



Horizon

OCL India Refractory Newsletter



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Silver Lining... ..

In the widespread gloom of recession, a silver lining has emerged as the top executive of Thyssen Krupp's core steelmaking division has expressed confidence that emerging market would keep the steel boom alive next year as economic growth slows. In his bullish comments it was mentioned that demand from Asia, Latin America, the Near East and CIS will increase at an above-average in the coming year, so said Karl-Ulrich Koehler

IS IT SIMPLE!

The entire World's annual steel output stands at 1.34 billion tones valued at \$800 billion. Arcelor Mittal, Nippon Steel & JFE Holdings produce nearly 20% of this quantity.

WHATS INSIDE

- On the Steel Front...
- News from Non Ferrous Metal Industry
- From the Group Business...
- Technically Speaking....
- Development of Hydration Resistant
- Thermal degradation of Alumino.....

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From Editor's Pen

the dramatic developments in US lead a pall of gloom in major economies and developing nations. Till mid 2008, what looked like an unprecedented growth story is in the grip of a financial meltdown of unforeseen proportion. The steel and automobile industries have bore the brunt of this downturn followed by construction and infrastructure. This lead to an unprecedented fall in global crude oil prices and indirectly to rein in spiraling inflation, especially in India. Most of the major steel producers have cut down production from 15-30% lead by Arcelor Mittal. Back home, JSW, RSP, VISL reportedly slowed down production by 20%. The prices of steel have fallen by as much as 50%. Iron ore demand has come down followed by steep decline in price to level of \$50 per ton from a peak of \$146. These lead to a sharp decline in the dream run that refractory industry in India witnessed in 2008. Most of the suppliers are sitting on huge stockpile of expensive raw materials purchased on the run up to Olympics. Projects have slowed down, consumption in construction in low & mid segment look steady and state run projects will see as through. But beyond April 2009 things look difficult to predict. However, Chief Executive of Thyssen Krupp & Chairman of Nippon Steel are optimistic of growth in 2009 based on momentum of emerging economies. OCL Refractory Division is breaking new ground with CC, Purging Plug and Slide Plate business in India and abroad. \$660 billion stimulus package by China for infrastructure, social sectors could re-ignite steel and refractory demand in 2009. \$8 billion package by Indian government so far could as well energize the economic turnaround. As we gear up for our upcoming Basic Burnt production facility in China, we are optimistic of a stable 09-10, while keeping our fingers crossed.

Wishing all our customers and well wishers a productive and profitable 2009.

Sk. Bashir Mohammed

ON THE STEEL FRONT....

- » **Inspite** of turmoil in global market the consumption of steel pipes in India and USA is growing. Since pipeline projects do not react immediately to incidents, in next 3 years US market will remain strong in pipe consumption
- » **Official** data shows that India's steel consumption rose to 10.7% in 2007-08 while output growth was slower at 5.1%. The gap was met through imports of 7.18 million tons. Steel production is expected to rise 6% upto March 09 and demand is seen growing around 12%
- » **Steel Ministry** was swift in removing 15% export duty in flats and reinstate 5% import duty as SAIL, Tata Steel, JSW, Bhushan were hit hard on long products after prices fell dramatically. Tata Steel's strategy of exporting billet to Natsteel and manufacturing long products in South East Asia also backfired owing to export duty
- » **Saudi Basic** Industries Corp's 2010 SE metal group plan to triple steel production to 17 mill ton by 2020 through acquisition and the building of new plant
- » **Tata Steel** looks set to go ahead with plan to build upstream steel plant in Indonesia's Kalimantan With an investment of US\$ 1 billion for a 1 million ton plant
- » **POSCO** is in talk with Thailand's largest stainless producer Thainox to take over a controlling stake as a part of its efforts to boost global business

Iron ore production cuts

- » **World's** largest iron ore producer, Brazil VALE has cut production by 10%. Rio Tinto, the No.2 in this field from Australia is getting deferment of order from its customer mainly in China is also pledging to cut by 1/3 for a year. BHP Billiton No.3 iron ore miner is also planning to cut output by 5% in view of sinking demand from customer
- » **Iron** ore export from India have dropped 45% as iron ore prices have come crashing down from \$146 a ton to \$50 a ton in a matter of 3 months. This is going to continue as Chinese buyers who take 88% of our products are holding their purchase plans

NEWS FROM NON FERROUS METAL INDUSTRY

- » **The Vedanta** group flagship firm had recently submitted revised bid which is believed to be 500 million dollar less than earlier offer of 2.6 billion dollar in a bid to take over ASARCO- miner, smelter, refiner of copper and molybdenum in USA and Peru
- » **Currently**, most of the large copper processing enterprises in china operates at a capacity below 60% of the total. Japan cut copper production by 7% till March 09. Chile's copper production fell by 10% in Nov 08
- » **Major aluminum** producer like NALCO, HINDALCO, VEDANTA etc draw upto 1000 cr expansion plan in next five years to increase aluminum production from present 1.5 million ton to 4 million ton. Vedanta has slashed aluminum production by 60% due to decline in metal price and global economic slowdown.

