PRESS RELEASE

January 19th 2010

JEC INNOVATION AWARDS PROGRAMME 2010
11 COMPANIES REWARDED FOR THEIR COMPOSITE INNOVATIONS

JEC Composites is announcing the new winners of the JEC Innovation Awards Programme 2010. This year, 11 companies and their partners will receive awards at the JEC Composites Show (April 13-15, 2010). The programme was created in 1998 with the goal of promoting innovation. Each year, a jury of renowned international experts chooses the best composite innovations, based on their technical interest, market potential, partnership, financial impact and originality. This year, the winners were selected from the following categories: Environment & Recycling, Bio-based Materials, Aeronautics, Building & Construction, Sports and Leisure, Transportation, Wind Energy, Raw Materials, Process and Automation. The decision to give prominence to these projects was based on their atypical nature and various noteworthy aspects. Read through the trade description to discover the eleven winners. The 2010 JEC Awards ceremony will take place on Tuesday April 13th at 5:00 pm on the JEC Show and will be open to all visitors.

The 2010 Innovation Awards competition is supported actively by UMECO Composites (Official Partner) and Huntsman Advanced Materials (Platinum sponsor).

This year stands out for the increase in the number of applications and by their distribution. Participation is worldwide, with applications from 22 different countries in Europe, South Africa, North and South America, and the Asia-Pacific region.
Categories tend to be cyclical over several years. There is an increase in Sports and Leisure. Automation in aeronautics is a confirmed trend, and so is the determination to eliminate the use of autoclaves to increase throughput and guarantee production reproducibility.

The integration of composites in the building and construction industry is becoming established. This means that works designers and architects are really using composites as full-fledged materials, in conjunction with traditional materials like concrete, steel and wood. Sustainable development considerations are here to stay, as seen in the choice of renewable raw materials for reinforcement fibres and matrix resins and the concern with materials recycling, e.g. by reutilizing them for the same or a similar application. This will become more of a trend with the increased use of thermoplastic composites.

Category: Environment & Recycling
Cutting edge possibilities with sustainable and intelligent materials

Winner: 3XN architects (DK)
Core partners: StageOne Freeform Composite (UK); COWI A/S (DK)
Other partners: Ashland Inc. (US); Amorim Cork Composites (PT); BASF (DE); Libeco-Lagae (BE); Flex Cell (CH); Phillips (DK); Scenetek (DK); 3M A/S (DK); Noliac Motion (DK); Optima Projects Limited (UK); NetComposites Ldt (UK); Danish Technological Institute (DK); Risø National Laboratory DTU (DK), NANO-X GmbH (DE).

This demonstration part was built for an exhibition on display during the United Nations Climate Conference in December. The vision of the project has been to create **an energy-self-sufficient sustainable pavillion** using bio-based materials that can both belong to and decompose in the biological cycle after use.

The result illustrates just how far bio-composites have come in an Architectural application based on commercially available components. The composite is a sandwich laminate with biological and reusable materials. The outer shell uses a bio-composite from **flax fibres** (Libeco Lagae) cast in resin based on **soybean oil and cornstarch** (Ashland). The inner core is made of sheets of **cork** (from Amorim). The gelcoat is covered by a two **nanoproducts** that breaks down pollution particles from the air and rain using sunlight, and gives the surface self-cleaning properties (Nano-X).´The pavilion contains an integrated LED lighting system (from Phillips) powered by piezoelectric actuators (Nolilac Motion) in the floor and bendable solar panels on the roof (from Flexcell).

The objective was to show that **Green Architecture** can be dynamic and active.

The main value is that the project offers new answers to environmental concerns often raised when using polyester, epoxy, glass fibres, etc. There is a growing need for the composite industry to find answers to energy consumption during production and to the recycling process. For end users, the product offers **an environmentally-friendly solution at a price comparable to other composite sandwich structures.**

The development phase literally started in March 2009 at last year's JEC show where the project found several motivated and innovative partners. The innovation can be seen today at the Louisiana Museum of Modern Art north of Copenhagen, where more than 200,000 visitors have already seen the project and numerous kids have played on it.

