PRESS RELEASE

JEC GROUP ANNOUNCES THE 2014 WINNERS OF THE JEC ASIA INNOVATION AWARDS
Celebrating the use of innovation in composite materials
SINGAPORE SUNTEC CENTER - November 17, 2014

Eleven Awards in total
This year, during JEC Asia - Composites Show and Conferences (November 17-19, 2014), 8 companies and their partners will receive an award for their composites innovations in a ceremony on November 17. The winners broach a wide expanse of domains. They were selected from the following categories: Raw Materials, Prepegs, Process, Automotive, Storage, Sustainability, Recycling and Compression Molding.

Moreover, 2 Singaporean key players will receive an Academic Award and a Life-Achievement Award. The awards will be attributed respectively to Republic Polytechnic for its involvement in developing technical expertise for the composites industry and to Prof. T.E. TAY for his contribution of outstanding scientific significance to the field of composites over his whole career.

In addition, 1 student Award will support tomorrow’s Composites Innovator as it will put forward a student final paper on the Composites field.

“The composites market is booming in Asia representing in 2013 not less than 50% of the world production and the JEC Innovation Awards aim to highlight innovative companies and processes among all the stakeholders. This year, we are very proud of the quality of the Innovation Awards Competition applications for their richness and the complexity of the processes they present” said Mrs. Frédérique Mutel, JEC Group President and CEO.

The jury of composites experts has selected the best composite breakthroughs, based on their technical interest, market potential, partnerships, financial & environmental impact and originality. The decision to give prominence to these projects was based on their atypical nature and various noteworthy aspects.

The JEC Innovation Awards ceremony will highlight 11 innovators on stage
Including an Academic, a Life Achievement and a Student Award
On Monday 17 November at 4:00 pm
at JEC Asia Composites Show and Conferences (Suntec Center, Singapore).

The event has been reshaped into a brand new ceremony and will be open to medias, exhibitors and visitors.

The Innovation Awards Ceremony is sponsored by Aviation Week and JEC Composites Magazine

JEC is the largest composites industry organization in the world and the world with a network of 250,000 professionals. JEC represents, promotes and expands composites markets by providing global or local networking and information services. Through knowledge and networking, the JEC experts offer a comprehensive service package: the JEC publications – including strategic studies, technical books and the JEC Composites Magazine – the JEC Composites weekly international e-letter and the French e-letter JEC Info Composites. JEC also organizes JEC Europe Show in Paris – world and European leader, strongly supported by the industry and four times bigger than any other composites exhibition – JEC Asia in Singapore and JEC Americas in Atlanta and in Boston, the www.jeccomposites.com website, the JEC Composites Conferences, Forums and Workshops (including I.C.S., the Innovative Composites Summit) in Paris, Singapore and Boston, and the JEC Innovation Awards program (Europe, Asia, America, India and China).

The composite industry employs 550,000 professionals worldwide and generates 90 billion Euros worth of business in 2013.

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Category: Raw Materials

Winner: UHT Unitech Co., Ltd (Taiwan)

Name of Product or Process: High-Modulus PAN-based Carbon Fiber

Description:

UHT’s project is to transform general PAN-based carbon fiber into high-modulus carbon fiber. This solution provides a more efficient and convenient access to intermediate-modulus (IM) and high-modulus (HM) carbon fibers, without considering precursor quality and huge investments in a facility for the whole production line. With a patented ultra-heating technology – microwave heating, combined with resizing and a re-winding technique – a new graphitization system was built.

The system focuses electromagnetic energy inside the carbon fibers and generates a huge amount of heat in a few seconds. This innovation has multiple advantages such as a 70% reduction in energy consumption, applicability to all types of PAN carbon fibers, availability of a sizing alternation, and being an environmentally friendly process.

So far, IM or HM carbon fiber products have been very expensive and well-controlled materials. This project eliminates most front investments such as precursors, oxidation and carbonization systems, along with higher energy efficiency, enabling many new types of IM and HM carbon fiber to be created at lower cost. For example, it is now possible to upgrade products like the Toray T700 grade (to an IM-grade fiber like T800, called U30S in UHT’s system (strength: 5,300 MPa, modulus: 295 GPa) with stable quality and around 15 to 30% cost reduction.

UHT began to work on this innovation in 2011, and has now successfully built a new IM CF product line with a 300 tons/year production capacity in Zhongli, Taiwan. More than 10 international patents have been set up. The next generation of PAN carbon fiber products with high and ultrahigh modulus is expected to be launched ahead of 2015 with a production capacity of 1000 tons/year. Many potential applications are possible, for instance in aeronautics, wind blades, vessels, construction, etc.
Category: Prepregs

Winner: Gurit (UK)

Name of Product or Process: Innovative Long-Shelf-Life Prepreg Systems

Description:

Pre-impregnated composite fibers containing a pre-catalysed epoxy resin system require cold storage to prevent a staging reaction from occurring before use. This staging reaction is accelerated with elevated temperatures, which can be problematic in countries with warmer climates.

