

Passive Fire Protection Application with Plural-Component Equipment

By Murphy Mahaffey, WIWA Wilhelm Wagner GmbH & Co. KG

Passive Fire Protection, or PFP, is a term that is frequently used in our industry today for describing technologies that delay or mitigate damage by fire to allow more time for protecting human life. PFP technologies operate without human intervention, focus on compartmentalization (preventing the spread of fire), and maintain the structural integrity of the vessel or building for a longer period of time—as opposed to Active Protection, which focuses on detection and suppression, including alarms and sprinkler systems. PFP systems include intumescent, cementitious materials, and proprietary boards or sheets. Each of these systems is engineered to protect the substrate.

This article will discuss aspects of intumescent plural-component PFP material application, including proper training, equipment required, and job profiles.

Intumescent PFP

Intumescent PFP materials are comprised of a resin matrix that contains a blend of thermally active chemicals formulated for fireproofing. An intumescent coating will expand (intumesce) 5 to 10 times its original thickness when exposed to fire, producing a carbonaceous char layer that insulates the substrate from the heat source by producing a char layer that protects it, and emitting gases that cool the surface area (Fig. 1).

Intumescent materials are applied in a variety of industries. PFP materials are used in onshore and offshore applications, including gas/petroleum storage and distribution; petrochemical plants; storage tanks/vessels; refineries; power stations; steel structural beams and elements; valves; offshore platforms; and



Fig 1: Intumescent coating applied to steel beam (left) and after the coating has been exposed to heat/fire and has expanded (right). Photo courtesy of International Paint



Fig. 2: A training class in Lahnau, Germany, conducted by an equipment manufacturer and a paint manufacturer, for an application company being certified. Photo courtesy of WIWA GmbH and International Paint

tanker vessels. The effects of heat on steel are significant, with steel losing half of its load bearing strength at 588 C (1000 F)—the failure point for steel. The dangers associated with this damage are structural collapse, explosion of vessel contents, pipe fractures causing jet fires, and lack of containment that allows fire to spread.

Why specify intumescent PFP sys-

tems? In addition to their passive fire protection properties, they are robust and have good adhesion, high tensile and compressive strengths, and good resistance to impact and vibration. They have excellent weatherability and often do not require topcoats. PFP materials also have good chemical resistance and protect the substrate against corrosion due to extremely low water absorption. These systems often have a lower installed weight than other systems with similar properties, thus adding less weight to the final structure while providing maximum protection. PFP systems can be 40%–60% lighter than “lightweight” cementitious products.

Training and certification to apply

these materials is of utmost importance to achieve consistent properties and the correct functioning of PFP systems. Normally a company's employees must be trained to apply PFP materials. Most material suppliers provide qualified applicator certification to ensure the correct application of PFP materials. For example, one global paint manufacturer provides a two-

day training course with hands-on application, including theory and practical training, sample preparation, and certification. The course trains and takes input from the applicator, fabricator, client, and material and equipment suppliers (Fig. 2).

In the training course, applicators

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Fig. 3: Carbon fiber hybrid mesh on structural steel piece. Photo courtesy of WIWA GmbH

Maintenance Tips

learn different application techniques. For example, one technique is to use carbon fiber hybrid mesh to allow higher thickness build and give anchorage and structural reinforcement to the intumescent material (Fig. 3, p. 19).

Surface Preparation for Intumescent

Even the best chemical system will not perform if the proper preparation steps are not followed. Important general preparation includes cleaning surfaces of dirt, oil, and grease to required standard SSPC SP 1; blast cleaning to required standard Sa 2.5, with 50–75 microns blast profile; checking ambient conditions to ensure they conform to primer manufacturer's specifications (Qualified Primer List); and priming surface with approved primer, ensuring thickness is between 50 and 75 microns, and less than 100 microns at overlaps.¹ Doing things correctly the first time always pays off and this is just one example of surface preparation. All of the steps recommended by the material manufacturer must be followed for a successful application.

