GOUDA *refractories*

Hot Blast Stoves

Iron & Steel Industry

Gouda Refractories delivers complete alumina refractory solutions for all types of installations in the Iron & Steel Industry. Rather than supplying commodities, Gouda Refractories focusses on finding the best possible solution for critical areas.

Gouda Refractories supplies refractory materials for critical areas in the iron & Steel Industry.

LRQA CERTIFIED ISO 9001

- Tight dimensional tolerances
- Extremely Low Creep values
- Full scope of **supply**

Since 1901, Gouda Refractories has proven that the company adds extra value when designing and producing refractory linings. Its state of the art production facilities does not just deliver refractory bricks, monolithic and precast shapes, but offers worldwide customer- specific total solutions for the iron & steel, non-ferrous metals, petrochemical, environment & energy and cement industries.

Every industry has its own specific challenges and demands. Whether it's a greenfield project or maintenance, Gouda Refractories seamlessly matches the design and the choice of materials to the specific needs of the industry and process. Longevity, ease of installation and consistency are all top priorities. Dialogue and cooperation with the customer mean that products for any specific application can be developed.

A Hot Blast Stove is one of the main equipment for the Blast Furnace of the iron plant. The function of the hot blast stove is to act as a heat exchanger, continuously providing high temperature hot air for the blast furnace. Approx. 25% of the heat required for blast furnace comes from the hot blast stove.

SHINAGAWA REFRA GROUP

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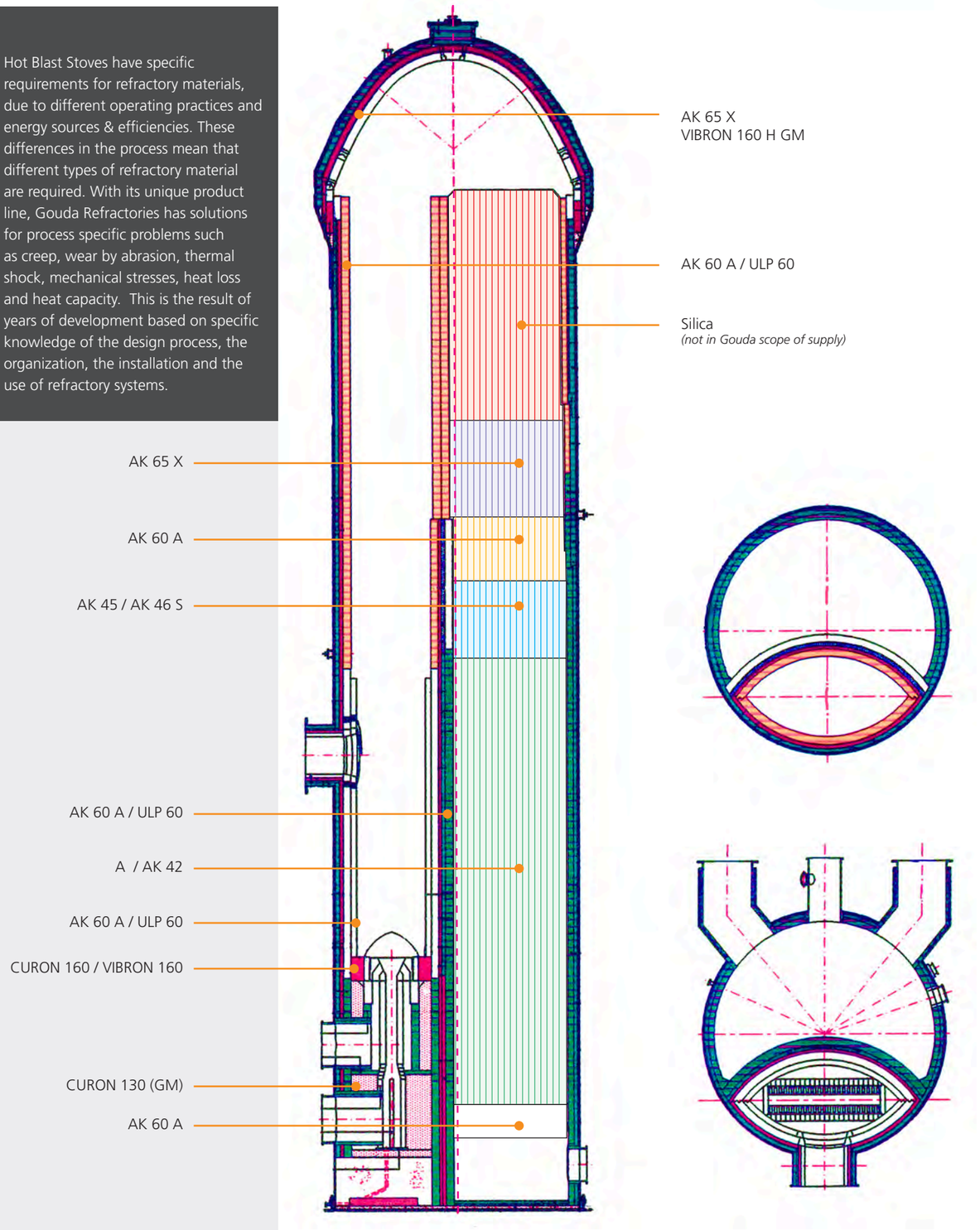
Hot Blast Stoves have specific requirements for refractory materials, due to different operating practices and energy sources & efficiencies. These differences in the process mean that different types of refractory material are required. With its unique product line, Gouda Refractories has solutions for process specific problems such as creep, wear by abrasion, thermal shock, mechanical stresses, heat loss and heat capacity. This is the result of years of development based on specific knowledge of the design process, the organization, the installation and the use of refractory systems.



