

# **WATERPROOFING REPORT**

1 | 2008

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***Waterproofing  
building structures  
with crystallizing  
sealing slurries***

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***Olympic National  
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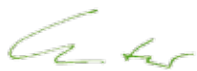
Mineral sealing slurries belong to the most proven and tested waterproofing materials group for building structures. Already in Roman times, they were used e. g. in the construction of aqueducts and they are still partially intact today. Due to the application of scientific knowledge from the fields of chemistry and physics, the effectiveness of mineral sealing slurries was significantly improved during recent years. They have prevailed as the only method for negative side waterproofing.



KÖSTER BAUCHEMIE AG has specialized for more than 25 years on effective waterproofing products and systems. In the course of this time, we have also continued the development of mineral sealing slurries. A main topic in this edition is **KÖSTER NB 1 Grey** with a double waterproofing effect as an example of modern crystallizing sealing slurries. Small cracks – as frequently occur on building structures – are closed via the crystallizing reaction of **KÖSTER NB 1 Grey** which can be reactivated over the lifetime of the coating.

Other topics covered in this issue are the introduction of **KÖSTER PSM** (a heavy duty acid resistant corrosion protection for concrete), a project report from the site of one of our system partners with the “The Waterproofer” network, as well as a short look at an Olympic project reference.

With best regards,



Dr. Dieter Köster  
Managing Director

## **KÖSTER NB 1 Grey**

# **Double effective: mineral waterproofing with crystallizing sealing slurries**



*Mineral sealing slurries are usually used as a positive side waterproofing material but they have also proven to be the only effective method of negative side waterproofing, even against high water pressure. KÖSTER has developed such a product many years ago. It has been used very successfully e.g. for basement waterproofing, concrete protection systems and in the construction of drinking water tanks: KÖSTER NB 1 Grey with its crystallizing active agents.*

### **Double sealing “active” waterproofing**

Applied as a closed layer, **KÖSTER NB 1 Grey** is absolutely waterproof to pressurized water. This has been documented by numerous test certificates. Due to its penetration into the structural member, the slurry develops an intense bond to the substrate and the capillaries are plugged.

“Active” waterproofing means that besides the hydraulic curing of the sealing slurry, crystallizing reactions can be activated by the slurry over its entire lifetime.

This is important insofar as all building structures move slightly

## ofing of building structures

with changes in temperature and humidity. If small cracks develop in the building structure after a few months, then leakages can occur. These leakages can normally only be remedied by over coating the area again. Not so when waterproofing with KÖSTER NB 1 Grey – one of its stand out characteristics prevents that: the so called active crystallization.

### **Active crystallization has many advantages**

While some deeply penetrating sealing materials have the disadvantage of including water soluble silicates as active ingredients and may even contain corrosive ingredients to achieve deep penetration, KÖSTER has developed a system with a different chemistry: Non water soluble activators and no ingredients that are corrosive to steel reinforcements. Another difference to water soluble

systems is that over painting is possible because no water soluble silicates can move to the surface.

The main advantages are:

- self healing properties during the life time
- penetrating crystallization leads to inseparable waterproofing
- non corrosive
- substrate does not have to be kept moist during the curing time

In KÖSTER NB 1 Grey, the active ingredients are contained already in the form of crystals. Together with the cement, the process of active crystallization starts – effected by the penetration of certain ingredients into the substrate to be waterproofed. These ingredients react to form crystalline (water insoluble) solid bodies and thus plug the pores.

