The Future of Mould- and Coremaking

With the use of innovative GIBA special sands productivity over the whole process will increase and at the same time environmental pollution will drastically decline.

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GIBA represents exclusively **Badger sands (GBM)** on the European market: **GBM** is a Silica sand with round and very pure grains. In this publication we refer to the literature published in GIESSEREI 98, 05/2011 with the title „Die Haftungsmechanismen von Cold-Box-Bindemitteln auf der Formstoffoberfläche" .

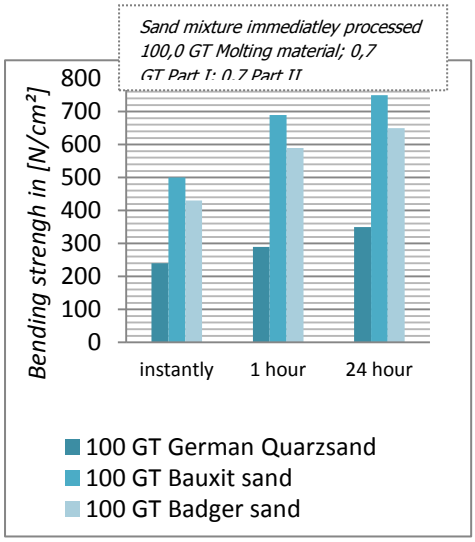


Diagram 1: Run of strength for different moulding sands and times[1]

„GBM Silica sands reache already instantly after processing strength values which are as double compared with the German quartz sand.[1]

Chemical Analysis	%
Silicon Dioxide	99,70
Aluminum Oxide	0,12
Calcium Oxide	0,12
Iron Oxide	0,04
Potassium Oxide	0,02
Sodium oxide	0,01
Magnesium Oxide	<0,01
Titanium Oxide	<0,01

Physical Properties	
Loss On Ignition	0,05%
Moisture	0,2%
Base pH	6,8
Sintering Point	1650°C
Grain Shape	gerundet
Specific Gravity	2,65
Bulk Density tapped	1681-1778 kg/m³
Bulk Density untapped	1505-1570 kg/m³
Clay Content	0,08%
Acid Demand Value	0,4

Table 1: GBM Silica sand - Chemical Analysis and Physical Properties

[1] Frank Iden et al. Zeitschrift GIESSEREI 98; 05/2011; s.26; „Die Haftungsmechanismen von Cold-Box-Bindemitteln auf der Formstoffoberfläche"

Comparison of GBM Silica sand and other customary sands on the markets

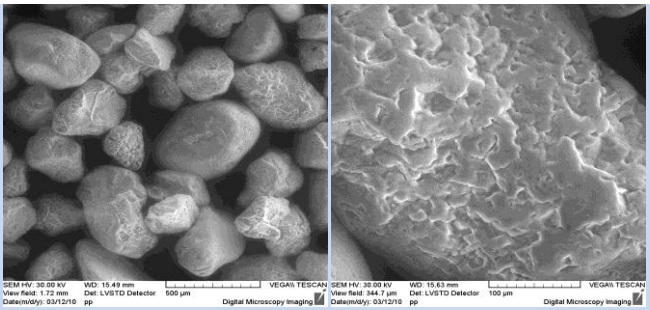


Fig. 1 und 2: European Silica sand - Ultrastructure, SEM picture

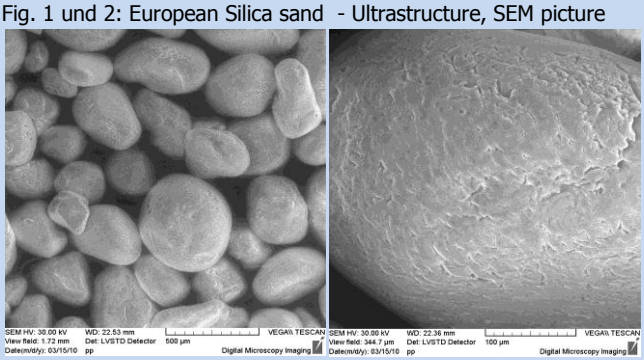


Fig. 3 und 4: GBM Silica sand – Ultrastructure, SEM picture

- GBM sands have an even surface finish
- GBM sands have a smoother grain surface
- GBM sands show a very good reworkability
- GBM sands cause lower costs in maintenance

Sand reworking: GBM sands change theire average grain size hardly even after the 10th reworking step.

