

# Processing instructions V 200

## REFRAJET<sup>®</sup> and REFRAMIX: basic gunning mixes

**Note:** Please read the product information sheet first, to ensure that these are the right processing instructions for your product. This document describes the application procedure for dense, basic **REFRAJET<sup>®</sup>** and **REFRAMIX** gunning mixes.

For refractory plant repairs in foundries and steelworks, this range of basic gunning mixes can be applied hot or cold. In cold conditions, these compounds can also be rammed, using slightly less water.

The instructions contained in this document must be complied with during processing and installation of the respective refractory concrete. Modification of or deviations from the processing instructions can lead to major problems during installation, and possibly to total failure of the installed refractory material. These instructions provide general guidelines for storage, processing, and installation of the specific refractory material. If, due to specific site conditions, it appears necessary to deviate from the procedures described here, please consult Refratechnik Steel GmbH before starting work.

### Storage

- In general: Store under cool, dry, and frost-free conditions.
- The shelf life stated in the product information sheet is valid from the production date, and only if storage is in accordance with our recommendations. The production date is stated on the packaging label.
- Under certain circumstances, material that has been properly stored may still be usable even after expiry of the stated shelf life. In such a case, conduct a setting test with a sample before using the material. In case of doubt, the expired material can be checked by Refratechnik Steel GmbH.
- Incorrect storage can greatly reduce shelf life, and can impair product quality.
- The original pallet wrapping foil should be left intact for as long as possible to protect the product. However, the foil is not a substitute for storage under cover.

- Also standing water, e.g. due to inadequate drainage of the storage area, can damage the material.
- Stacking of the goods supplied by us (in sacks, Big Bags, etc.) is done under the sole responsibility of the shipping company or customer. Refratechnik Steel GmbH accepts no liability for possible consequential damage (damaged packaging, personal injury, etc.).

### Health and safety

- Always wear suitable safety goggles, dust mask, protective clothing, and working gloves.
- Always wash thoroughly after working with the material.
- Observe the information in the safety data sheet.

### General information

- This product is a chemically setting refractory concrete for gunning applications. Delivered dry in 25 kg sacks or in

Big Bags, suitable equipment on site is used to convey the dry material through a hose to the gunning nozzle. In the gunning nozzle, the dry material is mixed with water before it is ejected from the nozzle at high pressure. Curing occurs at room temperature.

- Only use clean drinking water, as otherwise the setting behaviour may be affected.
- Low temperatures can retard or even stop the setting process. Therefore, the temperature of material and mixing water must be at least 5 °C. In some cases, it might be necessary to heat the installation area.
- On the other hand, the setting process may be significantly accelerated at temperatures above 25 °C.
- Please take the expansion of the refractory material for your specific furnace application into account. The reversible and irreversible expansion values and the respective material properties are given in the product information sheet.

Depending on the furnace operating conditions and the specific characteristics of the refractory material, any arising stresses and pressures must be compensated by suitably designed expansion joints.

- During installation of the monolithic refractory material, please ensure correct anchoring to the existing furnace structure and/or to the existing or adjacent refractory material (e.g. with steel anchors, ceramic anchoring systems, etc.).
- Suitable measures must be taken to ensure that the water or water vapour generated during the drying & heat-up process is removed from the refractory lining without pressure build-up.
- With certain kiln structures and refractory linings, the drying process can cause the generated water or water vapour to diffuse outwards in the direction of the furnace shell instead of inwards to the hot side (kiln chamber). Therefore, suitable measures must be taken to ensure that the water or water vapour can escape to atmosphere. For this purpose, 10-mm holes drilled into the kiln's outer steel shell (at least 5 per m<sup>2</sup>) have proved to be successful.
- Regarding the build-up of water vapour pressure, attention must be given to the entire wall structure of the lining (wear lining/permanent lining/insulation). In the area behind the wear lining, it must also be ensured that only such materials are used, which provide an adequate (highest possible) permeability to the steel shell.
- If the permanent lining/insulating layers are used several times and only the wear lining is replaced, they can become clogged in the course of time due to moisture transport with dust contaminations, salts, etc., thereby also impeding moisture transport. Consequently, multiple use of such layers must be seen as counterproductive in terms of dewatering performance. It might even be safer also to replace the permanent lining, in

order to ensure perfect flowthrough to the cold side.

- To ensure a continuous drying process, the complete kiln chamber must always be flushed with an adequate amount of fresh air during the entire drying and heat-up procedure. The air circulating in the kiln chamber may never be saturated with moisture.