- » **World** led production in steady state for last 15 years at 3,470000 tons. Zinc market was in surplus by 22000 ton, Nickel market was in deficit by 17200 ton and tin market was in deficit by 5400 ton

FROM GROUP BUSINESS – FORGING AHEAD IN THE IRON ORE BENEFICIATION FIELD IN INDIA

Hari Machines Ltd., a flagship company of the Dalmia group, established in 1971 has today spread its wings to cover a wide range of activities ranging from manufacturing of heavy industrial machines and equipments, boiler and mineral beneficiation projects. The wide spread growth has been achieved as or part of its strategic initiatives taken to maintain a consistent quality standards, prompt after sales service, customer satisfaction and its continuous urge to adapt changing environment and customer's need.

HML has made a technical assistance agreement with Allmineral GmbH, Germany for manufacture and supply of mineral beneficiation plants and Hazemag & EPR GmbH Germany (formerly known as – DBT Mineral Processing GmbH) for manufacturing and supply of Feeder Breakers in India.

HML has already bagged three major promising contracts in India!. They are

Jindal Steel & Power Limited

Brahmani River Pellets Limited (a Stemcor Group Company)

Global Supplies Limited (a Essar Group Company)

TECHNICALLY SPEAKING

- » **ED/R** had presented a paper titled "Challenges and Future Prospect for the Refractory Industry - 'Technology & Advanced Product' " in a Technical Meet on 'Nation Building Through Advancement in Technology and Infrastructure' which was organised by the Bengal Engineering College Alumni Association, Ranchi Chapter, comprising senior officers mostly from SAIL and MECON on 27th September, 2008 in the auditorium of R&D Centre for Iron and Steel (RDCIS), Steel Authority of India Limited (SAIL) at Ranchi
- » **Dr N Sahoo**, Sr GM (Tech)/R had presented a paper titled "Prospect of Refractories in Next Decade" in a conference on "Recent Trends in Refractory Raw Material" which was organised by NIT, Rourkela on 7-9 Nov 2008
- » **Mr B Prasad** AGM(Tech)/Concast Refractories had presented a paper on "Development of Subentry nozzle & Monoblock stopper for longer sequence castings (Author - B. Prasad, Dr. J.K. Sahu, Dr. N.Sahoo, J.N. Tiwari) in "International Conference on Refractories for Iron and Steel Industry" organised by Tata Steel on 10th & 11th of Nov 08
- » **Dr U Sengupta** AGM(Tech)/R had also presented a paper on "Experience in use of new generation slide gate mechanism for improvement of life of slide gate plates (Author - U. Sengupta, Dr N. Sahoo & J. N. Tiwari) in above conference

Presentations were well appreciated.

EXPERIENCE IN USE OF NEW GENERATION SLIDE GATE MECHANISM FOR IMPROVEMENT OF LIFE OF SLIDE GATE PLATES

The production of clean steel with minimum specific consumption of refractory has become the main goal of steel makers and refractory manufacturers. Consumption of slide gate plate plays very important role to achieve the same. Life of SG plates & the safety factor of the mechanism are two most important aspects.

OCL has recently launched New generation SG mechanism – TN series (TN 60, 80,100 depending on ladle capacity) to take care of the above aspects.

Special features of the system, SGplates & collector nozzle

The machine has higher stroke length with off centre bore with higher bore dia plate. The machine can be operated with existing adaptor plate and cylinder with minimum change in bell crank. Four point tightening system of plate to have less possibility of crack during use. It has better safety with high heat resistant coil springs. Specially designed geometry of plates results in minimum thermal stress during use. Higher spigot area of plate causes high face pressure during use resulting less chance of metal penetration in between plates. Low maintenance is required. Higher life of coil springs does not need any change in between heats. No air-cooling system is required. Slide gate preparation time in running ladle is less. The machine has got small and compact design for easy handling with high flexibility such as

- » Both toggle and hydraulic system can be used
- » Both bell crank and direct acting cylinder can be used



Alumina-Zirconia-Carbon SG plates & collector nozzle with higher resistance to corrosion and abrasion at high temperature was developed to use in TN mechanism.

