SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

TOTAL BURNER SOLUTIONS

CERAMIC SYSTEMS

SAINT-GOBAIN

SAINT-GOBAIN 2023

Derwent Top 100 Global Innovator 2023
Clarivate Analytics

top EMPLOYER GLOBAL 2024

1 IN 4
PRODUCTS
did not exist 5 years ago

160,000
EMPLOYEES

47.9 BILLION
SALES IN 2023

REPRESENTED IN 76
COUNTRIES

CO_2 -34 %
CARBON EMISSIONS REDUCTION
(vs. 2017 on scope 1+2)

8
MAIN R&D CENTRES

OUR PURPOSE

MAKING THE WORLD A BETTER HOME.

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.

WE ARE COMMITTED TO ACHIEVING NET ZERO CARBON EMISSIONS BY 2050

SAINT-GOBAIN

PERFORMANCE CERAMICS & REFRACTORIES

OUR MISSION

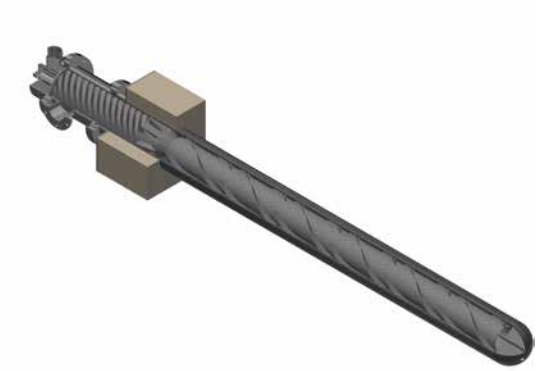
To design, develop and **supply solutions** and **services** for **extreme operating industrial conditions.** Our **engineered ceramics** and **refractory** products are manufactured to the **highest industrial standards** and deliver **enhanced performance** while **minimizing environmental impact.**

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

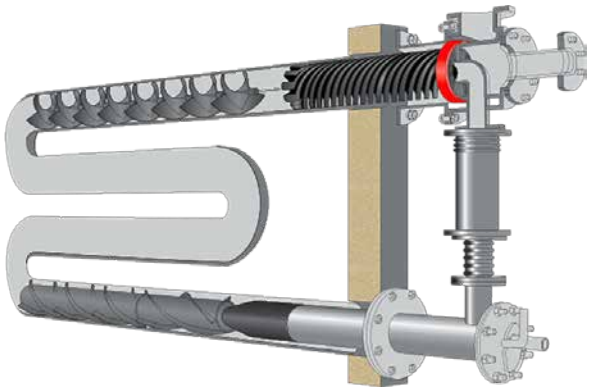
BURNER SOLUTIONS TECHNOLOGIES

Our engineered ceramic products are custom designed, co-developed and manufactured for industrial heating applications. They deliver value in your toughest challenges related to efficiency, throughput, emissions and maintenance.

SINGLE ENDED RADIANT TUBE (SERT) SOLUTIONS



PERFORMANCE ENHANCING THERMAL DESIGNS FOR U- AND W-TUBES



KEY MARKETS & APPLICATIONS

NON FERROUS
Aluminium, Zinc, Copper

CHEMICAL
High temperature processing

AUTOMOTIVE
Metal heat treatment

STEEL
Continious annealing/Continious galvanizing

CERAMIC
Direct & indirect heating

CERAMIC RADIANT TUBE

UP TO **3.500 MM LENGTH** AND **300 MM DIAMETER**

The foundation for our Burner Solutions is the silicon carbide radiant tube, that offers higher productivity at lower energy consumption. Our largest ceramic single ended radiant tube is 3.5 m long and withstands application temperatures up to 1,380°C / 2,500°F and can input up to twice as much energy as alloy radiant tubes into the furnaces. Available for straight and single-ended applications.

