HORIZON
OCL India Refractory Newsletter
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ENERGY CONSUMPTION IN STEELMAKING

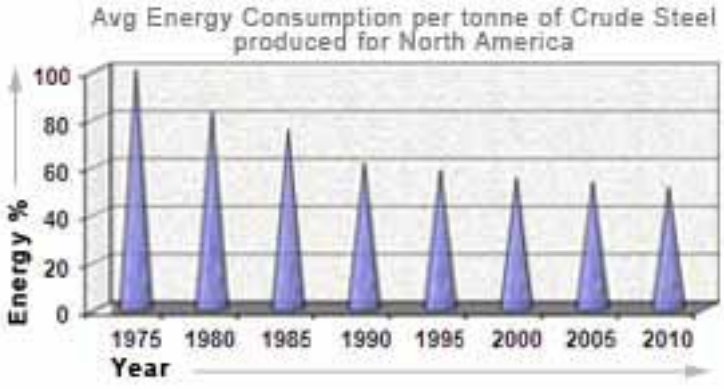
Steel production is energy intensive. Energy constitutes 20% to 40% of the cost of steel production. About 95% of an integrated steel plant's energy input comes from solid fuel (mainly coal), 3-4% from gaseous fuels and 1-2% from liquid fuels.

The production of primary steel is more energy intensive than that of secondary steel due to the chemical energy required to reduce iron ore to iron using reducing agents. Up to 75% of the energy content of the coal at an integrated facility is consumed in the blast furnace.

By-product gases from the coke oven, blast furnace and BOF can be fully reused, saving 40% of the total energy requirement. In Germany, BOF by-product gas recovery saves the equivalent of 300 million cubic meters of natural gas per year.

Innovative technology allows CO2 to be recaptured and remarketed. This will facilitate a 3 MTPA steel plant to supply 50,000 tons of CO2 per year to a nearby gas dealer for use in carbonated drinks after processing.

Improvements in energy efficiency have reduced the energy required to produce a tonne of crude steel by about 50% since 1975 in most of the top steel making units.



From Editor's Pen

Flashes of growth story is lighting up all industrial sectors in sync with the Festival of Light. Most of the steel world has recovered in earnings compared to significant drops in 2009. There is a slow down in Chinese steel production owing to power restrictions, but in rest of the continent the growth scenario is sustained. Banking sector is buzzing with activity and solid investment inflows have virtually ignited our stock markets. The mood in India is upbeat as the steel majors are revising prices northward as demands in construction, ports and automobile industry is showing a continuous rise. Steel demand in the country rose 7.6% last year and is expected to grow 9% this fiscal. Leading players like Tata Steel, Essar are venturing to secure new deals for long term ore supply and ore beneficiation. Most interesting is the fact that SAIL is networking with JSW, RINL and JSPL to form a venture for acquiring coking coal assets overseas. The POSCO steel project in Odisha is expected to get the green nod soon. Worldwide steel producing nations are expected to perform better this year financially and India, along with North Africa, Korea, Malaysia will enjoy the highest EBIDTA per ton. Refractory industry is going through a purple patch as most steel plants are geared towards high production and expansion projects are shaping up fast. The refractory raw material scenario is a bit unsteady as supplies of indigenous bauxite are dwindling and dependence on imports is inevitable. OCL Magnesia-Carbon bricks is capturing the imagination of users in subcontinent and other Asia countries. Let us open our arms to the coming year with renewed outlook and optimism. Will catch up with you in 2011. So long.

SK. BASHIR MOHAMMED

What's inside

FACT-O-METER

Primary steel currently accounts for about 75% of world steel production and is produced by reducing iron ores to iron and converting iron to steel. The main inputs are iron ore, coal, limestone, and recycled steel. The main primary production routes are:
Blast furnace (BF) – basic oxygen furnace (BOF): 66%
BF – open hearth furnace (OHF): 3%
Direct reduction (DR) – electric arc furnace (EAF): 6%
Secondary steel accounts for about 25% of steel and is produced by recycling steel in an electric arc furnace (EAF). The main inputs are recycled steel and electricity.

