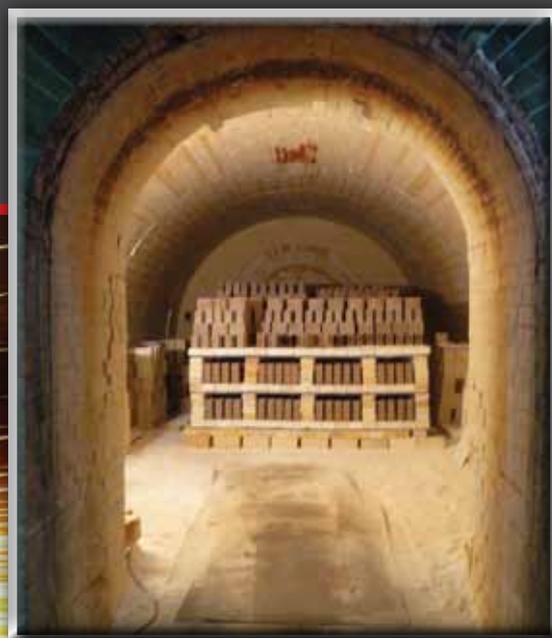


*Refractory
in Perfection*

VGT-DYKO 



Your Specialist for Refractories

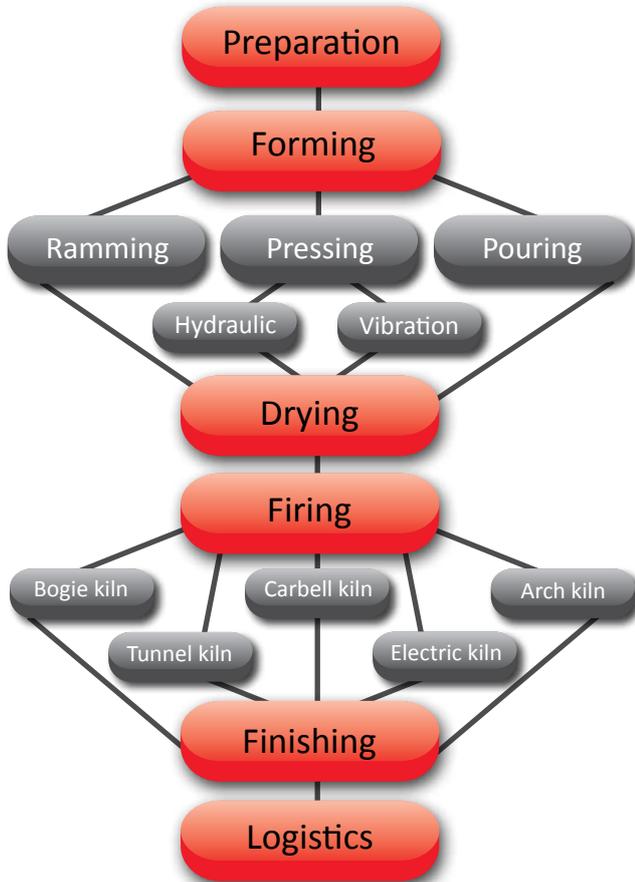


VGT-DYKO was founded in the year 1887 by the merger of several medium-sized companies. At first “Vereinigte Großalmeroder Tonwerke” (VGT) took up production in the fire clay factory in Großalmerode until a new work in Rommerode was built in 1923 in which high-grade refractory products are still produced up to day.

In 1984 company of DYKO was taken over and 15 years later production and property were acquired by VESUVIUS from which action the name of VESUVIUS-VGT-DYKO arose. The location in Rommerode with its roughly 90 employees is specialized on the production of non-standardized shaped parts. Customers from the chemical and petro-chemical industry, power stations and waste incineration plants are supplied with high-quality products produced in hydraulic presses, by hand-ramming and also by slip casting and pouring processes, the quality of which being assured by continuous quality control to the highest standard.

Since March 2013 we are no longer a group-controlled enterprise and trade under the name of VGT-DYKO.

VGT-DYKO is offering the most modern solutions with regard to fire-, heat-, fracture- and wear-resistant products on the highest possible quality level. Our engaged team covers efficiently all fields of research and development, production and logistics, sales and consultancy, based on the experience accumulated over more than 125 years.



