Dear Friends,

Wish you, your family, friends and colleagues a new year of prosperity, good health and happiness!!

As the sun rises over 2015, we hope that the positive thoughts generated post the establishment of the new Government at the Centre last year would translate to constructive policies and reforms leading to a vibrant economy.

Business daily, “Mint” reported that the Prime Minister has taken direct control of a project-monitoring body to fast-track investments worth almost US$ 300 billion in the country. This development could help companies planning coal, power, steel and infrastructure projects cut through a maze of up to 180 clearances.

India’s ranking in production of crude steel on a global basis is expected to improve with increasing demand for domestic consumption. Tata Steel reports that India’s steel sector is expected to witness investment of about Rs. 2.0 trillion soon.

According to the World Economic Outlook report released by International Monetary Fund, growth in India is expected to rise to 5.6% in 2014 and jump to 6.4% in 2015 as both exports and investment will increase.

Mr. Jean-Marc Bianchi, President & CEO of Kerneos SA and Mr. Stephane Epin, Director of Astorg Partners were in India in November 2014 to meet Senior Government Officials in the Ministry of Commerce in New Delhi besides the Chief Minister & Senior Government Officials of the State of Andhra Pradesh. They also met the Ambassador of France to India and the Minister Counsellor for Economic and Financial Affairs for India & South Asia in the Embassy of France. The main objective was to check out the country’s economic scenario and to seek support from the Officials for the proposed green field project Kerneos is planning to put up in Visakhapatnam.

I am indeed happy to report that Jean-Marc & Stephane went back convinced on the high potential for growth India offers. They were also pleased with the administrative machinery that’s ready to extend total support to new investments for high technology products like Calcium Aluminates.

This issue carries an article on “Effect of alumina characteristics on the placing and hardening properties of calcium magnesium aluminate cement based castable” besides other usual columns. We would be happy to receive your comments on the articles in this edition or any support that you may need from us.

Segi P. Idicula, Managing Director Kerneos India & Middle East Operations
Market Pulse

INDIAN ALUMINIUM INDUSTRY AND MONOLITHIC REFRACTORY SOLUTION

India with its abundant supply of quality bauxite and low cost labour has established itself as a low cost primary aluminium producer. Global primary aluminium production is around 50 million ton with China accounting for around 45%. Primary aluminium production in India has stagnated around 1.7 million ton mark for last three years. The three primary aluminium producers, Hindalco, Vedanta and Nalco have expansion plans as well as greenfield projects that should take the production to 2.5 to 3.0 million tonnes in the foreseeable future. India is the second largest consumer of aluminium in Asia with the electrical sector being the main driver of demand. In addition to the electrical sector, the automotive and construction sectors also contribute a major share for the aluminium market in India. As per forecast, the primary aluminium demand in India is expected to reach 6 million ton by 2025 which equates to about 4.1 kg of per capita aluminium consumption compared to present level of 1.5 kg. Import and export of primary aluminium in India have increased over the years and kept pace with each other, making the sector increasingly globalized.

Increasing technological changes to meet the market demands for greater furnace output have made it imperative to turn to newer refractories and refractory installation techniques. Monolithic refractories are well established as linings for a range of holding and melting applications during aluminium processing as they provide optimum productivity and cost effectiveness. Due to its inherent advantages, consumption of monolithic refractories has been continuously increasing while consumption of bricks and shapes has declined. The monolithic relining of aluminium smelting and re-melt furnaces resulted in increased capacity of up to 34% compared to original brick lining. This has been achieved by keeping similar or better thermal profiles and increasing service life of the refractory lining by adopting best installation practice / techniques and materials, which have been especially developed for aluminium furnace linings. It is increasing output for most aluminium producing companies worldwide without any capital expenditure involved. This leads to a 36% reduction in the cost per tonne of aluminium produced vs expenditure on refractories and also an 18% boost in productivity.

Technical News:
The Latin American refractory congress - ALAFAR 2014 was held in Santiago, Chile from 28 to 31 October. The topic was “Refractories – Impacts on Environment and Recycling”. Dr. Christoph Wöhrmeyer presented the following paper in the conference.

“In-situ recycling”: monolithic ladle repair with shotcreting

Kerneos launches its new website dedicated to the construction industry and public works
On 3rd December 2014, Kerneos launched a new website exclusively dedicated to its range of products for professionals in the construction industry.
This site follows on from cimentfondu.com and can be consulted at www.rapid-cements.com. The purpose of this new platform is to assist construction and public works professionals in using CIMENT FONDU®, the Kerneos signature product, and to introduce them to other high-performance, ready-to-use alumina products.
A local expert is on hand in the area to respond to questions from users of the products in the Kerneos range and from building material traders.
Acting as a toolbox for construction and public works professionals, this site provides:
• product descriptions
• advice for use and implementation
• data-sheets

• regulatory documents
• photo reports & videos illustrating the different types of application
• news about the range
The site is available in several languages: French, English, Spanish, Italian, German and Russian.
EFFECT OF ALUMINA CHARACTERISTICS ON THE PLACING AND HARDENING PROPERTIES OF CALCIUM MAGNESIUM ALUMINATE CEMENT BASED CASTABLE