Other finalists in the Environment and Recycling category:

- ECO-TITAN™ composite concrete pole technology, presented by **CMT Worldwide, LLC (USA)** with its partner OCV Reinforcements (USA).
- Single-process recycling of fibre-reinforced thermoplastics, presented by **MBM Maschinenbau Mühldorf GmbH (Germany)** with its partner OCV Reinforcements (Germany).

Category: Bio-based Materials
Flax yarn-based prepreg for vibration damping in sport applications

Winner: Lineo (Belgium)
Partners: Artengo / Decathlon (Oxylane group) (France); Huntsman Advanced Materials (Switzerland); LRPMN d'Alencon (Laboratoire de Recherche sur les Propriétés des Matériaux Nouveaux) (France)

The ultimate technical goal was to combine the damping properties of flax with the well-known performance of carbon fibre. Lineo not only developed a flax-based commercial prepreg but also **a unique yarn treatment and impregnation process overcoming the technological barrier imposed by flax properties.**

This allows the preparation and impregnation (compatibilization) of flax fibres with epoxy resin on an industrial scale. **It demonstrates the possibility to incorporate renewable materials in composite parts without compromising mechanical performance.** Flax fibres can now be considered as a genuine reinforcement fibre, to be used alone or with conventional fibres (carbon, glass, aramid, basalt), providing high damping properties and flame retardancy to composite structures.

Other applications are already in development: Bike frames with higher comfort due to the damping properties of flax fibres, mass transportation where, in addition to damping, flax fibres offer valuable flame resistance properties. Other composite applications include boatbuilding, design, luggage, automotive.

Other finalists in the Bio-based Materials category:

- Resin, gel coat and foam core made of castor oil, presented by **Bioresin Ltd. (Brazil)** with its partners University of Southampton (UK); Grupo Morelate (Brazil); BI 3 escola de iatismo (Brazil).
- a 55% bio-based resin for SMC and BMC applications, presented by **DSM Composite Resins (NL)** with its partners VDL Wientjes Emmen (NL); VelopA-Citystyle (NL).
- Semi-finished products containing long flax fibres, presented by **Groupe Depestele (France)** with its partners CNRS Délégation Normandie - LOMC FRE 3201/ CNRT Matériaux (France); Omnium Composites Industriels (France); Grand Largue Composites (France).
- Kenaf natural fibre mat to replace glass fibre mats in exterior automotive parts such as bumpers and fenders, presented by **Harusmas Agro Sdn. Bhd. (Malaysia)** with its partner Universiti Malaysia Sabah.

Category: Aeronautics
First welded thermoplastic composite Aircraft primary structure in series production

Winner: Fokker Aerostructures (NL)
Partners: Gulfstream (USA), KVE Composites Group (NL), Ten Cate (NL) and Ticona GmbH (Germany)

With a 4-m-long rudder and 6-m-long elevators, Fokker Aerostructures introduces the first induction-welded carbon/PPS thermoplastic composite-based primary structure aircraft control surfaces in series production for the new Gulfstream 650 business jet.

The lightweight design is achieved through the use of a post-buckled multi rib composite structure with thin skins and a tough carbon/PPS material.

Normally, a multirib structure would result in high assembly costs. This is not the case here, due to the use of welding as the main assembly technology. Press-formed ribs and two spars are welded to the left-hand and right-hand skins with a robotized induction welding process. Special tooling and tooling materials ensure that the melt area is limited to the weld interface. **Compared to resistance welding, induction welding offers a lower weight and cost design.**

The first full-size products were welded in October 2008. **In the summer of 2009, the first series production parts were integrated into the first Gulfstream G650 tail.**

The market potential for the innovation is wide, with applications that include control surfaces such as rudders, elevators, ailerons, and spoilers for a large range of aircraft. Other welded assemblies such as stiffened fuselage panels or wing leading and trailing edges are also feasible with this technology and currently being researched.

Other finalists in the Aeronautics category:

- A press-formed RTM, single-piece spar with 10-m span and max. height of 1 m assembled within the ALCAS lateral wingbox presented by **Airbus Operations Ltd. (UK)** with its partner Saertex Stade GmbH & Co. KG (Germany) and ALCAS Project (FP6 EU-funded project).
- An Epsilon™ benzoxazine prepreg resin and film adhesive for Airbus A380 Auxiliary **Power Unit** (APU) housing presented by **Henkel Corporation (USA)** with its partners Toho Tenax (Germany) and ITD (Spain).

