CW 2012 COMPOSITESWORLD | CARBON FIBER

IN ASSOCIATION WITH HIGH-PERFORMANCE Composites COMPOSITES TECHNOLOGY

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Confirmed Speakers as of November 2, 2012

Industrialization of Composites
Jai Venkatesan / Director, Materials Science & Engineering / The Dow Chemical Company
George Jacob / R&D Manager / The Dow Chemical Company

Carbon Fiber and Beyond: The $ Multi-billion World of Advanced Composites
Ross Kozarsky / Analyst-Advanced Materials / Lux Research Inc.

Carbon-fiber reinforced plastics (CFRPs) are an important class of advanced material that can offer remarkable performance in uses from speedier bicycles to more fuel-efficient aircraft. Historically driven by the sporting goods and aerospace industries, CFRPs are now finding their way into new industries – including wind, oil and gas, and automotive – that demand new materials with ever-higher strength-to-weight ratios, resistance to corrosion, and workability. However, so far, high costs, long processing times, and recyclability concerns have limited the penetration of CFRPs in mass-market applications. Beyond carbon fiber, nanomaterial fillers such as multi-walled carbon nanotubes (MWNTs) and graphene nanoplatelets (GNPs) further complicate the advanced composites space by serving both as complementary and competitive technologies. For instance, GNP-enhanced CFRPs offer both mechanical and electrical performance and this multifunctionality increases the value proposition, while MWNT-enhanced glass-fiber reinforced plastics (GFRPs) being developed by Applied Nanotech for wind turbine blades have the potential to steal away significant market share from pure CFRPs. Advancements in composite design essentially give material developers a palette of resins, reinforcing fibers, and nanomaterial fillers to work with to create the best price and performance combination for a given application. This presentation will highlight technology developers seeking to overcome the challenges obstructing CFRPs' traction in emerging industrial markets and share some of Lux Research's most recent market forecasting data in the carbon fiber and nanocomposites space.

SKA (Square Kilometer Array) Update and Opportunities for High-Value Carbon Composite Deployment in Very Large Radio Antenna
Geoffrey M Wood / CEO / Profile Composites Inc.

- Description of SKA and deployment timelines
- Antenna technology and materials in preferred configurations
- Value proposition for advanced composites in SKA
- Potential size of the market opportunity

Design of Carbon Reinforcements for Damage Tolerance Structures
Mike Braley / Vice President Applications Development / A & P Technology Inc.

Comparison of Metallic and Composite Aircraft Wings Using Aerostructural Design Optimization
Joaquim R. R. A. Martins / Associate Professor and Graduate Program Chair / Univ. of Michigan, Dept. of Aerospace Engineering

- Simultaneous design optimization of aerodynamic shape and structural sizing
- Design optimization of the stacking sequence
- Comparison between metallic and composite wing
- Evaluation of the gains in fuel burn and takeoff weight

In this work, we examine the design of metallic and composite aircraft wings in order to assess how the use of composites modifies the trade-off between structural weight and drag. To perform this assessment, we use a gradient-based aerostructural design optimization framework that combines a high-fidelity finite-element structural model that includes panel-level design variables with a medium fidelity aerodynamic panel method with profile and compressibility drag corrections. To examine the effect of the choice of the objective, we obtain a Pareto front of designs by minimizing a weighted combination of the mission fuel burn and take-off gross-weight of the aircraft over a multi-segment mission profile. The structural model includes both strength and buckling constraints and includes a detailed laminate parametrization that is used to obtain the optimal lamination stacking sequence and impose manufacturing requirements for composites including matrix-cracking and minimum ply-content constraints. We show that the composite wing designs are lighter than the equivalent metallic wings. Due to this structural weight savings, the composite aircraft designs exhibit both fuel burn take-off gross-weight savings.

Innovations in Oxidation Technology to Enable Market Growth: Pioneering Technology Design to Deliver Reduced Energy Consumption by 2x-3x and Support the Use of Many Emerging Precursor Materials
Robert Blackmon / VP of Integrated Systems / Harper International

The trajectory of the Carbon Fiber market indicates explosive growth that must be captured through achieving greater capacities in a more efficient and cost effective manner. One of the most critical stages in Carbon Fiber manufacturing is oxidation, where the most energy is consumed of any process step. Harper International is releasing the new standard in Oxidation Oven systems that are capable of reducing the energy consumption of the oxidation process by a factor of 2x – 3x as compared to traditional oven design. The Harper design utilizes a combination of mechanical design features and control systems to provide precision management of the energetic state within the oven. This innovation is an essential evolution towards the type of technology that will be necessary to meet the requirements for use of many emerging precursor materials. In this presentation, Harper will discuss the groundbreaking technical design of this system and correlate it to the expected benefits and savings to a typical Carbon Fiber production process. They will also discuss traditional PAN precursor compared to alternative precursor materials and how this technology can adjust for the challenges presented during oxidation to best optimize the process.

