

Surface tissue for fire-resistant laminates

Together with its partners CRC-ACS and Ampelite Australia Pty Ltd., Regina Glass Fibre Pty Ltd. won a JEC Innovation Award in the Raw Material Category at the JEC Show Asia 2009. The FireShield® product is a chemically-loaded surface tissue that can be added to any composite laminate during manufacture to provide fire resistance.

A lightweight carrier fabric (Figure 1) is impregnated with the appropriate intumescent chemical to produce the FireShield® product sold to manufacturers (Figure 2).

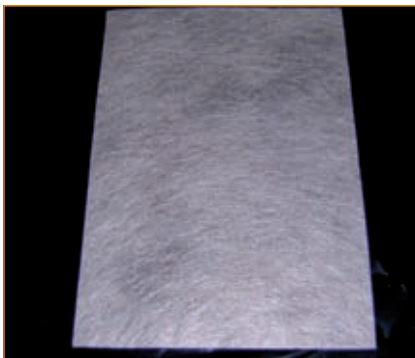


Fig. 1: Standard glass surface tissue. Sample is 210 mm wide, 0.3 mm thick



Fig. 2: Chemical-loaded tissue for FireShield. Supplied in rolls from 45 mm to 2.0 m wide, 100 m long

Ready to use

The manufacturer uses this product as a normal surface tissue to produce a

fire-resistant laminate. The example in Figure 3 shows a fire-resistant flat polyester sheet. When FireShield® is used as the exterior ply in a composite laminate, the halogen-free fire-retardant chemical is placed just beneath the surface where it is most needed.

This approach to providing fire resistance does not require any special fire-retardant resins, and thus allows standard laminating resins to be used to manufacture composites meeting international fire standards. When exposed to flame, FireShield® produces a well-bonded charred layer on the surface of the product. This insulates the product and inhibits the passage of oxygen, thereby smothering the flame. Furthermore, the environmental problems caused by the use of halogenated systems are avoided. By using standard resins, laminate manufacture becomes straightforward, the material cost is lowered, and the strength or stiffness of the composite laminate is not compromised.

Although the non-woven glass tissue provides the lowest-cost fabric for the FireShield® technology, carrier fabrics made of other fibres such as polyester or carbon, either woven or non-woven,



Fig. 3: Ampelite fire-resistant moulded polyester sheet, with FireShield below the surface on both sides. Sheet is 2.2 mm thick

can be used to meet particular engineering design requirements.

A team project

The original concept was developed by CRC-ACS, the holder of the process patents. CRC-ACS was commissioned by Regina to carry out subsequent research to overcome the impregnation and manufacturing problems that were identified in the field.

They prepared manufacturing instructions for various manufacturing processes. Ampelite carried out early trials with the FireShield® tissue and identified problems that were addressed by Regina and CRC-ACS. Several series of trials were required. Ampelite is now producing a sample product for the market.

Development phase and launching

The concept was initially developed by CRC-ACS to surface pultruded carbon-epoxy I-beams for aircraft floors (see Figure 4). The challenge was to meet



About Regina Glass Fibre

Regina Glass Fibre Pty Ltd. has been manufacturing lightweight surface tissues in Ballarat, Victoria, Australia since 1963. An independently owned and operated Australian business, Regina is a small company with annual turnover typically around €1 million, exporting about half of its production.

Traditional products provide corrosion resistance and surface improvement (print blocking) to composites, as well as thermal and sound insulation and decorative finishes. With increasing competition on world markets, the company has sought to expand its product range. It has added value to its products through coatings and by impregnating glass veils with beneficial chemicals which enhance the properties of composite laminates.

In addition to FireShield®, Regina is working on Nanoveil®, a product which impregnates tissue with nano zinc oxide and HALS to deliver improved weathering and UV blocking to composites exposed to weathering. Composite samples incorporating this product are being tested in the long-term testing facility in Allunga, Queensland. Results are due shortly. Regina is a member of Composites Australia and an Associate Member of CRC-ACS



Fig. 4.: Original I-beam with FireShield beneath all surfaces. The I-beam is 80 mm wide, 100 mm high (front is angled back giving illusion of height)

stringent flame, smoke and toxicity standards without compromising the pultrusion process or the strength and stiffness of the I-beam. Aerospace international standards for flame (FAR25.853(a)), smoke and toxic gas emissions

(ABD0031;ASTM-E662) were met.

Since 2005, Regina has been expanding the scope of the FireShield® technology both from the original epoxy resin – so that it is compatible with polyester and vinylester resins – and from the original pultrusion manufacturing process – so that it is compatible with other manufacturing processes including wet lay-up, resin transfer moulding, vacuum infusion and filament

winding. These product developments are based on research and testing carried out by CRC-ACS on Regina's behalf. Upgrading the carrier impregnation process from the original laboratory scale to a full-scale manufacturing process involved overcoming engineering, material handling and OH&S problems. An investment of about €0.5 million was required to acquire special equipment to supplement the existing factory equipment.

FireShield® is now being field-tested by partners using a number of manufacturing processes. In particular, Ampelite is using FireShield® in its unique manufacturing process. The certification of finished products to the relevant fire standards is underway.

Market potential

With the growing emphasis on the flame, smoke and toxicity performance of structural composite materials, particularly in mass transit and building applications, the market potential is seen to be substantial. This potential is further enhanced by the continued replacement of traditional materials by composites in most areas.

Key benefits

Manufacturers do not need to modify their processes or train staff to be able to produce composite structures meeting international flame, smoke and toxic gas emission standards. They can use their normal manufacturing processes and resins. This enables companies of all sizes to participate in the fire protection field without further capital investment. In most cases, laminate cost is lower than with alternative ways of achieving the same degree of fire protection. ■

More information:

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