



## POWER-PACKED: FIRST COAL FIRED AUSC PLANT

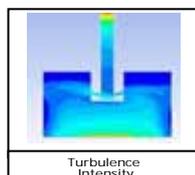
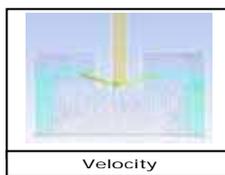
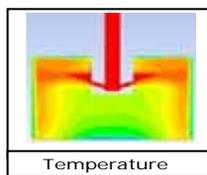
IGCAR, BHEL and NTPC signed an MOU in August 2010 to set up India's first 800MW coal-fired Advanced Ultra Supercritical (AUSC) power plant which will be operational by 2017. It will reduce operational costs and emit less carbon dioxide than existing similar units. After developing this India will be one of the leaders in the world in thermal power plant technologies.

The AUSC will have 5% more efficiency and reduce 12 percent coal thus reducing the overall CO<sub>2</sub> emission. At present there is no AUSC plant in world and will be based on our indigenous R & D with IGCAR'S expertise in design, materials and manufacturing technologies of the fast breeder reactor. The AUSC boilers will be able to operate at pressure of 300 bar and 700 degree centigrade.

This kind of high temperature and pressure will improve steam cycle efficiency, that is, for a given electrical output there will be less fuel and less release of CO<sub>2</sub>. The total cost of the project is estimated to be Rs 7000 crore, including Rs 2500 crore for R & D.

## Cutting Edge: Design by CFD Mathematical Modeling

For the first time a 4-port SEN for the bloom caster of a reputed overseas customer by CFD mathematical modeling. The new design SEN will impact on uniform flow and temperature distribution in the mould, maintain optimum linear velocity at mould level with low turbulence intensity and will reduce non-metallic inclusions in steel.



## EDITORIAL BOARD

### Advisors

Prof. S.K. Sarangi, Director, NIT, Rourkela  
 Prof. N.K.Mitra, Ex-Professor, Science College, Kolkata  
 Mr N Mukherjee, Sr Vice president, Adhunik Metaliks Ltd, RKL  
 Mr. V. Pandey, Sr.VP-Refractories, Ispat Industries Ltd. Dolvi  
 Mr. S.K. Bhattacharya, DGM(RED), VSP, Visakhapatnam

## From Editor's Pen

THE steel industry is seeing a recovery in global demand, led by consumers in developing countries. There is a rebound in all geographies from the levels of 2008-09. These views are also being echoed by Arcelor Mittal CEO. The steel growth scenario looks quite optimistic in 2011. World Steel Association reported a 15% surge in steel output year-on-year, to 1.414 billion tonnes which is 5 % higher than the previous peak of 1.346 billion tonnes in 2007. China, India and South Korea reached record production in 2010. India's output of 66.8 million tonnes was a record high. However, the biggest concern for the global economy is "volatility and uncertainty" particularly in Europe, where companies are loosing competitiveness. SAIL is looking forward to build four overseas plants. China is expected to generate a record of 660MT of crude steel this year. The Chinese manufacturing sector began 2011 on a strong footing, buoyed up by strong growth momentum as PMI rose to 54.5. The steel industry globally is under grip of a margin squeeze due to double-whammy of surging raw materials and volatile steel prices, leading to lower profit margins. In India, demand in auto sector has improved but the construction is still struggling. The steel consumption was fuelled by long products including rails. The country intends to double infrastructure spending up to \$1 trillion in its next five-year plan. The refractory industry is coming to grips with surging raw materials prices of all essential raw materials like Magnesite, BFA, WFA, Silicon Carbide, resins and graphite, and coupled with limited availability of Bauxite. The product price rise is but slow and sluggish and margins are badly battered. The export market for CC refractories, Purging plug and Slide plates look upbeat but the prices are shocking. It is a Himalayan task to pass the hike on to our buyers. Hoping the current financial year will unfold vigorous growth, both in terms of volumes and margins. So long.

SK. BASHIR MOHAMMED

## What's inside ?

- Steel 2010: The Year of Revival
- Global Steel News
- Refractory Raw Materials: Steep Price Hike
- OCL Reaching out to Customers
- Improvement of Monolithic Lances Performance

**Editors :** Sk. Bashir Mohammed, Utkal Garg, Anupal Sen

**Content Coordinators :** B. Prasad

## **STEEL 2010.....THE YEAR OF REVIVAL.**

Driven by growth and recovery of manufacturing sector in the developed countries, global crude steel output touched a new high in 2010. North America showed the sharpest rise by 35.7% followed by Australia/New Zealand (35.5%) and EU-27 (24.6%). Asian increase was 11.6% and South America's output rose by 15.9%. In Asia, China, India and South Korea reached record production levels in 2010. Chinese steel output touched 627 million tonnes, even though its share of global output dropped to 44.3% from 46.7%. India's production rate of 6.4% was lower than the other major producers, but its output of 66.8 million was a record high. South Korea's production increased strongly by 20.3% - a record high. Japan registered an impressive growth of 25.2%.

