It gives me great pleasure to present to you, The Refractory Beat, your window into the world of Dalmia-OCL.

Dalmia Refractories has been proudly serving the cement industry for over six decades now. We are the only refractory company who supports almost every cement plant in India to get the best output from their kilns. Our product range spanning across alumina bricks, basic bricks and castables, is the widest and is continuously updated to deal with changing production practices.

Today, Dalmia-OCL is the brand representative of the Refractories business of the INR 10,000 crore Dalmia Bharat Group. Our facilities span four raw material mines, four manufacturing plants in India, one in China along with a specialised refractory R&D Centre. This spread helps us cater to multiple segments spanning Iron & Steel, Glass, Non-Ferrous Metals, Power & Petrochemicals, aside from Cement. With 5,000+ man-years of diverse, rich and proven refractory experience, you will find in Dalmia-OCL an already dependable and responsive partner, now stronger in technical and delivery capabilities for your unique needs.

The Refractory Beat is a step in the direction of strengthening our relationship with you. I see it as a great platform to share what’s new at our end and how it could mean ‘more’ to you and your business as it evolves. Coupled with the technical meets that our teams organise at your locations, this direct platform will allow us to share with you what goes on behind-the-scenes to create bricks, monolithics and solutions that have helped us stay ahead of competition in many areas, for the longest time.

I hope you will enjoy The Refractory Beat as much as the team enjoyed putting it together. Do share what you liked and what you didn’t. Email your feedback, comments and suggestions to ceo.refractories@DalmiaOCL.com. I’m looking forward to hearing your views.

Warm regards,
Sameer Nagpal

Dear Partner,

If You Have A Coating Problem

As someone seasoned in running cement kilns can tell you, unwanted coatings and build-up of rings is a commonly-occurring problem that reduces refractory life and kiln efficiency. Often it also leads to alkali and sulphur infiltration, especially in a few critical zones of the kiln such as the burning zone, upper transition zone and calcination zone. All this has just one unwanted outcome - increased production costs and even kiln downtime in extreme cases.

Till date kiln managers in India had to depend on imported Silicon-Carbide (SiC) bricks to protect themselves against coatings and ring build-up. However, a recent introduction of special quality bricks called DALCR from Dalmia-OCL is just the relief any kiln manager would have wished for.

These anti-coating high-alumina bricks contain SiC ranging from 5% to 25%. The SiC converts to Silica to form a glassy surface to resist, repel and minimise nasty coatings and ring build-ups. What’s more, even if coating comes from process, it gets easily dislodged.

**UNIQUE FEATURES**
- High-pure chemical properties with different proportions of SiC
- Low porosity, permeability and high CCS
- High Refractoriness Under Load (RUL)
- Excellent spalling resistance

**Advantage DALCR**
First and foremost these are locally-made at Dalmia-OCL’s plants in Dalmiapuram (TN) and Khamamba (GJ). Which means savings in foreign exchange and downtime. Reduced waiting periods also mean speedier trials and production managers no longer need to keep inventory to defend against availability or delays in incoming foreign shipments.

**If You Have A Coating Problem**

Presenting one of the most effective tools to achieve energy efficiency in cement rotary kilns

Learn more about other advanced energy efficiency solutions that create savings for kiln managers

Find out what makes the two different from each other and how to choose what’s right for your kiln

In each issue we will share an overview of stellar performance achieved by a Dalmia-OCL product

Continued on next page
In addition to minimising coating and ring build-up, DALCR has demonstrated:

- Excellent abrasion resistance
- Ability to withstand severe thermal fluctuations
- High thermal & load bearing capability

What’s more, the anti-coating properties and chemical inertness of DALCR make it an ideal choice especially for kilns which are alternate-fuel fired.

**DALCR - recent successes**

Last year, Dalmia-OCL conducted trials of DALCR 60 bricks in kilns in Rajasthan & Madhya Pradesh, in plants of India’s two leading cement manufacturers.

