail and section mills. Rails are produced either using the two – high rolling method on two – high reversing mills or on three-high mills and increasingly these days, using the universal rolling method on a tandem reversing group. With universal rolling, we get closer rail tolerances, better surface quality and less roll wear. The rail is rolled product with the most demanding requirements. These include not only metallurgical properties such as steel analysis and purity, but also physical and geometric properties such as straight-ness, tolerance, surface quality, micro-structure properties and residual stress level. These days rails are used for high-speed transport so that compliance with these demands is of crucial importance. The rails are straightened on special rail straightener, checked for surface & inner defects, section geometry and waviness. The ends of the rails are cut off with special cold saws and drilled, if necessary. These days rails with a length of upto 125 metres are produced.

[Heavy Section and Rail Mill]

In India, as mentioned above, rail and structural mill of Bhilai Steel Plant is pre-dominantly being used as rail mill and Rail and universal beam mill of Jindal Steel & Power Ltd is being pre-dominantly used as Structural Mill.

Conclusions

The major steel plants such as SAIL and RINL have high capacity section mills with the then available technologies. SAIL has gone for the state-of-the-art technologies for section/rail mills being installed as a part of its expansion plans. JSPL though had installed used mill, but have upgraded & revamped as explained above. JSPL in its expansion plans is also going for the state-of-the-art technologies. But most of the section mills installed in the secondary sector are of cross country type mills – a design of nineteenth centuries with certain level of automation and of annual capacity up to 300,000Tonnes. Most of the Indian manufacturers of section mills do not have adequate design & technology expertise to develop their own designs, as is being done by the international mill manufacturers. The capital cost of the mills engineered by the international mill manufacturers is substantially high. Considering the high cost, the secondary sector generally has the tendency to go for local cross country type mills, such mills have the limitations both for quality and capacity to produce. However, some of the section mills installed in the secondary sector, in the recent past, have some modern features. Indian Steel Industry will continue to depend heavily up on international mill manufacturers for section mills of higher capacity with the state-of-the-art technology, unless & until Indian manufacturers of section mills develop the capabilities in the areas of design & technology. The re-engineering of the available modern mills in various Indian Steel Plants by consortium of Indian manufacturers of section mills, Indian Steel Plants, Consultants and Engineering Institutes such as IITs appears to be one of the alternates to absorb the state of the art technologies. China Metallurgical Group Corporation (MCC) having huge number of Design, Engineering & Research Institutes and associated with many manufacturing workshops and steel plants have successfully absorbed the state-of the art technologies from the international steel plant equipment manufacturers, who were associated with Chinese Steel Industry during last 5-10 years for their expansions programmes. Presently Indian Steel Industry is sourcing many capital steel plant equipments from China. It is certain that Indian Steel Industry can absorb the technology & manufacture the steel plant equipments indigenously, if it makes efforts collectively as an Institute, of course with the support of Indian Government.

LINKING SCIENCE & TECHNOLOGY FOR GLOBAL SOLUTIONS

Dr. (Mrs.) Malti Goel
Member, IIM Delhi Chapter &
Former Adviser / Scientist 'G' and Head, STAC
(Ministry of Science & Technology, Govt. of India)

Reduction of carbon dioxide helps to minimize the role of global warming and improving fuel self sufficiency. Carbon management is becoming a key issue for growth and industry. **'CO_2 and Other Greenhouse gas Reduction in Metal Industries'** one of the symposiums in TMS2011 **in** TMS 2011, 140th Annual Meeting & Exhibition February 27-March 3, 2011 held in San Diego, USA. The conference theme was on ''Linking Science & Technology for Global Solutions' covered in 75 symposiums dealing with Materials, Energy and Metal industries and attended by over 4000 delegates and exhibitors.

Dr. (Mrs) Malti Goel, Member, Technical Committee, IIM Delhi Chapter had the honour and privilege of participating in this important event as co-organizer and Technical Session Chair. She also

presented a paper on '**Greenhouse Gas Emission Reduction From Aluminum Industry In India: Challenges & Prospects'**. In this Session nine papers were presented from research in aluminum and steel industries. The examples include; carbothermal reduction of alumina, analysis of carbon reduction in china steel plants and pollution removal from bauxite residue, among others. In the paper presented by Dr Malti Goel, climate policy and Indian aluminum industry vision, greenhouse gas emission scenario and mitigation technologies are presented. New developments on global and national scene as well as carbon capturing research \were summarized. The challenge lies in bridging the gap between global industry benchmark and Indian industry as well as to realize the vision of the industry. There were several plenary symposiums on topics such as Aluminum Industry and Materials & Society, among others. Sessions such as lunchtime learning on Energy Management were also organized. Becoming an energy efficient company takes a little more than good intentions, but it can be well worth the effort in the long run. The speakers from Superior Industries and Aleris International, Energy Services Company CalPortland, and a professor from Metallurgical & Materials Engineering at the Colorado School of Mines gave examples from their own spheres of working. A seven-step road map to creating an energy management plan that works was presented. Implementing a plan does not have to be daunting. An energy reduction plan can actually result in enormous savings, one need an executive commitment and all the way down the line Solid waste landfills are becoming the 'Gross National Product,"' Recycling can be a win-win situation for both the industry and global environment.