	New Sand	After 1. Rew. Step	After 5. Rew. Step	After 10. Rew. Step
Av. Grain Size	**0,306 mm**	**0,306 mm**	**0,309 mm**	**0,306 mm**

Table 2: Reworked GBM Silica sand (mechanically and thermally, treated at 650°C)

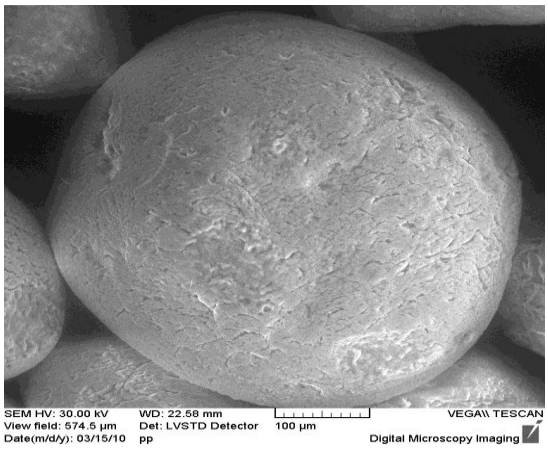


Fig. 5: GBM Silica sand – Surface Structure, monitored with a Scanning Electron Microscope (SEM)

Cold Box Process: Comparison of Bending Strengths

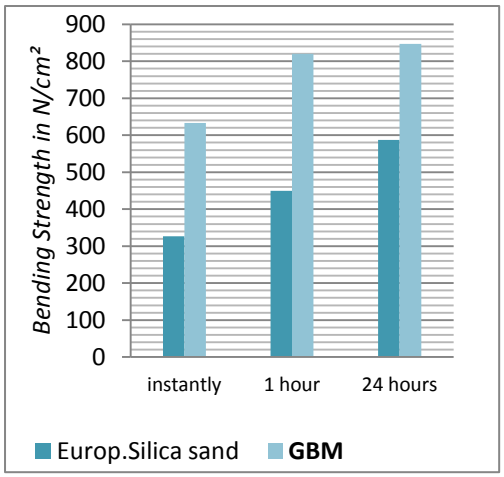


Diagram 2A:
0,8 % Teil I
0,8% Teil II

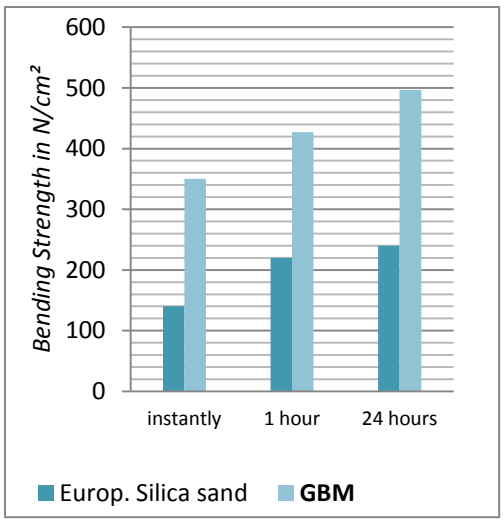


Diagramm 2B:
0,4 % Teil I
0,4% Teil II

Diagram 2A und 2B: GBM Sand reaches with the same content of binder almost the double binding strength.This means a drastical saving in costs for binding agents.

