



## **MC-RIM PW**

**Long-term Surface Protection for Potable Water  
Containers through DySC® Technology**



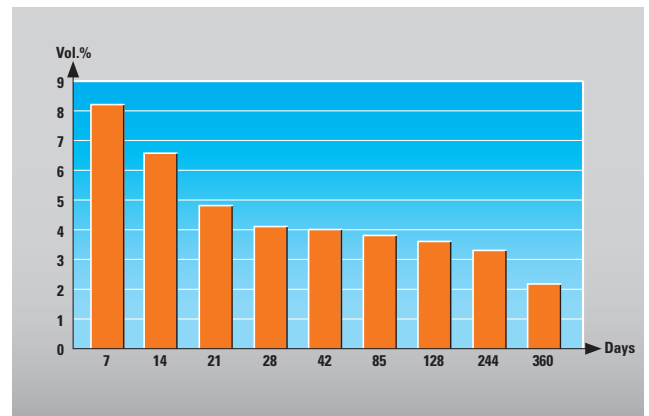
# MC-RIM PW

## Perfect Imperviousness through DySC® Technology

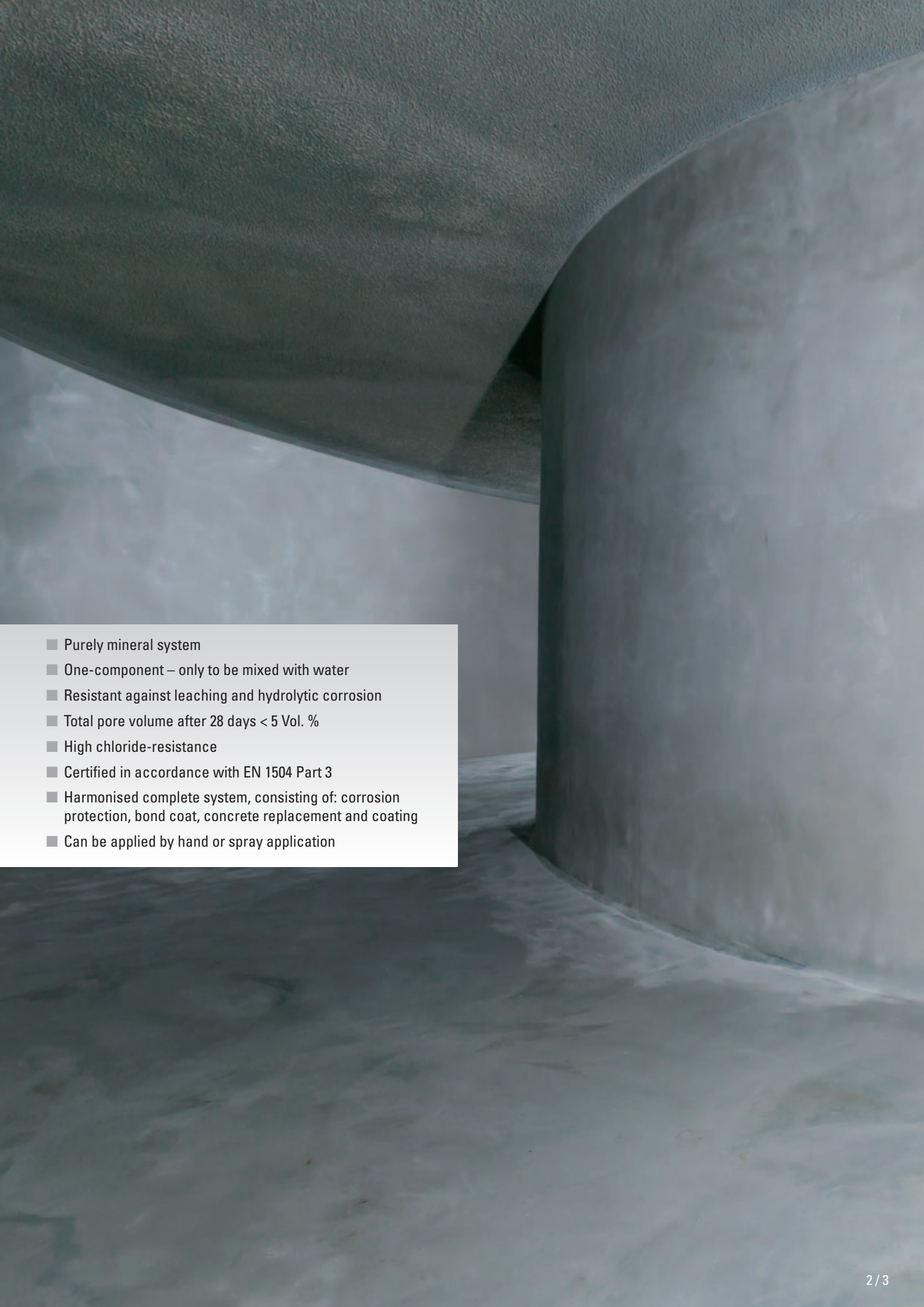
Potable water containers must be constructed and operated in a way that prevents the quality of the drinking water being impaired by any chemical/physical or micro-biological influences.