Material Properties

Monolithics	Description	Material Properties		Chemical Analysis			Physical Properties	
		Max. Serv. Temp.	Density	Al_2O_3	SiO_2	Fe_2O_3	CCS	PLC
		°C	kg/m³	%	%	%	MPa	1400 °C
CURON 160	Dense refractory andalusite based castable	1.600	2.450	63	30	1	25	+0,6 / -0
CURON 160 GM	Dense refractory andalusite based gunning mix	1.600	2.350	61	33	1	20	+0,6 / -0
CURON 160 HS	Dense refractory castable	1.600	2.300	62	30	< 1,5	70	+0 / -0,4
CURON 160 HS GM	Dense refractory gunning mix	1.600	2.200	65	29	< 1,5	60	+0 / -0,4
VIBRON 160 H	Dense low cement refractory castable	1.600	2.500	63	31	1,5	80	+0 / -0,3
VIBRON 160 H GM	Dense low cement refractory gunning mix	1.600	2.350	63	31	1	40	+0 / -0,3
CURON 130	Dense refractory castable	1.300	2.000	35	49		25	+0,5 / -0,5
CURON 130 GM	Dense refractory gunning mix	1.300	1.950	33	49		15	+0,2 / -0,5

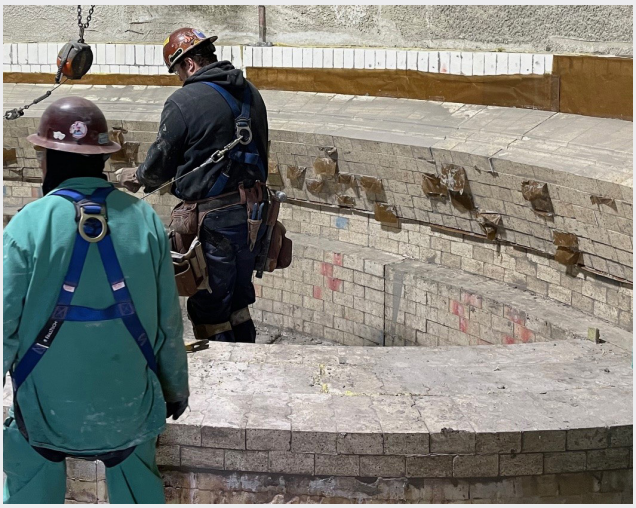
Dense Bricks	Description	Material Properties		Chemical Analysis			Physical Properties	
		Max. Serv. Temp.	Density	Al_2O_3	SiO_2	Fe_2O_3	CCS	Porosity
		°C	kg/m³	%	%	%	MPa	%
SiC90	Dense refractory brick based on SiC	1.650	2.600		92% SiC		80	15
AK 65 X	Dense refractory brick with high low creep	1.680	2.800	69	28	< 1	80	14
ULP 60	Dense refractory brick with low porosity	1.680	2.650	62	35	< 1	100	< 8
AK 60 X	Dense refractory brick with high low creep	1.680	2.550	60	37	< 1	70	13
AK 60 A	Dense refractory brick based on andalusite	1.680	2.550	60	37	< 1	90	13
AK 46 S	Dense refractory fireclay brick with low reep	1.550	2.400	49	47	< 1,2	50	15
AK 45	Dense refractory fireclay brick	1.500	2.300	45	50	< 1	55	16
A	Dense refractory fireclay brick	1.400	2.150	40	53	< 2	35	20