Honour for Dr. G N Mohanty

Dr. G N Mohanty, Member, Executive Committee IIM DC has been honoured for his outstanding contributions as a leading professional of the world 2011. This award has been conferred on Dr. Mohanty by International Biographical Centre, England. This award is given to an eminent professional for excellence.

Our Congratulations to Dr. G N Mohanty

Visit to JSL Stainless Ltd., Hisar (16April 2011) – A Brief Review

The Indian Institute of Metals – Delhi Chapter regularly organizes visits to eminent industries in and around NCR, for benefit of its members. In this series, a team of IIM DC members visited JSL Stainless Ltd., Hisar on 16April 2011, on invitation of IIM Hisar Chapter. The visiting members went around state of art facilities of JSL Stainless and had extensive deliberations with the office bearers of IIM Hisar Chapter.

JSL Stainless Ltd. is globally recognized producer of stainless steels flat products in Austenitic, Ferritic, Martensitic and Duplex grades. The product range comprises different grades of stainless steels including Slabs & Blooms, Hot Rolled Coils, Plates, Cold Rolled Coils and Special products like Razor Blade Steel, Precision Strip and Coin blanks. Its market share in India is ~ 45%. With the commissioning of its forthcoming integrated Orissa project at Jajpur, JSL Stainless will achieve a capacity of 2.5 MTPA, further consolidating its position as the largest producer in the country with wide product mix covering austenitic, Ferritic, Martensitic, dual phase and super-dual phase quality steels catering to critical requirements of defense, nuclear energy, automobile sector in domestic markets and exports.

PLANT FACILITIES

Steel Making

The two Steel Melt Shops, SMS I & SMS II, comprise Ultra High Power - Electric Arc Furnaces, Argon Secondary Metallurgy Converter and LRF (Ladle Refining Furnace). SMS is equipped with a continuous slab caster while SMS II is equipped with twin strand bloom caster. In addition, SMS I is also

equipped with VOD (Vacuum Oxygen Decarburisation) unit to produce steel with low inclusion and gas content. The present installed capacity of both SMSs put together is 550,000 MT per year. The Slabs are subjected to surface conditioning in a slab grinding section. The Slabs are then Hot Rolled into HR Coils in Steckel Mill, which are then used to produce HRAP No.1 Coils and Plates. HR coils are transferred to Cold Rolling Unit, to produce CR Coils and Sheets. The Blooms are hot rolled in Tandem Strip Mill to narrow coils and flat bars.

In addition, special steels like razor blade steel is cast into ingots, which are subsequently forged to slabs & rolled in tandem strip mill.

Process

The production of stainless steel begins with melting of ferrous scrap and ferroalloys in UHP Electric Arc Furnace, followed by secondary refining in AOD/VOD units. The liquid steel thus obtained, is cast into slabs in a continuous slab caster with Auto Mould Level Control (AMLC) System. JSL Stainless Ltd. produces stainless steel in 200, 300 & 400 series. On-going efforts of a dedicated R&D Team, along with Operations & Quality Assurance departments are constantly innovating in fields of cost reduction, product development and addition of niche products viz. Duplex Stainless Steel, Controlled expansion alloys like INVAR-36, Special Finish Cold Rolled Stainless Steel and Stainless Steels for critical applications.

Hot Rolling

Hot rolling comprises Hot Steckel Mill and Tandem Strip mill. The hot steckel mill comprises slab reheating walking beam furnace, 4 Hi reversing roughing mill, 4 Hi reversing Steckel Mill equipped with Hot Coilers on both sides and a down coiler. Slabs are rolled to hot rolled coils and plates. The mill is equipped with level-2 automaton system consisting of automatic hydraulic gap setting, roll bending system, automatic pass scheduling & mill setup, automatic sequencing, mill supervisory system and automatic gauge control. The mill is capable of rolling plates and coils up to 1250 mm width weighing up to 18MT.

The Tandem Strip mill comprises reheating furnace, 2-Hi roughing stand, five finishing stands and down coiler to hot roll stainless steel blooms into flat bars and narrow coils.

