

PRESS RELEASE

Seoul, November 14, 2019

JEC Asia 2019: Winners of The JEC Innovation Awards Revealed

The JEC innovation awards is a long-established and worldwide program with three simple goals: identify, promote, and reward the most innovative composite solutions in the world. Over the past 15 years, the JEC Innovation Program has involved 1,800 companies worldwide; 177 companies and 433 partners have been rewarded for the excellence of their composite innovations. The JEC Innovation Awards reward composites champions, based on criteria such as partner involvement in the value chain, technicality, or commercial applications of innovations.

« Every year, JEC rewards the best cutting-edge and ingenious projects using composites to their full potential in different categories. The JEC Innovation Awards program is emblematic and recognizes pioneers in composite innovation continuously reinventing the composites of tomorrow », says Franck GLOWACZ, Innovation Content Leader at JEC Group

The winners have been rewarded for their innovative solutions, in 10 categories:

- Aerospace
- Automotive - Exterior
- Automotive - Structural
- Electrical, Electronics & Appliances
- Industrial Equipment
- Marine
- Railway
- Renewable Energy
- Smart Composites
- Sports & Leisure

The awards ceremony took place on November 14, 2019, at 5:30 pm at the Startup Branch, COEX. **Ben Bassat**, President and CEO of **Platine Avner** opened the ceremony with a keynote about **“The 4th industrial revolution: implementing IIOT and AI to composite materials and manufacturing”**.

AEROSPACE

Composite Aileron structure - cured in one step

COMPO TECH PLUS SPOL, s r.o. - Czech Republic

www.compotech.com

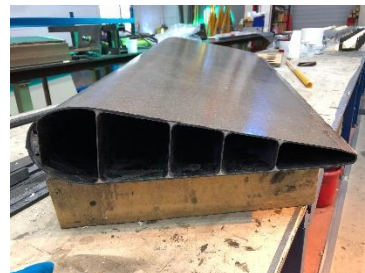
Associated Partners: Aero Vodochody Aerospace a.s. (Czech Republic)

Aileron structure of span wise box section connected by a Robot Wound Fibre layer with one-step curing. Process is automated production with no sandwich core structure or secondary bonding.

Key benefits:

- Strong and reliable structure
- No secondary bonding
- Continuous outer skin
- One process production and curing
- Production process can be automated

Innovation is in the applying process of robot assisted filament winding and laying for automated production of wing structures. The process involves the winding, with axial fibres, various shaped sections, which form the span wise box beams. The box beams together form the profile of the wing section. Before curing, with the tooling still in place, the outer layers are wound thus consolidating the internal beams and forming the shape of the aileron. The outer surface is then pressed with a flexible vacuum mould at room temperature. The part is then cured in one step and does not need secondary bonded parts. The surface is then finished.



AUTOMOTIVE - EXTERIOR

Evolution of Painting for CFRP Auto Body Panels

Hyundai Motor Group - South Korea

www.hyundai.com

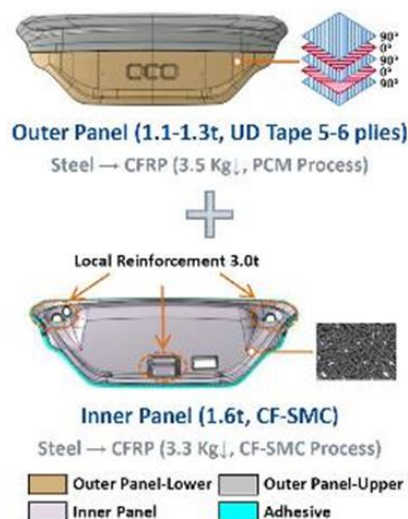
Associated Partners: Hyundai Motor Group (South Korea), Mitsubishi Chemical Corporation (Japan), Sk Chemicals (South Korea), Hyundai Steel Company (South Korea), Hyundai Motor Group - Polymer Research Lab (South Korea)

This innovation sheds light on the challenges of Class A surface finish by on-line / in-line painting processes. It proposes a new method for producing a CFRP trunk-lid based on PCM and SMC process.

Key benefits:

- CFRP on-line / in-line painting for mass production, solving 'color matching'.
- Achieve Class A surface with the conventional automotive painting process.
- Energy saving in painting process introduced by low temp. curing 2K Clear coat.
- Light weight CFRP trunk-lid in 60% weight reduction by design optimization.
- High cycle production of 5 minutes cure - PCM Prepreg.