Category: Building & Construction
Intelligent composite "seismic wallpaper"

Winner: D'Appolonia S.p.A. (Italy)
Partners: Sächsisches Textilforschungsinstitut e.V. (Germany); APC Composit AB (Switzerland); Karl Mayer Malimo Textilmaschinenfabrik GmbH (Germany) and several associations, laboratories and end-users in Europe (30 partners in the project).

This Intelligent composite "seismic wallpaper" is used for the reinforcement, strengthening, monitoring and management of civil infrastructure vulnerable to earthquakes. The project team redoubled their efforts following the L'Aquila earthquake (Spring 2009, with 15,000 houses destroyed).

Large textile machines were adapted to allow warp-knitting of fibre-optic cables into multiaxial fabrics. The textile fibre material type, orientation and density were optimised for the large forces and complex material behaviour associated with civil infrastructure, masonry, and earthquakes. **Multiaxial textile structures** are superior in this regard. The textile was then coated for durability and to enhance the textile-mortar bond interface. The specific nanoparticle-enhanced polymer coatings for the innovation were produced by the team members. The textiles were then applied to a structure using a mortar compound. This mortar compound was also enhanced by nanoparticle polymer additives.
The composite seismic wallpaper is intended as a full-coverage or wide-area reinforcing solution for unreinforced masonry buildings and structures. **The solution is simple, cost effective and easy to apply.** When applied as a full-coverage solution and tested in large-scale laboratories that conduct national standardisation testing for Germany, this solution provided **over 200% increases in structural strength (max. load) and over 200% increases in structural ductility** (max. deformation). Walls vulnerable to brittle behaviour and collapse were being held together even after they cracked. **This composite features embedded sensors** so that measurements can be taken before, during, and after seismic events. These measurements can be static or dynamic (high frequency). Engineers utilize such data to control new construction, to assess and quantify the benefit of retrofit actions, and to help manage the structure over time.

Other finalists in the Building & Construction category:

- A modular CFRP bridge that can be used for military purposes or civil protection, presented by **Invent GmbH (Germany)** with its partners Wehrtechnische Dienststelle für Pionier- und Truppengeräte (Germany) BWB (the Federal Office of Defense Technology and Procurement); Röhm Evonik GmbH; C. Cramer GmbH & Co. KG (Germany).
- A low-intrusion technique for strengthening timber structures in reconstruction, presented by **Mainz University of Applied Sciences (Germany)** with its partners Bauhaus-University of Weimar (Germany); Bennert GmbH, Betrieb für Bauwerkssicherung (Germany); S&P Clever Reinforcement GmbH. (Germany).
- The Bridge-in-a-Backpack™, presented by **the University of Maine's Advanced Structures and Composites Center (AEWC)** with its partners Advanced Infrastructure Technologies (USA); US Army Natick Soldier RD&E Center; A&P Technologies.

Category: Sports and Leisure
Carbon wheel for the road bicycle market

Winner: Corima S.A. (France)
Partners: Hexcel Composites (France); Evonik (Germany)

This CORIMA AERO+ MCC is a 100%-carbon wheel produced using a complete composite process. The rim is made of UD and taffetas carbon prepreg fibres (Hexcel) wrapped on a Rohacell foam (Evonik). The hub is partly made of prepreg carbon fibres and the spokes are totally made of carbon prepreg fibres. Some parts are overmoulded and others are adhesive bonded with a structural epoxy adhesive (3M). A very high performance wheel is thus produced offering:

- Low weight: **Only 1,000 g** for a pair of wheels! The low density of carbon fibre is a significant advantage;
- Inertia: The thickness of the carbon prepreg ensures **a very accurate weight distribution** and a very light rim, providing very good inertia in rotation;
- Stiffness: **A very high stiffness** is achieved vs. the performance of the wheel, the UD carbon prepreg used for the spokes gives incredible value, making it possible to use only 12 spokes;
- Aerodynamics: **Good aerodynamics,** the full composite solution developed for the rim and spokes provides a specific profile (conical spoke).
- Design: **A unique design**, the completely assembled wheel has exceptional aesthetics and the process provides high-performance parts with an excellent cosmetic aspect. The specific design using 12 spokes only for the front and 12 spokes only for the rear makes it a unique wheel.

