SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

BLAST FURNACE

REFRACTORIES FOR INCREASED SERVICE LIFE
**SOLUTIONS TO EXTEND BLAST FURNACE LIFE-TIME**

**IRON MAKING**

**GENERAL AREAS SERVED**

Crude steel production begins with the reduction process, whereby iron ore reacts with carbon sources inside the blast furnace. It is imperative that refractory products used inside the blast furnace are resistant to these thermomechanical and thermochemical reactions. Saint-Gobain Performance Ceramics & Refractories designs, engineers and supplies a comprehensive range of high quality refractory products and solutions, specifically developed for blast furnaces.

**SAFE ENERGY, REDUCE CO₂ EMMISSION**

‘INSULATE’ YOUR BLAST FURNACE HEARTH

With its insulating effect compared to a pure carbon hearth the Ceramic Cup reduces the coke consumption and the CO₂ emission at the same time. With the CO₂ certificate trading already existing in Europe - for other regions/countries to come - and with coke prices increasing the money saving effect will become a more and more important factor.

We provide ceramic materials designed to meet your needs:

- **QUALITY**
- **EFFICIENCY**
- **CUSTOM DESIGN**
BENEFIT FROM OUR SERVICES

DESIGN & ENGINEERING
CUSTOMIZED SOLUTIONS

We measure our success with your operating results. To enhance your performance, our team of passionate top skilled engineers are ready to develop the best adapted solutions for your needs.

Our engineers tackle your design challenges with forefront equipment at your service with great experience/knowledge.

- Full BF design including Carbon
- Thermal Calculations using Ansys
- Repairs
- Large Block Size Capability

R&D FOCUS
AMONG TOP 100 GLOBAL INNOVATORS

R&D is part of the DNA of the Group, ranked as one of the top 100 innovators in the world. For our ceramics and refractory activity, we invest strategically in innovation to bring you the most efficient solutions developed at Saint-Gobain Research Provence, our center for R&D in Europe with a specialized team dedicated to Blast Furnace application.

QUALITY SUPPLY
International and global network of divisions and suppliers allow us to access the best quality inputs for our materials. Innovation focuses on material properties to supply solutions specifically adapted to Blast furnace application.

- Top Quality Grades
- Wide Range of Grades

EXPERTISE
MORE THAN 50 YEARS OF EXPERIENCE

Rich experience constitutes our total design capability that is unique and unsurpassed, thanks also to the knowledge gained via companies such as Savoie Refractories and Carborundum.

INSTALLATION
More than 350 references that have built our market recognition

- Supervision
- Technical assistance

INCREASED LIFETIME
IMPROVE YOUR BLAST FURNACE LINING

Supplying all required refractory products specifically developed to extend BF lifetime. Unparalleled experience in BF design supply for over 50 years and several hundred references, relying on global production capacity with factories positioned worldwide to serve all areas.

Our production facilities are certified by:

- Quality
  DIN EN ISO 9001
- Environment
  DIN EN ISO 14001
- Occupational Safety
  OHSAS 18001
Saint-Gobain Performance Ceramics & Refractories has over 50 years of experience in blast furnace refractory design. The company continually develops new and improved materials, adapting to industry trends and evolving customer requirements.

UPPER STACK
In this low temperature area, abrasion by the solid burden is the primary mode of wear. Our silicon carbide has proven to be cost-effective solution.

Refrax® 20 SBF

LOWER STACK
Abrasion by the coke burden is still a concern but driven by an increasing temperature, in depth attack by Alkali and Zinc vapor become predominant. Our Refrax® 20 SBF is a worldwide recognized reference for this application.

Refrax® 20 SBF / Sicanit AL3 / Alfrax® 85 MS2 A

BOSH & BELLY
In addition to Alkali and Zinc attack, the occurrence of molten iron and slag calls for SiAlON bonded materials. We recommended either our silicon carbide Sicanit AL3 or our Corundum based Coranit® 3S. The final decision depends on thermal conductivity requirement (low, to save energy, or high, to promote a protective skull).

Sicanit AL3 / Coranit® 3S / Refrax® 20 SBF

TUYERE BELT
The tuyere surroundings experience high heat load and thermal shock in combination with corrosion by molten iron and slag and intense Alkali and Zinc vapor attacks. Backed by a unique range of refractory materials, including silicon nitride or SiAlON bonded shapes and pre-formed no and low cement castables, our engineered tuyere surroundings will fit best to the specific requirements of your Blast Furnace operation.

MonoCoral / Sicanit TB

HEARTH
Traditionally, blast furnace hearths are lined with high thermal conductive carbon-based materials. Placed inside the carbon lining the concept of the Saint-Gobain Ceramic Cup is an example where a specific advanced design and material quality render significant benefit to blast furnace operators in terms of lifetime extension and operational efficiency. Beware of cheap copies on the Ceramic Cup. Design (avoiding high stress, and items floating off) Material Quality (to ensure slow wear) and correct Installation all need to be correct to ensure good lifetime.

Coranit® SlagR / Coranit® AL / Mullfrax® 70 MS4-F
Saint-Gobain has pioneered and promoted “Ceramic Cup” technology since 1982. We have learned a lot over last four decades. We are now into our third generation of design (SiAlON bonded corundum – “Coranit””) and have recently developed a new improved quality called Coranit® SlagR. Detailed feedback from users has shown that the “Coranit” grade wears very gradually over the lifetime of the hearth. 400 mm thickness has been shown to last 9 years or more. After the Ceramic Cup has worn, the carbon then wears quite rapidly until an equilibrium is reached whereby the hot face is sufficiently cooled to allow a self-protecting “skull” to form.