**Rajasthan trials** Since 2015, indigenous DALCR bricks are being used from 38M to 48M area in these kilns. During an annual shutdown in October 2017, the said area was inspected by a team comprising members from both Dalmia-OCL and the customer. The team concluded that the bricks were suitable for another campaign basis residual thickness measurements they recorded. The lining was therefore allowed to remain.

**Madhya Pradesh trials** The purpose of this trial was to observe performance of DALCR in 38M-48M area of the kiln. At the end of the first year, the team recorded the residual thickness of installed bricks during the annual shutdown. And basis the measurements recorded (see table above), it was decided that the lining should be continued with as the bricks were in perfect shape (pun intended) for the next campaign.

At the time of performance assessment, SiC grains were clearly visible on brick surface implying that coating-resisting properties of the bricks were unimpaired. Chemical analysis showed that about 13.5% SiC still remained in the hot face, and about 2%-3% SiC turned into a glassy phase to impart coating-resisting property to the hot face.

**Report snapshot**

Used brick sample (length 210 mm) collected from debri for testing

<table>
<thead>
<tr>
<th>Properties</th>
<th>Hot Face</th>
<th>Middle Portion</th>
<th>Cold Face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent Porosity %</td>
<td>7.4</td>
<td>10.4</td>
<td>14.1</td>
</tr>
<tr>
<td>Bulk Density g/cc</td>
<td>2.67</td>
<td>2.66</td>
<td>2.57</td>
</tr>
</tbody>
</table>

**Key observations:**
- No cracks or alkali spalling. Alkali salt infiltration found up to 75 mm from hot face resulting in reduction of AP (Apparent Porosity). Bulk density measurements show no threat of alkali spalling. Chemical analysis confirms adequate presence of SiC in cut surfaces for an additional campaign life of >1 year.

To learn more about DALCR, email us at Comms@DalmiaOCL.com or call Sobhit on 9810480520 today.
To implement the concept of kiln lining optimisation, great care needs to be taken on various process, mechanical condition and refractory related factors of the kiln. Critical areas of the kiln are identified and classified both in terms of importance towards affecting lining life and importance towards controlling radiation losses. Based on findings suitable measures are taken towards optimisation of kiln lining without compromising on safety factors for critical areas to reduce energy losses. Whenever possible, lining of higher thermal conductivity is replaced with lining of lower thermal conductivity with a view to reduce the overall shell temperature of the kiln. Special quality bricks with improved thermal properties have been developed for burning, upper transition, safety and calcining zones of highly thermally loaded kilns which help us to implement optimisation concept.

Substantial energy savings could be obtained when highly radiation prone areas like upper and lower transition zones of the kiln are lined with refractories of suitable quality which bring down shell temperatures without compromising on lining life. In one of our recent case studies, there is an average reduction in kiln shell temperature by 50°C in 15M - 40M area from outlet where basic bricks of higher thermal conductivity have been replaced with special bricks of lower thermal conductivity. This will result in annual savings of up to Rs 25 lakh on fuel.

Optimisation is a continuous process. Our next goal for this plant is to improve energy efficiency in 60M to 75M area from outlet by replacing 40% Alumina bricks with special-quality low Alumina bricks which have been specifically developed for minimising radiation losses in calcination and inlet zones of rotary kiln. This will improve the calcination efficiency. Performance of girth gear will also improve due to low shell radiation and reduced refractory load. The planned improvement in lining will result in additional savings of about Rs 22 lakh per annum.

Continuous process of evaluation and optimisation helps in reducing energy losses and substantial savings could be gained in terms of reduced fuel cost and an environment-friendly output. Email us at Comms@DalmiaOCL.com to learn more about Refractory Optimisation services and how your kiln could benefit from it.