The project started with a market survey. Customer expectations and a brainstorming by the sales and research staff served as a basis to establish the project goals and schedule. Despite the use of CAD software, more than 60 prototypes were built before finalizing the wheel design. Several in-house tests (on machines) and road tests with "test" riders were carried out to improve the wheel details.

The AERO+ MCC wheel was launched at Bicycle Shows in Germany, Paris, Milan, Spain, London and Copenhagen in September and at the Korean and Japanese Bike Shows in November. It will also be introduced at the Taipei Show in March 2010.

Other finalists in the Sports and Leisure category:

- A fishing rod using the 3M Matrix Resin, presented by **3M Company (USA)** with its partner G. Loomis, Inc. (USA).
- A mountain spring tibia support, presented by **AlpControl (France)** with its partner Sotira (France)
- Composite riggings for race sailing boats, presented by **Carbo-Link (Switzerland)** with its partners Team Alinghi SA (Switzerland); Huntsman Advanced Materials (GmbH) Switzerland; EMPA (Switzerland) (mechanical characterization).
- Samsonite Cosmolite suitcases using Curv® technology, presented by **Samsonite Europe N.V. (Belgium)** with its partners Katholieke Universiteit Leuven (Department of Metallurgy and Materials Engineering); Propex Fabrics GmbH (Germany).

Category: Transportation
High-performance LFT PP pallet

Winner: Lomold Pty Ltd. (South Africa)
Partners: Chuan Lih Fa Machinery Works Co. Ltd. (Taiwan); KHS Consulting cc (South Africa); Addcomp Holland BV (NL)

Lomold developed a new Long Fibre Thermoplastic (LFT) manufacturing process. The patented innovation achieves very long fibres in a very large and complex 3D product moulded through one gate (sprue). The resulting fibre length exceeds 20 mm (up to 50 mm). **Consequently, very high mechanical properties are achieved and very strong, thin-walled lightweight designs are possible.**

Lomold's high-performance LFT PP pallet shows a truly unique racking performance (no creep under high loading).

- Very high mechanical properties;
- Complex designs possible while keeping long fibres;
- Very high performance LFT products with unmatched properties;
- Due to the closed-mould manufacturing system, very complex 3D designs are possible;
- Moisture-sensitive polymers can be processed without any problem.

The development was carried out in-house by a team of engineers over a period of 10 years. The technology is now patented worldwide. Several years ago, an exclusive cooperation with CLF in Taiwan resulted in the development of the Lomolder, with several machines (different sizes) having been built already.
Currently, Lomold is building two manufacturing facilities to produce the Lomold pallet, one in China and one in South-Africa. Other manufacturing plants are planned in Australia, the USA and Europe.

Other finalists in the Transportation category:

- A new modular product which uses different panels to replace a traditional monocoque car body construction technique, presented by **Icolfibra** (Colombia) with its partners Pontifical Bolivarian University (Colombia) and Colciencias (Colombia).
- A full CFRP monocoque construction for a commercial vehicle trailer, presented by **TTT The Team Composite AG (Germany)** with its partners Zoltek Zrt (Hungary); Sika Deutschland GmbH; IFAM Fraunhofer Institute Bremen; FRIMO Group GmbH; Horst Witte Geraetebau Barskamp KG; ReKnow Dirk Janssen und Sebastian Schneider GbR; PRETECH Predictive Design Technologies GmbH (Germany).
- A low-cost, mass-produced carbon-carbon composite for use as a clutch disc in high-performance automobiles and race cars, presented by **Wellman Products Group (USA)** with its partners Koppers Inc. (USA); Asbury Carbons (USA); A&P Technology, Inc.; Toray Carbon Fibers America, Inc.; SPEC Clutch (USA).