In the beginning there is the fire and the desire to master it. This desire applies to all our customers. Their production process – which in the true sense of the word is a hot affair – can be performed by use of the appropriate materials so effectively that they can concentrate on their essential subject – their actual product. Thus, we are encouraged to share with you our know-ledge and our experience. Because we also have to handle high temperatures und use these in a manner that we can provide you with what you are entitled to receive from us: First-class ceramic components of the highest quality level. Thanks to the know-how of our specialists and our experience from

the past 125 years we have improved our production processes continuously in order to be able to offer to you the optimum of refractory ceramics production.

In the following we would like to describe our production flow in more details in order that you become more acquainted with us and our portfolio of services. Before the actual production of our high-quality products can commence, the necessary materials must be procured and stored.

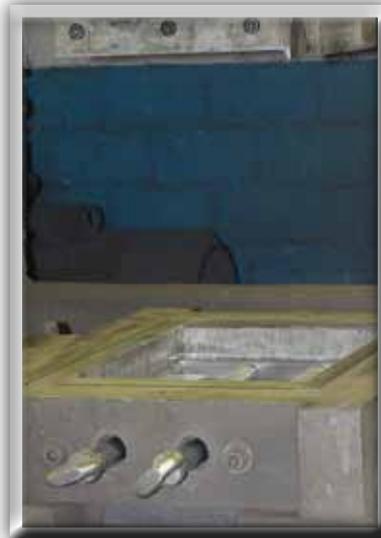
Raw material storage

The required raw materials are always delivered as packaged goods. In order to be able to prepare the mixes we are keeping in stock about 300 different raw materials amounting to around 650 tonnes.

Preparation

The actual process starts in the preparation department with a formulation. Based on this formulation all charged components are weighed and delivered into the mixing process. Ten mixers ensure extreme flexibility and cleanly segregated preparation of the different mixes. Thus, any contamination of production mixes is prevented. To the mainly powdery components water and other additives are added. After mixing a first quality check is carried out. The finished production mix is filled into transportation boxes and is then available for the forming process.

Forming



Different material grades corresponding to the widely differing formats and requirements of our customers are calling for different forming processes. At the Rommerode site three different forming processes are used. Ramming, pressing and pouring. With regard to pressing, we differentiate between hydraulic pressing and vibration pressing. For ramming we are using the manual ramming process.

Hydraulic pressing

All products of which large numbers are ordered as standard products by our customers are produced on hydraulic presses. By means of seven hydraulic presses the most differing pressures can be applied. With 1450 tools 1800 products can be produced. Due to high precision based on modern technology, this process is particularly reliable.

Vibration pressing

Six vibration presses ensure the productivity and flexibility of this forming method. The more demanding geometries are produced by this method. In this sector 150 tools allow production of 200 formats.

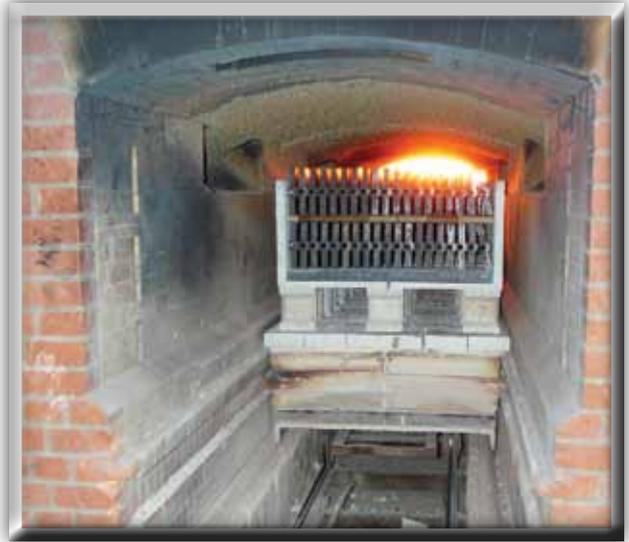
Manual ramming

10,000 basic shapes and 16,000 formats – these two figures alone indicate how incredibly large this production range is. Complex shapes and/or low quantities ask for production by manual ramming. The possibilities in this sector are truly inexhaustible.

Pouring

Particularly in case of rounded, spherical or cylindrical work pieces pouring is the opportune process. Independently of the forming process all products are subsequently passing through the drying process.

