HASLE REFRACTORIES

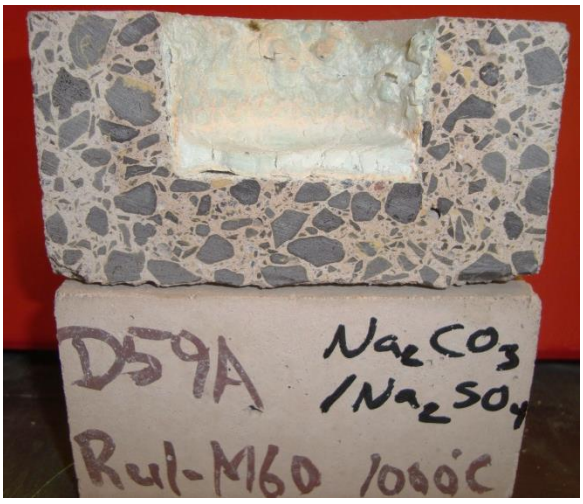
Resistance of HASLE precast elements to alternative fuels and wear

Increased utilization of secondary fuels, i.e. industrial, agricultural and household wastes, petroleum coke and various qualities of coals etc. in the cement industry, challenge the lifetime of refractory materials as a high extent of volatile matter such as alkalis, sulfur and chlorine most often occur.

The corrosive mechanisms of these alkalis and alkali salts on refractory materials are complex, but destructive bursting and spalling are most often the result. Moreover this cocktail of volatile elements also increases the risk of build-up formation leading to operational changes/stop.

HASLE low cement castables are characteristic by having a very low porosity and permeability which, combined with the properties of the raw materials, ensure a high resistance towards chemical corrosion and build-up formation.

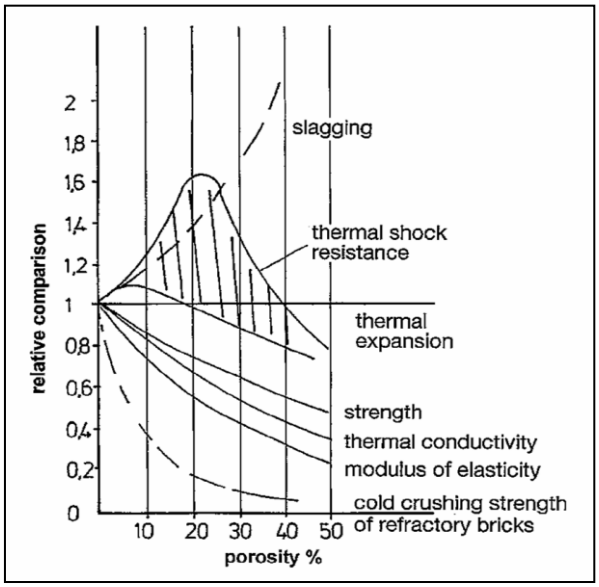
The porosity of HASLE precast is extremely low; only 10-12% thanks to an optimal particle size distribution and thoroughly casting and heating practice in our production line. Most often it is difficult to achieve such a low porosity when casting on site. Not only is water addition, mixing and packing by vibration more difficult to control, but there is also a risk of crack formation during heat-up, which also leads to increased porosity.



HASLE precast modular lining is cast from our LCC D59A.

D59A combines Andalusite with Mullite and Bauxite which give the castable high strength and wear resistance and a good resistance towards chemical corrosion thanks to a glassy-phase of SiO_2.

The crucible pictured here was tested according to EN 51069. The prefired cups were exposed to alkali-salt mixtures for 5 hours at 1000°C and cut open to see the infiltration.

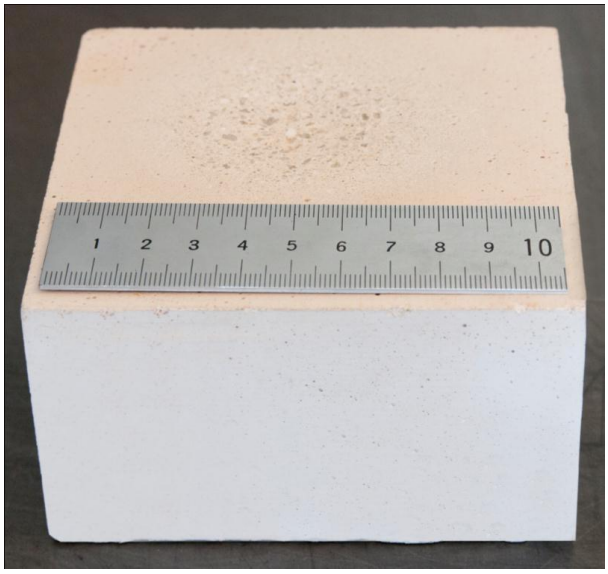


The dense packing of grains also gives high mechanical strength and high wear resistance.

This figure shows the correlation between open porosity and performance of refractory bricks – a correlation that is also valid for castables.

It can be seen that the strength reduces dramatically as the porosity increases in the range between 10 and 20%, as does the risk of build-up formation ('slagging'). Therefore the low porosity of HASLE precast elements significantly increases the resistance towards both chemical and mechanical stresses.

Adding to that the Bauxite content of D59A gives an extra high wear resistance at all temperatures.



At HASLE we measure wear resistance as abrasion loss at 1000°C according to ASTM C704, where SiC particles are blown against precast samples. Measuring at high temperature simulates the performance during operation better than if measured at room temperature.

The abrasion loss is measured as cm^3 material loss and all HASLE LCCs show excellent results with losses less than 5 cm^3 thanks to raw materials and particle packing.

The abrasion resistance of D59A at 1000°C is high irrespective of the test angle of particle flow:
45° angle: 2.5 cm^3
90° angle: 3.0 cm^3

Our precast elements are inspected and tested according to international standards before leaving our plant in order to ensure a high uniform quality and the best product performance.