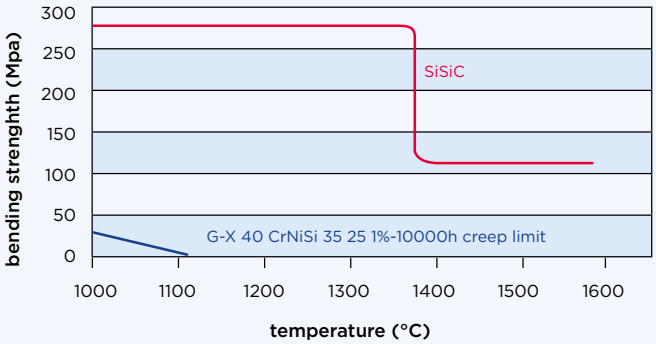
BENEFITS

By comparing a ceramic radiant tube to a metal alloy system, you benefit on:

- **Increased service-life**
- **Reduced maintenance costs**
- **Lower energy consumption**
- **Optimum efficiency**
- **Excellent creep resistance up to max. application of T = 1,870°C**

CERAMIC VS. METAL ALLOYS

High temperature properties of Silit® SKD radiant tubes are superior in comparison to metal alloys. Strength of Silit® SKD is appr. 10 times higher and max. application temperature of 1,350°C compared to 1,100°C.



MORE POWER

- For both horizontally and vertically installed tubes, Silit® SKD can resist net heat outputs of appr. 50kW/m² (up to 1,050°C) whereas steel reach only 50% = 25kW/m².

LOW MAINTENANCE AND WEAR

- Strength of Silit® SKD is very good, no support for horizontal installation is necessary. Significantly higher resistance to bending rotation.
- No scaling on the ceramic tube. Therefore no wear and no cleaning of the tubes.

RECUPERATORS

Our recuperators that are integrated into burner systems for both direct and indirect-heating applications. Recuperator serves to recycle energy. Traditional ceramic recuperators allow for efficiencies of up to 75% in more sophisticated burner systems.

FLAME TUBES / DIFFUSERS

Flame tubes (diffusers) act as a guide for the flow of combustion and combustion gas in single-ended radiant tube applications.

BURNER NOZZLES

We provide a wide range of industrial, domestic oil or wood pellet boiler burners for direct heating. Amasic-3D® Additive Manufacturing, 3D printing capabilities enable us to offer burner nozzle designs of novel configurations and innovative designs to enhance performance.

HEATCOR™ RECUPERATOR

Saint-Gobain also possesses a heat exchanger technology, enabled by its Amasic-3D® manufacturing platform that allows recuperators and burner systems to exceed 80% efficiencies. Known as HeatCor™, the unique twisted-channel design enables surface areas of up to 3x more than traditional recuperators that fit the same footprint.

FEATURES

- Thin-Wall Silicon Carbide
- Variable Twist / Channel Cross-Section
- 3D Printed End-Sets
- Novel Metal-Ceramic Interface

BENEFITS

- **Excellent thermal conductivity**
- **3x higher rates of heat transfer**
- **Custom designs for optimizing application variability**
- **Minimizes long-term failures**
- **Low pressure drop**
- **Working temperature up to 1,350°C**

3D PRINTED END-SETS

for unlimited entrance and exit conditions maximize retrofit possibilities. It allows us to customize HeatCor™ recuperators for each application.

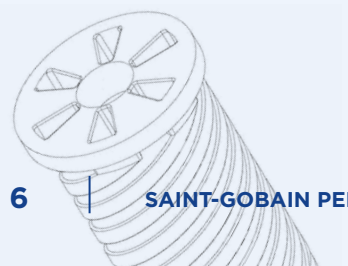
CASE STUDY

Continuous annealing line,
U-type Radiant Tube w/metal recuperator

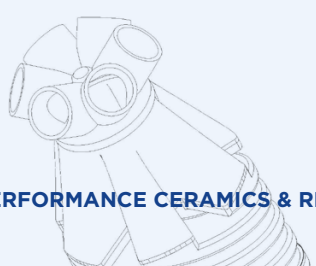
9% to 16% energy savings
39% NOx REDUCTION

Metal recuperator	Efficiency	70 - 72%
	NOx	320 ppm
HeatCor™-140	After with HeatCor™-140	79% to 83%
	NOx	195 ppm