Category: Wind Energy
Wind turbine made of 100% natural materials

Winner: LTP (France)
Partners: Groupe Depestele - Teillage Vandecandelaère (France); ACT ENER (France); Université Le Havre (Laboratoire Ondes et Milieux Complexes)

This wind turbine size **can feed public lighting systems**. The goal is to supply natural energy with a clean system.

This wind turbine's configuration makes it possible to produce energy in a very restricted volume and dimensions. Its safety control system allows it to operate even with strong winds. It uses a patented ACTENER technology.

The material combines flax fabrics with a PLA matrix, so it is **100% biodegradable.**

The blades and their support were designed and manufactured using the "sheet composite workshop" process especially developed by La Tôlerie Plastique as part of a research project between three partners: LTP, SEINARI and the University of Le Havre. The project was financed by OSEO. The sheet-composite workshop technology consists in a CNC machining and fabrication process that uses assembly and machining techniques borrowed from the sheet-metal-fabrication and (wood) cabinet-making industries.

Composite materials provide the mechanical characteristics required for the wind turbine operation as well as the lightness needed to reach the efficiency objectives.

Furthermore, the 100% natural composition fits with the cultural environment associated with renewable energy production. This small wind turbine is **easy to install and to use**, making it **suitable for a wide range of users, including city halls, local governments, private individuals and companies**.

Other finalists in the Wind Energy category:

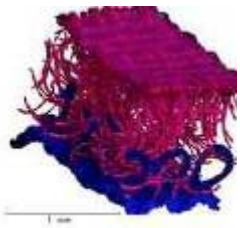
- The first wind turbine blades made with thermoplastic composites, presented by **OCV™ Reinforcement (France)** with its partner EireComposites Teo (Ireland).
- An epoxy-compatible reactive hot-melt, self-adhesive, functionalized non-crimp SAERfix fabrics to fix textile even in complex-shaped mould, presented by **SAERTEX GmbH & Co. KG (Germany)** with its partner PN Rotor GmbH (Germany).

Category: Raw Materials
Han-3D-Fabrics and Han-3D-Composites. New type of fabrics to avoid the problem of delamination and lack of resistance in general adhesives

Winner: Advanced Fiber Materials Technologies Co., Ltd. China
Partners: OCV Reinforcements (China); Shandong Shuangyi Group Co., Ltd. (China)


Figure2. Fiberglass Han-3D-Fabric

Han-3D-Fabrics are a new international patent-pending approach from Advanced Fiber Materials Technologies, Co., Ltd. that uses Velcro (hook-and-loop fasteners) on both sides of fibre sheets to produce 3D composites with increased interlaminate strength.



They do not disturb the 2D laying processes of today's main composite production technologies. The hook-and-loop fabrics can be made of any fibres such as carbon fibre, glass fibre and Kevlar fibre, using proprietary technologies.

Test results and theoretical analyses show that Han-3D-Composites **can increase interlaminate strength by 50%-100%, compression strength by more than 20%, impact strength by about 20% and lay-up efficiency by 40%.**

Han-3D-Fabrics can also significantly increase the fatigue strength, bolt hole strength, bonding/connection strength and quality of composites, while greatly increasing the efficiency and consistency of the lay-up process by enabling automation due to the easy handling of hook-and-loop fabrics.

Hook-and-loop 3D fabrics are cost competitive with the 2D laminate composites currently available in the market. They can be used in the energy, aerospace, automotive, chemical and construction industries.

The development of Han-3D-Fabrics is completed and they have been launched in China and the USA. Shandong Shuangyi Group Co., Ltd. uses the low-cost 3D fabrics to make wind-turbine nacelle covers and other products.

It is estimated that 10% to 25% of all composite products in the world can be made using this new 3D technology.

Other finalists in the Raw Materials category:

- Construction panels using the SwissCell honeycomb technology and Kleiberit adhesives, presented by **Klebchemie m.G. Becker GmbH & Co. KG (Germany)** with its partner The Wall AG (Germany).
- New material with auxetic properties for core applications and the corresponding production process, presented by **Chismatech srl (Italy).**
- A one-step production of hollow hat profiles based on continuous fibre-reinforced thermoplastic the CBT® matrix, presented by **Institut für Verbundwerkstoffe GmbH (Germany)** with its partner Xperion Aerospace GmbH (Germany).