GREEN EFFORTS

Outokoumpu has been commended by the Carbon Disclosure Project (CDP) for its approach to climate change disclosure by being featured in CDP's "Carbon Disclosure Leadership Index" for the second time.

Taiwan aims to start reducing emissions this year as it bids to join the United Nations Kyoto climate pact. 266 companies that generate a total of 174 million tons of emissions per year have offered data to the government to launch a carbon trading platform by the year end.

GLOBAL STEEL FRAME...

World crude steel production for the 66 countries reporting to the World Steel Association stood at an estimated 111.75 million tons in September 2010 — a 1.0% decrease from the previous month (August 2010) and an 0.9% increase than September 2009.

Average EBIDTA of steelmakers registered a significant decline from the peak of 241 USD per ton in the 3rd qtr of 2008 to 25 USD per ton in the 2nd qtr of 2009 and has recovered to 110 USD per ton in the 2nd qtr of 2010.

INTERNATIONAL STEEL MOVEMENTS.....

US based Schnitzer Steel Industries, Inc. reported net income of $18.15 million on revenues of $639.1 million for the fourth quarter, and net income of $70.7 million on revenues of $2.3 billion for the full fiscal year 2010, which ended August 21, 2010.

For the 2010 third quarter ended September 30, 2010, Reliance Steel & Aluminum Co. of USA reported net income of $48.7 million, an increase of 17% compared to 2009 third-quarter net income of $41.8 million. Sales were $1.65 billion, a 33% increase from 2009 Q3 sales of $1.24 billion.

Nippon Steel has signed a long-term technical collaboration agreement with Australia's BlueScope Steel to develop and cross-license high-function coated steel for construction applications.

POSCO is accelerating efforts to ensure a successful steel mill (3 MTPA) construction project ($2.7 billion) in Indonesia in collaboration with Krakatau Steel. It plans to import 5 million tons of iron ore per year from 2013 when the plant will start production. It will spend $162 million to buy a 24.5% stake in an iron ore project in Western Australia.

Arcelor Mittal will invest $4 billion to increase its annual iron ore production from its own mines to 100 million tons in 2015 which is 50% increase from current capacity. In India, instead of concentrating on mega projects, it will now focus on smaller hubs, with the first production expected by 2013.

Corus has signed a MOU with Sahaviriya Steel Industries (SSI) of Thailand to sell its Teesside Cast Products plant in UK, valued at around $500 million, which can produce 3.5 million tons of slab per year.

Vietnam is catering with 74 steel projects with an investment of nearly US$ 22.2 billion having a combined capacity of around 40 MTPA, which exceeds the anticipated demand of 15 million tons product in 2015 and 230 million tons in 2020.

Brazil's steel consumption is expected to reach 25 million tons in 2010, which is a rise of 34.5% from 2009. Crude steel production will reach 33.2 million tons in 2010 against 26.5 million tons in 2009, a rise by 25%. The overall production so far this year is 19.23 million tons which is a rise by 47.3%.

In China, steel production recorded 51.7 million tons in July which is 3.9% lower than June due to weak demand. Baosteel and Wuhan Iron & Steel have reduced prices by 5% in August than in July. However, China's steel output reached 269 million tons up to May in this year, which 23.8% higher than the same period last year.

ON THE INDIAN STEEL FRONT.....

Steel demand in India rose by 7.6% last year and is expected to expand by 9% in this year due to growth in automobile sector and infrastructure development. India produces 57 million tons steel against the global consumption of 1.2 billion tons and is expected to produce 120 million tons by 2014.

Tata Steel's domestic manufacturing capacity is expected to become 10 MTPA by 2012 from present 7 MTPA after completion of its expansion project at Jamshedpur. It plans to invest Rs. 4500 cr in this year and Rs. 7000 cr by 2011-12 for projects. Overall Tata is targeting to three-fold to 21 MTPA after its expansion in Jamshedpur, Chhatitisgarh and Odisha

Tata Steel is eyeing on acquiring 80% of New Millennium Capital Corporation's 4 MTPA direct shipping iron-ore (DSO) project in Canada which is expected to start production in 2012.

Nippon Steel Corp. of Japan has established a new automotive steel pipe business in India, Nippon Pipe India Private Ltd, for manufacturing and selling electric-welded pipes for two- and four-wheeled motor vehicles.