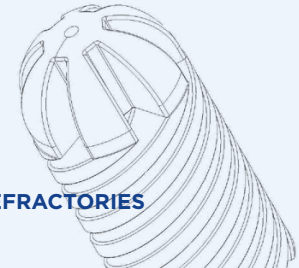
FLANGE



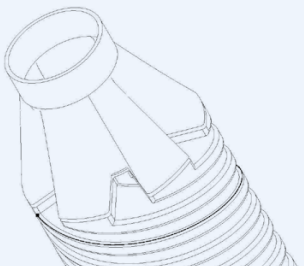
DIRECTIONAL NOZZLE



ROUND

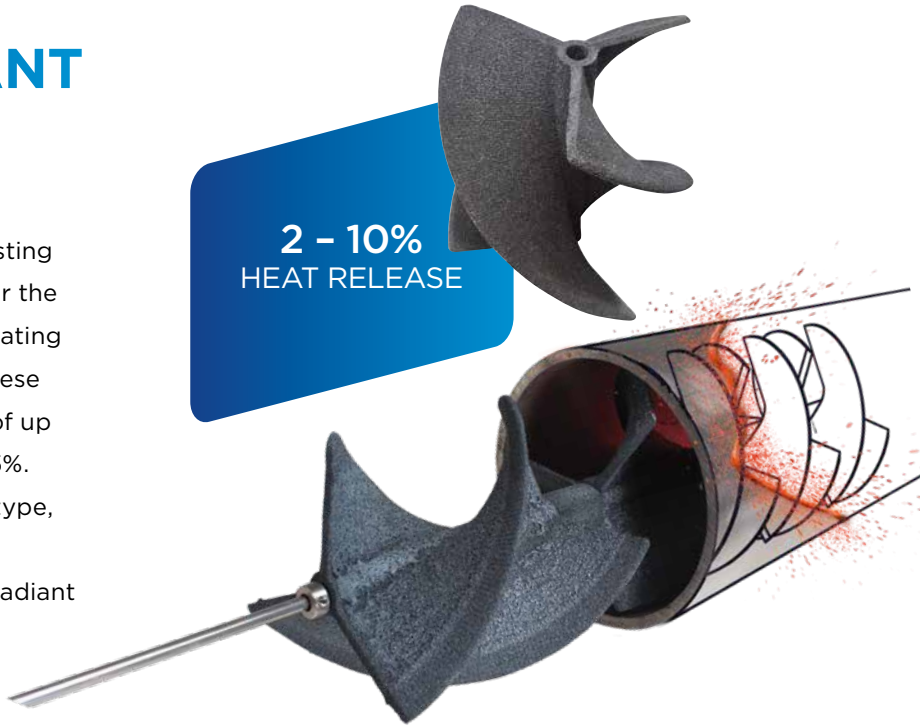


INTEGRAL BURNER NOZZLE



SPYROCOR® RADIANT TUBE INSERTS

These inserts can be easily retrofitted into existing radiant tubes to improve efficiency and bolster the amount of heat that the radiant tube is re-radiating into the furnace chamber. By implementing these inserts, users can experience energy savings of up to 15% or throughput improvements of up to 5%. Available for simple installation in straight, U-type, W-type, and tri-type radiant tubes.
Also applicable in P-type and double-P-type radiant tubes.

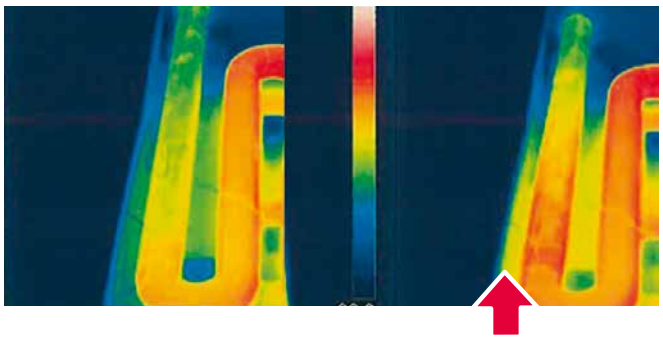


FEATURES

- Patented twist fin design
- Absorbs heat energy
- Re-radiates heat back into the furnace
- 2 - 6 % throughput improvements

BENEFITS

- **Reduction of exhaust temperature**
- **Improved energy efficiency**
- **Reduction of polluting emissions**