The CFRP parts should be applied to the well- defined engineering procedures with the qualified manufacturing process in fit-for-purpose facilities in the automotive industry. The autoclave process is the most common one for producing high-quality structures in composites industry, however, it has its drawbacks. The recognition of its shortcomings has designed to specially address the need for low-cost and high-quality manufacturing process. This new and multi-material trunk-lid is accepted two novel curing techniques (i.e. PCM and carbon fiber SMC) for the mass production. It has been adopted for the Genesis G70 (winning Motor Trend's 2019 Car of the Year award) sports, the new luxury sedan from Hyundai Motor Group. It leads to a substantial reduction in the weight (up to 60%, 6.4 kg weight saving compared to conventional



AUTOMOTIVE - STRUCTURAL

Lightweight Engine Bracket using Hybrid Processing

Hanyang University - South Korea

<https://sites.google.com/site/hyucomposites/>

Associated Partners: Kolon Plastics (South Korea), Hyundai Motors (South Korea)

Lightweight and noise-damping engine bracket is developed using compression molding of chopped and Continuous UD Carbon Prepreg to replace the complex shaped bulky and heavy automotive engine bracket.

Key benefits:

- 80% lighter than steel
- Recyclable using thermoplastic materials
- Hybrid process for high stiffness, strength according to complex shape
- Excellent damping effect
- Fast production cycle time

The conventional steel engine bracket is needed to support the Engine and reduce the noise and vibration. Since the automotive engine bracket is very complex in shape, it is difficult to manufacture them using continuous fabrics such as prepreg, woven and NCF. Thermoplastic Carbon UD tapes of KOLON PLASTIC's Carbon/PA6 are chopped for the major portion of the complex engine bracket and UD Carbon tapes is inserted to enhance the stiffness and strength and achieve both moldability and stiffness. Very importantly, the developed product can absorb the vibration and noise, as good as the original steel product. To be suitable for mass production, compression molding process is developed, and the cycle time is reduced to less than 10 minutes. This short cycle process significantly contributes the lower price of the mass production. The most important feature of the current product is its lightweight, i.e. 80 % weight reduction of the conventional steel product.



ELECTRICAL, ELECTRONICS & APPLIANCES

Soluboard® - New PBC paradigm

Jiva Materials Ltd - United Kingdom

www.jivamaterials.com

Associated Partner: Eco-Technilin SAS (France)

Jiva and Eco-Technilin have created Soluboard®, a revolutionary bio-composite material manufactured with Eco-Technilin's FlaxTape™. Soluboard® is designed to redefine the way that we manufacture PCBs.

Key benefits:

- A direct replacement for FR-4 with the same price and improved sustainability
- A decrease in impacts from Waste Electronic and Electrical Equipment (WEEE)
- A decreased carbon footprint generated by electronic and electrical products
- Increased yields of precious metal recovery from PCB recycling
- Improved incentives for electronics manufacturers to internalize recycling

Currently, the substrate used in the Printed Circuit Board industry is constructed using epoxy resin and fibreglass; this means that the only method of recycling PCBs involves shredding them down and incinerating them in order to extract the precious metals used in these boards. This is a very inefficient process with substantial loss of these metals during reprocessing as well as releasing toxins such as cyanide, mercury, and dioxins into the environment.

Currently patent pending, Soluboard® is intended to replace the current standard material used within the industry (FR-4). It is a competitively priced, entirely- biodegradable material that can rival the outdated fibreglass and epoxy alternative. The primary ingredient in the composite material is Eco- Technilin's FlaxTape™. It is a patented tape consisting of unidirectional flax fibres with a lower density than alternative carbon and glass-based fibres. The unidirectional orientation of the flax fibres within FlaxTape™ means they can be efficiently arranged to form the multilayer bio-composite structure of Soluboard®, giving the material strong mechanical properties. FlaxTape™ is also ideal for manufacturing lightweight products with improved mechanical properties and a lower environmental impact. With nearly 45 million Tonnes produced last year, electronic waste is now the fastest growing waste stream in the world. Dissolving a circuit board made from Soluboard® allows for 90% of its components to be reclaimed and then either repurposed or recycled in an overall much more efficient process.



