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REFRATECHNIK

Processing instructions V 6.1
REFRARAM® AB

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 ceramically bonding **REFRARAM® AB** ramming mixes. It does not apply for **REFRARAM®** or **REFRARAM® CB** products.

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.
- Storage at temperatures above 25 °C can result in the earth-moist granulate drying out. Also frost during storage will impair the product's homogeneity.
- 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 an earth-moist ramming granulate. Delivered dry in 25 kg sacks or in Big Bags, it is ready for processing on site. Bonding is purely ceramic, and occurs at temperatures of at least 1000 °C. The product contains a pre-bonding additive (**AB** = air bond)) for a certain degree of setting at room temperature.
- In cold weather, the ramming granulate must be stored at higher ambient temperatures (at least 5 °C) before processing. **REFRARAM® AB** may only be installed at temperatures above 5 °C, and must be protected from frost before, during, and after application (heat the installation site if necessary).
- 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 m²) 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.

- During heat-up, it essential that flames do not impinge on the refractory lining only in small areas. Local overheating can result is severe damage of the refractory material. Therefore, it must be ensured that the entire lining surface is heated uniformly and without significant temperature differences.

Processing

- If using formwork, make sure it is sufficiently stable, and that its surfaces are smooth. Unstable formwork has a tendency to bulge under the ramming pressure. Use formwork release oil.

- Depending on installation conditions, compaction is achieved by means of a suitable pneumatic ramming hammer or a motorized vibratory rammer. In some cases, a heavy hammer (mallet) may be used.

- During ramming, the desired lining thickness is obtained by individual rammed layers. Only in this way can the necessary compaction be achieved.

- Depending on the ramming tool used, the following layer heights are recommended: about 60 mm with a pneumatic ramming hammer, and up to 200 mm with a heavy vibratory rammer. Depending on the material, a compaction ratio of approx. 1,6 : 1 can be assumed.

- Continue ramming until no further compaction is observed.

- Apart from achieving optimum material compaction, the bond between the individual rammed layers is critical for the quality of the overall lining. Therefore, the previously rammed layer must always be intensively roughened before applying the next layer. This can be done by scratching, by ramming with splined ramming feet, or with vibratory rammers fitted with spikes on the ramming plate.

- During work interruptions, the most recently rammed layer must be covered with film to prevent it drying out.

- **REFRARAM® AB** can be processed as long as it can be kneaded easily by hand. Do not use material that has a crusty surface. It can be made reusable by adding water and mixing.

- Remove residual material from the tools at regular intervals by washing thoroughly with water, and then dry them well.

- Depending on layer thickness and heating-up time, it may be advisable to drill or punch evaporation holes through the entire layer (not in areas subjected to the liquid phase)

Drying and heating up

- **REFRARAM® AB** linings can (but must not) be dried and heated as soon as possible after installation.

- The additive "AB" (air bond) ensures a certain degree of setting even at room temperature. Therefore, **REFRARAM® AB** linings can remain in the unfired, frost-free condition for a longer period after installation.

- However, **REFRARAM® AB** products only achieve their ultimate strength after ceramic bonding (sintering) at temperatures above 1000 °C.

- To ensure homogeneous solidification of the material, a temperature of at least 400 °C should be reached during the first heat-up, and must be maintained for at least 10 hours.

- Suitable equipment must be provided for drying. Do not use steam (boiler steam) for this purpose.

- Direct contact of newly lined surfaces with open flames should be avoided,
- The supporting formwork of suspended linings must also be heated up.
- Please check the product information sheet to ensure that you have the right heat-up instructions for your product.
- The heat-up instructions must always be followed precisely. Hereby, it must be ensured that the respective heating curve is followed, monitored, and recorded by means of several correctly-positioned thermocouples. Moreover, a homogeneous temperature distribution must be ensured throughout the refractory lining.