Principles which apply to repair measures just as well and which therefore determine the specifications demanded of the coating materials used. Cement-based building materials have proven their effectiveness in the potable water area over the past decades. These building materials' resistance against wear-and-tear degradation processes such as leaching and hydrolytic corrosion does, however, mainly depend on the internal structure and density of the cement stone.

The mineral coating system MC-RIM PW was specially developed to meet the high demands of potable water containers and offers a hitherto unequalled density and life expectancy – providing a maximum of security coupled with long-term protection.



The diagram shows the findings of a long-term test of porosity development in the example of MC-RIM PW 10: After 360 days the total pore volume lies significantly below 3 Vol. %. Results which are possible due to the process of Dynamic SynCristallisation (DySC® technology).

- 
- Purely mineral system
  - One-component – only to be mixed with water
  - Resistant against leaching and hydrolytic corrosion
  - Total pore volume after 28 days < 5 Vol. %
  - High chloride-resistance
  - Certified in accordance with EN 1504 Part 3
  - Harmonised complete system, consisting of: corrosion protection, bond coat, concrete replacement and coating
  - Can be applied by hand or spray application

# Risks Posed by Standard Systems

## Leaching and Hydrolytic Corrosion

Even if standard cement-based coatings at first glance seem to have a dense structure when cured, such building materials still have a measurable porosity. This “pore structure” is made up of gel pores, shrinkage pores, capillary pores, air voids and compaction pores with the majority of these forming in the cement stone matrix.

These cavities may be partially or completely interconnected. This renders them open to penetration from the outside. In terms of a structure’s diffusion capability this is often deemed advantageous. However, in certain application areas, such as in drinking water structures, this “porosity” is actually a grave disadvantage. The low density of the cement stone (high porosity) leads to leaching when in contact with water. In this scenario, one distinguishes between two basic damage mechanisms:

Leaching – changes in the coating due to changes in concentration and composition in the cement stone’s pore solution.

Hydrolytic corrosion – changes in the coating through a porosity-dependent ion transportation (diffusion) as a result of the concentration gradient between impacting water and pore water.

In terms of resistance against these two processes it is therefore vital to use a coating system that has the highest possible porosity in order to minimise transport processes.