Category: Process
Assembly by structural adhesive bonding

Winner: S.A.B.C.A. (Belgium)
Partners: Biteam AB (Sweden); Cooperative Research Centre for Advanced Composite Structures (CRC-ACS) (Australia), Dassault Aviation (France), Deutsches Zentrum für Luft- und Raumfahrt (DLR) (Germany), EADS Deutschland GmbH (Germany), EADS Innovation Works (France), Eurocopter Deutschland GmbH (Germany), KTH – University of Stockholm (Sweden), Premium AEROTEC GmbH (Germany), Secar Technologie GmbH (Austria), the University of Patras (Greece), Výzkumný a zkusební letecký ústav a.s.(VZLU a.s.) (Czech Republic).

The MOJO demonstrator (Modular Joints for composite aircraft components) is one of the very first representative aeronautical structures designed for assembly by structural adhesive bonding, which provides damage tolerance characteristics.

The composite innovation is a full-size aerospace structure designed to gather all the features developed in the MOJO project. The innovation brings together various developed elements. These will ultimately find use in different domains by different end users, including SABCA, Dassault-Aviation, Premium AEROTEC, EADS Military Air Systems and Eurocopter.

The innovations will combine tailored preformed profiles for modular joints with structural bonding processes, including out-of-plane reinforcements. Applications will include stiffened wing-skin panels, vertical and horizontal tail planes, flap-track beams, cargo and pax doors, cargo- and pax-door surroundings, as well as unmanned air vehicles. The main components of this closed beam were **manufactured with out-of autoclave infusion processes such as Resin Transfer Moulding (RTM) for the top and side panels, and Vacuum Assisted Resin Infusion (VARI) process for the lower panel.** Non-crimp carbon fabrics (from SAERTEX and CYTEC) and tailored preformed profiles made of high-performance textiles (developed by the partners) were used.
Considering that structural bonding is the most compatible joining method for composite parts, adhesive processes with both film and paste adhesive were developed and successfully used for the assembly.

Structural bonding is still not a widely accepted alternative to riveting. Therefore, demonstration projects like MOJO, leading to the cost and performance benefits described, will help change minds and gain a wider acceptance, opening the way to "rivetless" CFRP structures. Structural bonding provides around 25% overall cost savings and 50% weight savings, up to 60% assembly cost savings as compared with "black metal" concepts. The project started in 2006 and was completed in 39 months. The launching of the innovation started with the selection of the MOJO project under the 6th European Framework Program.

Other finalists in the Process category:

- Microwave curing of composite components, presented by **Dr. Ing. h.c. F Porsche AG (Germany)** with its partners GKN-Aerospace GmbH (Germany); Karlsruhe Institute of Technology KIT (Germany).
- SQRTM processes combining the advantages of RTM with the mechanical properties of prepreg unidirectional tapes, presented by **S.A.B.C.A. (Belgium)** with its partners SABCA Limburg (Belgium); COEXPAIR (Belgium); DGO6/SKYWIN Aerospace cluster of Wallonia (R&D financial support).
- A super thermal conductive mandrel technology, presented by **Acrolab Ltd. (Canada)** with its partners McClean-Anderson (USA); Ameritherm Inc. (USA); TCR Composites (USA).

Category: Automation
2 innovations tie for first place!

Cured Laminate Compensation (CLC) process – an innovative composite manufacturing solution for saving composite material and increasing production throughput

Winner: Magestic Systems Inc. (USA)
Partners: Lockheed Martin (USA); Nikon Metrology (Belgium)

The CLC process harnesses the vast capabilities of both Nikon Metrology's Laser Radar technology and MSI's TruPLY Compensation (TPC™). The process was developed specifically for the F-35 Joint Strike Fighter to test and **correct the thickness of cured composite wing skins.** The CLC process is not limited to Aerostructures. **Wind turbine blades, super yachts and automobiles are all beginning to incorporate composite materials into their construction and could use the CLC process to achieve the same savings and quality.**

By combining Laser Radar and TPC™ technologies, Lockheed Martin set up an automated production process that is designed to produce parts of predictable quality, while rigorously reducing scrap and maintaining accuracy, scalability and ease of use.