TN80 system was tried a full ladle campaign (ladle 140mt) in one of an integrated steel plant in India. Average life of plate & collector nozzle obtained 3.5 hts without repair against one heat of conventional Flocon 6300 model. Used plates when examined found that the rate of bore erosion is about 0.5mm/ht & no channel formation was observed & the plate has further capacity to withstand higher life.

This is a proven system & being successfully used in countries like Japan, USA, France & Canada & the plate

life achieved is more than 7 heats in ladle of more than 200 mt capacity.

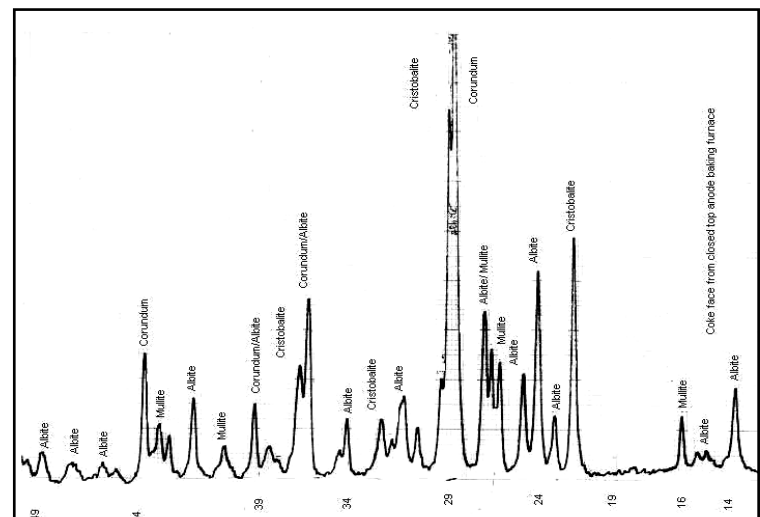
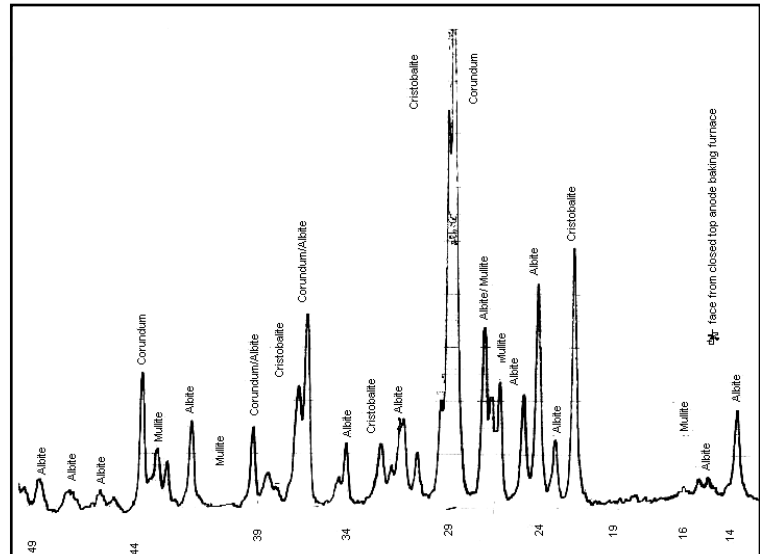
Compiled by **Dr. U. Sengupta**
OCL INDIA LTD
(Refractory division)

THERMAL DEGRADATION OF ALUMINO-SILICATE REFRACTORIES IN ANODE BAKING FURNACE

Anode backing furnaces are the integral part of the Aluminium industries, where anodes are baked at around 1150 – 1200°C to be used in electrolytic reduction of aluminum. Alumino-silicate refractory ranging alumina content from 45 – 50% is the generally used in this type of furnaces studies have been made on the failure mechanism of the refractory in a Reid hammer bake oven. Suggested the selection of refractory for higher life.