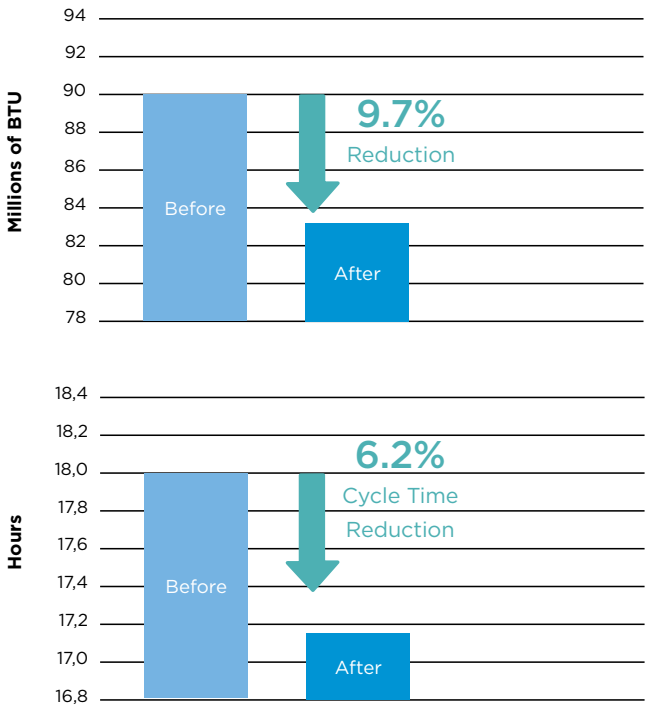
More heat into the furnace allows operators to reach YOUR desired temperature faster and boost throughput.

CASE STUDY

Aluminum slab reheating furnace with W-type Radiant Tube & 567,000BTU/Hr burner

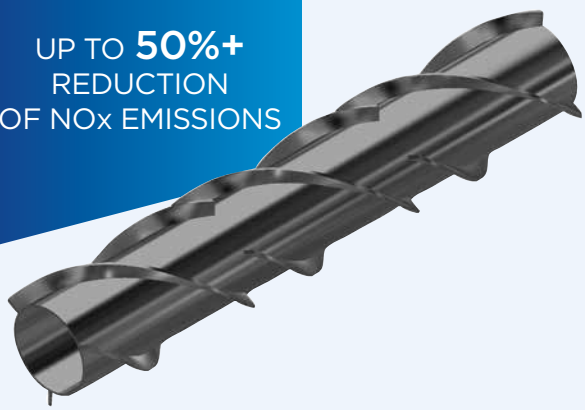
Energy saving: 9.7%
Additional capacity: +28 cycles / year
ROI*: 4 months

Natural gas consumed per furnace cycle



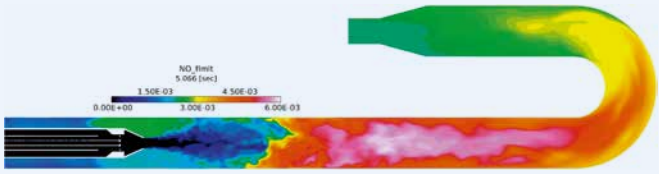
*Energy savings represents an average at gas cost of $4.00/MMBZU.

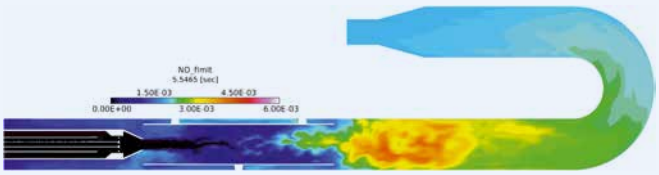
UP TO **50%+** REDUCTION OF NOx EMISSIONS



NOXBUSTER® RADIANT TUBE INSERT

NOxBuster® patented design permits the recirculation of flue gasses within the radiant tube. With the NOxBuster® shape, you can significantly reduce flame temperature and lower NOx emissions by up to 50%!