### Coating structure in case of “soft” water

#### Leaching

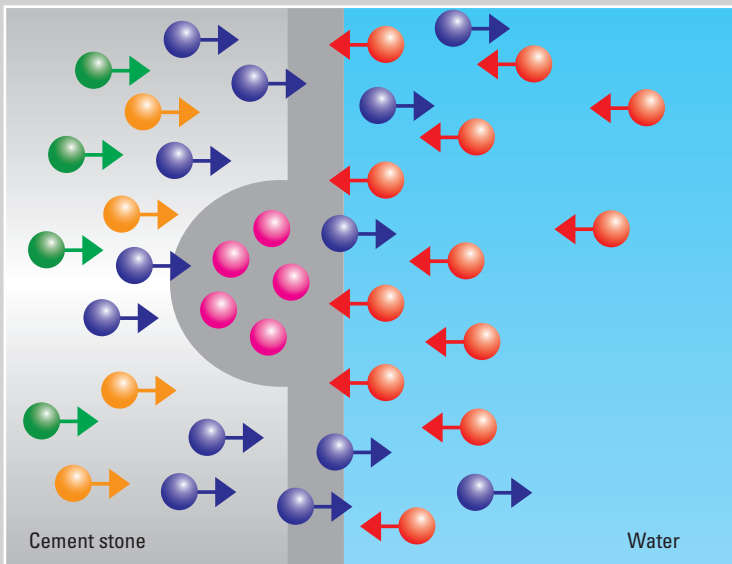
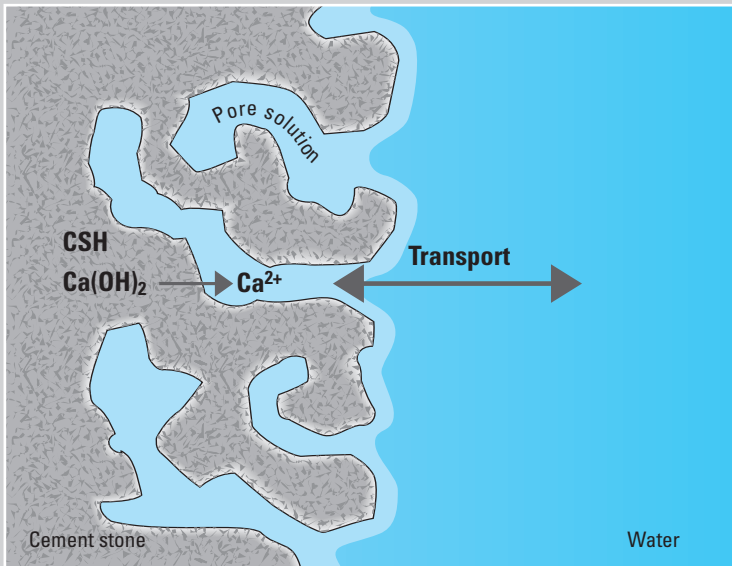
Cement-based materials are composite materials, cement stone acts as a binding agent. The latter consists of calcium silicate hydrate (CSH) and calcium hydroxide ( $\text{Ca(OH)}_2$ ), is porous and contains a highly alkaline pore solution.

When the cement stone comes into contact with drinking water, whose chemical composition differs from that of the pore solution, transport processes (transport of calcium ( $\text{Ca}^{2+}$ )) are initiated due to the concentration gradient. This upsets the balance between the solid phases of the cement stone and the pore solution. To restore balance the cement stone reacts with dissolution and crystallisation. When the cement stone’s entire calcium content has been lost through transport processes, its strength is destroyed. As a consequence the coating will soften.

### Coating structure in case of “hard” water

#### Hydrolytic corrosion

The damage mechanism is based on the local transportation of hydrogen carbonate ions ( $\text{HCO}_3^-$ ), which in hard water are found in higher concentrations towards the borders of the coating. There, the lime-carbonic-acid balance is upset, which results in the precipitation of calcium carbonate ( $\text{CaCO}_3$ ) under consumption of calcium hydroxide ( $\text{Ca(OH)}_2$ ). This initially leads to a complete transformation of the calcium hydroxide contained in the cement stone. Thereafter the strength-forming phases of the cement stone degrade, which in the final instance means loss of strength.



SEM image of damaged binder matrix

# Security through DySC® Technology

## Optimised Structure through Layered Silica

The DySC® technology concept starts at the point where standard cement-based coatings meet their performance limits!

