

Basilisk Info sheet no. 4:

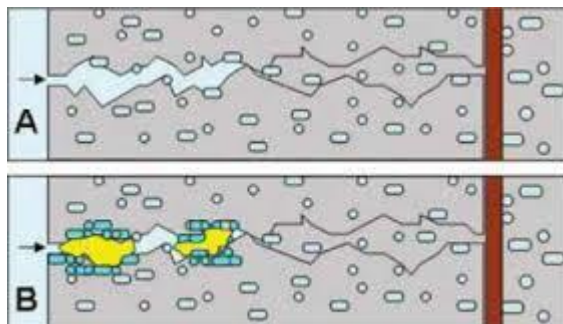
Choosing the Healing Agent additive

Basilisk Healing Agent

Basilisk healing agent is an additive consisting of solid particles of size 0-2 mm to add to the dry constituents or wet mixture of new mortar or concrete up to a dosage of 10 kg per m³. Healing agent in its current form is typically applicable to mortar and concrete with conventional cements containing more than 30% clinker. The healing agent disperses in the mortar or concrete matrix, where the particles wait upon occurrence of a crack or surface porosity and water entering. Upon contact with water, the bacteria inside the healing agent activate and convert the healing agent components into carbonate-based minerals that seal the crack or porosity automatically up to a crack width of 0.8 mm. This limits the amount of required repair and extends the service life of the structure.

Crack sealing

Places where the healing agent can come in very useful are structures that either need to keep surface water outside or inside, for example in water reservoirs, basements or irrigation systems. Watertight sealing of concrete structures is quite a challenge. Current methods to



In A, water enters from the left into a micro crack activating the self-healing agents. In B, the active bacteria seals the cracks with production of limestone.

obtain water tightness of concrete are for instance by applying a water tight membrane or by increasing the amount of steel reinforcement, which limits the crack widths in the concrete in such a way that the concrete can restore its own water tightness. For the latter case, the added steel can be up to double the amount of steel required for the structural function. Aside from that the added steel does not have an additional function and increases the environmental and economic burden of the

structure, it can also complicate the casting of the concrete and therefore hamper the quality, due to the complex and dense steel cage.

Surface densification

The quality of the concrete surface is very important to guarantee the service life and durability of the concrete structure. Additionally, as concrete structures typically make use of steel reinforcement to take over tensile stresses, the surface of the concrete should be in good condition to protect the embedded steel. One of the ways to indicate a good quality surface is a limited surface water absorption, indicating reduced susceptibility to ingress of deleterious materials.

Comparison

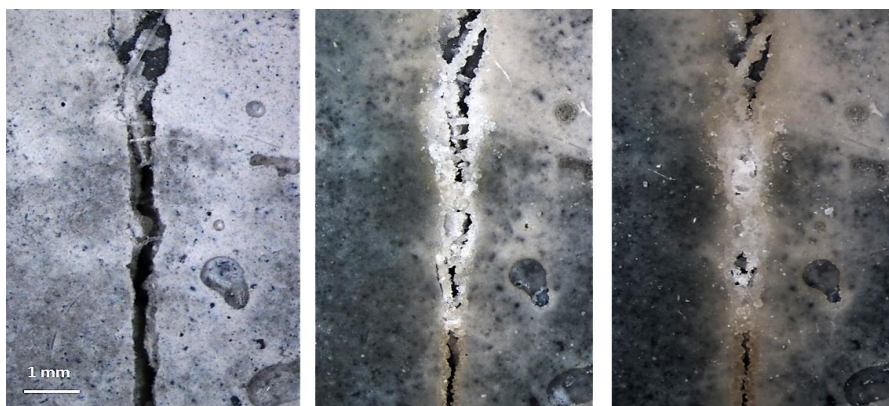
Upon addition of the Basilisk healing agent cracks can be made watertight that have a width more than double of that of concrete without healing agent [1]. Given that the healing product is carbonate based, effectiveness of the sealing function decreases with increasing acidity of the solution that needs to be retained. For the typical blocking of water leakage no limitations are expected. Something quite special when compared to alternative additives such as expanding minerals, is that in case of addition of Basilisk healing agent the same crack was able to restore its water tightness multiple times. After healing, the same crack was fully healed again upon re-opening the same crack three times. Additionally research was undertaken to demonstrate the automatic sealing of the cracks when water was actively leaking through the crack. A maximum crack width of 0.8 mm was found to seal, without the presence of water pressure. With increasing water pressure it is recommended to allow a crack width based on a comparable rate of water leaking through the crack.

An additional function upon addition of the healing agent to the concrete mixture is the ability for the surface to densify [2]. The surface absorption was up to half of that of the concrete without healing agent. This property allows to delay the ingress of deleterious materials and therefore extend the surface life of the concrete.

Pricing

Given that more than double the crack width can be automatically sealed upon addition of Basilisk healing agent, part of the crack width controlling steel reinforcement can be reduced, slightly increasing the crack width. This already compensates the economic and environmental impact of the addition of the Basilisk healing agent to the mixture. Additional cost benefits occur because there is no need to close the access to the structure for repair and the actions for repair.

Considering the densified concrete surface upon addition of the Basilisk Healing Agent, less ingress of deleterious materials can be expected. This approximately doubles the time until maintenance is required.





Conclusion

In case of constructing a concrete structure or element that requires to be watertight, addition of the Basilisk healing agent can be considered. Especially in case limited crack widths (< 0.2 mm) are difficult or expensive to obtain, for instance due to added steel reinforcement, the healing agent can be of service and cost effective.

More information at: www.basiliskconcrete.com

References

- [1] Mors, R. M., & Jonkers, H. M. (2017). Feasibility of lactate derivative based agent as additive for concrete for regain of crack water tightness by bacterial metabolism. *Industrial crops and products*, 106, 97-104.
- [2] Mors, R., & Jonkers, H. (2017). Effect on concrete surface water absorption upon addition of lactate derived agent. *Coatings*, 7(4), 51.