The synergy between Magestic Systems' TPC™ and Nikon Metrology's Laser Radar offered Lockheed Martin a seamless solution **to control critical thickness zones of the cured laminate composites** used in the F-35 Joint Strike Fighter – utilizing metrology, automatic ply nesting and laser projection technologies to produce composite parts within engineering thickness tolerances.
Within a range of 60m, the contactless Laser Radar system from Nikon Metrology captures the surface geometry of composite parts of any shape and size, without requiring SMR or other targets.
Magestic Systems developed TruPLY Compensation™ (TPC) to compare the "as-built" data collected by Nikon Metrology's Laser Radar with known "as-designed" data taken from the composite design files. The TPC™ process then determines where the part is structurally deficient and by how much. TPC™ then automatically generates the appropriate number of compensation plies required to build a wing skin meeting engineering tolerances. These plies are then automatically nested and the NC program is generated for the ply cutting machine with MSI's TruNEST™ application. In addition, MSI's TruLASER™ View automatically creates laser projection files so a 3D laser projector can indicate the correct location for each ply as it is installed on the wing skin. The part is then ready to be re-cured to obtain final geometry. The finished composite part is then measured again with Nikon Metrology's Laser Radar for geometry quality.

The CLC process offers many benefits. Lockheed Martin can accurately satisfy the difficult engineering specifications for composite parts while achieving an efficient manufacturing process that minimizes waste and increases throughput.
The value created by this process is in immediate material savings, reduced aircraft weight and increased production throughput.

By producing composite parts correctly the first time, immediate savings can be made through **minimizing waste and maximizing accuracy, part quality, and process efficiency.**

Category: Automation
2 innovations tie for first place!

Automated preform production line for CFRP aircraft frames

Winner: EADS Deutschland GmbH (Germany)
Partners: SGL Kuempers GmbH & Co. KG (Germany); Airbus Operations GmbH (Germany).

In co-operation with SGL Kuempers, EADS Innovation Works invented a process which **allows producing high-quality, low-cost composite frames with high design flexibility and unmatched repeatability.** The main objective of the automated pre-form production line is to lower manufacturing costs by resorting less to manual operations and the primarily usage of raw roving material. **This can lead to a final fly-to-buy ratio of almost 95%.** The project was launched in January 2008 and was **successfully completed by the end of 2009.** The machinery is located in the Technology Centre in Stade. The process line was especially designed for the highly automated production of aircraft Airbus frames and can meet the requirements of future aircraft types, e.g. A30X. **The target of approximately 30-40 aircrafts (A30X) per month can be achieved.**

The design of aircraft frames can vary within a wide range of shapes to meet fuselage structure requirements. **The machine is capable of producing frames with alternating cross sections and curvatures.**

To lower the costs of forthcoming CFRP production and to be able to compete with metallic structures, it is mandatory that material suppliers, machine manufacturers and end users work closely together. The project has demonstrated this in a remarkable way. Therefore, a high market potential is expected for automated CFRP production.

Other finalists in the Automation category:

- A “part centric” approach to manufacture a “part purpose” machine, presented by **Accudyne Systems, Inc. (USA).**
- An Autovac process, presented by **CTC GmbH (Germany)** with its partners Airbus Operations GmbH (Germany); Premium Aerotec GmbH (Germany).

Trends observed during our review of 2010 JEC Awards applications

The aerospace sector will always be keen on composites, due to weight-saving issues. Both the number of parts with composites and the performance required are on the rise. This is the case for temperature resistance, with the emergence of new matrices like benzoxazine resin, a new material (which also has crucial fire safety properties) used for the housing of the auxiliary power unit (APU) on the Airbus A 380. Composite parts must be capable of withstanding high loads, as they are also used in primary aircraft structures, e.g. Airbus Alcas's project for wingbox spars. These parts require flawless 8-to-10-cm thicknesses, entailing a perfect command of the manufacturing process.
Over the past few years, the trend towards eliminating autoclave curing is spreading to longer production runs in order to improve productivity, and also to achieve energy savings. Another reason is to eliminate the need for expensive finishing operations, e.g. for net-shape parts. At the same time, the use of automation is growing, making it necessary to design specific machines for the part to be manufactured, and moulds that can perform several different operations during the production process. The projects by Sabca and Accudyne are indicative of these trends. Assembly methods can also lead to weight savings and faster production: adhesive bonding is always a good candidate and so is automated welding, while riveting and bolting processes (which require drilling) are losing ground. All of these manufacturing concepts could be applied advantageously to road and rail transport.