Drying and Firing

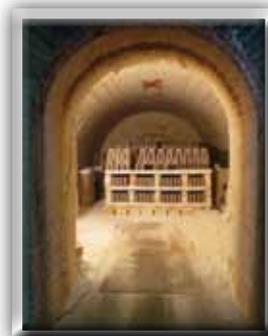


Drying

A ceramic mix is made mouldable by the addition of water. This means: Water is added to the mixes in preparation for making forming possible. Before the parts are fired for final ceramic hardening they are subjected to drying. For this, computer-controlled drying systems are available. Freely programmable drying cycles based on temperature and moisture warrant excellent results.

Firing

The firing technique is as individual as the product. There are nine firing units available. Five different firing procedures are possible. Depending on the material and the geometry, and also the requirements of our customers, it is possible to apply temperatures up to 1800°C. The range of the units covers “traditional” to “state of the art”. Unique products for special demands call for firing processes which may appear conservative but are unsurpassed regarding the results.



Finishing and Logistics



Finishing

Depending on the requirements profile the fired products have to be drilled, ground or cut. Trained operators are working on the product in a manner that it fits even the most extraordinary application.

Quality management

One of the decisive process steps takes place at the end of the production process flow – the quality check. In line with our philosophy only first-class products are leaving our production site. Prior to delivering the product to actual use, we are checking all quality-relevant parameters. Our team of quality inspectors and lab specialists guarantees performance and reliability of our products.



Logistics

Our maxim “Service” is realised at the interface to our customers. High-grade components for demanding applications deserve adequate packaging and responsible handling in preparation for transport.

Silicon carbide materials SICA

Silicon carbide is a synthetic raw material which is produced according to the Acheson process. In this process sand (SiO_2) and carbon are mixed and made to react by application of high electrical and thermal energy. In oxygen-free atmosphere SiC can be used at temperatures up to above 2300°C . The SiC material used for the refractories industry has a purity of 96% to 99%. SiC can be bonded single-ceramic or high-valent with nitride phases.

The proportion in the respective charge varies according to grade between 70% and 95%.

SiC is characterised by the following properties:

- High corrosion resistance
- High abrasion resistance
- Good thermal conductivity
- Low specific heat
- High strength at high temperatures
- High hardness (Mohs 9.6 / Vickers 2600)

Application examples:

- Lining plates for waste incineration plants
- Kiln furniture plates, burner nozzles
- Lining of plants for abrasive mass flows
- Muffles
- Rail bricks

Fire clay materials HASSIA

Fire clay bricks are characterised by easy application for various requirements. The dominating factor for the respective fire clay grade is the Al_2O_3 content. Particular attention regarding the fire clay quality is paid to a low content of Fe_2O_3 , which improves significantly the service life in cer-

tain applications in the steel industry. In the lower temperature range fire clay grades are often a cost-efficient alternative. The maximum continuous service temperature should not exceed 1450°C .

Application examples:

- Backup brickwork of high-grade materials in furnaces
- Standard furnace/kiln lining brickwork
- Standard linings for the chemical industry
- Internals of tiled stoves
- Pizza stoves
- Heat storage bricks for night storage heaters
- Brick lining of molten iron ladles
- After-burning chambers
- Generator bricks
- Furnace bricks for reducing atmospheres (low-iron grade)

Corundum materials DINIX

Corundum materials are characterised, depending on Al_2O_3 content, by very high service temperatures. The main constituent of the corundum materials is aluminium oxide, which allows, depending on content, service temperatures of up to nearly 1900°C . Base materials for this are white fused alumina (produced by melting in the arc furnace) and tabular alumina (produced by sintering in the shaft furnace). The mechanical strength is good to very good. In the refractories industry sector corundum materials are generally used in continuous high-temperature service applications.

By adding certain raw material components it is possible to optimise the thermo-physical properties with regard to special requirements.

Application examples:

- Reactor industry
- Inner lining for soot reactor
- High-temperature firing kiln
- Chemical industry
- glass industry

Mullite materials MULLIDUR

Mullite materials as raw material are either fused mullite ($2\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$) or sintered mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$). The thermal shock resistance of mullite is excellent, making it the optimum choice for high-temperature discontinuous furnaces. By controlled mixing with other raw material constituents the mullite materials, as well as the corundum materials, can be adapted to special customer requirements. Depending on the grade, the service temperature is up to 1800°C .

