

Microfibre functionality

Adfil Microfibres

Adfil microfibres are often used to improve the durability of concrete. By adding microfibres to the concrete the permeability of the concrete will be reduced, plastic shrinkage cracks will be avoided, the chemical resistance and the freeze/thaw resistance of the concrete will improve.



Microfibres

Microfibres are made of PP with a diameter smaller than 300µm. Typically 1kg of fibres will be sufficient to greatly improve the physical properties of concrete. Adfil microfibres are produced in a range from 17 to 32µm diameter. Adfil prefers to work with fine fibres as they have a better performance in concrete. 1kg of fibre can contain up to 1.5 billion of fibres, a lot more than what competition can offer. The more fibres per kg, the higher the performance of the fibre will be.

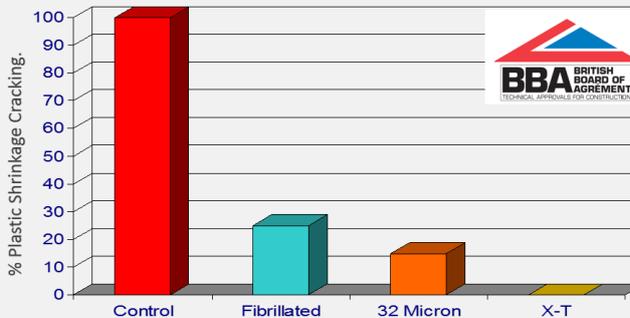
How it works

Microfibres will create a network of fibres within the concrete matrix. The fibres will block the capillaries formed during curing of the concrete. The more fibres per kg are present, the more effective the fibre network becomes, the better the efficiency and performance of the fibre will be. By blocking the capillaries, water will be kept more inside the concrete during curing in the plastic state. Fewer water and cement will bleed towards the surface. So fewer water will evaporate.

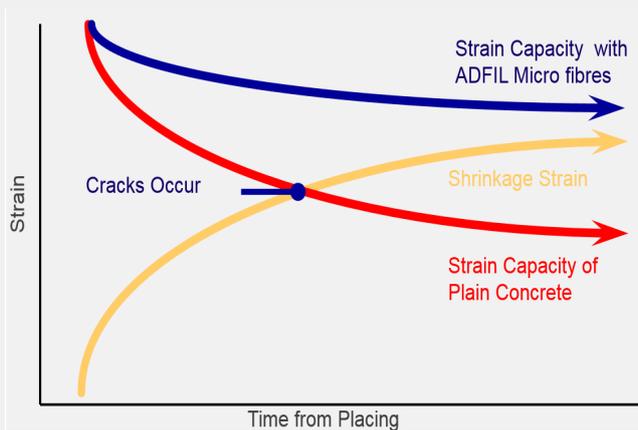
Therefore less volume reduction will take place as the water stays in place during curing. This creates less tension in the concrete at the moment the concrete is still very weak. With other words the cement gets more time to hydrate and to form crystals which leads to higher strengths at the moment the tensions start to take place. In this way the fibres will avoid early age plastic shrinkage cracks. When the cement creates more crystals not only the strength of the concrete will improve but concrete will also become less permeable as the crystals will densify the concrete. The capillaries in the concrete will become smaller.

Chemical resistance

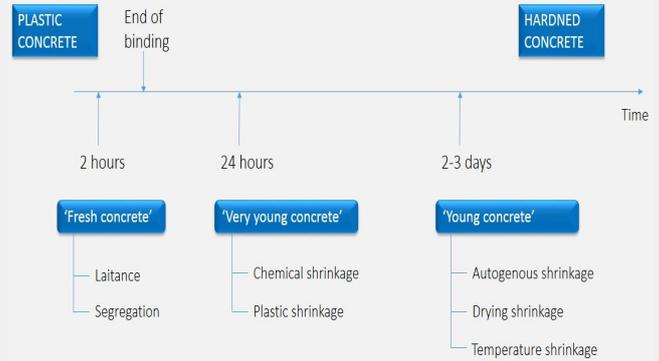
As the permeability of the concrete is lowered by using Adfil microfibres, it immediately improves the chemical resistance of the concrete as well. Fewer chemicals will be able to reach the steel reinforcement, causing it to rust and spall.



Trontheim test results



Adfil microfibers can greatly reduce early age plastic shrinkage .



Fibres work mainly during the plastic phase of the concrete. They alter the behavior of plastic concrete in such way that the hardened concrete benefits from it.

Fibre performance

Adfil PP microfibres are inert. Generally speaking, the chemical resistance of polypropylene is considered superior to that of metals. They are unaffected by most inorganic acids, alkalis, and aqueous solutions which rapidly corrode metals, although some concentrated acids and oxidizing agents can attack them, especially at elevated temperatures. The chemical resistance against kerosene (Jet fuel JP-3, JP-4, JP5) however is unsatisfying. As stated previously the microfibres will alter the concrete during the plastic phase. During this phase the contact with kerosene would have a negative influence on the performance of the fibre.

Conclusion

Adfil microfibres are almost completely inert. However, kerosene can make the fibres weaker. The microfibres improve the concrete during the plastic state of the concrete, during this state no kerosene will be involved. As the slab will not be in service yet. In fact the concrete needs to dry out for 28 days. By that time the microfibres will already have improved the characteristics of the concrete.

So the functionality of the microfibres in concrete slabs will not be affected by kerosene at the moment of use. Therefore Adfil microfibres can be used in airfield aprons without any performance reduction.