The present rolling capacity of both the mills put together is 720,000 TPA.

HR coils are cut to length, annealed and pickled to produce plates in HRAP No. 1 finish. For thickness 10.0mm and above, plates are directly produced from steckel mill, which are annealed and pickled to produce HRAP No. 1 finish plates.

Cold Rolling

The cold rolling mill complex comprises four units - CRD I, CRD II, CRD III & CRD IV. CRD I, CRD III & CRD IV comprise a combination of 20 Hi Sendzimer mills, annealing and pickling lines and various sophisticated associated equipment & processing lines to produce Cold Rolled Coils & Sheets with quality surface finishes, precise dimensional control and good flatness control in wider coils (>600mm width). The facilities at JSL Stainless Hisar are equipped to produce and supply material in 2D, 2B, No.3, No.4 and BA surface finishes. CRD II is engaged in production of precision strips in thinner sizes (0.05mm to 0.50mm thick) e.g. Razor Blade, other ferritic and Martensitic stainless steel.

The present installed capacity of cold rolled products is 1,50,000 TPA.

Coil buildup line is used to attach leader ends in hot rolled coils for increasing the overall yield of coils. It is also equipped with edge trimming to improve production for further operations.

The Skin pass mill is designed and installed in dust proof housing. It is used to give cold rolled pass by

polished groundwork roll on 2D finish dull material to convert to 2B bright surface finish. The mill is designed to meet requirements in 600 to 1600mm width coils in 0.40 to 3.00mm thickness.

Slitting lines are used to side trim the coils and cater the market requirements in smaller width coils with a thickness from 0.45mm to 6MM.

The Strip Grinding line is used to produce No.3, No.4 and some special finishes requiring grinding which is used for decorative purposes in architectural applications, restaurant equipment, dairy equipment, lifts, elevators etc.

The flying shearing line with Voss Levelers is used to produce sheets with good flatness, which is the first and foremost requirement of customers.

The annealing and pickling line is used to anneal and pickle Hot Rolled stainless and Cold Rolled stainless steel coils. The continuous annealing & pickling line is equipped with a neutral electrolyte tank for pickling by Ruthner process, using sodium sulphate for the neutral electrolyte, scanacon system for acid recovery and removal of metal content.

The bright annealing (BA) line at JSL is one of its kinds in India. The annealing in BA line is done in controlled atmosphere of cracked ammonia to avoid any oxidation of metal which ensures a bright finish called as BA finish.

Razor and Surgical Blade Steel

JSL Stainless Ltd. is an exclusive producer of stainless razor blade steel in India. The microstructure of their strips is designed to optimize / facilitate hardening, sharpening & honing operations at customers end and to develop ideal characteristics for intended end applications. These are achieved with stringent quality checks utilizing modern and sophisticated testing equipment such as Metallurgical microscope with advanced Image Analyzer, digital micro-hardness tester, microprocessor controlled Tensile testing machine and Scanning Electron Microscope. Persistent R & D activity had led to improvements in quality of product enabling JSL, not only to cater to the Indian razor blade steel requirements but also to export a substantial quantity on a regular basis. The current capacity for precision strip production is 12,000 TPA.

Coin Blanks

JSL Stainless Ltd. has been supplying AISI 430 grade ferritic stainless steel coils & blanks to India Govt. Mint & Foreign mints for making coins on regular basis. To diversify its product range, coin blanking and associated processing facilities of world-class quality have been installed and commissioned. Facilities are available for supplying Ferritic Stainless Steel `5, `2 and `1 coin blanks. The present installed capacity for coin blanking is 10,000 MTPY.

The cold rolled and bright-annealed coils are processed at coin blanking lines. This comprises a blanking press, deburring machine, edge rimming machine, annealing furnace and polishing machines. Subsequently the coin blanks are inspected on Inspection Conveyors, then counted by counting machine and packed in drums for dispatch. The punched out strips of AISI SS430 are by-products during production of coin blanks. These are aesthetically pleasing and elegant and have a vide variety of applications such as cable trays, kitchen racks, Paper Baskets etc.

Cupro-Nickel Complex

In order to expand the business for coin blanks, an independent production line has been installed to produce high value copper-base non-ferrous alloys importantly cupro-nickels. The production facility includes induction melting, continuous horizontal strip casting, cold rolling, annealing, pickling and slitting. The installed melting and casting capacity is 6000T per annum. Apart from Cupro-Nickels, the unit can produce Aluminum-Bronze, Phosphorus Bronze, Nickel-Silver and Tin bearing copper for

various engineering and jewellery applications. Aluminum-Bronze along with Cupro-Nickel is used to manufacture duplex coins. At present JSL Stainless Ltd. is supplying the newly introduced Aluminum bronze with high value Copper based non-ferrous alloys - Cupro Nickel duplex coin blanks of denomination of `10 to Govt. of India, Mint.