As well as structural members made of concrete, KÖSTER NB 1 Grey



**Typical fields of application for KÖSTER NB 1 Grey in basement and tank waterproofing**

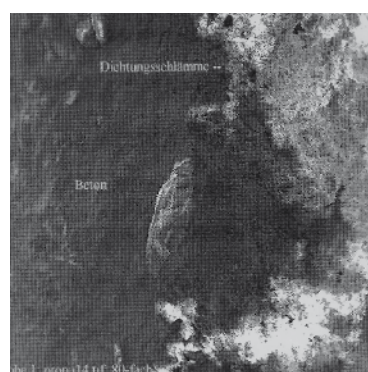
is suitable for application to brick, shotcrete and porous concrete. These substrates can not be waterproofed by systems with water soluble active ingredients. Where flexibility is needed, KÖSTER SB Bonding Emulsion “Concentrate” is added to the mixing water of KÖSTER NB 1. This makes a powerful system for many conditions.



### **Salt crystallization in the substrate**

Conventional coatings can be pushed off the substrate due to salt crystallization from the substrate which then leads to leakages in the waterproofing of the building. This destructive effect can be reduced or totally stopped by using systems which possess the above mentioned active crystallization and which are additionally hardened if required. Under such conditions KÖSTER Polysil TG 500 is the ideal primer for KÖSTER NB 1, it is a hardener and salt stopper in one product.

→ continued on the next page



**The pictures taken under the scanning electron microscope show a piece of concrete coated with KÖSTER NB 1 Grey. On both pictures, white areas are visible. These are latent hydraulic ingredients in the slurry that have penetrated into the pore structure of the substrate. These have reacted to form a tight, pore plugging solid body, visible especially in the lower area of the picture on the right hand side.**

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Coatings containing latent hydraulic compounds plug the

pores of the substrate. This way, the moisture and salt transport to the boundary surface

between coating and substrate is prevented. Additionally, the evaporation of water contained in the building material is inhibited. Both mechanisms prevent the formation of salt crystals on the boundary surface.

### Technical data

Compressive strength (28 days)	> 20 N / mm <sup>2</sup>
Flexural tensile strength (28 days)	> 5 N / mm <sup>2</sup>
Adhesive tensile strength	> 1.5 N / mm <sup>2</sup>
Waterproof against pressurised water (positive and negative side)	up to 13 bar
Coefficient of water vapour diffusion, Resistance (μ)	60
Pot life	approx. 2 hours
Resistant to foot traffic	after approx. 2 days
Full cure	after approx. 2 weeks

### Conclusion

With the application of KÖSTER NB 1 Grey, a permanently present safety factor can be built in which protects the building from the intrusion of moisture.

## CE-certification

### Fit for Europe

Waterproofing products are subject to the European standardization process. The European standard DIN EN 1504 is part of a series of standards dealing with products and systems for the restoration and the protection of concrete structures. The standard defines products and systems for restoration, their application in maintenance and for protection as well as in the reconstruction and reinforcing of concrete structures. Requirements are formulated and the quality control and evaluation of the conformity are specified. The EN standards exclusively specify the performance of the product. This is new, compared to the currently existing standards and guidelines where the characteristics of the product itself are specified.

Products which prove their conformity with the standard receive the CE-sign. These

products can be installed in constructions throughout the EU. National regulations which stand in opposition to these standards have to be withdrawn. At the latest beginning on 1st of January 2009, all restoration products which fall under the standards have to carry the CE symbol.

### KÖSTER KB-Pur IN 5

Currently, KÖSTER has proved the conformity of the injection resin KÖSTER KB-Pur IN 5 and received the CE symbol.

KÖSTER KB-Pur IN 5 is an elastic 2-component PU injection resin which is solvent free, and has a low viscosity (approx. 70 mPa.s.). Because of this, it is especially suited for the closing, filling and waterproofing of very fine cracks. Additionally, it is used in pressurized injection of injection

hoses. Due to the curing time of approx. 4 hours, it is possible to carry out complex works, KÖSTER KB-Pur IN 5 can easily be used to carry out post-construction injection of cracks and injection hoses.

Permanent and elastic waterproofing of dry, moist and water-bearing cracks and joints can thus be carried out – according to the standard – with certainty!