Machining Optimization in Composite Materials
Linn Win / Industry Specialist – Composites / Sandvik Coromant

Increasing Produce-ability to Drive Affordability in Automated Fiber Placement processing
Dan Ott / Global Strategic Account Manager /Web Industries

Automated manufacturing processes, particularly Automated Fiber Placement (AFP) which requires prepreg in Precision Slit-Tape form, now face the challenges of program ramp-ups and concurrent pressures to increase productivity, material yield, and part performance while containing or reducing costs. Machine performance specifications have grown, but that performance depends on seamless payoff and delivery of material to the laydown head. The goal of this presentaion will be to explore how the key players in this supply chain might better meet these challenges, working collaboratively on those drivers which will benefit our end-customer's performance, with particular focus on those involved with producing the prepreg material, the processing of slit-tape spools, and the design and function of the AFP machine lines. While this is a topic aimed originally at thermosets in aerospace, we are currently working on several potential opportunities of significance in thermoplastics, and in wind energy this year. Common issues and examples for this presentation from those other products and markets will also be discussed.

Removing the Barriers for Manufacture with Carbon Fiber Prepreg
Damian Bannister / Chief Technology Officer / Gurit UK

Carbon fiber prepreg is perceived by many end users to be a problematic material to use in high volume manufacturing and in the manufacture of large structures. Some of these problems are attributed to the technical difficulty in producing high quality laminates with low void contents, but many are associated with the cost of use of these materials, Gurit has developed a new generation of carbon prepregs that address many of the barriers to adopting carbon prepreg technology with a novel matrix chemistry, VELINOX, and an advanced prepreg surface technology known as Airstream. The development of the matrix system has been focused on providing the lowest cost of use by reducing the capital required to implement serial production. The low snap cure temperature of 80 C is accompanied by a very low exothermic heat release which enables the manufacture of thick laminate sections (100 mm) with low cost low temperature performance tooling (120 C). The matrix system also has the additional benefit of being chemically stable at temperatures as high as 35 C for over 4 months which eliminates the requirement for frozen or chilled storage. To complement the benefits of the matrix chemistry the physical properties of the prepreg have been developed to optimize high speed processing, eliminate the requirement of air conditioned workshops and enable high quality laminates in large structures without the use of autoclaves. The Airstream coating technology provides a stable surface air permeability and surface tack over a temperature range of 15 to 35 C whilst maintaining the excellent drape characteristics of the bulk prepreg. This unique combination of high drape and high breathability, over a very broad temperature range, enables fast material deposition rates and the production of very low void content laminates with the use of vacuum bag technology.

The Korean Carbon Fiber Wave
Anthony J. (Tony) Roberts / Sales and Marketing Director / Hyosung Corporation

- Hyosung carbon products and plans.
- The Korean carbon fiber market
- Hyosung world carbon view on supply-demand

The Human Factor in Carbon Fiber Manufacturing
Lee McGetrick / Director, CF Technology Facility / Oak Ridge National Laboratory

Oak Ridge National Laboratory (ORNL) will start up their Carbon Fiber Technology Facility in early November. We will present the carbon fiber technician training system developed to train mid-level technical skills (between vocational school level and college level) required to operate highly instrumented, complex advanced manufacturing equipment. Our goal is to make this resource a national asset that can be used to further the advancement of carbon fiber research and manufacturing in the U.S. by mitigating some of the business risk associated with scaling up and training a workforce in this technology. In addition, the presentation will provide an overview of the ORNL Carbon Fiber Technology Facility's opportunities for collaboration and partnership that might be of interest to participants in the conference.

Aerospace vs. Automotive – Perspectives on Composites Usage Needs and Requirements
Dr. Robert N. Yancey / Senior Director-Global Aerospace
Anthony Norton / Senior Director-Global Automotive / Altair Engineering

The Aerospace industry has driven much of the composites usage over the past few decades with significant acceleration in their use in primary structures in the last few years. The automotive industry is now taking a serious look at composites and how they can help the industry meet the demanding fuel efficiency requirements in the near future. Altair Engineering provides engineering services and technology to both industries and has a unique perspective on the challenges, opportunities, requirements, and needs of these industries in regards to composite structure design, manufacturing, repair, and disposal. A review of these issues will be presented as well as lessons that each industry can learn from one other and areas of potential collaboration in the future.

Opportunities and Challenges in Global Electrical Transmission Infrastructure (including climate impact) (Title to be confirmed)
Jason Huang / CEO / CTC Global

- History of CTC and Evolution of ACCC Technology; How could ACCC technology help?
- What CTC Global plans to do? What it means in terms of Carbon fiber needs…

Cost Analysis of Pan-Based Carbon Fiber Manufacture
Are Cost-Savings Possible? It Depends Upon - -
Chuck Segal / Managing Director / OMNIA LLC
and presented by
John Dispennette / Chief Analyst / OMNIA LLC

- A base-line model is presented
- Major cost variables are identified, such as: energy, raw materials, labor, depreciation, infrastructure, management, operating efficiency
- Opportunities for cost-reduction are proposed

Automated Dry Fiber Placement for Infused Composites
David Maass / Danobat FIBRA

- Fully automated and full scale equipment for high volume production applications such as wind turbine blade manufacturing
- Automated dry fiber placement capability is described as a key enabling technology to significantly increase production rates, improve quality and reduce unit costs necessary for composites to effectively compete in the marketplace.
- Laydown rates achieved that are two to three orders of magnitude higher than currently seen in automated fiber placement (AFP) of prepreg material used in commercial and military aerospace
- Capabilities common and applicable to other industries, such as aerospace and automotive
- Future directions and capabilities

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