











# JEC COMPOSITES INNOVATION AWARDS

Celebrating the best composite breakthroughs

## Ebusco 3.0 series of city buses

### Pondus Operations bv

**Partner:** 5M s.r.o. , Acralock / Engineered Bonding Solutions GmbH , Alba tooling & engineering GmbH , Ebusco , Eurocarbon , Grunewald GmbH & Co. KG , HÜBERS Verfahrenstechnik Maschinenbau GmbH  and Telene SAS 

**A groundbreaking and unique series of electric buses created by a combination of different composite materials and technologies resulting in a series of real game changers in public transport.**

#### Key benefits

- 33% weight reduction
- Operational life span of the bus beyond 20 years
- 500 km range on a single charge
- Fully flat floor throughout the bus, increasing freedom of movement.
- Reduced maintenance costs



For the Ebusco 3.0 series multiple materials, processes and technologies have been combined from various partners in the field of composites. The Ebusco 3.0s are a showcase of multiple composite technologies and each individual technology contributes to the overall performance in terms of reduced cost and weight compared to conventional city buses. Ebusco is a Dutch company based in Deurne, the Netherlands. Ebusco is a pioneer and a forerunner in the development of fully electric buses and charging systems. Telene SAS has developed a revolutionary DCPD resin system which allowed short cycle times at lower pressures compared to conventional RTM and allowed for improved damage tolerance compared to conventional matrices. This resin system was selected as demonstrator for two body panels. Various load carrying carbon fibre beams are used in the body structure. For these beams foam cores have been overbraided with dry carbon fibres on a Eurocarbon braider. The benefit of overbraiding is an automated, affordable, and repeatable process, which creates preforms ready for injection using RTM. Alba Tooling developed a dedicated PUR application system for the in-situ foaming of main body components. PU

cores for various components have been developed and manufactured by Alba. Grunewald is partner and supplier for RTM tooling for the carbon fibre structural beams. Multiple cavity RTM tooling has been engineered and manufactured to allow for the annually required number of parts to be produced for the different Ebusco 3.0 variants. Hübers Verfahrenstechnik is partner for the resin mixing and dispensing systems for epoxy resins for the RTM carbon beams. The Hübers system provides the desired quantity of degassed material with constant viscosity and highest mixing quality to the RTM tooling. 5M is partner for pultruded 2D glass fibre profiles for both interior and exterior, both in monolithic and sandwich construction, consisting of specific reinforcement orientations and matrix system. Pultrusion allows for efficient and economic manufacturing for different longitudinal components in large volumes. For structural bonding of the various sub-components Acralock adhesive materials have been selected. Acralock adhesives are advanced two-component structural adhesives, designed to bond chemically to most surfaces and provide a permanent bond between high performance composites and other materials.