Designers in **building and construction** are getting better and better at integrating all the potential of composites into buildings and civil works. The project proposed by D'Appolonia is worthy of note not only by the number of partners from all over Europe, but also for its inventiveness and the fact that it addresses very utilitarian needs, notably for earthquake risks. The product they are developing will serve just as well in new construction as in renovation and rehabilitation. In addition, it will be possible to monitor the construction's mechanical properties and the loads it is subject to, in real time and on a permanent basis. An original idea developed by the University of Maine in the United States is to use the composite both as a formwork and as a corrosion-proof structural reinforcement. Composites have a significant role to play in terms of corrosion protection. A rational use of composites can also be seen in the rehabilitation system for the beams of old buildings, developed by the University of Mainz in Germany in cooperation with manufacturers: polymer concrete in the compression zone, timber in between and, as a bonus, very short execution time. So composites are not simply substituted for other materials, they are used additionally to achieve new performance. **In civil engineering**, Invent GmbH introduced a modular CFRP bridge that can be used for military purposes or civil protection (emergency management). With a free length of 21.6 metres and a width of 3.5 m, the bridge includes fewer than 100 individual parts and can be assembled and disassembled manually within 2 hours. The Bridge-in-a-Backpack™ developed by the University of Maine's Advanced Structures and Composites Center (AEWC) is so named because the arch support system is lightweight and compact enough to be carried to the construction site in a backpack.

There are many opportunities in the **sports and leisure** sector to make use of the high strength and low weight of composites. For cycling, you have the ultra-lightweight Corima wheels at under 1,000 g per pair. The highlight is on cutting cost and material quantities (optimization) through upstream design and the manufacturing process. And fishing poles are getting the benefit of nanomaterial properties (3M). Composites are also being used to boost the strength of mountain hikers, in the brace designed by Alp Control to allow using the same boot for climbing and skiing. The Samsonite Cosmolite suitcases offer exceptional impact resistance. They simply don't break and recover their original shape after an impact. These 100% polypropylene suitcases are fully recyclable. Carbolink project for Team Alinghi's rigging, proves to what extent it is possible to adapt a composite material to that specific function; the development could also be of immediate benefit to the heavy-load-handling sector.

Transportation: Issues around weight saving, durability of materials and easy maintenance are things that inspire designers. Here, TTT's monocoque trailer made of carbon composite, Lomold's pallets and Icolfibra's buses all reap the benefit of the high properties of composites. Reducing weight increases the potential useful load and also helps to save on energy. Wellman Products Group (USA) also produces low-cost, mass-produced carbon-carbon composite for use as a clutch disc in high-performance automobiles and race cars.

Renewable materials and recycling: one thing holding back the use of natural materials is the variability of their mechanical and physical properties. The projects submitted by the Depestele Group (France) and Harusmas Agro (Malaysia) show that producers have a concern for the consistent quality of their products, to the point of monitoring the growing conditions. One consequence of these agricultural resources is to maintain the population around processing centres (Harusmas). Production capacity is rising for fibres and for the resin materials, e.g. Bioresin Ltd. in Brazil (castor oil). Traditional chemical companies like DSM are beginning to integrate renewable raw materials into their products. These renewable materials can serve in energy applications, for example small wind turbines for limited local needs (LTP). In recycling, thermoplastics provide a real opportunity to reutilize production waste either directly or at end of life (MBM in Germany). This will perhaps be the case for Eire Composites' wind turbine blades, the first to be manufactured in thermoplastic composite using OCV's Twintex.

Emerging: The project from 3XN Architects uses nanomaterials to produce self-cleaning surfaces. It also illustrates a new focus of interest, which is the use of energy-harvesting systems to make facilities self-sufficient in energy, e.g. using piezoelectric materials. Composites are preferred materials for integrating such systems.

Pictures of the winners available on request to Apocope