- Compiled by Anupal Sen, Sk. Bashir Mohammed

MAKING WAVES: Products & Performances

MCRK 3-specially developed Magnesia-Chrome brick for burning zone supplied to a leading cement unit in South India completed 1 year life against 8 months of other suppliers.

Monolithic Argon Rinsing Lances are continuously averaging 340 minutes which is higher than the guaranteed life of 250 minutes and reached a record of 501 minutes of rinsing in a leading integrated steel plant.

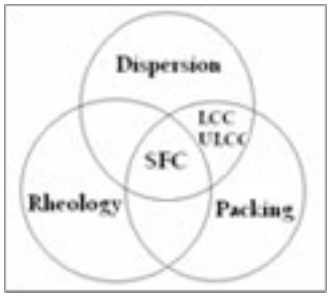
Our CC products entered into new plants in Germany, Sweden, Malaysia and Australia.

USER FRIENDLY: Self flow castables

- Anupal Sen & Sourav Bangal

Castables have largely replaced refractory brick in many areas because of its advantageous features of joint-free lining and ease of application. Castables have wide applications in:

- Repair of stacks and lining of iron and slag runners in blast furnaces
- Steel ladles and tundish linings
- Hearths, soaking pits, and skid rails of reheat furnaces
- Nose ring and discharge areas of rotary cement kilns
- DRI kiln lining
- Foundry ladles and heat-treating furnaces
- Aluminum reverberatory furnaces and ladles
- Fabrication of monolithic porous plugs
- Refractory lining of snorkels in RH degassing vessels
- Seating (well) blocks and powder injection lances
- Argon stirring lances



High cement conventional castables are replaced by LCC, ULCC and cement free castables due to high strength at intermediate temperatures, refractoriness and corrosion resistance. The concept of self flow castables came to making the application more user-friendly. This has the advantages of filling all the spaces of application during vibro-casting. The fundamentals of Self flow castables are :

The basic idea is to reduce the points of contact between the aggregates, which hinders the flow, by increasing the volume of the matrix, yet keeping its density high by adopting:

- Modification of the rheology of the LCC and ULCC systems
- Modification of Particle size distribution
- Modification of fillers
- Judicious application of additives
- Use of superior quality CA Cement

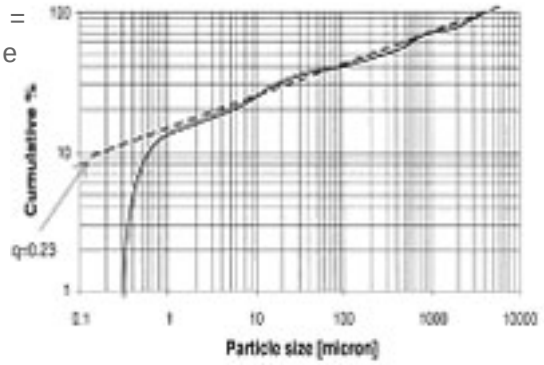
Particle size distribution is as per Modified Andersen's Equation:

Volume % of particle of diameter D = [D/Dmax]1/q

where, Dmax = largest particle size

q = Andersen quotient

For self flow castables, q = 0.21



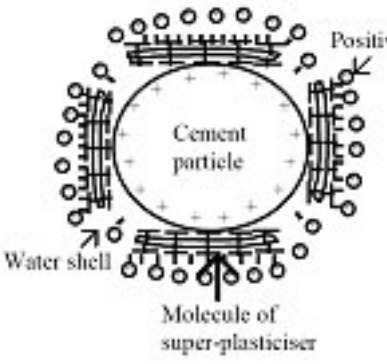
The spacing between the particles is important as this will dictate the ease with which the aggregate particles can move relative to each other.

The greater the spacing the more easy the flow paths can be followed for adjusting the granulometric distributions of free flow castables: modification of the relation between coarse and fines with an increase in the matrix volume or creation of discontinuities in the distribution. Fillers may be silica or alumina based:

- Silica based filler material allows by its fineness a particle size distribution very favorable to flow behavior, which reduces water demand and hence final porosity.
- Alumina based filler material does not necessarily improve placing characteristics because it has to be deflocculated itself by admixtures which explains the difficulties to achieve good placing characteristics in alumina castables. On the other hand hot properties are largely improved because the formulation of alumina rich phases such as CA6 or MA-spinel is encouraged.