In MC-RIM PW this revolutionary technology results in reducing porosity to a level that has never been reached before. At last it is possible to produce mineral coatings of extreme resistance, imperviousness and durability. A total novelty in the lining of potable water containers!

The strength of a cement-based material is formed as the clinker components of the cement are crystallised out, which leads to tiny crystallites forming on the interior surface that firmly interlink.

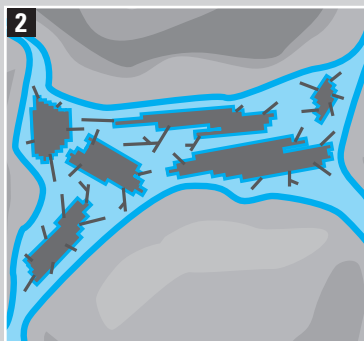
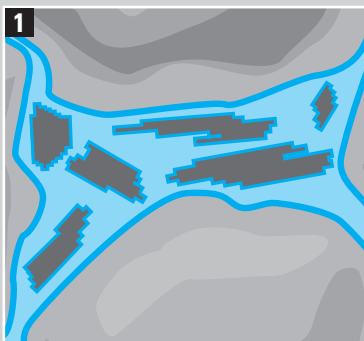
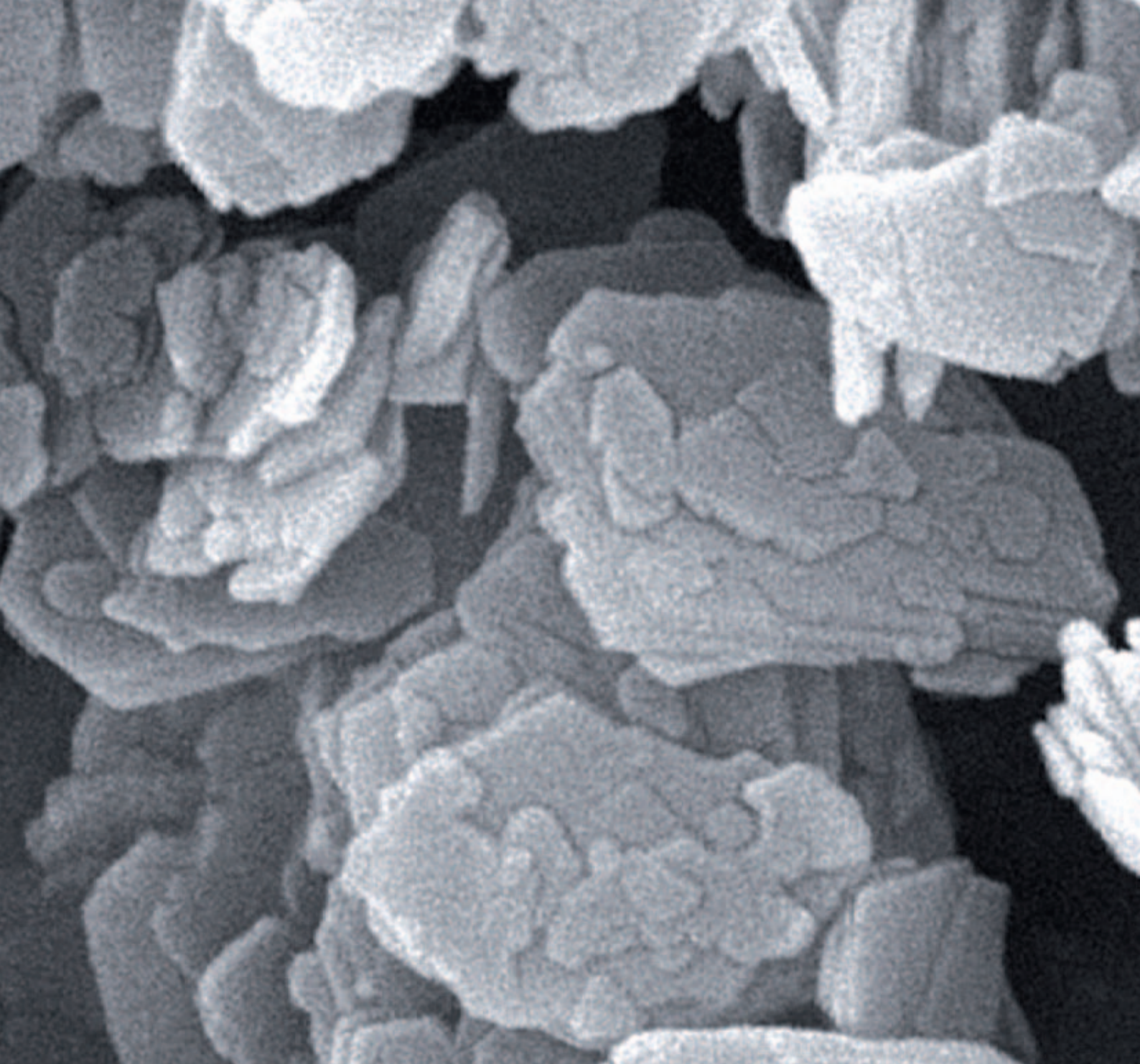
### **Layered silica – a vital component**