**KÖSTER PSM**

# Protection of concrete against heavy attack by acids

*KÖSTER PSM is a special mineral mortar based on a polymer and silicate combination. It has been developed to protect mineral surfaces, such as concrete, from damages due to attack from acids and other high chemical stresses. The fully cured coating is highly resistant against acids and a multitude of chemicals; the product is also resistant to alkalis to a certain extent, which gives it a broad range of application areas.*

The polymerized silicate mortar consists of three components which have been adjusted to each other: the powder component (24 kg bag), the silicate component (5.5 kg canister) and the polymer component (1.25 kg can).

The fully cured mortar is characterized by very high



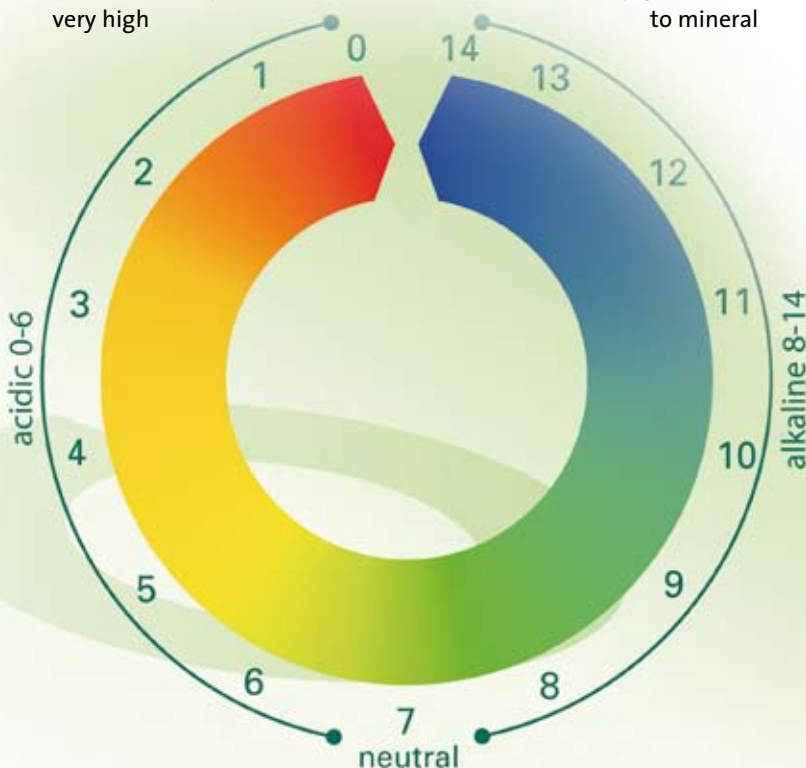
**Acidic liquid has corroded the concrete of a tank (left and above). The surface coating made of KÖSTER PSM offers lasting protection.**

compressive strength and abrasion resistance. The material is water-proof. It has, besides that, excellent application characteristics. After mixing, it is characterized by very good adhesion to mineral

substrates. KÖSTER PSM can be applied by hand with a trowel or with suited spraying equipment.

The pot life is approximately 30 minutes at 20 °C ambient temperature. Consumption is approx. 1.9 kg/m<sup>2</sup> per mm layer thickness. The layer thickness should be at least 3 mm. Depending on the substrate, consumption can be significantly higher.

- Fields of application are:
- Chemical and pharmaceutical industry
  - Steel and metal processing industry
  - Power plants
  - Paper industry
  - Constructions in sewage treatment
  - Agricultural repositories
  - Food industry





**“The Waterproofer” in action:**

## **Restoration of the foundation of a wind energy plant**

***In Germany there are about 50 specialised waterproofing and renovation companies, which are certified system partners of KÖSTER BAUCHEMIE AG. They work under the brand name “The Waterproofer”. In the Waterproofing Reports we present typical case studies – here the repair of a naturally weathered foundation of a wind energy plant in Dornum, Germany.***



In the case on hand, concrete foundations were built approximately 15 years ago on which a wind energy plant was installed. Due to the influences of the weather over the course of the years, the following damages were noticed:

- Formation of cracks due to movement
- Ingress of moisture into the structure
- Spalling of the concrete
- Corrosion of the reinforcement
- Flaking of the paint

Mainly, these damages have to be attributed to the fact that the surface of the old foundation was made without slope. Thus, rain water was able to penetrate into the structure.