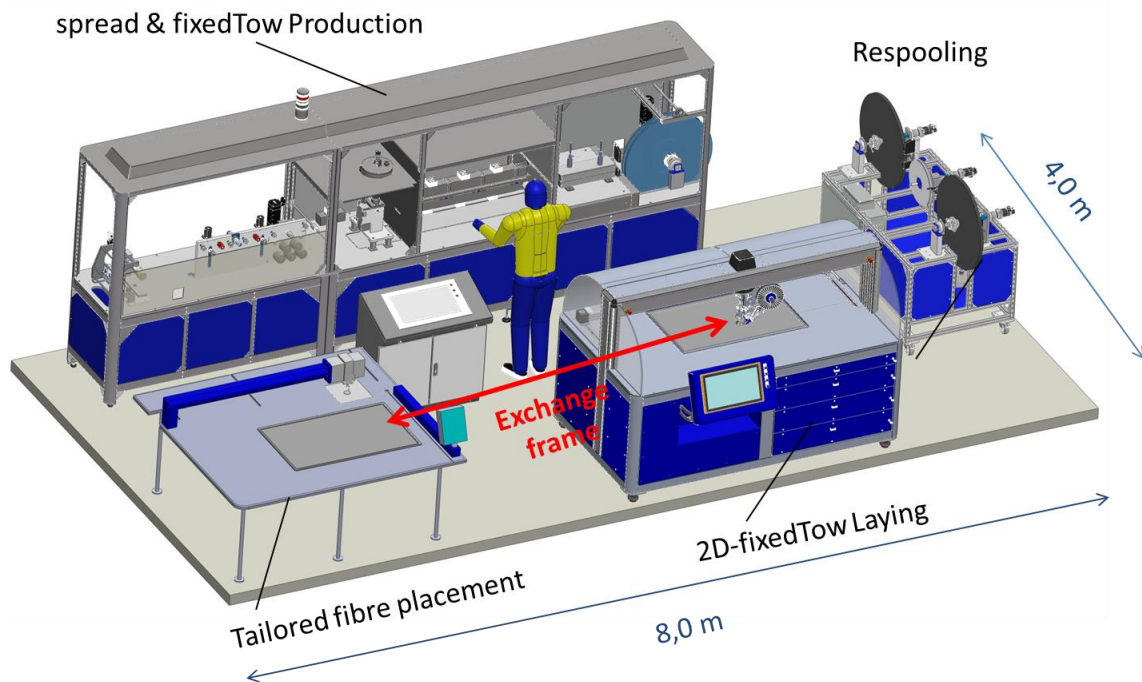
INDUSTRIAL EQUIPMENT

New paths in preforming: novel machine and process

M&A Dieterle GmbH - Germany

www.ma-dieterle.de

Associated Partner: Filacon Systems by Tajima GmbH (GERMANY), University of Stuttgart - Institute of Aircraft Design -IFB (GERMANY)



Combine FixedTow laying with with tailored fibre placement for simplified and optimized preforming: Novel Tailored fixedTow Placement Machine for fast results and ease of use.

Key benefits:

- Low cost machine, ease of use and programming
- Compatible with established stitching (TFP) machines and process
- Independence from material suppliers and flexible material choice
- Optimized preform process for improved composite part
- Process control, flexibility, low material scrap, fast results

Within one year, M&A has developed an efficient machine for tailored automated fixedTow placement as one step our newly designed process chain for preforming. The machine flexibly lays 2D-preforms, with dimensions: 500 mm x 1.000 mm. The goal of such a machine is to offer customers an entry machine for automated preform manufacturing. The machine was specifically designed to be user friendly, robust, affordable, and functional. In addition, the preforming process chain is overhauled: we produce the entry material for the laying machine. The roving is spread and fixed with powder binder. We call it fixedTow since it has textile character.

This enables the production and use of tailored material to the preforming task. We adjust areal weight, binder content and fiber type of the fixed spread tow. The placement head lays the fixedTow in a preprogrammed pattern. Users can easily program the pattern themselves.