Gurit has developed a range of solvent-free prepreg technologies with significantly extended storage shelf lives.

Gurit’s long-shelf-life prepreg chemistry allows prepregs to be produced with a life span of up to 2 months when stored at an elevated temperature of 35°C, and greater than 6 months at 21°C, depending on the system. Gurit achieved this by using advanced catalyst chemistry to provide increased stability at storage temperatures, yet remain reactive at temperatures of 85°C and above, allowing fast curing of components.

This allows users to replace their current prepregs with a long-shelf-life version generating savings in their storage requirements, simplifying their inventory management and without changing their curing cycle or finished material properties.

The Product Development department initially focused on improving the latency of the catalysts used to cure epoxy prepregs. The challenge was to significantly increase the latency at ambient temperatures without reducing the reactivity at the higher temperature used for curing.

Once the core chemistry was developed, Gurit proceeded to formulate this into a range of prepregs for different applications. Initially, three different prepregs were developed: one for industrial applications (wind turbine blades), one for low-temperature component manufacture (marine race yachts), and one for high-performance autoclave parts (marine masts and spars). During this development, the project team optimised the formulations to ensure that mechanical and thermal properties were maintained. The teams then ensured that these new systems could be manufactured on a production scale. Once this work was completed, production samples were manufactured for beta testing with selected customers.
Category: Process
Winner: Dongsung Chemical Co., Ltd (Republic of Korea)
Name of Product or Process: High Cycle Speed Molding Method

Description:

The innovation is a molding method that can produce thermoplastic/carbon fiber composite sheets with a high cycle speed (within 2 minutes). Typical thermoplastic resins have difficulties in penetrating the carbon fiber sheet due to their high viscosity. When the thermoplastic is pressed on the carbon fiber mat with high viscosity, the void space causes a loss in mechanical properties. Additionally, it is difficult to produce a uniform thermoplastic/carbon fiber composite as a continuous product.

The following issues were considered important when developing the TPU and PA thermoplastic/carbon fiber composite sheets: control of the interfacial treatment of the carbon fiber and thermoplastic resin, the temperature and process used to make the sheet, and finally the inter-diffusion phenomena between the carbon fiber and the thermoplastic resin. This new process can produce uniform CF composite sheets without a void space and is an effective method for the mass production of thermoplastic/carbon fiber composites. To make it possible to commercialize these products for automotive applications and other markets, the process needs to possess a high cycle speed for the press molding. Automotive customers need to produce carbon fiber composites within one minute. To answer this need, a high-frequency (HF) press molding technology was developed for use with this thermoplastic sheet, and it has been a success. The cycle time is one minute, including press molding and demolding.

For the past few years, the need to be responsible and eco-friendly has emerged as an important factor. Weight saving is one of the methods used to reduce gas consumption. The low weight and high performance advantages of carbon fiber-reinforced composite materials come into play here. In addition, reprocessing and recycling are possible through the use of thermoplastic resins instead of thermoset resins. The commercialization stage will start within a year or two, after more research and development.
Category: Automotive

Winner: KC Tech (Republic of Korea)

Partners: Advanced Manufacturing Research Centre with Boeing (UK), SsangYong Motor Co., Ltd. (Republic of Korea)

Name of Product or Process:
Microwave Curing of a CFRP Acoustic Cover for Automotive Applications

Description:

Economic and environmental drivers have forced the composite manufacturing industry to consider moving away from traditional oven or autoclave curing, which has high energy costs and long cycle times that are not suitable for large production. Microwave curing is a technology that offers improved cycle times and reduced energy consumption. Microwave processing does not involve convection heating of the surfaces as microwave energy penetrates directly into the material.

Therefore, heat is distributed evenly, even within thick materials, in a short time. It has been shown that cycle times can be reduced by 50% or more compared to autoclave molding.

An engine acoustic cover incorporating complex surface details uncommon in typical carbon aerospace components has been successfully manufactured using microwave curing. The process demonstrated a reduction of curing time and energy consumption up to 30% compared to traditional convection heating techniques, with further gains expected after additional research and optimization. Refinements were made to the layup, bagging, shielding of fibers and consumable arrangements, which resulted in the final component exhibiting properties equal to an equivalent oven-cured one. Curing the engine acoustic cover by microwave is one of the most difficult tasks in the manufacturing process since the shape of the cover is quite complex.