#### Processing

- Low temperatures can retard or even stop the setting process. This can result in a risk of the material slipping. Therefore, the temperature of material and mixing water must be at least 5 °C. In some cases, it might be necessary to heat the installation area.
- Processing is done with suitable gunning equipment operating either with the rotor principle or a two-chamber system. Common to both processes is that they use compressed air to convey the dry mixture through hoses into a jet mixer chamber. The amount of water required for the setting process is applied to the dry material as a fine spray via a separate hose connected to the mixer nozzle. Depending on the gunning requirement, the precise amount of water is set manually by the gun operator via a control valve on the nozzle.
- The gunning unit requires a constant supply of water and air at a sufficient pressure. For this reason, separate air compressors and water pumps should be used.
- For correct operation, the gunning unit requires an air pressure of at least 7.5 bar and an air quantity of 7,5 m<sup>3</sup>/min.
- The water pressure must be constant, and higher than the material pressure at the spray nozzle. Experience has shown that for short distances at ground level, a water pressure of 6 bar is sufficient, but if greater height differences must be overcome, pressures of 20...60 bar might be necessary.
- In order to avoid pressure drops, the gunning unit should be positioned as close as possible to the place of installation. However, to ensure as even a flow of dry mixing material as possible, the overall length of the delivery hose should not be less than 20 m, particularly for rotor gunning units.
- The design of the nozzle mixing chamber is decisive for obtaining a homogeneous and complete wetting of the dry material in the nozzle. We recommend an 18-hole water ring with hole diameters of 1.2 mm, and a spray angle of 45° in the gunning direction. For the most precise and sensitive control of water injection possible, we recommend using a needle valve.
- The mixing section (distance between the water ring and the nozzle outlet) should have a length of 60 cm to ensure the greatest possible internal mixing.
- If possible, the diameter of the mixing section should taper down from 32 mm at the water ring to 24 mm at the nozzle outlet.
- For optimum material compaction, combined with the least possible water content, and taking the spray characteristics (rebound, formation of dust etc.) into account, the gunning pressure should be as high as possible.
- The distance between nozzle outlet and the surface being gunned should not be greater than 1 m. Perform circular movements with the nozzle, keeping it perpendicular to the surface being gunned. This procedure minimizes rebound and achieves a uniform material structure.
- While gunning, no moisture may be drawn out of the refractory material by adjacent dry and absorbent surfaces. Therefore, any existing refractory lining should be pre-wetted. Any moisture-sensitive materials should be covered with foil.

- Before gunning, the surface only needs to be roughly cleaned. The bonding system used is very well matched to all kinds of refractory linings. The material even bonds to surfaces that are contaminated with slag. A hot surface improves the gunning material's bonding ability.
- Very hot surfaces (>1400 °C) can have a negative effect on the gunning material's bonding ability. Therefore, the first gunning layer should be applied to the refractory lining with a bit more water, in order to cool the wall surfaces.
- Only walls and ceilings may be gunned. If floors are gunned, the material compaction will suffer, because rebound material will inevitably be mixed in. If possible, rotate/position a floor section into an upright position.
- On no account may rebound material be reused.
- Prevent layering.
- In general, bays are gunned individually, whereby they are divided by means of partitioning formwork so that the bays are lined one by one. The surface of a bay can be touched up immediately after it has been gunned (caution: Do not seal the surface by trowelling it).
- Depending on layer thickness and heating-up time, it may be advisable to provide evaporation holes. Immediately after gunning, prick or drill evaporation holes into the lining (diameter 4 mm, spacing 120 mm, but not in areas subjected to the liquid phase.).

#### Setting and curing

- Due to the bonding systems used, curing is very fast and permits the plant to be recommissioned immediately.

#### Drying and heating up

- If the gunning mix is applied to a hot surface, no special drying or heating up phase is required.
- If the material is applied to a cold surface, e.g. at room temperature, a drying and heating up phase of at least 30 minutes up to a temperature of 1000 °C should be observed.

#### Basic REFRAJET® and REFRAMIX products:

Amongst others, these processing instructions are valid for the following basic REFRAJET® and REFRAMIX products:

REFRAJET CBP M 80  
REFRAJET CS M 85  
REFRAJET D M 85  
REFRAJET S M 60  
REFRAJET S M 65  
REFRAJET S M 80  
REFRAJET FMS S M 70  
REFRAJET FMS S M 83  
REFRAMIX S M-93