The first step in the restoration of the foundation was pressure injecting the cracks with KÖSTER KB-Pur injection resins – through which an elastic closure of the cracks was realized. The total surface was strengthened through the application of the primer KÖSTER Polysil TG 500. After that, a waterproof sloped layer was installed using KÖSTER Repair Mortar. Finally, the moving joint between the foundation or respectively between the KÖSTER Repair Mortar and the steel tower of the wind energy plant was sealed elastically with KÖSTER Joint Sealant FS-V.

The applicator was “Umweltbüro Michael van Garrel” from Westerland, Germany, who has been a system partner of KÖSTER BAUCHEMIE AG’s “The Waterproofer” network for several years now.

## National Indoor Stadium, Beijing

# For the Olympic Games the Chinese chose high quality materials produced by KÖSTER



*When the Olympic National Indoor Stadium was built on the Olympic Green Area in the north of Beijing, the quality products of KÖSTER BAUCHEMIE AG from Aurich were chosen for waterproofing. Air channels, cisterns, sewage canals and tanks with a total area of more than 15.000 m<sup>2</sup> were waterproofed with the KÖSTER products NB 1 Grey, NB Elastic Grey, NB Elastic White, KB-Flex 200 Sealing Paste as well as SB Bonding Emulsion "Concentrate".*

"For the Chinese Government, the Olympic games were a prestigious project of the highest importance. During the design phase and in the choice of materials for the sport arenas, the highest quality was chosen. That is why it makes us proud that our products were chosen for waterproofing." said

Dr. Dieter Köster, managing director of KÖSTER BAUCHEMIE AG.

The National Indoor Stadium with a total floor space of 81.000 m<sup>2</sup> and 18.400 seats, was one of the most prominent of the arenas for the Olympic games 2008. In this arena which was designed by the architecture office Glöckner from Nürnberg, Germany, the contests in gymnastics, various ballgames and martial arts took place.

### *The KÖSTER daughter company in China*

KÖSTER BAUCHEMIE AG has been developing and producing products and systems for waterproofing and restoring building structures in Aurich for the past 26 years. Worldwide, KÖSTER is active in 47 countries and has holdings in altogether 12 countries.



**Dr. Dr. Yang (middle) with some of his staff on a site visit**

Foto: Glöckner<sup>3</sup>

In China, KÖSTER has been represented for 2 years now by a 100% owned daughter company. The CEO, Dr. Dr. Jianping Yang, who received doctorates in engineering and economics, lived in Germany for 18 years.

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If you would like to know more about the topics discussed in this issue, please copy this sheet and send it to us by fax or send us an e-mail to: [info@koster.eu](mailto:info@koster.eu).

Yes, I am interested in these topics:

- Waterproofing building structures with effectively crystallizing sealing slurries**
- CE-certified injection resin KÖSTER KB-Pur IN 5**
- Protection from heavy attack by acids**
  
- Please send me "The Green Pages of Construction Chemicals"**

**Other**

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## **What you always wanted to know about waterproofing...**

... you can, of course, also ask us. If you prefer to quickly and specifically find and read up on a certain topic, our three "standard works of waterproofing" will help you:

- our website at [www.koster.eu](http://www.koster.eu)



- the planning folder, with all of the master work-schedules and technical guidelines for tradesmen, architects and civil engineers
- "The Green Pages of Construction Chemicals" – our sales catalogue, which with its extensive information pages is a must for all applicators and anyone with an interest in waterproofing and restoration.



You can order the planning folder from us by writing to us to:

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