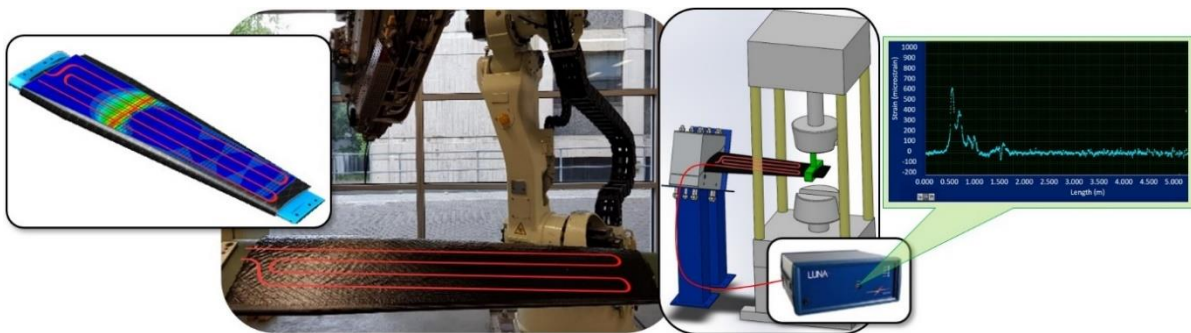
The placement head dispenses the tow, heats and fixes it on a substrate according to the program and lays patterns of short and long segments by cutting the tow. The head was designed for robustness and ease of use: Heating requires no sophisticated lasers but uses small IR lamps. In the system control, you can easily define the shape of the preform and define the placement pattern. The number of layers, tow orientation and number of stacks. With a short 2-day training, any user can fully operate the machine. The machine is a fusion between automated dry fiber placement and a stitching machine (TFP). The 2D preform is therefore placed on a removable frame as is the case in TFP. During layup, the frame moves in the horizontal x-y direction. The placement head can rotate 360° and moves in the z-direction. After laying the textile stack, the frame is transferred to the stitching machine as the next processing step. Subsequent stitching optimizes the preform further: it offers better resin permeability, improves drapability and overall preform stability.

MARINE

Shape Adaptive Hydrofoil with Fiber-Optic Sensing

University of New South Wales, Amac - Australia

Associated Partner: Defense Science and Technology (DST) - Maritime Division Department (Australia)



A validated optimized methodology for design of passive shape adaptive structures. This 1:1 scale 3D part was embedded with fiber-optic sensors and manufactured using Automated Fiber Placement robot.

Key benefits:

- Light weight composite structural part
- Shape adaptive tailored directional stiffness
- Automated digital manufacturing aligned with Industry 4.0
- Embedded ply-wise optical fibre sensors
- Smart life cycle monitoring

This composite hydrofoil is a generic representation of a 1:1 3D propeller blade, which is usually made of nickel-aluminium-bronze (NAB) alloy. However, compared to NAB, fibre-reinforced polymer composites in the hydrofoil structure provides many benefits including a significant reduction in weight by about 75% while ensuring structural strength and increasing fatigue life. This composite hydrofoil comprises of two parts - the 'core' made of glassfibre/ epoxy and the 'skin', which is carbon/epoxy prepreg (HTS45E23/E-752-LT at 35% resin content and 145 gsm) from Park Aerospace Corp. This prepreg was wrapped around the core using Automated Fibre Placement (AFP) technology. Here, fibre orientations were taken into design considerations. The precise control offered by AFP allowed for the introduction of tailored stiffness distribution and created a passive shape-adaptive structure, which can transform its shape according to the loads of the inflow and improves its overall efficiency. Together with those benefits, the application of advanced AFP technology ensured an efficient and accurate manufacturing process for complex 3D layups that contain various ply shapes with different fibre angles. Another innovative aspect of this composite hydrofoil is the integration of the optical fibres, which were embedded inside the hydrofoil during the manufacture.

These sensors were used for in-situ structural health monitoring (SHM) during the AFP layup process as well as to gather strain information during the structural testing of the post-cured section. This would increase maintenance efficiency and confidence in-service performance. In addition, feedbacks from in-line SHM quality assessment could assist in future optimisation and performance prediction, which in turn will further improve to a higher quality and more accurate layups as well as reducing waste through near net shape fabrication. Thus, it could be said that this development itself was aligned with Industry 4.0.