Furan Resin Process: Comparison of Bending Strengths

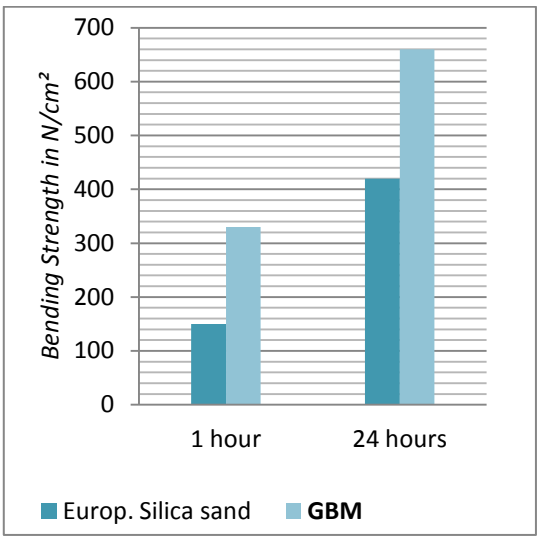


Diagram 3:
Kaltharz F700
1,0 %
Activator 500 T1
0,5 %

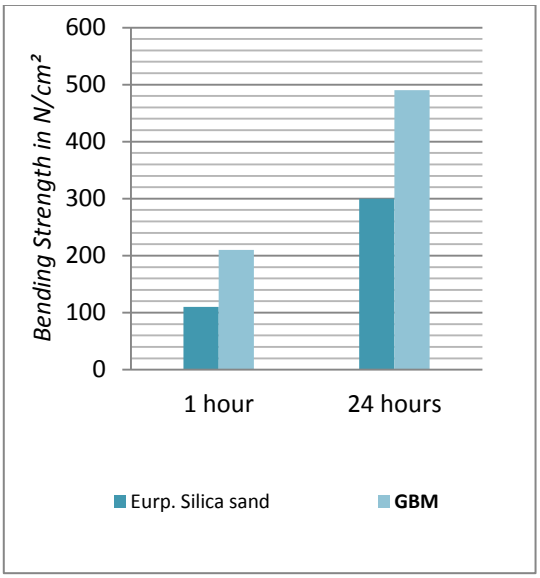


Diagram 4:
Kaltharz F700
0,7 %
Activator 500 T1
0,35 %

Cold-Box with GBM Silica sand Advantages:

- Less consumption of binding agents and a smaller amount of catalyzer – this means lower environmental pollution
- Depending on core geometries higher productivity in core making up to 20% can be achieved
- Increased core strength and better abrasion resistance
- Better permeability of the cores, caused by even screen analysis and lower quantities of chemicals
- It is possible to use finer sand with the same amount of binding agents, partly blackwash is no longer necessary
- Better flowability of the sand, easier blowing of the cores
- Longer liftime of the core boxes
- Reduced gasification during pouring
- Better surface on the castings, lower costs for fettling and reduced scrap rates

Furan Binder with GBM Silica sand Advantages:

- Reduced binder consumption up to 40%
- Reduced addition of new sand to the reworked sand (5-6 %), this effects lower disposal costs
- Higher mould stability
- Better permeability
- Better surface of the castings
- Lower wear in the reworking equipment

Warm Box Process: Comparison of Bending Strengths

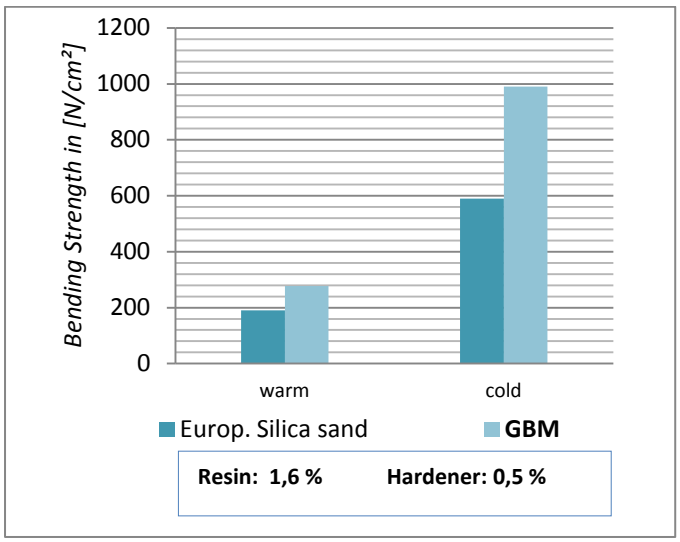


Diagram 5:
Comparison of Bending Strengths – instantly and after 24 hours

Reduced volume of condensates by reduced amount of binder addition.

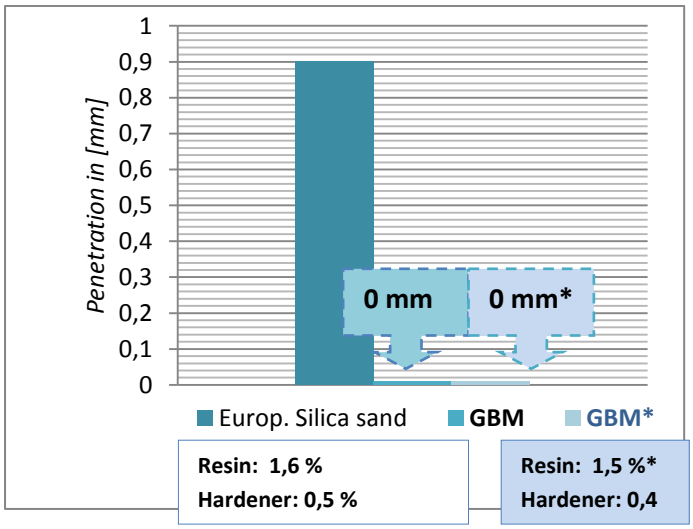


Diagram 6:
Comparison of Abrasion Resistance of Europ. Silica sand and GBM Sand in the Warm-Box Process.