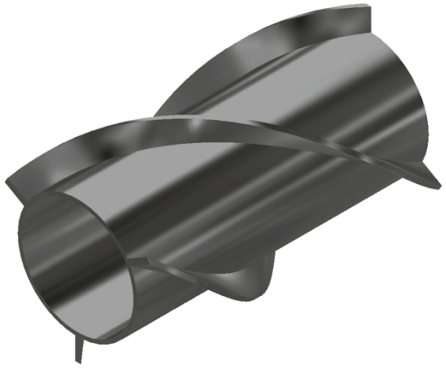


BENEFITS

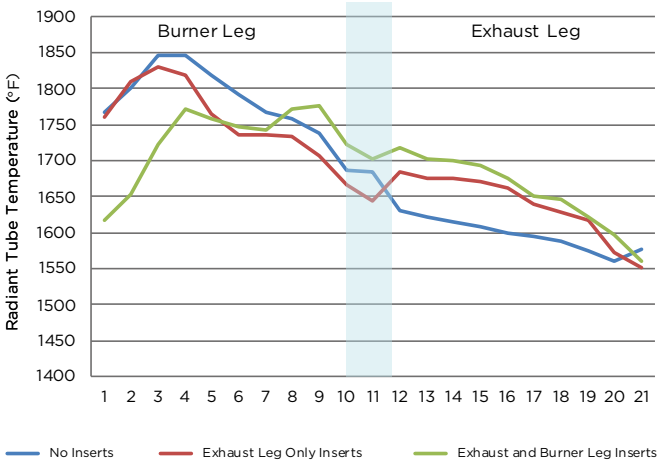
- **Significant energy and maintenance savings via hot-spot elimination**
- **Combined with SpyroCor®, achieve temperature uniformity up to 150°F / 83°C**

PYROCOR™ FLAME TUBE

An uniquely designed flame tube, modified and developed for use in U-tubes and W-tubes, that protects the radiant tubes by eliminating hot spots caused by direct flame impingement and increases the life of the radiant tube. The spiral shape can be custom engineered to promote excellent temperature uniformity.