## **STEEL GROWTH**

The World Steel Association (world steel) released its April 2011 short range outlook (SRO) for 2011 and 2012, where apparent steel use will increase by 5.9% to 1,359 mmt in 2011, following 13.2% growth in 2010. In 2012, it is forecast that world steel demand will grow further by 6.0% to reach a new record of 1,441 mmt.

This forecast suggests that by 2012, steel use in the developed world will still be at 14% below the 2007 level whereas it will be above 38% in the developing economies, above. In 2012, the emerging economies will account for 72% of world steel demand against 61% in 2007.

India is expected to show strong growth in steel use in the coming years due to its strong domestic economy, massive infrastructure needs and expansion of industrial production. In 2011, India's steel use is forecast to grow by 13.3% to reach 68.7 mmt. In 2012, the growth rate is forecast to accelerate further to 14.3%.

## **DISCOMFORT ZONE .....**

### **HIGH IRON ORE PRICES**

Top global miner BHP Billiton's chief executive has predicted that iron ore prices will stay strong for as long as two years. But his counterpart in Rio Tinto while forecasting tight supplies and high prices mentioned of prices falling below \$190 when their mine expansions are completed in 2014-15.

## **HYUNDAI & HYUNDAI**

Hyundai Motor Co. is strengthening its ties with Hyundai Steel as it plans to more than double the use of high-strength steel in its vehicles by 2015. By using advanced steel to keep with its Japanese competitors in cost and performance, it will raise the ratio of

high-tensile steel in vehicles to 50 percent from 18 percent. Hyundai Steel started two mills in 2010 with capacity of 8 million tons per year. The third will also have a capacity of 4 million ton. Of the total capacity of three, steel used in cars and home appliances will account for about 8.5 million tons. Part of which will go to Hyundai Motor and Kia.

## **SAIL: OVERSEAS ADVENTURE**

SAIL is planning to spend \$12 billion to build four plants overseas, setting its eyes for expansion. The steel giant is looking for a strategic investor for the proposed plants in Indonesia, Oman, Mongolia and South Africa with 3 million tons capacity each. As per Mr. C S Verma the funding will be met through 70-80 percent of debt and the rest 20-30 percent through equity. The talks with respective governments are in progress and it will take 3 years to start from the date of signing of MoU.

## **GLOBAL STEEL NEWS**

World crude steel production for the 66 countries reporting to the World Steel Association (worldsteel) was 129 million metric tons (mmt) in March 2011 and 372 mmt for the first quarter 2011. This is 7.0% higher than March 2010 and 8.8% higher than the first quarter 2010.

China's crude steel production for March 2011 was 59.4 mmt, up 9.0% compared to March 2010. Japan produced 9.1 mmt of crude steel in March 2011, a decrease of -2.7% compared to the same month last year. However, Japan's first quarter crude steel production figure of 27.7 mmt was 4.4% higher than the same period in 2010. South Korea produced 5.8 mmt of crude steel in March 2011, 14.4% more than March 2010.

[Tata Steel](#) has invested £53 million at its Port Talbot works to introduce in the Basic Oxygen Steelmaking plant a new cooling system that will produce steam, allowing electricity to be generated. The investment will reduce its external power requirements by about 15%.

[Japan's Nippon Steel Corp.](#) and [Wuhan Iron and Steel \(Group\) Corp.](#) have agreed to establish a joint venture for the manufacture and sale of tinplate in China. Nippon Steel announced plans to establish a new company for the manufacture and sale of hot-dip galvanized and galvanized steel sheets primarily for automotive use in Thailand.

[South Korea's steel giant Posco](#) recently completed construction of a new thick steel plate plant in Gwangyang Steelworks that will make the company the largest steel plate producer with an annual production capacity of 7 million tons. Posco announced plans to establish its fourth FINEX plant, third wire rod plant and a new stainless steel plant at its Pohang Works. Siemens VAI recently started up a two-strand ultra-thick slab caster capable of casting slabs up to 400 mm at its Pohang Works in Korea.

The **Qatar Steel Company** awarded a contract to Siemens VAI Metals Technologies for the supply of a new EAF, ladle furnace and billet caster for a new steel mill in Mesaieed, Qatar.

**US based AK Steel** reported net income of \$8.7 million on net sales of \$1.58 billion for the first quarter of 2011. However, United States Steel reported a net loss of \$86 million on net sales of \$4.86 billion for the first quarter of 2011.

Global stainless steel melting activities increased by 24.9% in 2010 to a new record high of 30.7 million tonnes, according to the latest report from the International Stainless Steel Forum.