Operators are then able to maintain a stable “skull” to achieve required campaign lifetime. It has been observed on many occasions however that when the protective “skull” is lost the carbon can be worn away very rapidly resulting in dangerous situations. The Ceramic Cup does not depend on a “skull” to achieve its intended lifetime.

We can design your Blast Furnace Hearth using the following PHILOSOPHY:
Hot-Face of Ceramic Cup, with just enough thickness of carbon behind to allow a protective “skull” to build-up. No point in having too thick carbon as it will quickly wear to the equilibrium point.

In a perfect world the operator is able to achieve an eternal hearth lifetime by maintaining forever the protective “skull.” In this case, there is no need for Ceramic Cup. Unfortunately, we do not live in a “perfect world”. Operators get the benefit of maybe 10 years lifetime on the Ceramic Cup before needing to stabilise the “skull” (and avoid water leakages, variable raw materials, unplanned stoppages, large-dense dead-man formation, productivity variations etc.). It is this assurance that operators are given when adopting SG Ceramic Cup technology.”

**OUR PHILOSOPHY - ENHANCING PERFORMANCE**

- Longer hearth lifetime
- Reduction of CO₂ emissions
- Lower energy consumption
- Faster start-ups

**Visit our website and contact us today.**
HEARTH

CERAMIC CUP SOLUTION

Designed to boost the performance of Blast Furnace, withstanding the severe conditions inside Blast Furnace hearth. Applicable also in other parts of BF that face extreme conditions. Heat flow from the hearth wall/bottom are in the ratio of approximately 80:20.

With a Ceramic Cup wall the thermal conductivity of the Coranit® is around 3.5 W/mK at 1000°C whereas many super-micropore carbons are over 20 W/mK. Heat flow at hearth wall drops from around 15 W/m² with carbon to 5 W/m² with a Coranit® Ceramic Cup. It is clear that heat flow reduction is good for the environment, good for economy!

Graph:
Case study calculated on an existing blast furnace with ceramic cup (hearth diameter 11m)

*Ceramic Cup Savings (M€) after "x" years:
- By direct coke saving
- By CO₂ tax saving (M€)
- Cumulated Total (M€)

TOTAL COKE SAVINGS 20 kt
TOTAL CO₂ SAVINGS 65 kt

CERAMIC CUP WALL

Pioneering this solution since 1982, Saint-Gobain recently developed a 3rd generation of Coranit® Ceramic Cup quality with enhanced the characteristics.

SIALON BONDED CORUNDUM BRICK

Coranit® SlagR
- Improved mechanical stability
- Better slag/iron resistance
- Excellent abrasion resistance

Coranit® AL
- Iron / slag corrosion resistant
- Good abrasion resistance
- Alkali corrosion resistance

CERAMIC CUP PAD

Best solutions to protect the bottom of the Blast Furnace, with materials that are highly resistant to Iron.

HIGH ALUMINA BRICK

Mullfrax® 70 MS4-F

Both Mullfrax® 70 MS4 and Mullfrax® 70 are well suited for hearth pad application. Both can be provided in circular and herring bone design.
TUYERE BELT SOLUTION

Big block tailor-made that can be customized according to your needs. There is no universal quality that has been accepted as recognized solution for tuyere belt, carbonaceous materials as well as SiC or Al₂O₃ are used but we suggest our three top performing materials. Each operator can decide the best solution depending on what he considers to be the main wear mechanism for his Blast Furnace (refractoriness, slag/iron attack, oxidation attack, alkali attack, abrasion etc.).

**MonoCoral**
- The original Ultra-Low Cement
- Corundum
- Big Block with 89% alumina
- Almost 100 references for tuyere and counting

**Sicanit TB**
- Pre-assembled sialon bonded SiC bricks
- Combines the properties of SiAlON bonded bricks with same easy and fast installation as for a pre-cast block

**BOSH**

As for Bosh application, Sicanit AL3 (SiAlON bonded SiC) with improved alkali and oxidation resistance or Coranit® 3S (sialon bonded corundum) are most often chosen, the latter when low thermal conductivity is required.

Refrax® 20 SBF or Alfrax® 85 MS2 A can also be chosen for lower stack. In addition to alkali and zinc attack, the occurrence of molten iron and slag calls for:

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## CERAMIC CUP

More than 102 references for Ceramic Cup:

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## TUYERE BELT

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# REFERENCES

BOSH & STACK

128 references for Bosh and 88 for Stack since 1982:

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SAINT-GOBAIN

WE ARE COMMITTED TO BEING CARBON FREE BY 2050.

OUR MISSION

Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the well-being of each of us and the future of all.

OUR PURPOSE

MAKING THE WORLD A BETTER HOME.

SAINT-GOBAIN

PERFORMANCE CERAMICS & REFRACTORIES

OUR MISSION

To design, develop and supply solutions and services for extreme operating industrial conditions. Our engineered ceramics and refractory products are manufactured to the highest industrial standards and deliver enhanced performance while minimizing environmental impact.

PIONEERING CERAMIC SOLUTIONS FOR EXTREME INDUSTRIAL APPLICATIONS AND A GREENER WORLD.
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