RAILWAY

Maglev train CFRP beam

Jiangsu Hengshen Co., Ltd. - China

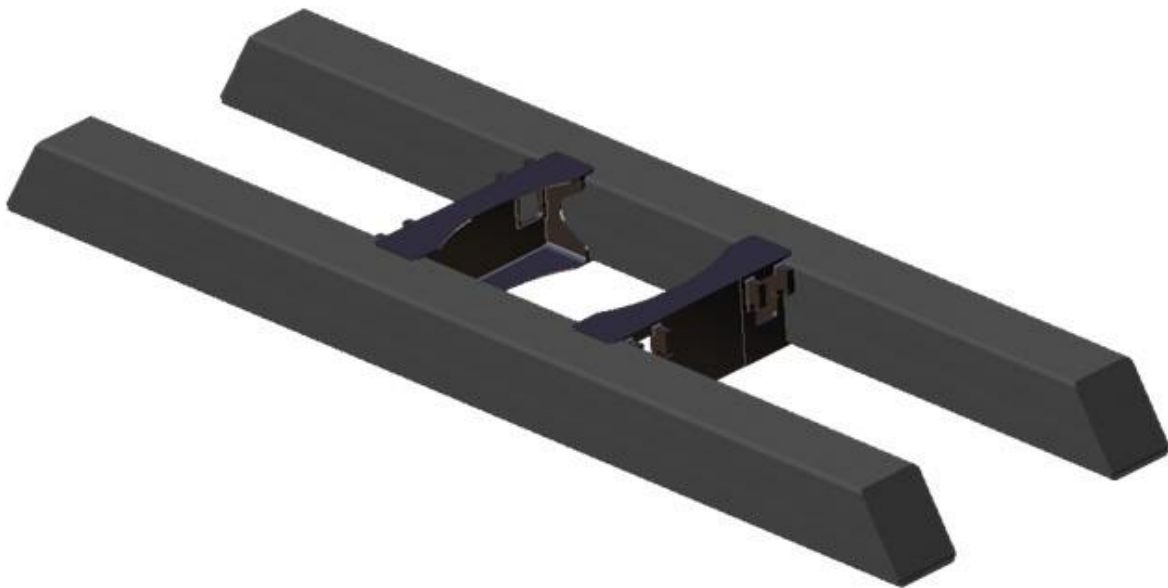
www.hscarbonfibre.com

Key benefits

- Flame retard
- Energy saving
- Excellent fatigue performance

For the first time, a composite material is used to manufacture the suspension frame beam to meet the flame retardant requirements of EN45545-2013 (HL2). Also, for the first time, the OOA process is used to prepare structural members such as suspension frame beams.

The CFRP beam has a total length of 3,550 mm and a width of 1000 mm. The application of the flame-retardant composite material makes the structure of the component lose weight by 32%. This bottom main bearing structure of the maglev train has an excellent fatigue performance. This part was prepared by OOA molding process and selected low-cost medium-temperature curing epoxy flame retardant material (EM119 series) independently developed by Hengshen. This material meets the flame-retardant requirements of EN45545 HL2 and meets the requirements for prohibited substances. It has been widely used in the field of rail transit.



RENEWABLE ENERGY

Smart Station

Flying To The Sun - Brazil

www.ergonprojetos.com.br

Associated Partners: Cogumelo (Brazil), ARMOR (France), Owens Corning (Korea)

The smart station is an innovative urban structure, off-grid stationary generator that provides shadow, clean energy, night lightening, connectivity and can be used for the IoT Commerce and MOOH.



Key benefits

- Dissemination/awareness about sustainability and generation of renewable energy.
- Use of recyclable resins, OPV, global IoT network, augmented reality and blockchain
- Innovative sustainable design; focus on economic and social development
- New Smart furniture concept for smart cities.
- App with innovative IoT e-commerce for sales of sustainable products

The Solar Tree uses Arkema's Elium recyclable resin, which has excellent structural characteristics and causes less impact to the environment. This is due to the fact the tree is styrene-free, recyclable, thermoformable and enables the manufacture of lighter parts, making it easier to process, store and transport. They promote high modulus, toughness and stiffness. The solar tree was developed with two types of manufacturing processes: - PULTRUDED. The stem is manufactured with pultruded profiles due to the needs of lightweight, bold design, high mechanical resistance in the support of the leaves, and precision of the rails in which the led strips are fitted. - INFUSION. The base and seat of the tree are made by infusion using also Elium resin. Two molds are made, one on each side of the leaf, which are then bonded by adhesives or by induction, and secured to the pultruded profile of the stem. The stems are then connected to the pultruded profiles, which are also fixed by adhesives or by induction at the base of the tree bench, formed by two parts (base and seat cover). It has been possible to innovative and to make a lightweight structure in composites with the use of a new technology: the OPV (organic photovoltaics film) weighing 200g per m², being extremely light and able to directly adhere to the leaves.

SMART COMPOSITES

Composites 4.0 – CFRP with wireless sensor systems

Daimler AG - Germany

www.daimler.com

Associated Partners: ARENA2036 [Active Research Environment for the Next generation of Automobiles] (Germany), Robert Bosch GmbH (Germany), Institute of Aircraft Design (IFB) at the University of Stuttgart (Germany), University of Applied Sciences Ravensburg-Weingarten (RWU) (Germany), ACE - Advanced Composite Engineering GmbH (Germany).