Application examples:

- Kiln furniture
- Heat treatment furnace (with ZrO_2 addition)
- Soot reactor
- Chemical industry
- Burner lining
- Tunnel kiln car cover
- General industrial furnace/kiln construction

Sillimanite materials SILIDUR

Sillimanite materials, as a raw material, are based on andalusite. Andalusite is a naturally occurring mineral. By thermal treat-

ment (firing) the raw material is converted to mullite. In the refractories industry the sillimanite materials are used when thermal shock resistance is required.

Application examples:

- Kiln furniture
- Soot reactor
- Burner lining
- Tunnel kiln car cover
- General industrial furnace/kiln construction
- burner brick, cover brick, recuperator
- glass industry

Zirconia Mullite / zircon sand DYKODUR / ZIRKODUR

Zircon-containing materials are characterised by high chemical resistance against glass melts and acid melts. The thermal shock resistance can be significantly increased by mixing zircon and mullite. In the refractories industry this material is used either as zirconia mullite (raw material produced in the arc furnace) or as zircon sand (occurring naturally). The service temperature in continuous operation should, depending on grade, not exceed 1700°C .

Application examples:

- Glass industry
- feeder channel, feeder cover
- Glass tank bottom
- feeder expendables: spouts, stirrers, plungers, tubes, orifice rings

Lightweight refractory materials SUPO

Lightweight refractory materials are insulating bricks which can be produced according to the requirements profile by the targeted selection of the most different raw material constituents.

For less demanding applications organic opening materials are added as a raw material. The residual ash content of these should be as low as possible. For more demanding applications synthetic materials (hollow sphere corundum) are used. In the refractorys industry these materials are used for primary (front area) or for secondary (back-up) insulation. Based on the insulation effect of the material its range of application is extremely wide, but should always be adapted to the respective requirements profile. Nearly every requirement profile can be satisfied by making the appropriate additions. The service temperatures can reach up to 1800°C.

Application examples:

- All types of thermal insulations
- Furnace/kiln linings

Cordierite CORDIERIT

Cordierite materials are produced by thermal treatment of defined raw materials for controlled Cordierite formation during the firing process. Cordierite is characterised by very good mechanical strength. But its particular property is its optimum thermal shock resistance due to very low thermal expansion (expansion of the material with increasing temperature). With a specific weight of approximately 2g/cm³ cordierite materials have a very low density which makes them, combined with the above mentioned properties, an ideal material for kiln furniture (low mass = low thermal input during heating-up = low energy consumption). The maximum service temperature for Cordierite materials is limited to 1280°C.

Application examples:

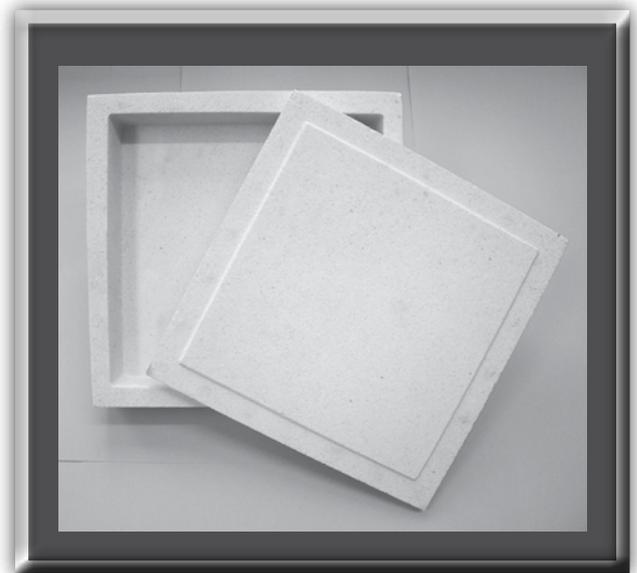
- Kiln furniture
- Kiln car systems
- Electro-ceramics (radiators)
- Kiln car structures with supports and plates
- Fast firing kiln

Fused silica materials VITRODUR

Fused silica materials with very high SiO₂ content are characterised by very low thermal expansion (approx. 0.06% in the range up to 1000°C). This allows extremely fast heating-up and cooling-down rates in thermal furnaces/kilns without weakening the material by crack formation. The maximum service temperature should be limited to 1160°C because above that new formation of mineral phases can have a negative effect.