Warm Box with GBM Silica sand Advantages:

- Reduced binder consumption, up to 40 %
- Higher productivity in core making
- Reduced gasification during pouring, lowered risks of defects caused by gas in the castings
- Reduced formation of condensates

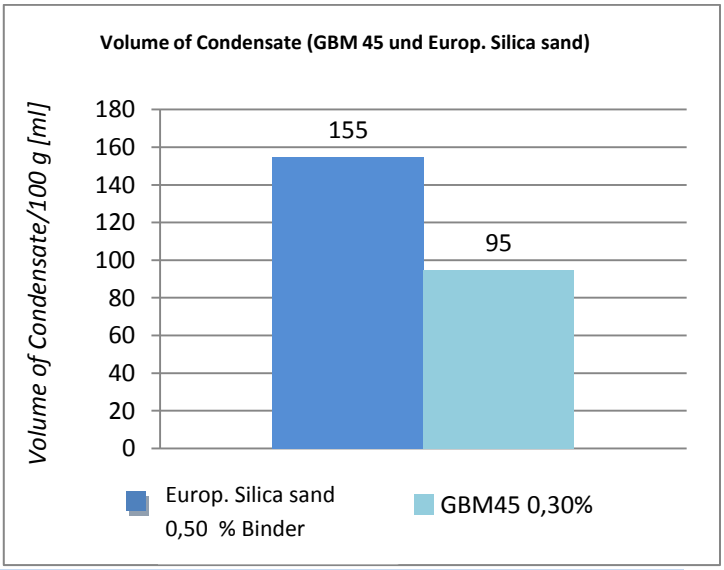


Diagram 7: Formation of Condensates

Despite reduced binder agent in the GBM Silica sand the hardness of the surface is such high that the depth of the penetration is hardly to measure.

Europ. Silica sand: 0,9 mm Depth of Penetration

GBM Sand: 0,0 mm Depth of Penetration

Through the use of GBM Silica sands are obtained for each mold and core production process a saving of 40 - 50% of binder - therefore far less gas shock and volume of gas (less gas bubble tilt).

Synthetic Sands

Our delivery program also embraces synthetic sands, which can be used as alternatives for Cr, Zr und Bauxit sands.

CKI und CKL

Sands produced on a industrial base with different chemical analysis`.

	CKI	CKL
Al_2O_3 [%]	75,0	47,7
SiO_2 [%]	11,0	48,5
TiO_2 [%]	3,0	2,1
Fe_2O_3 [%]	9,0	1,0
LOI [%]	0,15	0,02
Moisture [%]	0,03	0,08
Base pH	6,9	6,9
ADV @ pH 5	0,6	-1,3
ADV @ pH 5	0,0	-1,7

Table 3: Chemical Analyseis and Physical Properties

	CKI	CKL	ZIRKON	CHROMIT	SILICA
ASG	3,23	2,68	4,65	4,51	2,65
GFN	40	40	110	50	60
Loose BD (lbs/ft³)	113	94	168	163	100
Packed BD (lbs/ft³)	125	109	189	183	110
Therm. Expansion (%LC)	0,708	0,667	0,51	0,97	1,808
Coefficient of Expansion (1E-6 in/in- °C)	6,62	6,21	4,75	9,06	16,85
Thermal Conductivity (W/m-°C)	0,7	0,74	0,63	0,94	1,14
Heat Capacity (cal/g-°C)	0,291	0,292	0,197	0,235	0,284
Thermal Diffusivity (cm²/s)	0,0029	0,0035	0,0025	0,0033	0,0054
Meltingpoint (°C)	2200	2200	2100-2300	>1850	>1700
Sinterpoint (°C)	1500	1540	1200	1350-1500	>1550

Table 4: Comparison of Physical and Thermal Properties (1100°C)

Grain Shapes of CKI and CKL Sands:

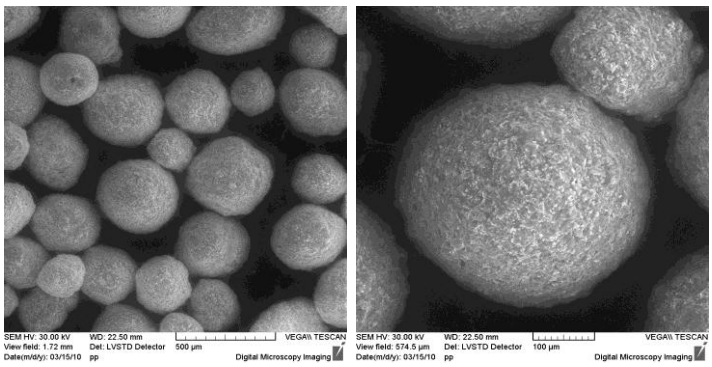


Fig. 6 und 7: **CKI-Sand**, Ultrastructures, SEM Pictures

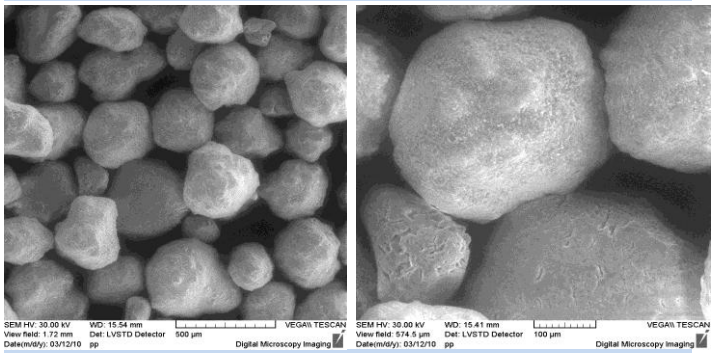


Fig. 8 und 9: **CKL-Sand**, Ultrastructures, SEM Pictures

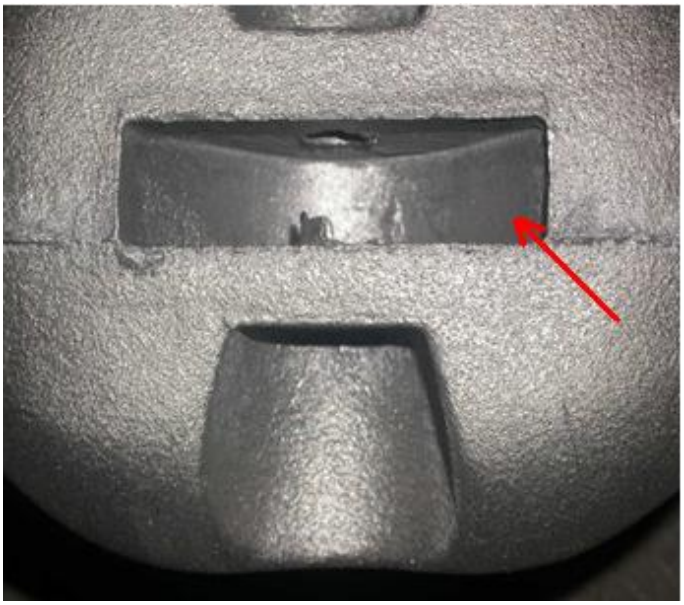


Fig. 10: Casting (produced with a core of CKI sand)
Reduced tendency for formation of leafe fins and penetration defects.
Much better surface quality.

