A ONE-STOP PRODUCTION ‘TWIST’ FOR THE NEW PESA TRAM

Since 2009, the Polish company PESA Bydgoszcz SA, has manufactured approximately 300 of its modern, low-floor ‘Swing’ trams. The major advantage, which makes the ‘Swing’ so attractive to potential buyers, is the exceptional price-quality ratio and in 2009 it became famous when selected by the Warsaw authorities in one of the largest tram tenders in Europe. The new ‘Twist’ tram is a supplement to the ‘Swing’ range and has been designed for operators providing services on routes with smaller passenger streams.

Designed for passenger comfort and safety

The ‘Twist’ tram harmoniously combines modern styling and a comfortable interior with durability of the body. Depending on the operator’s needs, PESA offers 2-, 3- or 4 car vehicles that can either be one or two-directional. The trams are adapted to tracks of various technical quality with various available gauges: 1524mm, 1435mm and 1000mm. Travelling comfort is enhanced by two-stage suspension. All trams are built of non-flammable or fire retardant materials, while the installed roll cage and the energy absorbent zone offers additional protection during collisions.

When designing the wheel covers for the new tram, PESA required a fire retardant material and technology that would not only enable the production of lightweight parts, but would also produce ready-to-paint parts when demoulded, eliminating the need to apply gelcoat as a finishing process.

Gurit's Fire, Smoke and Toxicity retardant (FST) materials

PESA evaluated Gurit's range of fire-retardant epoxy systems. Suitable for applications where increased mechanical properties are required, Gurit's FST materials generally exhibit good flame spread properties and can be used in more structural components compared to phenolics. Pesa's choice of Gurit materials for the 'Twist' wheel covers included Gurit® G-PET™ 100 FR Fire Retardant Structural Core material and ST 70FR Fire Retardant epoxy SPRINT™ product.

Wheel cover on Pesa 'Twist' tram

Gurit® G-PET™ FR recyclable fire retardant foam

Gurit® G-PET™ 75FR and Gurit® G-PET™ 100FR have been developed in order to meet the growing need for structural core materials with good Fire, Smoke and Toxicity (FST) properties. Gurit® G-PET™ can be processed at high temperatures, withstanding exotherms up to 150˚C and offers outstanding fatigue properties, chemical resistance, good adhesion. It is a highly consistent extruded foam, ideal for transportation applications with applicable processing techniques including vacuum infusion, bonding, prepreg and thermoforming. Piotr Stejter at PESA explains, "We chose Gurit® G-PET™ FR as it offers the right balance between mechanical properties, cost efficiency and FR properties. It is also very easy to shape and even thermoform."

ST 70FR Fire Retardant SPRINT™

ST 70FR is a low temperature curing fire retardant epoxy SPRINT™ (SP Resin Infusion Technology) product providing high quality laminates from out of autoclave, vacuum only processing. The SPRINT™ format makes this product ideal for the manufacture of thick sections requiring a high level of fire protection. It can be cured at temperatures as low as 70˚C, but can also be used for the rapid manufacture of components through its 25 minute cure at 120˚C. Pitor Stejter comments, "ST 70FR gives the right balance between low cure temperature, strength and fire retardancy. It is very easy to use and very practical to mould in comparison to other high quality material technologies. There is also no debulking and all laminate and core layers are moulded in one hit."

Easy, one-shot production process

The manufacturing process of the wheel cover parts involves firstly applying ST 70FR as pre-cuts directly onto the mould surface. ST 70FR woven glass fibre layers are then placed together with Gurit® G-PET™ 100FR in one lay-up process (single-shot). The mould is than vacuum consolidated and cured in a normal oven. Once cured the surface is ready to paint without the need for surface films."

The result

PESA's expectations for the 'Twist' wheel cover have been exceeded through using Gurit's materials. Using ST 70FR and Gurit® G-PET™ 100FR, the parts are now not only ready to be painted when demoulded, but the laminated wheel cover is now 6.2kg compared to 10.5kg when previously using solid glass and PU foam, and this outcome can be even further optimised. PESA is also now starting to work with Gurit on the tram's front end and plans are in progress to provide engineering and material in kits.

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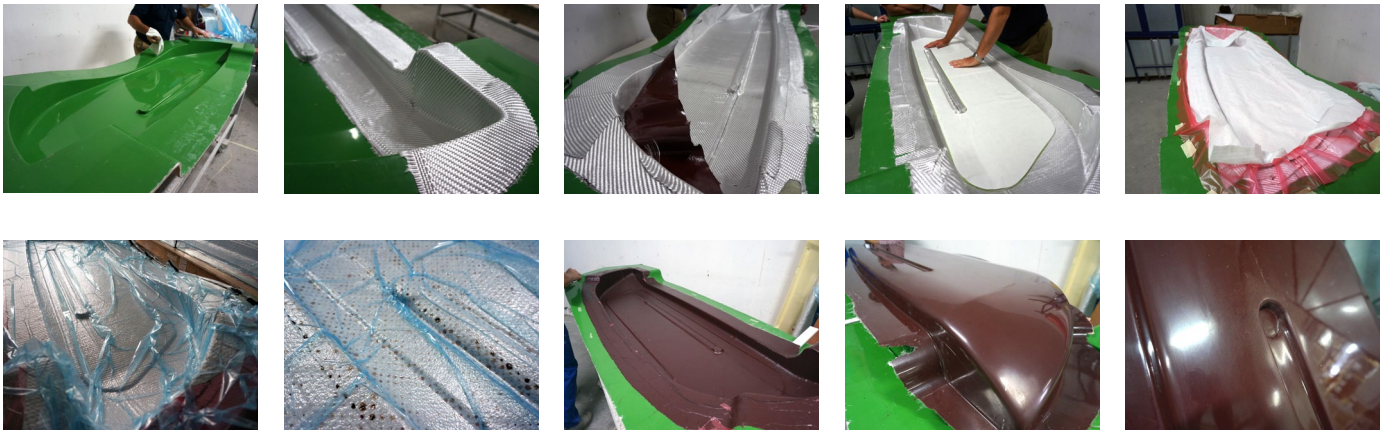

Figures 1 – 10: The 'one-shot' lay-up and curing process from start to finish