

Case Study

Lightweight Electric-hybrid Fleet Demonstrator Uses ACG's Prepregs



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Bob Mustard, Technical Specialist from the IE-LEV Team, said: "ACG is a key development partner in our demonstrator vehicle programme. The engineering and commercial support has been critical to assist us in delivering proof of concept and in developing a viable route to production for a composite intensive body."

Companies:

UK-based Revolve Technologies Ltd. and IE-LEV Ltd. collaborated to develop an exciting lightweight, range-extended electric-hybrid commercial fleet demonstrator vehicle project, part-funded by the UK Technology Strategy Board (TSB).

ACG was called upon to apply its expertise in composites manufacturing to minimise the weight of the body components and, therefore, minimise fuel consumption and CO₂ emissions of the vehicle, code named 't-001'.

Objectives:

- To offer a new concept in the delivery van sector and present fleet operators with a cost-effective solution to the problem of achieving low CO₂ without increasing running costs.
- To work with a composites company to reduce the weight of the vehicle and, therefore, optimise the performance and range capability of the electric drive train whilst maintaining a competitive payload.
- To prove the technologies used were suitable for the intended application and use in a vehicle in this sector of the mass market.

Production Process:

Advanced Composites Engineering (ACE), ACG's engineering division, worked closely with the project team to develop and manufacture master models and two sets of panels (payload box roof and sides, bonnet, left and right hand cab doors and roof, front left and right hand quarter panels) for the first two demonstrator vehicles.

Using a 5-axis CNC machining centre, ACE manufactured a full suite of tooling to produce the panels without intermediate tooling.

ACG's BPS240 body panel system was used to mould two sets of panels directly from master models. Panels incorporate foam-cored stiffeners to eliminate distortion.

Improvements Gained:

Thanks to ACG's prepregs, the t-001 will offer fleet operators an 80% reduction in CO₂ emissions compared with conventional vehicles in the same class.

Extensive research with fleet customers over the past 3 years has optimised the vehicle design



Master model light cluster detail



Payload box roof master model



Assembled payload box unit

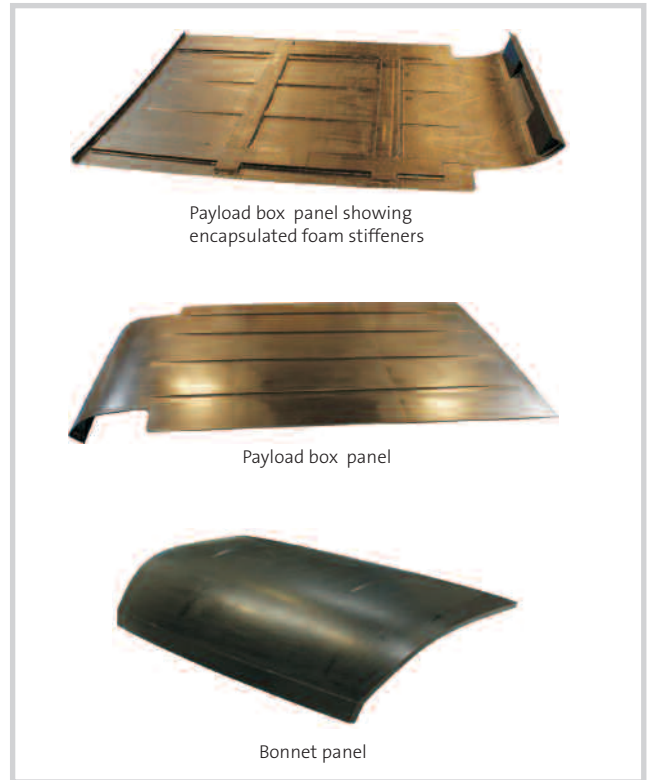
and it is planned that, with a 463 mile range, the t-001 will give the first 66 miles at zero emission in EV (electric vehicle) mode.

The t-001 will significantly reduce fuel costs and give fleet operators a lower lifetime cost per mile.

Body Panel Features:

ACG's BPS240 is a two-ply, partially impregnated epoxy prepreg system designed for the manufacture of Body-In-White (BIW) panels with excellent surface quality from vacuum-only processing at cure temperatures between 85 to 150°C.

BPS240 is designed to be ready for painting without abrading or reworking. In many instances, paint can be applied directly to a degreased panel. However, in this application, the demonstrator vehicle panels will not be painted, but will use a vinyl wrap system already widely applied to commercial vehicles.



Liam Moloney, ACE Engineering Manager, said: "We were delighted to work with Revolve Technologies Ltd and IE-LEV Ltd., and to have the opportunity to assist in the development of their t-001 demonstrator vehicles.

The project has progressed very well; ACE's manufacturing flexibility coupled with ACG's versatile BPS240 body panel prepregs have delivered everything that the customer required.

BPS240 is already widely used in the automotive industry, where low component weight and high panel stiffness are key requirements.

ACG has the automation and materials technology that would assist Emerald Automotive in entering the high volumes manufacturing phase that they are anticipating. We wish Emerald Automotive every success as they move forward into the production phase."

Notes:

At the time of writing (December 2011), the project was in its 'technology demonstrator' phase with IE-LEV Ltd as the lead partner and Revolve Technologies as the main collaborating partner. IE-LEV has formed a subsidiary company 'Emerald Automotive' to take the project forward into its production phase. Based in St. Louis, Missouri, USA, Emerald Automotive will manufacture the vans, code-named t-001, for sale to large fleet operators in the USA and Europe.

The Technology Strategy Board is an executive body established by the Government to drive innovation. It promotes and invests in research, development and the exploitation of science, technology and new ideas for the benefit of business - increasing sustainable economic growth in the UK and improving quality of life.

For further information about this project, please visit: www.innovateuk.org www.emeraldautomotive.com www.revolve.co.uk

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