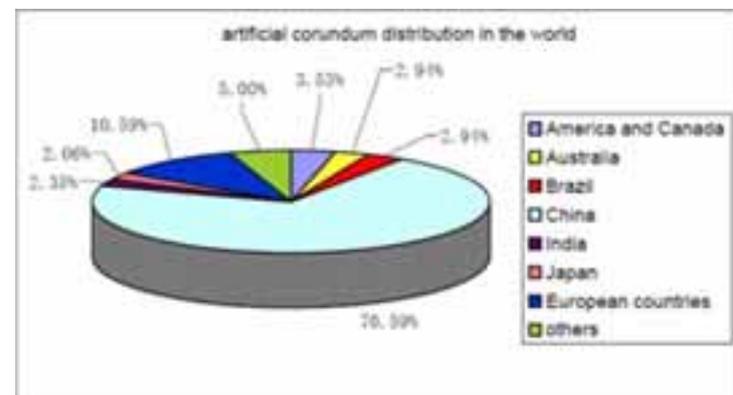
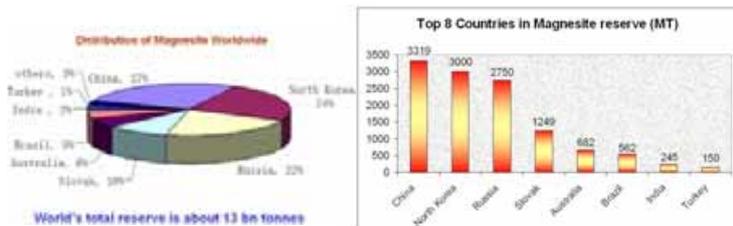
## ON THE INDIAN STEEL FRONT

**Essar steel** announced its highest-ever monthly crude steel production of 380,000 tonnes in March 2011, a growth of 24.04% over the same period a year ago.

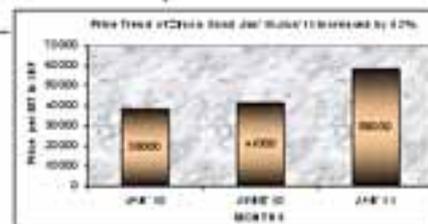
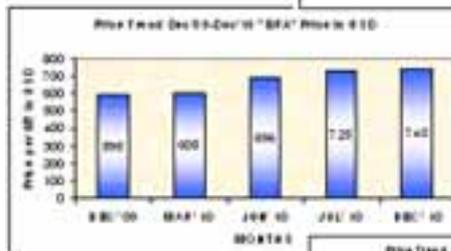
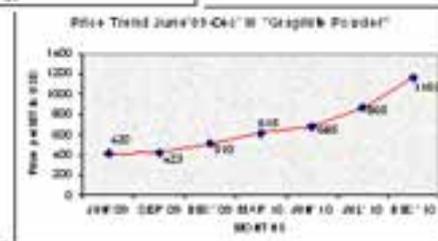
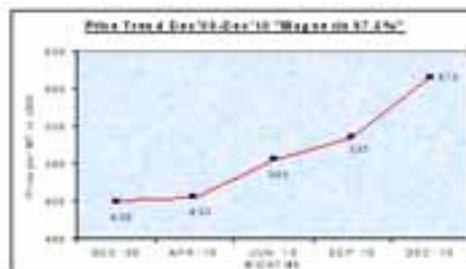
**JSW Steel** Limited reported its highest-ever quarterly crude steel production of 1.72 million tonnes in the fourth quarter of FY 2010-11, and its highest-ever quarterly production of 1.32 million tonnes of flat rolled products.

## REFRACTORY RAW MATERIALS: STEEP PRICE HIKE

Major refractory raw materials include magnesia, graphite, alumina, zircon and chromite. Price of these materials is showing a drastic increasing trend in international market owing to high demand and less availability. Most of these are imported at present and China has high reserves of these as shown in the figures below.



Monopoly of overseas countries, particularly China, has had a positive impact over this. This has an adverse effect on the refractory industry who are unable to pass this increase in input cost to the user owing to stiff competition.



It is time now for some serious thoughts on reducing the material cost. The indigenous raw material manufacturers should focus on indigenous development of zircon & zirconia as India has good reserves of zircon sand. Effective beneficiation of Indian Magnesite & graphite can restrict their prices. Indian Government needs to amend its policies on mining restrictions, beneficiation rules of less than 100 micron size (chromite becomes unusable at this size), providing free quota to refractory makers, declaring refractory industry as the core sector of coal, etc. to control this price hike.