The engine acoustic cover protects the engine and helps provide thermal and acoustic insulation while driving. Lightweight carbon fiber reinforced composite materials demonstrated excellent thermal resistance, noise and vibration absorption, weight saving and durability under high temperatures. These features will make them more attractive to the automotive markets.
Category: Storage

Winner: German Aerospace Center - DLR (Germany)

Partners: Helmholtz Association (Germany)

Name of Product or Process: Innovative Composite Winding Technology for CNG Storage in the Automotive Industry

Description:

In the automotive industry, natural gas is currently stored as CNG (Compressed Natural Gas) in cylindrical high-pressure tanks. In order to increase the range of vehicles, the available design space needs to be used more efficiently. The modular, shape adaptable, cellular high-pressure storage tank “CNG-DLR-Wabentank” shows the potential for increasing the range of CNG vehicles while reducing CO₂ emissions compared to diesel or petrol vehicles.

The innovation presented here uses an innovative composite winding technology (polar winding of non-rotationally symmetric cells and 3D-winding) to produce the first ever fully manufactured modular and free shapeable high-pressure vessel, offering 30% more available volume.

This patented tank concept creates the possibility of new space utilization with minimal weight gain due to the intensive use of optimally placed reinforcing fibers. Thin aluminium liners are overwound individually, connected to each other with a novel high-pressure joining concept and finally wound using an innovative robot-assisted 3D-winding procedure. CNG vessels (operating pressure of 200-250 bar) no longer have to be built as rotationally symmetrical cylinders. The manufacturing process will be validated by November 2014 and the functional capability will be demonstrated by testing the first shape-adaptable gas vessel by January 2015.

Possible license holders could be car manufacturers, automotive suppliers, or companies working in the CNG tank industry and wishing to expand their business. The market potential is immense: new manufacturing processes open the door to new composite solutions, moreover, a new space-efficient high-pressure vessel is a major competitor for standard vessels.
**Category:** Sustainability  
**Winner:** Lavender Composites (Australia)  
**Partners:** Archer Cork Skateboards (Australia), Amorim (France), Sicomin (France), Bcomp® (Switzerland)  
**Name of Product or Process:** Cork Composite Skateboard  
**Description:**

Lavender Composites supplied materials and knowledge to Archer Cork Skateboards to assist them in the research, development and production of a vibration-reducing cork composite skateboard. Traditionally, skateboards have always been made of wood or carbon composites, but Archer decided to use Amorim’s CoreCork, reinforce it with Bcomp’s Amplitex flax fabrics, and infuse it with Sicomin’s GreenPoxy.

The result is a laminate that displays a high level of vibration reduction and improved performance without the use of any traditional materials, proving there is a sustainable option that does not sacrifice performance.

The process started out with traditional hand-laid wood laminates, examining what the main performance issues were. The first and main issue was the “feel” of the ride, and how the vibrations could be suppressed. The initial test consisted in adding cork “spacers” between the deck and the “trucks”. This worked as a temporary solution for existing wooden boards, paving the way to attempt an improvement by creating the whole board from cork. The next step was to find a matrix that would perform well, but could be infused so to keep the VOC content to a minimum. The GreenPoxy was chosen as it displays one of the highest contents of bio-based ingredients.

Skateboarding is a worldwide, multimillion-dollar industry, but it is the laminate that holds the key to success. If the new product can replace even a small percentage of currently manufactured boards, the potential is promising.
Category: Recycling

Winner: FRP Recycling Center, JRPS (Japan)

Partners: Japan Fuji Recycle Center (Japan), Goko Butsuryu Co., Ltd. (Japan), Sumitomo Osaka Cement Co., Ltd. (Japan)

Name of Product or Process: Waste FRP Recycling

Description:

Fiber-reinforced plastics (FRP) are widely used in daily necessities such as bathtubs, bath units, industrial pipes, septic tanks and fishing ships. These materials have a high commercial value with excellent durability in the field, but were believed to be difficult to recycle. Since 1999, the JRPS (Japan Reinforced Plastics Society) and Clean Japan Center have been repeatedly setting up experiments in order to make data available for the Cement Kiln Process (recycling of glass fiber composites through co-processing). These were conducted as a commissioned NEDO grant project entitled: “Waste reinforced plastic product recycling demonstration system research”.

The extensive experiments proceeded smoothly; in 2002, the machinery and equipment used for these studies were transferred to industrial waste disposal contractors in the private sector. The FRP Recycling Center was able to launch the recycling business of waste FRP products according to the required emission level (7,200 tons/year).