In DySC® technology a specially formulated layered silica serves to stimulate additional crystallisation in the remaining cavities. This leads to further mineralisation of the cavity structure. From the pore solution gels form in the alkaline area that further consolidate and seal the matrix.

These crypto-crystalline gels are in dynamic balance with the crystalline phases. As a result of the exposition recrystallisations and additional formation of new minerals occur. Over time the structure of the matrix is thus becoming more refined, overall porosity decreases and pore size distribution is optimised.

### **Long-term reaction mechanism of layered silica**

- 1** Deposition of layered silica between the cement particles in the free water section of the pore area
- 2** Formation of first crystals on the layered silica surface
- 3** Crystal growth with definite reduction of pore area



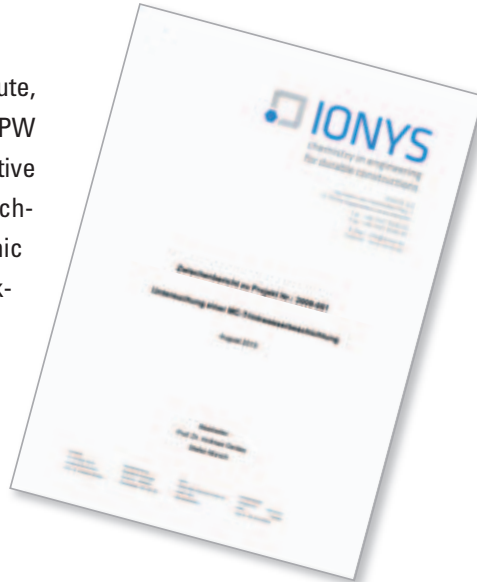
SEM image of  
the layered silica

# MC-RIM PW

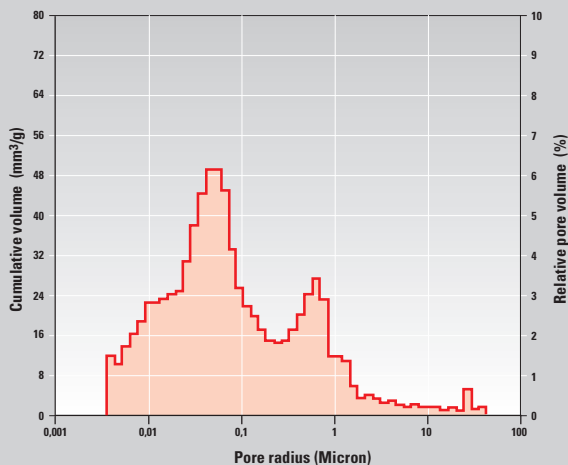
## Unique Density Confirmed

Extensive tests carried out by an external test institute, confirm the impressive resistance capacity of MC-RIM PW against leaching and hydrolytic corrosion. This positive behaviour can be attributed to the integrated DySC® technology. Using selected latent hydraulic and puzzolanic components a structure of the most dense sphere packing is formed.