Application examples:

- Doghouse curtain bricks
- Kiln furniture
- Hot repairs
- glass industry



Below, we are presenting to you some of our first-class products, being produced by different production processes:



Retainer shell
(DINIX H 60E)
[Kiln component for installation of a heating element]



Charging frames incl. foot for hardening furnace



BHM perforated plates/
grooved plates
(Cordierite)



Kiln furniture: Tooth supports/plates
(Cordierite)
roller passing brick
SUPO 35/8



Front: Door elements –
glass kiln (VITRODUR)
background: Suspended roof
(carrier brick/roof brick)

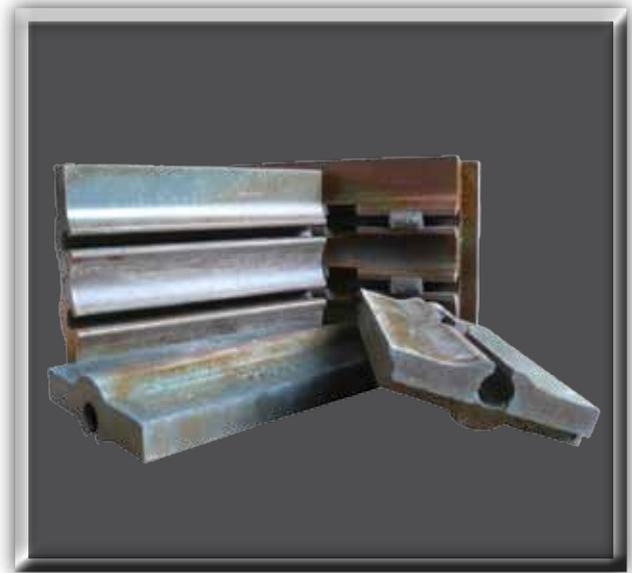
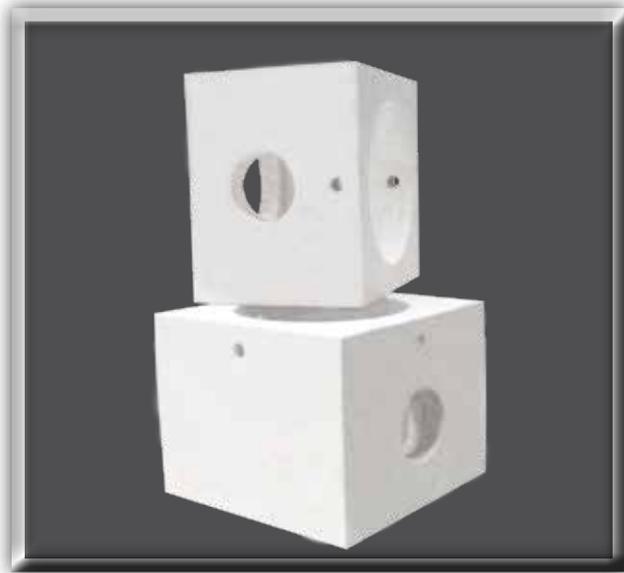


Flame tube brick/
silo chamber brick for
gas turbine



Spout
for the glass industry
(Dykodur30BC)

Our Products



Burner brick
(DINIX 99AC)



Muffel
out of silicon carbide



Plunger
(Dykodur 30BC)



Tube wall cladding plate
3-tube plate



heating-element
support brick
(Hassia 44)