**Currently, more than 5 million tons are recycled by thermal recycling each year in Japan. This also includes material recycling, thus more than 80% of the production volume has been effectively utilized.** In addition, the FRP Recycling Center expects that companies involved in the recycling business have expanded their business, and will extend more and more in the future. The ultimate goal is to transfer the technology to many other countries, thus spreading the practice.
Category: Compression Molding

Winner: HOPE Technik (Singapore)

Name of Product or Process: Ultra-Thin Sheet Molding Compound Application

Description:

HOPE Technik is a privately-owned Singapore-registered engineering company that provides complete engineering solutions to clients demanding high performance unique solutions. The company’s expertise goes from product conceptualization to prototype development and mass production. A dedicated team of qualified engineers and technical staff equipped with in-house design, prototyping and production equipment answers to the clients’ requirements to set up high quality solutions with a quick turn-around time.

Established in 2006, HOPE Technik focuses on providing solutions for high performance industries. They initially focused on motorsports engineering, but demand for robotics increased and the company changed direction. It is located in a quiet industrial estate in Singapore, in a 3 story factory, allocated particularly to engineering cells for various projects, test cells for engines, fabrication areas and design offices. Its composites division includes in-house facilities for mold construction to parts construction in pre-impregnated carbon or aramid fiber with various core materials, in order to meet the most stringent weight, strength and stiffness requirements.

Recently (February 2014) HOPE Technik took part in the Singapore Airshow to test its “space plane”. HOPE Technik had previously signed a deal with Airbus Defence and Space at the 2012 Singapore Airshow. The manufacturing of SMC is a continuous in-line process.

A Sheet Molding Compound (SMC) is a ready to mold glass fiber reinforced thermoset material used mostly in compression molding.

It is particularly interesting for automotive applications thanks to its superior mechanical properties for parts such as panels and seat backs as well as the generally replacing traditionally metal parts. Other applications cover parts as varied as shower stalls, bathware, and fire helmets, etc.
**Category:** Academic

**Winner:** Republic Polytechnic

**Name of Product or Process:** Tapping into the Potential of Composite Materials for the Future at Republic Polytechnic

**Description:**

Republic Polytechnic has introduced a Specialist Diploma in Advanced Composites (SDAC) as a continuous education and training course, the first of its kind among Singapore’s institutes of higher learning. Targeted at developing technical expertise for the composites industry, the course has received support from organisations such as DSO National Laboratories, ST Kinetics and Rolls Royce, which have sponsored the full course fees for their staff participants.

To explore the potential of composites, RP has developed strong capabilities in advanced composite materials design, manufacturing and characterization through the setup of laboratories. RP students and Future Cities Laboratories researchers are jointly developing bamboo composites with high tensile strength and durability comparable to steel. Furthermore, lecturers from the School of Engineering and the School of Applied Science are working with the researchers from the Newcastle University International Singapore to develop techniques for in-situ healing of damaged composites aero-structures.

In order to deepen partnerships between industry, business and educational sectors on advanced composites materials, the New Materials Technology Centre (NMTC) organised an Industry Forum on September 5th 2014 at Republic Polytechnic. 125 participants from 55 organizations benefitted from industry talks and a panel discussion comprising four keynote speakers from Newcastle University, Composite Cluster Singapore (CCS), 3M Corporate Research Lab, Nanyang Technological University and the National University of Singapore.
Category: Life Achievement Award

Winner: Tong-Earn Tay, Head of the Department of Mechanical Engineering at NUS (Singapore)

T.E. (Tong-Earn) Tay is a Professor and Head of the Department of Mechanical Engineering, National University of Singapore. He is the founding Director of the Centre for Aerospace Engineering at the department.

Previously, he was Vice-Dean for Research at the Faculty of Engineering. Prof. Tay obtained his Bachelors of Engineering (First Class) and PhD in Solid Mechanics from the University of Melbourne, Australia.

He is an Associate Editor for the Journal of Reinforced Plastics & Composites, and serves on the editorial boards of the Journal of Composite Materials, International Journal of Damage Mechanics and Applied Composite Materials. He has also served on a number of scientific advisory committees of international conferences on composites and reviewed articles for 18 journals.

His current research interests are in progressive damage, failure, fracture, impact and computational analysis of composite materials and structures, and multi-scale modeling and molecular mechanics of polymers and composites. He is the author or co-author of more than 90 international journal papers and 170 conference and seminar presentations. Over the years, he has obtained significant research funding from agencies and industry, including Airbus, Boeing, Vestas, Air Force Office of Scientific Research, A-Star SERC, Defense Science Organization, Marine Port Authority and Ministry of Education. He has graduated 12 PhD students, 20 Masters students, 15 postdoctoral research fellows and 6 research engineers to date. In the university, he currently teaches a course on Aircraft Structures, but he has also taught Mechanics of Composite Materials to students and engineers locally and abroad. Prof Tay is also a registered professional engineer.
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