



Jotun Protects Property

JOTACHAR MESH TECHNICAL PAPER:

Dispelling the mesh-reinforcement myth

Jotachar

MESH FREE EPOXY PASSIVE FIRE PROTECTION

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Jotun Continues To Lower Risks And Raise Safety Levels With Jotachar Mesh Free Epoxy Passive Fire Protection

Dispelling the mesh-reinforcement myth

Manufacturers would have you believe that for any traditional epoxy intumescent coating (EPFP) product to meet industry requirements for fire safety, durability and system adhesion, it requires additional system reinforcement such as fabric, metal or hybrid mesh installation. The myth being that additional reinforcement is always required to provide the necessary stability and rigidity when the system is exposed in a non-fire scenario. Previous technical papers and standards have been published promoting this myth, giving further credence to the need for additional reinforcement, legitimising its use on safety grounds.

Based on extensive internal and 3rd party testing, external mesh reinforcement is shown to be an inherently weak part of any cured EPFP system. It is a misconception within the passive fire protection industry that the inclusion of mesh contributes positively to the coating's performance during normal non-fire service conditions. Being an external component within an applied epoxy system, any mesh reinforcement has several challenges. Firstly, it cannot chemically bond to the EPFP coating during the curing mechanism i.e. adhesion of the reinforcement to the cured epoxy relies solely on the reinforcement being successfully embedded into the wet epoxy layer by the installer. Furthermore, as an inert and foreign component, mesh can actually be the cause of multiple potential failures commonly witnessed with high build EPFP materials.

Adhesion

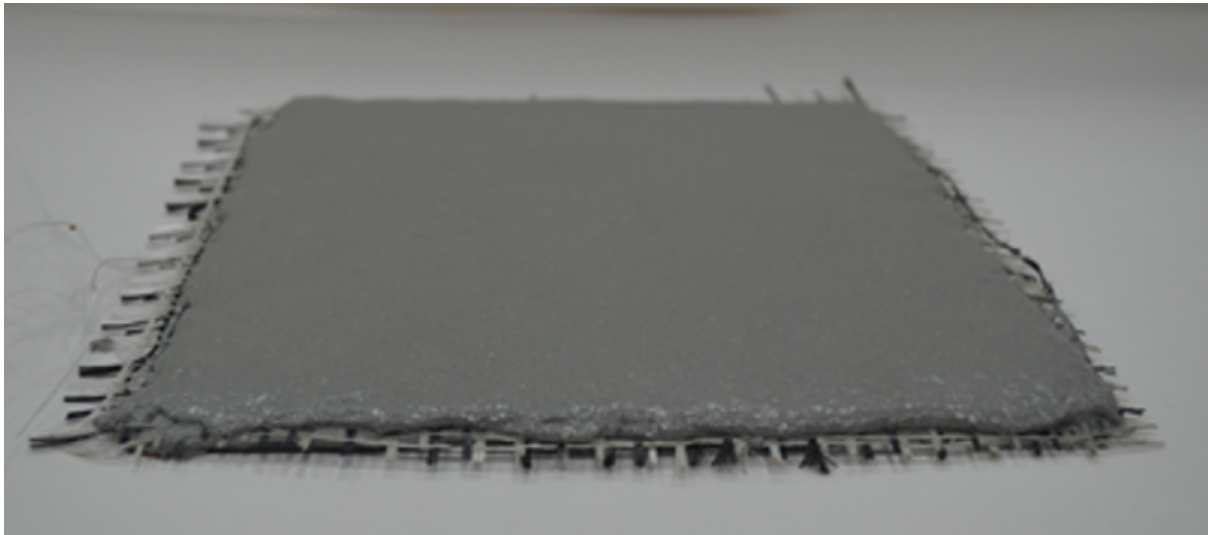
Laboratory and real-life assessments have consistently shown that any adhesion test will result in the failure occurring at the coating/mesh interface. This reduction can be up to 50% of the cohesive strength compared to a system without any mesh inclusion.



Close up detail of failure at mesh interface at mid depth in a traditional EPFP

Water uptake and durability

Fabric meshes will actively absorb any water they are exposed to, especially if any mesh remains exposed after application, e.g. at an incorrectly installed termination. Any absorbed water can be propagated within the epoxy intumescent coating resulting in an increased water uptake in the applied system. Up to 30% has been demonstrated during independent testing, reducing adhesion and fire performance as some of the water sensitive intumescent ingredients are degraded.