Fired Prefab Shapes	Description	Material Properties		Chemical Analysis			Physical Properties	
		Max. Serv. Temp.	Density	Al_2O_3	SiO_2	Fe_2O_3	CCS	Porosity
		°C	kg/m³	%	%	%	MPa	%
V 140 PT	Fired fire clay based Prefab Shape	1.400	2.250	47	43	< 1,5	50	20
V 163 A	Fired andalusite based Prefab Shape	1.600	2.500	62	32	< 1	80	18
V 168 H	Fired mullite based Prefab Shape	1.600	2.300	64	31	< 1,5	100	19
V 188 H	Fired corundum based Prefab Shape	1.760	3.000	94	5	< 0,2	100	20

Mortars	Description	Material Properties		Chemical Analysis			Physical Properties	
		Max. Serv. Temp.	Max. Grain Size	Al_2O_3	SiO_2	Fe_2O_3	$Na_2O + K_2O$	SiO
		°C	mm	%	%	%	%	%
ADHESIET A	Air Setting Mortar based on chamotte	1.450	0,5	38	53	2	3,5	0
ADHESIET 160	Air Setting Mortar based on sintered bauxite	1.600	0,5	75	18	1,5	2	0
ADHESIET K80	Air Setting Mortar based on silicon carbide	1.600	0,5	3	12	1	2	80
HS 160	Heat Setting Mortar based on bauxite	1.600	0,5	80	15	1,5	0	0

Values are typical. Datasheets are available upon request.

For each of the hot blast stove section, different types of refractories are used to reduce the total cost and to carefully select products that can withstand the typical wear mechanisms. Not only the operating conditions are considered when selecting the optimal products, also the best method of installation must be considered when selecting the type of refractory.



Gouda can supply the full scope of alumina refractory products: dense bricks, special prefab shapes, checker bricks, insulation bricks, castables, blankets and anchors. The only exception are the silica materials.

As each section has its own critical demands for the refractory properties, the general most important properties of the refractory materials are:

- Thermal shock resistance to accommodate temperature difference caused by the cyclic operation.
- High Strength (expressed in CCS and HMOR) and a low creep rate. A Hot blast stove is a high tower, the lower sections take the compressive stress from the refractory above, while at elevated temperatures.
- Abrasion Resistance to withstand the air flow in the stove.
- High Resistance against Chemical Abrasion
- Low Permanent Linear Change (PLC)
- Large Heat Capacity of the checker bricks to keep the heat when the flow direction is changed from heating to cooling stage.
- Tight dimensional tolerances. The Regenerator Port consists of a large number of checker layers.

  The height of checkers is therefore categorized in different bandwidths. Gouda has two measuring systems to categorize and colour-mark each individual checker.

Checker Heigth Sizing (Band Colors)

For checker banding refer to QC spec. sort into max. 7 bands on height:

White band	152.5 - 153.5	Red band	156.6 - 157.5
Black band	153.6 - 154.5	Blue band	157.6 - 158.5
Brown band	154.6 - 155.5	Yellow band	158.6 - 159.5
Green band	155.6 - 156.5		

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