Expansion Tendency

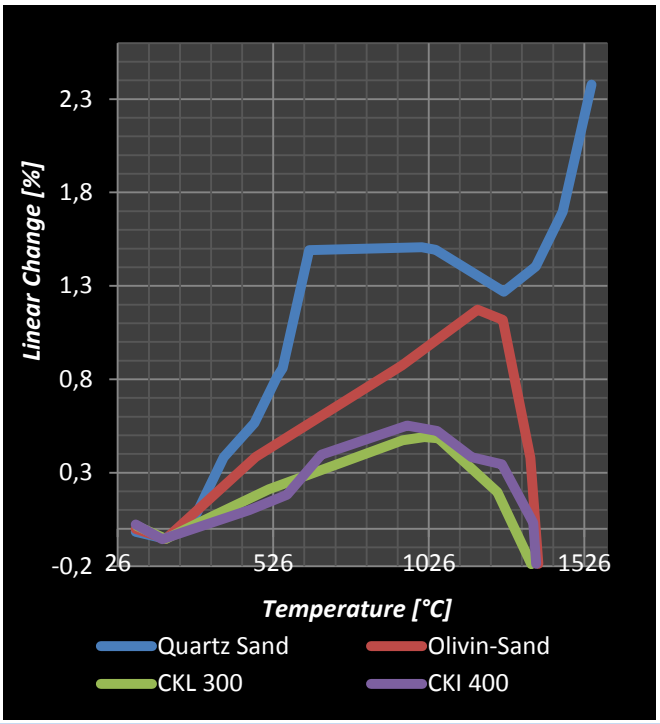


Diagram 11: Physical Properties of CKI und CKL Sands

Smaller thermal expansion in comparison with many other sand types.

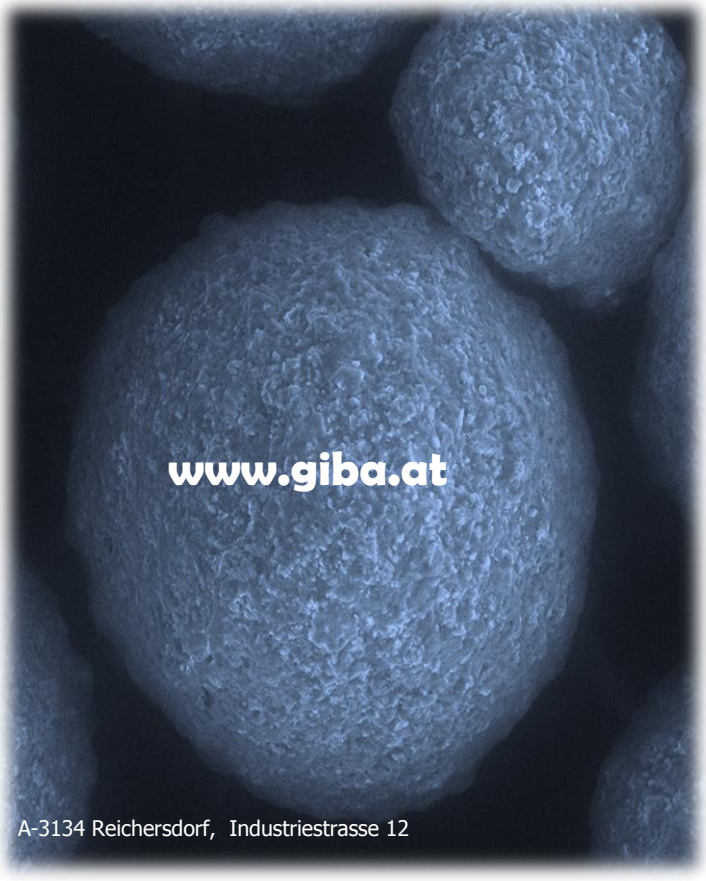
Advantages of CKL und CKI Sands:

❖ CKL Sand

- Same density like Silica sand
- better thermal Conductivity
- High permeability
- Low thermal expansion
- „Round" Grains
- Almost zero content of little fines

❖ CKI Sand

- In comparison with Chromite sand lower bulk density of 3,2 to/m³
- Reduced disposal costs
- strong cooling effect
- High permeability
- Low thermal expansion
- „Round" Grains
- Almost zero content of little fines



Who is GIBA?

GIBA was founded in 1982 as a family owned trading company. The type of company corresponds to a British Ltd. The company is located in Lower Austria, next to the S33 motorway and the Danube harbour Krems.

Main Equipments:

- Warehouses with approx. 2.500 m²
- Silos with approx. 450 mtons capacity
- Sufficient stock pile places of about 30.000 m² for sand, pig iron etc.
- Fully equipped sand laboratory

Main fields of trading:

- Iron-, Non-ferrous- and steelindustry

Trading goods:

- Silica- and specialsands
- Refractory masses
- Chemical products (binders, blackwashes etc.)
- Ingate systems, feeding- and filter techniques
- Alloying- and inoculation materials
- Pig irons
- All auxiliary materials for foundries
- Assemblies, installations and mountings

v

Silica sands with new properties, which represent a revolution in binder consumption and which therefore are environmentally friendly.

Delivery program:

- Silica sands
- Synthetic Sands
- Refractory masses
- Chemical products
- Alloying materials
- Feeder- and filtertechniques
- Ingate systems
- Assemblies,installations and mountings

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