Composites with Intelligence on board: The presented CFRP-part is a completely autonomous system made from carbon fibers in a serial process with wireless power supply, sensors and data Transmission.

Key benefits

- Added value across the entire life-cycle. (Smart Composites as an IOT device.)
- Various functionalities with same sensor-system (e.g. Process-Monitoring, SHM).
- Increase of the cost-benefit-ratio of composites parts.
- Reduction of weight and complexity through functional integration.
- Implementation of the technology development directly in a series component.

The design and integration of the sensor system is based on the specific requirements of the Resin-Transfer-Moulding (RTM) process as an established manufacturing process for CFRP components as well as specific functional requirements of a sensor integrated component in automotive engineering. For this purpose, sensors were integrated into a fiber composite structure using the RTM method. In the RTM process, a resin system is injected into an inserted reinforcing fabric in a closed mould. The resin then cures under pressure and temperature to form the finished fiber-reinforced plastic component. This production process, which is suitable for series production, has been increasingly used in the automotive industry for several years.

One of the biggest challenges was the proper selection of electronic components: micro-controller, antennas, battery, sensors and loading coil. They must not exceed certain dimensions, otherwise spatial integration would not be possible. At the same time, they have to withstand the pressures and temperatures during production. A change in the manufacturing parameters towards lower values would have posed a risk to the quality of the component. Another innovative topic is the integration of sensors in the form of fibers, which are predestined for implementation in the textile semi-finished products of fiber-reinforced plastics due to their flexibility and shape. This approach enables sensor data use along the entire composite value chain. Data can already be captured during lay-up and preform. In the next step the component collects process data during infiltration and curing. In the usage phase, data can be collected, evaluated and sent again and new functions can be mapped from this. Even at the end of the life cycle, data is available for identification and monitoring of recycling process.

SPORTS & LEISURE

TORAYCA® Prepreg ET40 with Superior Formability

Toray Industries, Inc. - Japan

<http://www.torayca.com/en/index.html>

Associated Partners: Honma Golf Co., Ltd. (Japan), Suzuki Motor Corporation (Japan)



TORAYCA® Prepreg ET40 achieves superior levels of formability with complex shapes while keeping equivalent mechanical properties to conventional continuous fiber UD prepreg.

Key benefits

- Extensible and transformable
- Equivalent modulus and 80% strength of UD prepreg
- One-shot molding and quick cure
- Multiple rib formation from flat laminate in compression molding
- Excellent drapability similar to woven fabric used in preforming process

UD Prepreg, as it integrates unidirectionally aligned fibers with minimal amounts of resin, enhances the characteristics of carbon fiber's 'lightness, strength and resistance to rust'. However, when manufacturing complex shapes, UD Prepreg's limited formability can generate various defects such as wrinkling, void and resin rich areas due to the bridging of fiber at corners. One of the methods used to enhance formability is the use of woven fabric. The disadvantage of woven fabric is that its mechanical properties and surface flatness are inferior to those offered by UD Prepreg. Another technique is to use carbon fiber pellets in injection moulding and Sheet Molding Compounds. This last method is capable of manufacturing complex shapes such as sharp convex and concave forms.

Nevertheless, the fiber volume fraction of parts manufactured using this technique is lower than that of UD Prepreg and its mechanical properties are insufficient due to the use of pre-cut fibers. Extensible and Transformable TORAYCA® Prepreg ET40 has been developed to provide an innovative product that combines simultaneously high mechanical properties and excellent formability. It has the advantages of UD Prepreg without the usual trade-off between mechanical properties and formability.

TORAYCA® Prepreg ET40 is made by introducing slits into UD prepreg in a controlled manner, creating a type of unidirectional SMC material in which fiber bundles are regularly arrayed in the same direction. This method allows for the consistent and regular flow of the bundles during the molding process and therefore results in the ability to be shaped into complex shapes, such as rib and deep-drawing, while maintaining a homogenous laminate structure due to its extensible and transformable nature. As a result of specific slitting patterns, ET40 is able to achieve the equivalent surface appearance, modulus and over 80% of the strength of UD prepreg.

JEC Asia 2019 Awards Ceremony Highlights



About JEC Group

JEC Group is the world's leading company dedicated entirely to the development of information and business connections channels and platforms supporting the growth and promotion of the composite materials industry. Publisher of the JEC Composites Magazine - the industry's reference magazine, JEC Group drives global innovation programs and organizes several events in the world, including JEC World (the foremost and world-leading international exhibition dedicated to composite materials and their applications), which takes place every March in Paris.

www.jeccomposites.com