RESEARCH & DEVELOPMENT ACTIVITIES

The R&D division at JSL Stainless Ltd., Hisar plays a pivotal role in retaining and consolidating company's leadership role in stainless steel business by continuous up-gradation of quality, processes & services and innovating development strategies to come up with new products.

Major tasks

- ✓ Developments of high value products to serve niche markets
- ✓ Quality up-gradation of existing products enabling global acceptance
- ✓ Cost reduction by process development, optimization and refinement to improve competitive edge
- ✓ Technology enhancement to increase production with quality
- ✓ Market segment improvement by interacting & sharing knowledge with customers and assisting them in trouble shooting operation

In addition to the above, R&D Division closely interacts with reputed national and international laboratories/scientific institution/universities to avail expert services for critical investigations.

INTERACTION WITH IIM HISAR CHAPTER OFFICE BEARERS

Detailed discussions were held with the office bearers of IIM Hisar Chapter. Mr. J.Sood, AVP (Operations) CRD, JSL Stainless Ltd. and Chairman IIM Hisar Chapter welcomed regular interactions with IIM Delhi Chapter.

The issue of joint development of a one or half day workshop on "*Stainless Steel Applications & Business Opportunities*", to disseminate basic knowledge of Stainless steels amongst business persons and students of engineering colleges, was discussed in detail. This may cover introduction to various manufacturing processes applicable to stainless steels, information about availability of plant and machinery, consultancy & support services etc.

With the same theme as above, during MMMM-2012 Exhibition scheduled in Sept. 2012 in Pragati Maidan, New Delhi, we can jointly plan an exclusive section/hall as "***The Stainless Show***", where visitors should be able to get all information on the subject under one roof. Here business sessions for select visitors to clarify all queries could also be planned.

This would call for advance planning of the event with adequate publicity in industrial clusters across the country, involving local industry associations/ business forums and engineering institutions.

Office bearers of IIM Hisar Chapter agreed the proposal, in principle. It was indicated that the Marketing Development Group of JSL Stainless Ltd., based at N. Delhi, would be associated in this venture.

The visit to JSL Stainless Ltd. Hisar ended with thanks to JSL Stainless Ltd. and IIM Hisar Chapter for facilitating this visit.

National & International News

A New Step towards Value Addition at MEL

Maharashtra Elektrosmelt Ltd (MEL), recently added another product in its basket. The product-mix of MEL comprises of High Carbon Ferro Manganese (HCFeMn), Silico Manganese (SiMn) and

Medium/Low Carbon Ferro Manganese (LC/MC FeMn). Most of these products are used by plants in order to meet requirement of manganese based ferroalloys. Over the years, MEL has made a number of technological advancements that include in-house development of technology of production of SiMn, quick changeover of products from HCFeMn to SiMn and vice-a-versa, production of LCMC FeMn through Electric Furnace route as well as bottom blown converter route, layer casting of ferro alloys and its mechanized processing etc. During 2009-10, under its New Products Development initiative, it developed low carbon low phosphorus silico manganese – with carbon level about 1% and phosphorus about 0.15% against the specification of 2.5% carbon and 0.35% phosphorus in normal grade of Silico Manganese. Though the above grade of SiMn was difficult to make through submerged Arc Furnace in a single stage process. MEL accepted the challenge and successfully produced 400 tonne of material at reasonable cost. The difficulties included increase in viscosity of slag causing problem in drainage of submerged arc furnace during tapping, and improper drainage leading to variation in charge conductivity. The new product has helped MEL earn the twin benefits of increased profit and has also met a unique requirement posed by Bokaro Steel Plant for making a special grade of steel viz. DMR grade steel.

Source: SAIL News

Chinese steel capacity is yet to become excess – GM, Baoshan Steel

According to Mr Ma Guoqiang GM of Baoshan Iron and Steel Co Ltd, Chinese steel capacity is yet to go excessive as a whole, however, with the fall back of economic growth and slowdown in investment we will face steel over capacity in the long run. During a financial forum held recently, he said that the high priced iron ore is mainly attributed to China steel mills, although partly concerned with three mining giants' monopoly, the price can't reach high without sufficient market demand. He added that "In recent years, China crude steel output has risen to 0.6 billion tonnes from 0.1 billion tonnes previously, with the capacity hitting 0.7 billion tones and many steel plants are still under the construction."