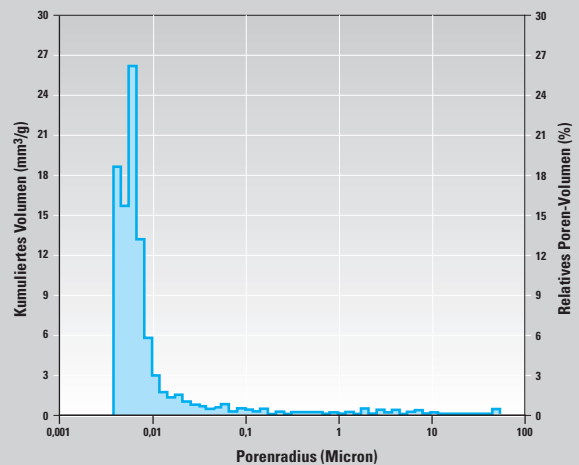
Porosity, cavity structure and capillary pores needed for leaching processes are thus reduced to insignificance. See for yourself and request a test report.




**Pore radii distribution of a standard coating**



**Pore radii distribution in MC-RIM PW with DySC® technology**



The porosity and pore size distribution in cement-bound construction materials is determined by means of mercury pressure porosimetry. Compression ( $> 0.1$  mm) and capillary pores ( $> 0.01$  mm) as well as contraction ( $< 0.01$  mm) and gel pores ( $< 0.0000$  mm) are recorded. While mass transfer is not possible with regard to contraction and gel pores, compression and capillary pores make cement-bound construction materials penetrable for harmful substances. The following applies: the larger the proportion of compression and capillary pores, the smaller the chemical and hydrolytic resistance of the system.

A large industrial tank, possibly a silo or storage vessel, is shown. It has a circular hatch with a metal flange and bolts. The tank's surface is covered in a blue-green coating, which appears to be a type of cement or concrete. The lighting is dramatic, with a strong light source from the top left creating a bright, curved highlight on the tank's surface. The background is a dark, textured wall.

### **Blue equals quality**

Hydration of cement undergoes different mineral phases. Based on their chemical make-up these phases effect different colourations in the coating. Especially the bluish-green colour typical for MC-RIM PW is a quality characteristic which undergoes a distinct transformation under the influence of oxygen and carbon dioxide during this process. The final result is a very light surface. The duration of this colour change is dependent on the respective spatial and atmospheric conditions.