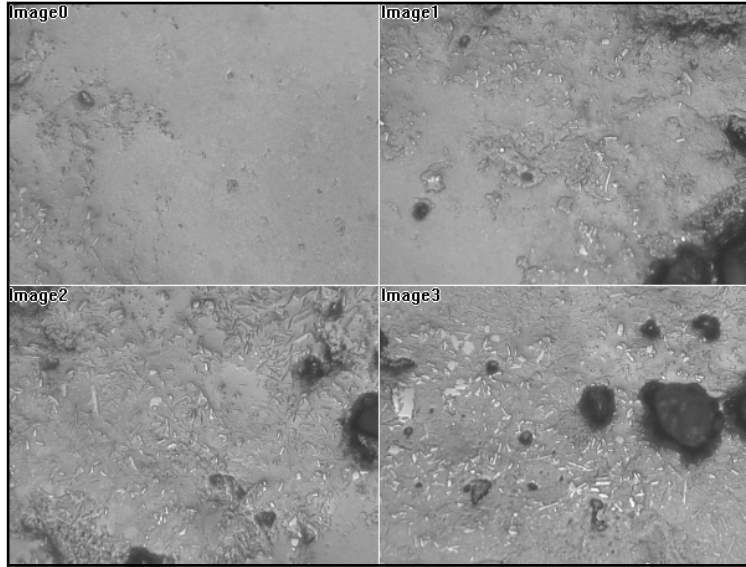
Used sample collected from Reid hammer furnace operating at 1140-1160°C after 50 cycles of operation. The bricks samples were porous (AP 19.1%, BD 2.26 gm/cc) and found deformed.

Mineralogical study says that, apart from standard mineral phases such as Mullite and Cristobalite, an extra mineral phase (Albite) have developed which has been formed by interaction of alkali and base material. This result confirms the findings from chemical analysis.



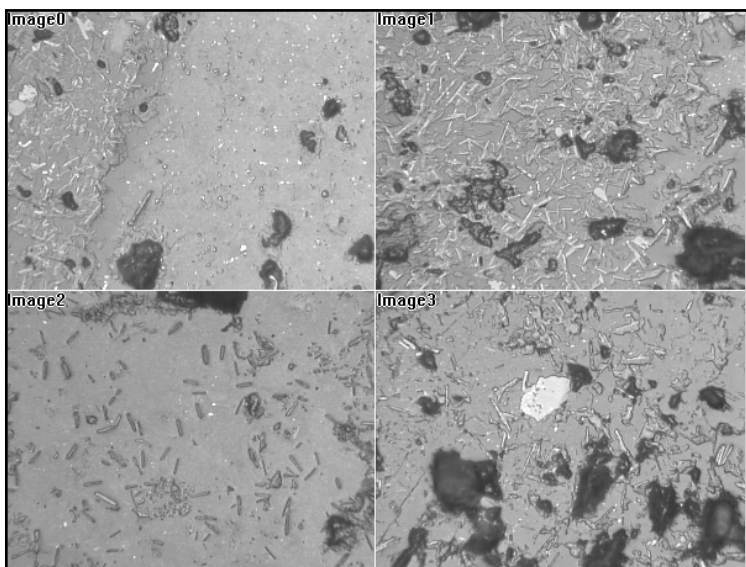
Photomicrograph of high alumina brick from coke face

All the coarser grains show the longulitic crystals on the peripheral zone along with Mullite, cristobalite and glassy phase. Where as the middling and matrix are completely converted to these needle shaped crystals all around. As the brick is exposed to severe alkaline environment, that crystallizes in needle shaped albite ($\text{NaAlSi}_3\text{O}_8$). The matrix is completely free from glassy phase.



Photomicrograph of fireclay brick from gas face

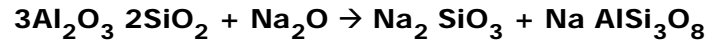
All most all part of the brick including the core of coarser grain is converted to albite. A little variation in crystal size is found in between coarser, middling and matrix portion. However albite concentration and corundum precipitation in this sample is more than the sample from coke face. This may be due to severity of alkaline and high temperature condition.



Chemical analysis & XRD study show severe Na_2O attack in the brick. Particularly the Na_2O attack is more severe in reducing condition. In both the cases the periphery of coarse grain along with matrix is completely transformed dissociating Mullite to albite and corundum. All the secondary Mullites are completely dissociated where as some primary Mullite remains unaltered. The dissociation of Mullite is nearly complete in the gas face extending to the core of the coarse grain where as in coke face Mullite is found as major phase particularly in the core of the coarse grain. This may be due to higher Na_2O concentration and high temperature in gas phase.

Silica covers a major part of fireclay brick and in alkaline environment sodium combines with silica to form sodium silicate. If there is any deficiency of silica, then excess alkali attack to mullite and decompose it to form albite and corundum making the brick porous. . As albite melts at 1108°C the porous bricks got deformed under its own load.

The chemical interaction is purely a decomposition and substitution reaction where the alumino-silicate gets decomposed at around 950°C in alkaline condition to $\beta\text{-Al}_2\text{O}_3$ and silica. Immediately after the decomposition, the imbalanced silica reacts to form sodium-silicate glass and sodium aluminate as per the following reaction.



To improve the performance and to reduce alkali attack in refractories, the refractory should have low porosity & permeability & low R_2O_3 content

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