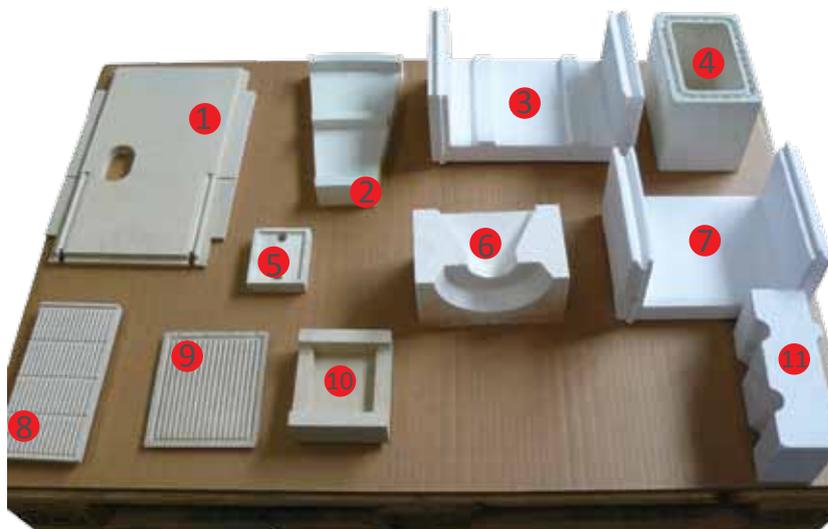
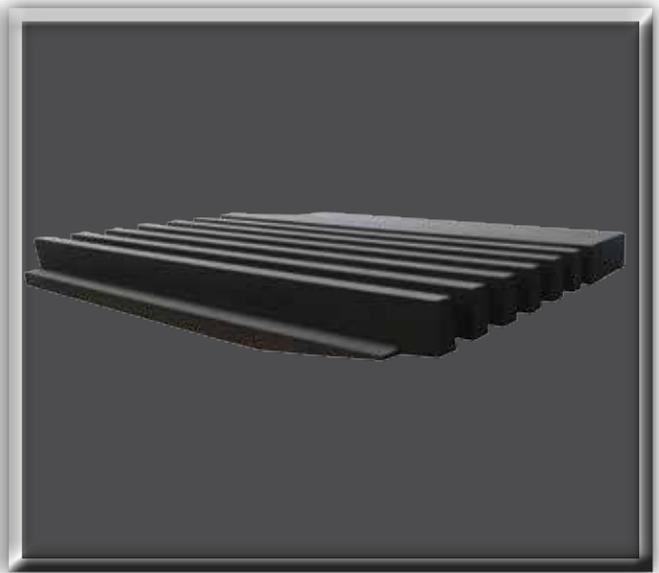
Rail brick/hardening
furnace
(SICA 95 AN)



teeth support
(Cordierit M10G)



Firing muffle frame
(DINIX H 60E)
grate bottom plate
(SICA 95 AN)



Section through nozzle for flue gas cleaning

- 1: Oven plate
- 2: Bottom plate segment
- 3: Muffle semi-shell
- 4: Muffle frame
- 5: Kiln furniture
- 6: Burner brick half
- 7: Muffle semi-shell pusher-type furnaces/kilns
- 8: Kiln furniture Cordierite
- 9: Kiln furniture Cordierite
- 10: Kiln furniture
- 11: Tongue and groove brick, furnace/kiln construction



All our operational and commercial activities concentrate on the effort to ensure that the quality of our products and services meets the demands of our internal and external customers. Prevention of customer complaints and the continuous improvement of our quality management systems and quality performance determine our actions. With regard to the continuous improvement of our performance we rely also on our customers, employees and suppliers. We are pleased to receive quality-related suggestions and to integrate these into our operations. Therefore, we welcome any positive criticism which will contribute to the improvement of products and production processes.

The quality of our products is subjected to continuous internal and external checks. The production units are certified according to DIN ISO 9001 and are steadily improving. Defined testing schedules for the many different tests ensure consistent quality of the products. In the in-house

laboratory at Rommerode the research and development team is using the state-of-the-art testing equipment for ensuring development and quality assurance of our products.

We guarantee to our customers a first-class product. If, however, we should receive a complaint, we will carefully examine the defect in order to prevent it in the future. Each single member of our team is responsible for the quality of the products and services delivered within his scope of responsibility. This ensures that you can always expect to receive a first-class product from us.



We are convinced that good protection of the environment is the basis of any good enterprise. We are paying attention to protecting the environment and to act in a sustainable manner. We feel obliged in particular to reduce waste in procurement and in production and to minimize the consumption of energy, water and other resources. Beyond that we endeavour to minimise the emission of substances which are harmful to the environment. In this context we are operating our own water treatment plant at our Rommerode works. In this plant the water from our production processes is first cleaned and harmful substances are removed prior to release into the sewage system. We will also in future increase our efforts of sustainable production and to integrate environmental protection into all our products and processes.

Health & Safety

Health & Safety are the basis for a good environmental policy. Therefore, it is natural for us to pay attention to the health and the safety of our colleagues and employees. In all our operational and commercial activities we make sure that health and safety of all concerned, employees, visitors, customers and contractors are protected. Our endeavor is to work continuously and proactively on the improvement of health protection and safety. Should, however, an incident happen, this will thoroughly be investigated in order to gain knowledge and to pass this on for preventing repetition. Of course, compliance with basic and irrefutable standards is for us undisputable. Employees and workers from other companies are trained regarding our health and safety standards in order to avoid accidents also in future and to prevent personal damage.



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