How To Gain Energy Efficiency Without Losing Lining Performance

By Sumanta Mukhopadhyay

One of the most effective refractory management tools to achieve energy efficiency in rotary kilns today is optimisation of kiln lining. Optimisation as a process deals with reduction of energy losses through kiln shell radiation without impacting lining performance.
Gunning vs. Shotcreting

Kiln managers are constantly looking at ways to ensure minimum downtime for their kilns. Which is why a gradual shift is being observed in the cement industry from conventional casting methods to gunning and shotcreting. Forms or moulds are not required and since the castable is compacted by impact, there are savings in time and effort for ramming and compaction. The most amazing bit is that gunning and shotcreting enable hot repair work on refractory lining while the lining is in service.

Quick comparison

Gunning is generally associated with dust generation and rebound losses which sometimes cause higher consumption of refractory material as an average rebound of about 25% of the castable is observed. This rebound material could not be reused. Shotcreting, however, takes care of this problem. Some of the notable differences between the two are given in the adjacent table.

Dalmia-OCL too now provides end-to-end gunning and shotcreting solutions across India. Call Sobhit at 9810480520 or email Comms@DalmiaOCL.com for details.

In The Blue Corner...

These bricks are suitable in reducing radiation losses in critical areas like upper and lower transition zones of cement kilns under pet coke and alternative fuel firing. Thermal conductivity of these special quality basic bricks could be as low as 2.5 W/mK as against average conductivity of 3 W/mK for a normal Magnesia-Alumina spinel basic brick.

3) Development of ALITE - ALITE brick with very low thermal conductivity has been developed for inlet and calcining zone of kilns.

Apart from low thermal conductivity, these bricks have high resistance to alkali and sulphur attack, good cold crushing strength and low density which helps in reducing total refractory load in the kiln. On an average up to 75°C reduction in temperature is achieved by using ALITE bricks as against 40% alumina bricks.

A careful combination of the above three approaches helps reduce radiation losses in kiln shell and results in substantial fuel savings. In fact, Dalmia-OCL’s technical group is now trained and equipped to provide all possible assistance to its customers in creating a tailor-made solution suitable for their kiln. For more information, email Comms@DalmiaOCL.com today.

Performance Report

<table>
<thead>
<tr>
<th>Product: MAGNEL 85</th>
<th>Kiln location: DCBL Ariyalur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of installation: 2.4 M to 6 M in the outlet</td>
<td></td>
</tr>
<tr>
<td>Previous lining life in this area: 3-4 months with 70% Alumina bricks</td>
<td></td>
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<tr>
<td>Installed in: May 2016</td>
<td></td>
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</tbody>
</table>

Comparison between Dalmia-OCL’s Magnel 85 and bricks imported from competitor’s plant in China

<table>
<thead>
<tr>
<th>Magnel 85</th>
<th>Competitive Offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crack-free</td>
<td>Crack-free</td>
</tr>
<tr>
<td>Tolerance of ±1 mm</td>
<td>Tolerance of ±1 mm</td>
</tr>
<tr>
<td>Uniform colour</td>
<td>Variations in colour</td>
</tr>
<tr>
<td>No patchmarks</td>
<td>Patchmarks</td>
</tr>
<tr>
<td>No edge defects</td>
<td>Rough edges</td>
</tr>
</tbody>
</table>

Result: During a recent inspection, it was found that Magnel 85 bricks still have sufficient residual thickness for one more campaign. DCBL has decided to extend the basic brick area during their next shutdown in this kiln.

Now Reduce Your Fuel Costs With The All-New Alite

ALITE is a high-strength Low-Alumina energy-saving brick which not only withstands abrasion from kiln feed for a longer campaign life, but also reduces thermal energy losses. Specially developed for calcination & inlet zones (0-15 M), ALITE has excellent Alkali and Sulphur resistance properties. Compared to denser 40% Al₂O₃ bricks, ALITE is nearly 45% more effective in controlling radiation losses. The best part is, with fuel cost savings it pays back for itself in under 3 months.