Additives play an important role in determining rheological and setting behaviors of CA Cement containing castables. There are three types of additives – retarder, deflocculants and accelerator.

Retarders influence the kinetics of hydration by modifying, usually slowing down the dissolution of the anhydrous cement particles.



Deflocculants or water reducing agents are absorbed on cement grains, modifying the surface and increasing the zeta potential. Good dispersion occurs due to repulsive effect of the positively charged grains which hamper flocculation.

Accelerators influence the dormant period of hydration by forming germs which reduces the time necessary for homogeneous for germ formation, therefore accelerating the hydration.

KEEPING PACE WITH TECHNOLOGY:
Quick change mechanism for sub entry nozzle

- Anupal Sen, B. Prasad

With so many firsts in its feather in refractory technology OCL is now into the business of different refractory operating mechanisms. First, is the TCD mechanism of changing Sub-entry nozzle (SEN) without terminating casting, with European specialist in flow control refractories. This mechanism is of two types:

- Flow control of steel from tundish to mould is done by Monoblock stopper (MBS) – ZKB system
- Flow control of steel from tundish to mould is done by Slide plates – HK1 system

In ZKB mechanism, the refractories associated are MBS, SEN, Tundish nozzle and well block, whereas in HK1 system, the refractories required are SEN, Tundish nozzle, well block and 3 slide gate plates in which the top and bottom plates are stationery and the middle plate moves to control the flow of steel.

All refractories will be manufactured and supplied by OCL and mechanism will be provided by Sider Trading, free of cost with the refractories.

FEATURES

SEN can be changed any number of times, hence casting sequence can be increased to a great extent, as long as 30 heats also

- SEN can be changed in less than 1 second without any disruption of steel flow. and without lifting or lowering the tundish.
- Re-oxidation of steel can be prevented at the refractory joints by effective Argon purging system.
- Blank plates are provided to discontinue casting in case of emergency situations, which ensures safety.
- Enhancing cost-effectiveness.
- This is a tailor-made and can be fitted under any tundish with minor modifications.
- It has a compact structure with average dimensions 900 x 600 x 300 mm3.
- Cylinders for pushing SEN or slide plates are operated hydraulically without any jerk thus minimizing SEN breakage.
- Spring checking equipments and SEN handling devices during changing will be provided along with the mechanism for safer operation.

ADVANTAGES

- Less down time of tundish as all parts are not dismantled after each casting.
- Higher life of mechanism to more than 2000 hours of casting.
- Higher life of springs to more than 1000 hours of casting.
- Low maintenance time
- Disc type springs maintains a face pressure of 1.5 MT in between tundish nozzle and SEN and 5 MT in between the slide plates to avoid steel leakage.
- Springs are high temperature resistant and can operate upto 450 deg C.
- Nozzle diameter can vary over a vast range of 60 mm to 100 mm.

Presently, these are in operation in Chinese steel units of Bao Steel, Ma Steel, Wuhan Iron & Steel, Handan Steel, etc. and also in steel plants of Italy, Korea and Nigeria.

EVENTS: OCL IN IRON & STEEL SUMMIT:

OCL has actively participated in "Iron & Steel Summit" held on 6th-7th Aug'2010 at Raipur, organized by Steelworld. This seminar focused on :

- Emergence of Sponge Iron Industry in India
- Viability of Integrated Mini Steel complexes and Co-generation
- Availability of Raw Materials
- Financing of New Projects
- The Techno-Commercial aspect of Beneficiation and Pelletisation
- Market behavior of products like Iron ore, Sponge Iron, Billets & Construction Steel

Mr. J. Behera, Mr. B. Nag and Mr. G.P. Nayak participated in this event. Mr. Nag has presented "Monolithic lining for sponge iron rotary kiln with a special focus on purging & concast refractories for steel melting shop", in which, several insights into future technology of refractories were stressed upon.

Your comments and suggestions may please be sent to bmohammed@ocl.in
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