If the mesh is not fully encapsulated water will ingress into the EPPF system

These serious issues are well known within the EPPF manufacturing industry because traditional products require mesh reinforcement to control and retain the char during the intumescent expansion phase and as part of certification requirements. Manufacturers and the industry had little choice but to accept these inherent system weaknesses.

Manufacturers are required to omit reinforcement such as mesh when preparing samples for assessment to the offshore durability standard NORSOK M501 System 5a revision 6 for Epoxy PFP materials. Mesh omission is required due to a known and significant reduction in post exposure system adhesion caused by including additional mesh reinforcement. In severe cases adhesion reduction will result in a failure to meet NORSOK required adhesion values after exposure cycles to ISO 20340.

A more representative performance test should include the complete system “as-certified” including any required additional mesh reinforcement undergoing the full range of accelerated durability, adhesion and post exposure fire testing.

Whilst mesh reinforcement has been demonstrated to be an inherently weak component within Epoxy PFP systems, it is still an ESSENTIAL component for the FIRE performance of many traditional systems. These products simply will not perform to fire certification requirements where mesh is omitted, nor without it installed correctly as certified. If mesh reinforcement is not present, the rapidly expanding low thermal conductivity char generated during a hydrocarbon fire is weak and friable, leading to char detachment. Any char detachment exposes the steel structure to the heat of the fire eventually leading to rapid temperature rise and structural failure. Flange tips are particularly at risk due to the char expanding in opposing directions, leaving the resultant char on the outer flanges to fall away. A system designed for 3 hours of protection can struggle to achieve 1 hour of protection if the mesh reinforcement is not installed or installed incorrectly.

Can you be certain that the mesh is installed at all, or in its correct orientation to certification once the final layer of EPPF has been applied?

Next generation materials are now available where additional mesh reinforcement is no longer required. Char reinforcement and management is formulated within the wet system, therefore any risk associated with incorrectly installed mesh reinforcement is effectively removed. All the long-term durability benefits of a high performance EPFP material under normal exposure conditions are fully retained, fully endorsed through extensive 3rd party assessment and certification.

Jotachar Next Generation Mesh Free Epoxy Passive Fire Protection

Mesh-Free doesn't mean reinforcement free

There have been many new innovations recently within the Oil & Gas fire protection industry. It is healthy to ensure the industry remains active and driving to be at the forefront of technology and safety. One of the many innovations has been the introduction of mesh free Epoxy Intumescent Coatings. The Jotachar product range delivered the first mesh free system for all its certified fire designs & scenarios, including jet fire.



Jotachar Jet Fire test

The phrase “mesh-free” however, is not entirely true for Jotachar and the words alone have been known to raise concerns in the minds of traditional EPFP consumers, calling into question the products ability to perform as well without an external reinforcement. Whilst there is no complex and risk prone external mesh reinforcement to install, when exposed to fire, Jotachar produces a robust and temperature stable low thermal conductivity insulating char. This is made possible due to an advanced fibre matrix within the formulation, a

“liquid-mesh” if you will, incorporated directly into the paint. This ensures that the necessary reinforcement is installed correctly every time, without fail and without risk.

The package of fibres used for reinforcement in Jotachar have been chemically chosen to ensure softening, melting and flow characteristics are in synergy with each other, ensuring constant reinforcement of the carbonaceous char as it develops through the different temperature phases of a fire.

With it being liquid, it also allows the fibre matrix to form in 3 dimensions, rather than the traditional 2-dimensional plane that fabric mesh can, magnifying the effect of the reinforcement in the product. As the matrix is incorporated within the polymer backbone, as the product cures, the fibre matrix helps to bridge these polymer chains and induce reinforcement in all directions within the film.

Provision of protection up to 3 hours in a high heat flux jet fire, without the need for any external reinforcement, demonstrates the robust performance of Jotachar’s liquid 3D fibre matrix. Jotachar also provides certified H120 division solutions in both vertical and horizontal orientations debunking the myth that mesh-free epoxy PFP cannot protect large flat areas without some form of mesh reinforcement.

In today's safety critical, high risk operating environments, any opportunity to reduce operational risk should be grasped. Jotachar mesh free Epoxy Passive Fire protection innovations virtually eliminate any risks associated with incorrectly installed mesh containing Epoxy PFP, without compromising on fire performance, durability, system adhesion and long-term performance.

For further information visit Jotun.com