Mr. Ma committed that "China hyper normal development of steel industry is caused by the hyper normal development of the national economy. When China's economic GDP growth rate falls back to 7% to 8%, the investment is slowing down. So, the steel capacity will go excessive as a whole in a long term." Besides, he emphasized that the iron ore price hikes were not the key issue among the steel mills, because the previous data showed that increase of iron ore prices usually led to profit growth in steel mills. He said "What we are afraid of is the decline of steel price followed by drop of iron ore price, while the high inventory level was mainly caused by the high production costs." He also disclosed that RMB appreciation was favorable to China steel industry. "RMB appreciation will lower the import prices of crude oil, iron ore, etc which will better meet the domestic needs."

Source: Steelguru

Request for Contributions to the News Letter

We are trying to give a technical orientation to IIM DC activities. The News Letter can become an effective dissemination source of technical contributions. We also wish to circulate the News Letter to different academic institutions, research organizations, regional IIM Chapters and small and medium industrial enterprises. We want that these institutions become aware of the services that IIM DC can provide to these units. Technical write-ups and other important personal news, family events such as marriage, birth, scholarships, victory, higher education, acquiring additional qualification etc. etc. are earnestly solicited from our esteemed members for the monthly News Letter. Your inputs and contributions for inclusion in the news letter are earnestly requested.

S C Suri
Chairman
Technical & Publication Committee

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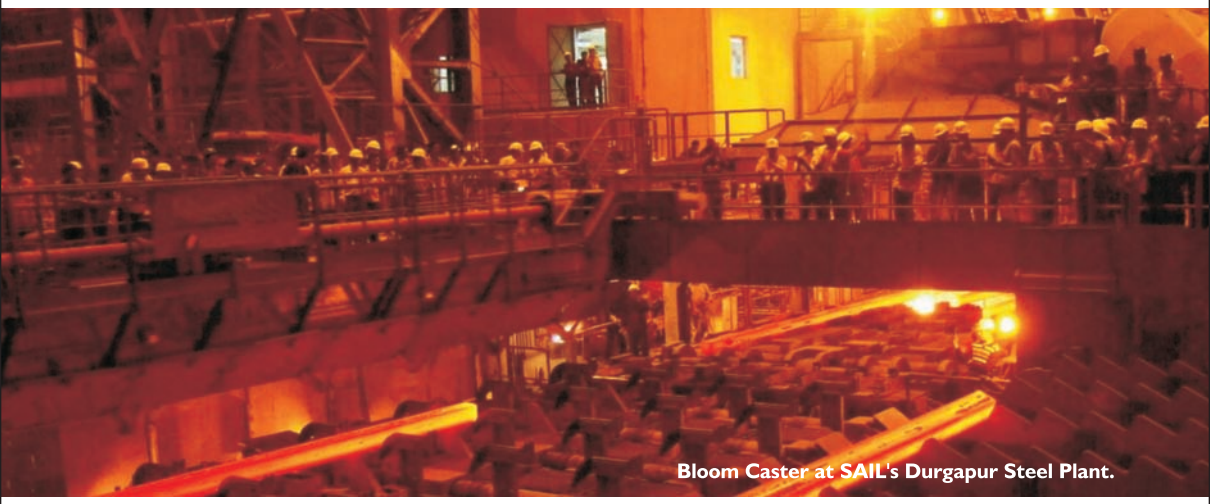

Bloom Caster at SAIL's Durgapur Steel Plant.

Steel Authority of India Ltd. (SAIL), owns and operates five integrated steel plants at Bhilai, Durgapur, Bokaro, Rourkela and Burnpur and three special steel plants at Salem, Durgapur and Bhadravati. SAIL also produces iron-ore. It has its own captive mines that fulfil its iron ore requirements. A subsidiary at Chandrapur produces ferro alloys. SAIL has recently been awarded the prestigious status of a *Maharatna* by the Government of India.

- All its production units are ISO 9001:2000 certified.
- Current annual production of crude steel is around 14 Million Tonnes (MT). Produced over 350 million tonnes of crude steel since its inception.
- SAIL's product basket comprises Flat products, Long products and Pipes, including branded products such as SAIL TMT, SAIL JYOTI GP/GC Sheets.
- Supplier to strategic sectors like defense, atomic energy, power, infrastructure, heavy machinery, oil & gas, railways, etc.
- Supplier of rails to the Indian Railways.
- Major production units are ISO:14001 certified.

SAIL STEEL - Catering to Diverse Segments

Bandra-Worli Sea link

Windmills

Chandrayaan

Railways

Hydro Power

Construction

Petrochemicals

Naval Warship

Power

Infrastructure

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