Applying Intumescent

PFP materials can be applied with a trowel, a single-leg pump (hotpot), or with a plural-component system. Plural-component equipment allows the fastest production and gives the most control over application. Plural-component application also produces the least amount of waste of the three methods and

allows solvent-free application. The material suppliers must certify the equipment for the application. The components are made from materials that will provide the longest life during oper-

ation and help resist material abrasiveness while generating and maintaining the temperature and pressure required.

Plural-component equipment must be configured with the material supplier and certified for application of the specific material. Components designed and specified for use with these materials are 'configured' or put together in an optimum way to allow the desired output. Components include pumps, heating systems, motors, tanks, hoses, and spray guns. The equipment system must be able to heat the material to the proper temperature, maintain the temperature to the gun, proportion the material to give proper ratio, and generate the correct pressure for mixing and spray pattern. The specialized chemistry in PFP systems requires a machine that is designed with these considerations in mind (Fig. 4).



Fig. 4: Units for plural-component application of intumescent. Photo courtesy of WIWA GmbH



Figs. 5 and 6: Intumescent applied to an offshore platform under construction. Photos courtesy of Disnamair S.A.; WIWA GmbH; and Dragados Off Shore S.A.

Intumescent Applications

Where are PFP materials being applied? All over the world. Many structures that can benefit from having PFP, including offshore rigs. Figures 5 and 6 show the application of an intumescent on the offshore platform "Hammerfest."

In the U.S., PFP is being used on the steel structure for the new interchange station servicing subways, buses, and trains in New York City. The architect of the project specified intumescent PFP, and a steel structure workshop was conducted in La Coruña, Spain. Structural members have the PFP applied (Figs. 7

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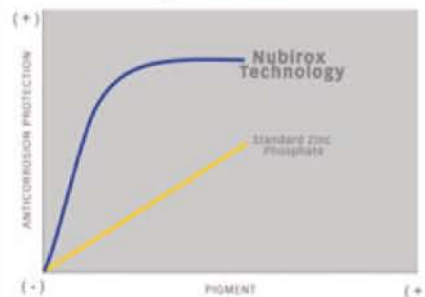


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and 8), and are then installed.

Large storage vessels in the petroleum industry are a target application area for PFP materials because they benefit from the fire protection and anti-corrosion properties of PFP materials. The adhesion to substrate and moisture-resistant nature of intumescent materials minimize the possibility of corrosion occurring due to moisture between the material and substrate. Figure 9 shows a gas sphere in Tenerife, Spain, on which a proprietary PFP has been applied. This was an on-site application, as can be seen by the plural-component unit set up on the scaffold below (Fig. 10). Figure 11 shows a sphere on which a cementitious PFP material was applied.


Conclusion

Passive Fire Protection is a very specialized niche application that is growing worldwide due to the need for fire and corrosion protection that is low in

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Figs 7 and 8: For the New York interchange station project, a certified painting contractor applied the PFP with technical support from a distributor for the equipment manufacturer. Photos Courtesy of Disnamair S.A.; WIWA GmbH; and Julio Crespo S.A.

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Fig. 9: Coating application on a gas sphere in Tenerife, Spain. Photo courtesy of Disnamair S.A. and Compañía Española de Petróles S.A.



Fig. 10: Plural-component unit staged on scaffolding for on-site application. Photo courtesy of Disnamair S.A.



Fig. 11: A sphere collapsed due to undetected corrosion under cementitious PFP. Photo courtesy of International Paint

installation weight. Companies who are certified to apply these materials have an advantage today because they have a lead in specialized markets and competition is currently limited. The only way to get involved is to become certified by one of the material suppliers and work to develop the market together. Proper training and technical support from the material and equipment suppliers are important components of a successful

and on-time installation of PFP because PFP requires the combined expertise of the applicator, technical advisor, material supplier, and equipment supplier.

Acknowledgements

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Reference

1. International Paint, "Pre-Application Key Points to Note," on steps before applying PFP.



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