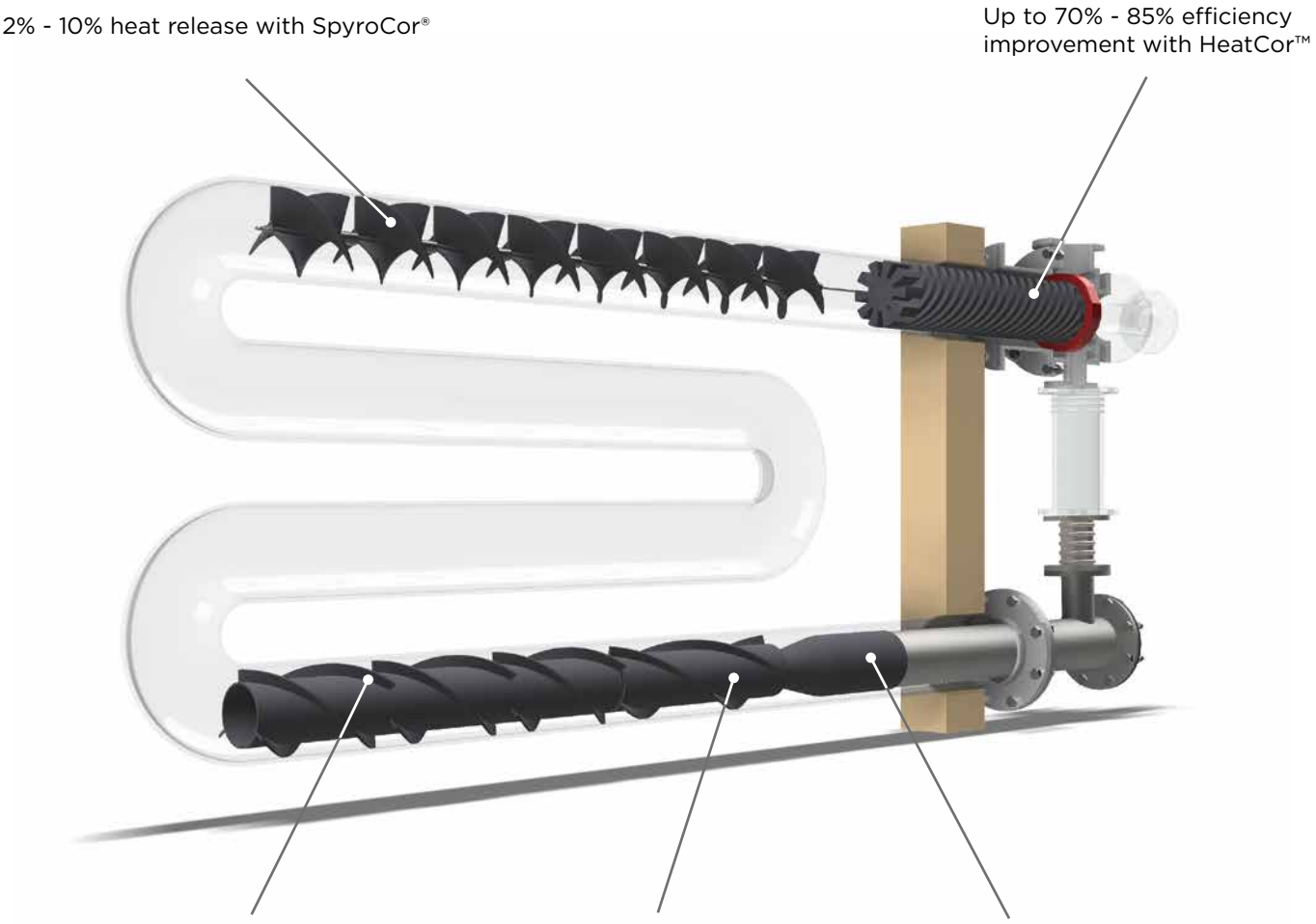


Radiant Tube Temperature Profile



PERFORMANCE ENHANCING THERMAL DESIGNS

The combined benefits of Saint-Gobain's Thermal Designs make them the best total sustainable solution for you. Apply them to your system to help achieve your performance objectives.



SERT

U-TUBE

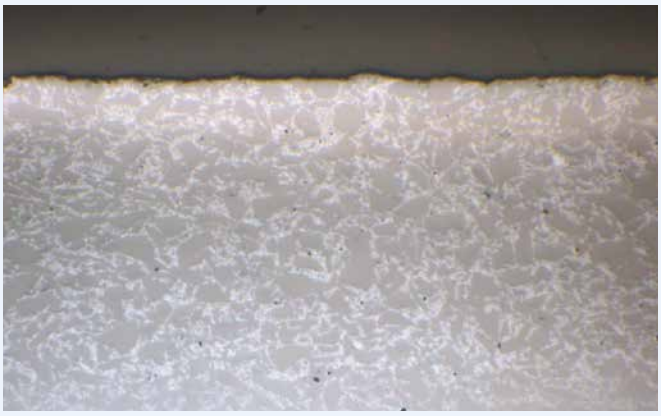
W-TUBE

SILIT® SKD / AMASIC-3D®

Silit® SKD and Amasic-3D® are a reaction-bonded, siliconinfiltrated silicon carbide (SiSiC).

FEATURES & BENEFITS

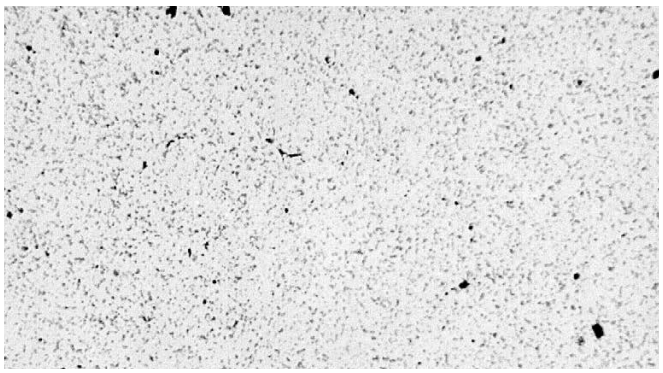
- Gastightness
- Very high thermalshock resistance
- Dimensional stability till maximum application temperature
- Very high thermal conductivity
- Low mass
- High efficiency
- High operational reliability and operating efficiency
- Amasic-3D®: 3D-printable SiSiC



Photomicrograph of Silit® SKD (100x)

HEXOLOY® SA SIC

Hexoloy® SA SiC is a pressureless, sintered form of alpha silicon carbide, with a density greater than 98% theoretical. It has a very fine grain structure (4 - 10 microns) for excellent wear resistance and contains no free silicon, which makes it highly chemically resistant in both oxidizing and reducing environments.



Photomicrograph of Hexoloy® SA SiC (200x)

FEATURES & BENEFITS

- Near universal corrosion resistance
- Excellent resistance to wear
- Exceptional strength at high temperature
- High oxidation resistance, up to 1,650°C in air
- Low thermal expansion
- High thermal conductivity

PROPERTIES OVERVIEW

Saint-Gobain‘s application engineers are available to assist you with your technical project in designing cost effective high performing products that will meet your need now and in the future.