## EVENTS: REACHING OUT TO CUSTOMERS

With a vision to find solutions for practical problems and performance through operational excellence, OCL & DISIR jointly organized their third workshop on "Refractory Lining in Sponge Iron Kiln & Flow Control Refractories for Steel Making" on 12th March, 2011 at Hotel Babylon International, Raipur. The objective is Dr. L. Tiwari (GM-RED, Bhilai Steel Plant) Chief Guest, inaugurated the workshop along with Mr. J.N.Tiwari (ED/R-OCL) and Dr. B.K. Panda (Director-DISIR).

The workshop was set rolling by an introduction of OCL journey by Sri B. Prasad. It was followed by animated presentations on Sponge Iron Kiln lining, Purging Refractories Slide Gate Refractories and Concast Refractories including TTM. The presentations focussed on new product developments and improving life of refractories by right application. Dr. B.K. Panda, presented "Application of Nano-Materials in Refractories".



Sri J.N.Tiwari organized the valedictory session to receive valuable feedbacks from the customers. Sri R.K.Hota, -instrumental in organizing the participation, showered thanks on all invitees. OCL highlighted their product developments and real life problems were addressed in this interactive session. Technical experts from steel and sponge iron industries in Raipur along with who is who of steel industry were present to add to the glitz.

### **Improvement of Monolithic Lances Performance by Limiting Crack Generation During Operation**

– S.P.Das, S. Si, B. Mohammed, B Prasad

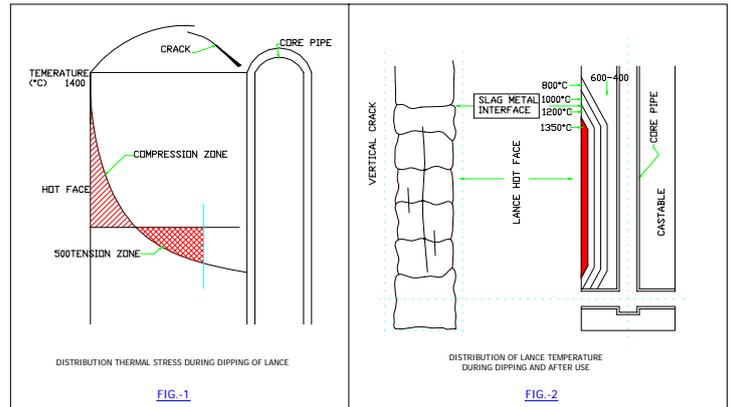
#### **Introduction:**

The role of argon rinsing lance is both vital and critical in a steel operation shop. The argon rinsing is carried out by bottom purging is also done effectively by the top lancing. In case of desulphurization lances the injection of CaC<sub>2</sub>, CaO or Mg is carried out. The effectiveness of the reaction depends on the flow of slag and the stirring efficiency as well. Presence of fluidizers likes CaF<sub>2</sub> and high temperature cycles impact significantly to reduce life. Thermo-mechanical stresses generated at a faster rate, affects the lance refractory and core pipe.

#### **Wear Mechanism:**

The differential residual expansion of refractory and steel core-pipe during dipping and waiting period leads to generation of differential stresses, thus leading to cracks and hot metal penetration damaging the core pipe. This is owing to changes in the microstructure, where the generation of micro cracks is absent or minimum and fast sintering of castable leading to a huge stress development that ultimately leads to a catastrophic crack.

Spalling cracks also develops in due to repeated heating and cooling cycles resulting into penetration of slag into refractory and subsequent erosion. This erosion becomes so severe inside that thick slabs come out of the lance and dissolves into the slag.



#### **Development:**

High expansion aggregates are used in optimum proportion to bring the thermal expansion properties of refractories close to that of steel to compensate the thermal stresses given by the expansive metal on the refractory. This will prevent the formation of cracks due to thermal expansion mismatch between refractory and core-pipe.

In order to improve the thermal spalling resistance of the refractory as such, non-oxides have been added in suitable proportions. This also helps in increasing the abrasion resistance of the refractory. With high thermal spalling resistance, crack generation is prevented during repeated heating and cooling. This has improved the life of lance as a whole.

#### **Life Improvement:**

In Tata Steel LD-I shop, for hot metal DS lance, against the life requirement of 80 heats (1000 mins.), earlier the life achieved was 65 heats (750 mins.). But, after the development, life has improved top 115 heats (1400 mins.). Similarly in VSP argon rinsing lance, earlier the life was 200 mins. against the plant requirement of 250 mins. Now, average life obtained is 350 mins. with a record achievement of 505 mins..

#### **Conclusion:**

Further development is continuing for increasing the thermal spalling resistance and erosion resistance. Work is also going on to obtain a refractory material having thermal expansion compatibility with steel core-pipe in order to reduce the differential stress build up.

Your comments and suggestions may please be sent to [bmohammed@ocl.in](mailto:bmohammed@ocl.in)

Published by the Editorial board. The views expressed in the newsletter are not necessarily of OCL management and they are not responsible for the same.

Please visit us at [www.ocl.in](http://www.ocl.in)