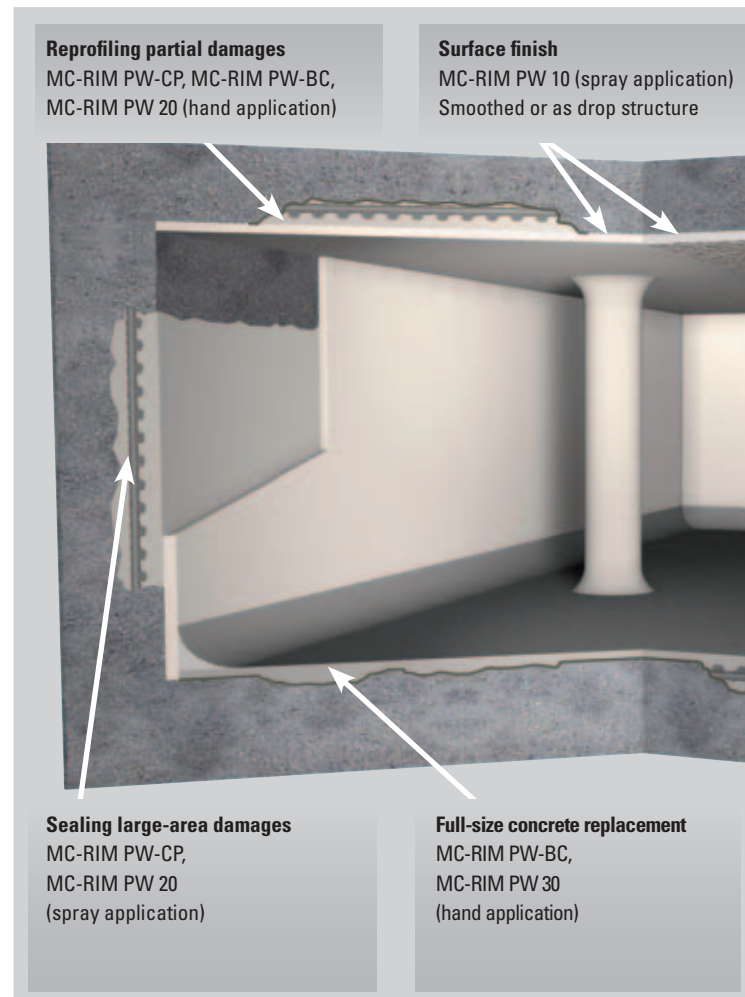
# The MC-RIM PW System

## The Perfect Complete Solution

The MC-RIM PW system consists of five components. The basic components are the corrosion protection coating MC-RIM PW-CP, the bond coat MC-RIM PW-BC and the concrete replacement MC-RIM PW 20.

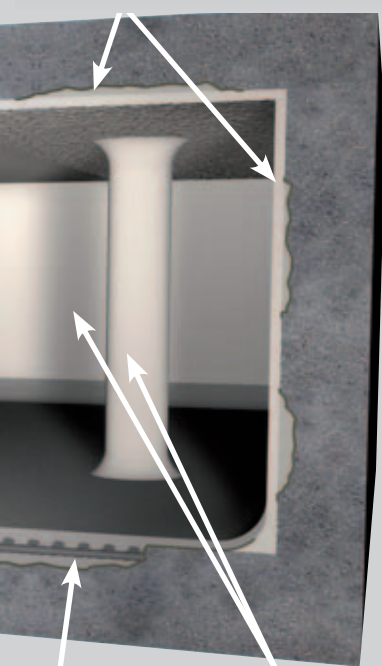
The complete system is rounded off by the highly efficient surface protection coatings MC-RIM PW 10 and MC-RIM PW 30. From the drop-structure in ceiling areas right down to very smooth surfaces on walls – MC-RIM PW 10 achieves it all. Almost without limitations are installations and surface treatments for floors as well – with MC-RIM PW 30.

Whether manual installation, machine application using the vibrating beam method, surface treatments using the conventional smoothing technique or use of a power float, the choice is yours when giving your drinking water container perfect long-term protection.





**Reprofiling concrete damage near the surface**  
 MC-RIM PW-BC,  
 MC-RIM PW 20 (hand application)



**Sealing partial damages**  
 MC-RIM PW-CP,  
 MC-RIM PW-BC,  
 MC-RIM PW 30  
 (hand application)

**Surface Finish**  
 MC-RIM PW 10  
 (spray application)  
 Smoothed



## MC-RIM PW

### Long-term Surface Protection for Potable Water Containers through DySC® Technology

- Resistant against leaching and hydrolytic corrosion
- High chloride-resistance
- Certified in accordance with EN 1504 Part 3

## Information

Request MC-RIM PW information now – by mail, fax or email!

Yes, I would like...

☐ ... you to send me the technical data sheet MC-RIM PW.

☐ ... you to call me!

☐ ... to see a demonstration of MC-RIM PW at work!

Please arrange an appointment with me.

Company: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

MC-Bauchemie Müller GmbH & Co. KG  
Protection Technologies

Am Kruppwald 1-8  
46238 Bottrop  
Germany

Phone: +49 (0) 2041 101-10  
Fax: +49 (0) 2041 101-188

protection-technologies@mc-bauchemie.com  
www.mc-bauchemie.com