	Test specification	Unit	Silit® SKD	Amasic-3D®	Hexoloy®
Main components	SiC	%	85	60	> 99
	Si		15	40	
Maximum application temperature[1])		°F / °C	2510 / 1380	2460 / 1350	3450 / 1900
Bulk density	EN 993-1	g/cm³	3,0	2,8	3,1
Apparent porosity	EN 993-1	Vol. %	0	0	0
Young’s modulus RT[2])	EN 843-2	Gpa	340	155	430
Modulus of rupture RT[2])	EN 993-6	Mpa	260		380
Coefficient of thermal expansion **α** RT ... 1.300°C	EN 993-10	10^{-5}/K	4,5	4,8	4,0
Thermal conductivity 1.000°C	EN 993-15	W/(m*K)	35	40	126

1) Dependent on the corresponding operating conditions
2) Ambient temperature

SAINT-GOBAIN’S TOTAL BURNER SOLUTIONS

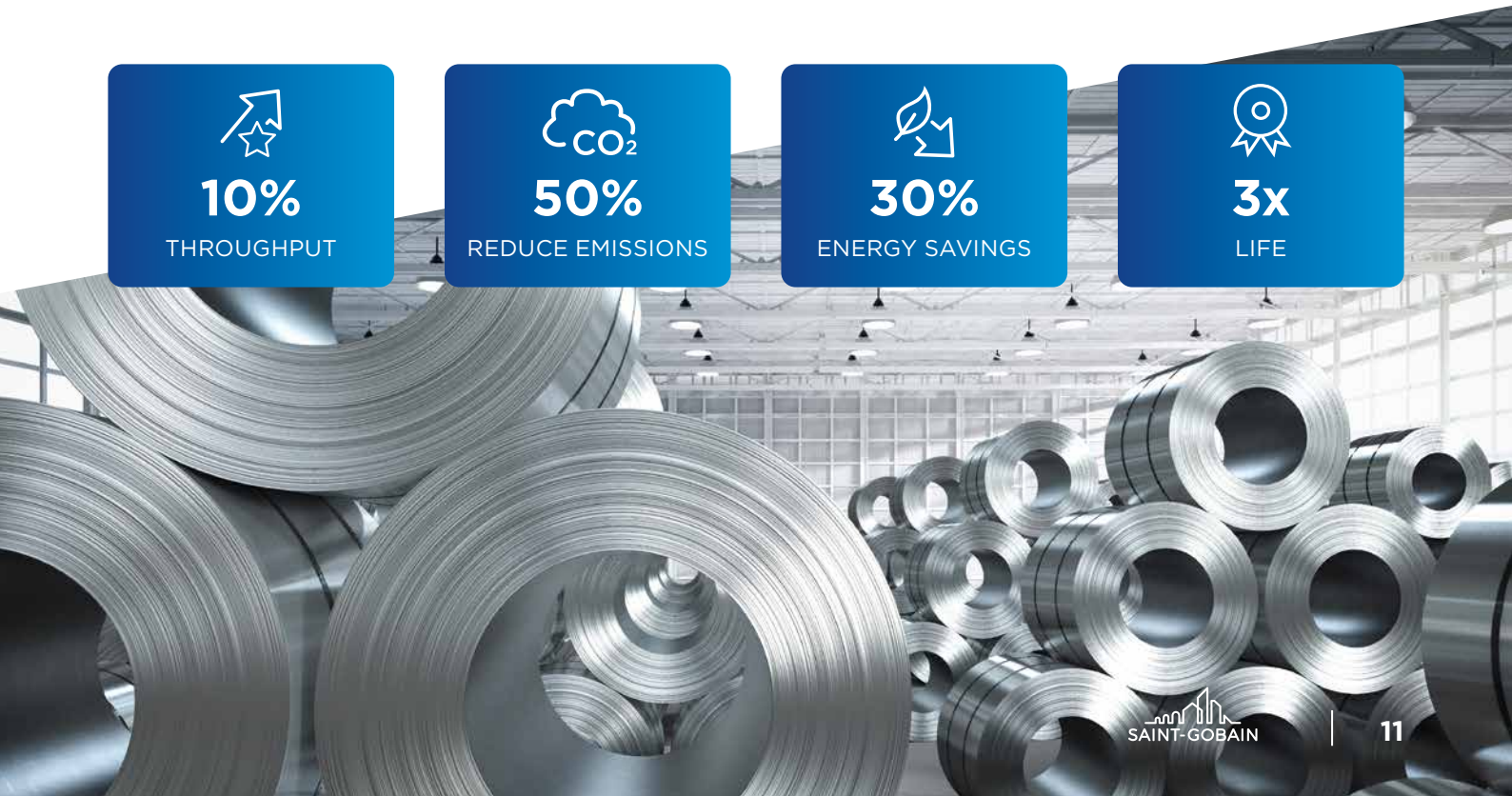
The combined benefits of Saint-Gobain‘s Total Burner Solutions makes it the most sustainable solution for you. Apply them to your systems to help achieve up to