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Introduction:
Following its launch in UNITECR 2011, calcium magnesium aluminate cement (CMA 72) has found several successful applications such as in ladle walls, bottom, precast shapes, EAF roof delta, steel lances and in aluminium industry (aluminium contact areas) in many countries. The advantage of CMA 72 based castables is mainly due to their better corrosion and penetration resistance against slag and metal [1, 2, 3]. To extract the full advantage of CMA 72, it is important to develop an optimised castable composition, which ensures appropriate placement of the castable. Alumina properties influence castable placement parameters. In this article several aluminas and their combination were used to compare the placing and hardening properties of a CMA 72 - containing castable composition.

Alumina types and castable composition:
A composition (Table 1) with tabular alumina aggregates, preformed spinel, CMA 72 and

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<th>Table 1: Castable composition</th>
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<tr>
<td>Raw materials</td>
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<tr>
<td>Tabular Alumina - 3/6 mesh</td>
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<td>Tabular Alumina - 8/14 mesh</td>
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<tr>
<td>Tabular Alumina - 28/48 mesh</td>
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<td>Tabular Alumina - 48/200 mesh</td>
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<td>Calcined/Reactive Al₂O₃</td>
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<td>Spinel AR 78 - 0.5-1 mm</td>
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<td>Spinel AR 78 – 0-0.5 mm</td>
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<td>CMA 72</td>
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<td>Peramin® AL 200</td>
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<td>Peramin® AL 300</td>
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<td>Total</td>
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polycarboxylate based deflocculant Peramin AL 200 and AL 300 was chosen for comparison of placing properties with different alumina and their combination. Six different alumina (A-F) and six different combined alumina (G-L) were used. Typical key properties of alumina which influences castable placing properties, i.e. particle size (d50), surface area (BET), soda content and particle size distribution profile (mono-modal, bi-modal or multi-modal) are listed in Table 2. The particle size distribution profiles of the combined alumina types are broader and their numbers of mode are also higher than their constituting single alumina types. The plot (Figure 1) of particle size (d50) of alumina and their respective surface area (BET) shows an inverse relationship as expected. Calcined alumina which generally have larger crystal size (>1µm), lower surface area (<1.5m²/g) and higher soda (>0.1%) than the reactives [4] occupy top left of the plot (Figure 1), whereas the reactive alumina types are more on the bottom right. The calcined aluminas also require more water than the reactives to achieve the targeted flow.

Effect on water demand and flow:
Water addition %, flow and flow decay of the castable for different alumina types (single and combined) are shown in Figure 2 and 3. Relatively higher water demand and slower flow decay has been observed for calcined alumina (C,D,E,F and L). Since reactive alumina are much finer, it can easily go into the interparticle spaces and provide a fine matrix reducing friction and also higher surface area gives better deflocculation enhancing the flowability. The castables with multi-modal alumina (such as A) developed better flow than bi-modal (such as B) and the latter than mono-modal (such as C, D, E and F) alumina. The combined alumina gets broader particle size distribution and generally shows good flowability. Flow and flow decay of the castable with A are similar to that of I, which is a combination of a reactive (A) and a calcined alumina (E) although I is less expensive due to the use of calcined alumina E in it. Flow decay is influenced by the accelerating effect exerted by different alumina on calcium aluminate cement (CAC) hydration and is discussed along with hardening in the next section.

Effect on hardening:
The plot of castable exothermic peak time (PTT) against alumina surface area reveals an inverse relationship (Figure 4). The mechanism of acceleration of CAC hydration by alumina is via enhancement of nucleation and precipitation of calcium aluminate hydrates. The larger the surface of alumina, the more effective it becomes to accelerate as this surface is used as nucleation surface for CAC hydration and thus converts this
The plot of PTT against soda% of different alumina shows that they are proportional to each other (Figure 5). However, it should be noted that the aluminas have different surface area and water demand of castables are different. Therefore, this observation may be considered typical for this composition and alumina. Soda, if present in the soluble form is found to cause flocculation in some compositions leading to shorter working time [4].

Conclusion:
As for pure alumina or alumina-spinel castables, alumina influences the placing and hardening properties of CMA 72-contacing castables significantly. Reactive alumina show lower water demand, higher flowability and shorter working time compared to the calcined ones. Exothermic peak times (PTT) of castables decrease with increase in the surface area of alumina due to the greater accelerating effect on nucleation by high surface alumina. PTT are found to increase with increase in soda% of alumina. This observation may be considered in the context of solubility of soda, difference in the surface area of different alumina types and the castable water demand for these alumina. The combined alumina generally showed good rheology due to a broad particle size distribution and sometimes may offer good cost optimisation.

References

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Kerneos India Business section is now available on our website. Please visit http://www.secar.net/spip.php?page=in_sommaire for access to technical papers, brochures, product data sheets of Indian as well as international products, all editions of SECAR® Gazette, FAQ etc.