10% THROUGHPUT

50% REDUCE EMISSIONS

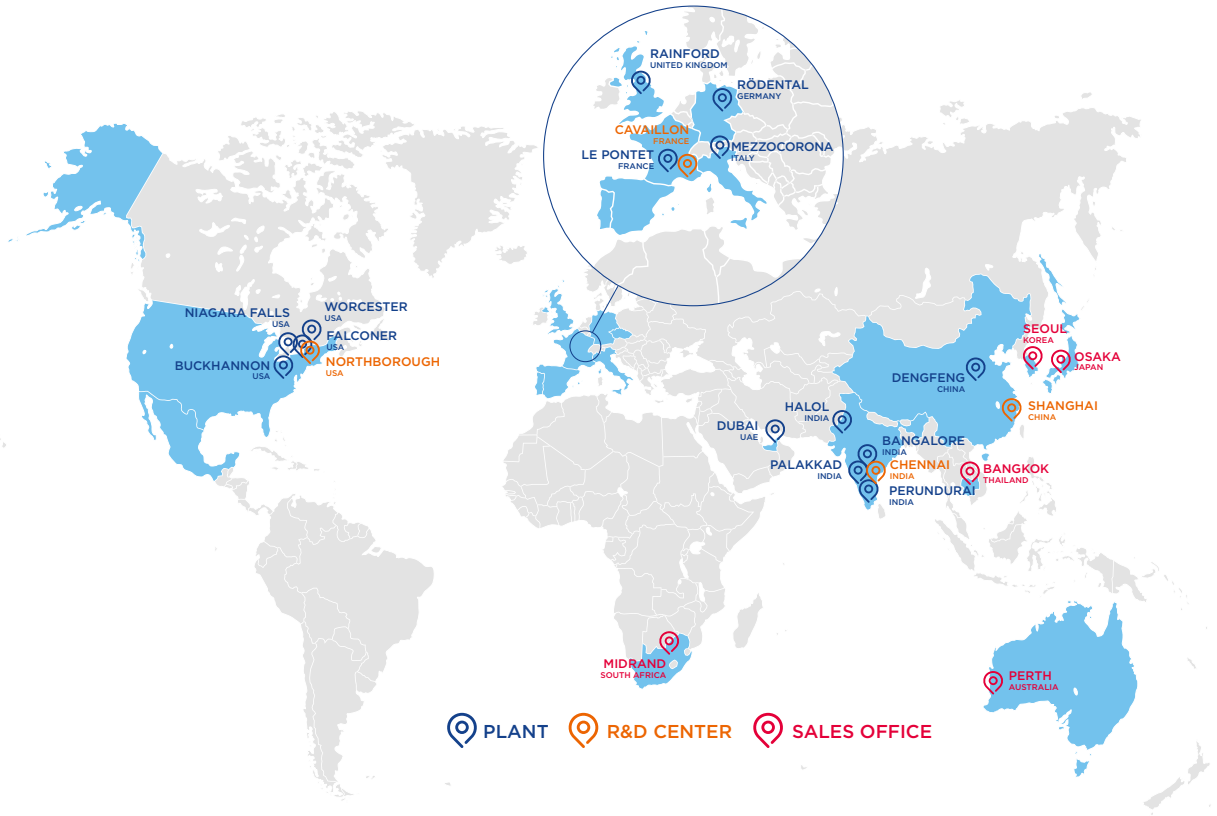
30% ENERGY SAVINGS

3x LIFE



SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

OUR GLOBAL PRESENCE



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