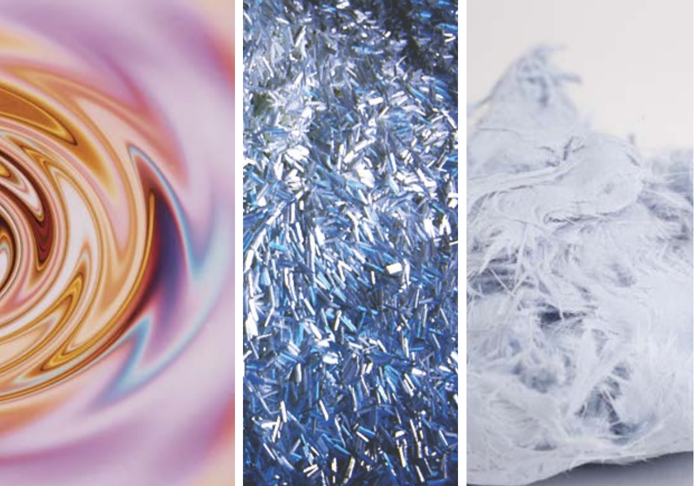

SPE Thermoset

TOPCON

CONFERENCE & EXHIBITION

March 21-22, 2017

Scottsdale Resort at McCormick Ranch.
Scottsdale, AZ

TUESDAY, MARCH 21, 2017

8:00 AM Registration Opens

8:00 -8:45 Breakfast - Sunset Plaza (adjacent to Coronado Ballroom)

8:45- 9:00 Welcome and Opening Comments (Coronado Ballroom)- Division Chair, Len Nunnery, Quadion, LLC

9:00 - 9:45 **"Industry Challenges and Opportunities for Thermoset Materials in AdvancedComposites"**

Author: Dale Brosius, Chief Commercialization Officer, Institute for Advanced Composite Manufacturing Innovation (IACMI)

Abstract:

Increasing demand for a more sustainable environment is creating opportunities for lighter weight vehicles, more efficient wind energy capture

and reduced oil consumption. Advanced composite materials offer significant potential to achieve these objectives, but have historically been used in low volume industries like aerospace. Challenges to use these materials in high volume applications like automobiles, advanced wind turbines and compressed gas storage tanks include speeding up manufacturing processes, improving confidence in predictive models, effective multi-material joining, and recycling. To address these challenges, the Institute for Advanced Composites Manufacturing Innovation (IACMI) has been created, sponsored by the US Department of Energy. This presentation will explore the key obstacles to true mass production of advanced composites and how IACMI will partner with industry to tackle these obstacles. Specifically, opportunities for thermoset materials and processes in key industries will be presented, as well as how industry can get involved to make high volume commercialization of new technologies a reality.

Biography:

Dale Brosius is Chief Commercialization Officer for the Institute for Advanced Composites Manufacturing Innovation (IACMI), focused on composites technologies for more energy efficient vehicles, wind turbines and compressed gas storage. He has a B.S. in Chemical Engineering from Texas A&M University and an M.B.A. and over 30 years of industrial experience in the composites industry. As a manufacturing engineer for Dow Chemical, he was responsible for a 900million pound propylene oxide facility. This was followed by marketing responsibilities for automotive composites in Detroit, where he led development of low density SMC, carbon fiber drive shafts, pickup truck boxes, leaf springs and infused primary structures made from thermoset resins. Subsequently, at Fiberite and Cytec, he led numerous activities related to high performance carbon fiber prepreg-based components for aerospace and industrial markets, and managed thermoset molding compound businesses in the U.S. and France.

Mr. Brosius has more recently been involved in the production of class A carbon fiber components for a U.S. OEM, and development work with automotive and aerospace OEMs in Europe, Japan and the U.S. prior to joining IACMI, he spent 10 years with Australia-based Quickstep Technologies, setting up demonstration sites in the U.K., Germany and the U.S. for Quickstep's innovative out-of-autoclave curing technology. He has intimate knowledge of all composite processes, from injection molding to textile preforming to autoclave, as well as glass and carbon fibers and a wide range of thermoset and thermoplastic polymers. He has served as Chair of SPE's Thermoset and Composites Divisions and four years as chair of SPE's Automotive Composites Conference and Exhibition. He has authored numerous technical papers for conferences in the U.S., Europe, Japan and Australia, and is the author of many articles for High Performance Composites, Composites Technology and Composites World magazines.

9:45-10:15 **"Differences and Benefits of Carbon Fibers and Glass Fibers"**

Author: Kevin Miller, Market Manager, Plastics Product Manager, Non-Carbon Inside Sales Manager- Asbury Carbons

Abstract:

In this paper, we will be looking at some of the features and benefits of using chopped or milled Carbon fiber vs Glass fiber. As customer demands increase in the areas of metal replacement, conductivity, and high strength composites, it is important to understand the basic structures and benefits of whether to choose carbon fibers or glass fibers. We will take a look at a few different types of applications and environments in which composite parts can be used, and provide information about which type of fillers would be better to formulate with.

Biography:

Plastics Marketing Manager for Asbury Graphite Mills. Has been with Asbury 2 years working with customers to solve material and additive needs. Also,

current Marketing and Sales Manager for Titan Advanced Composites, a new joint venture delivering unique, high end thermoset composite solutions.

10:15-10:45 **BREAK - EXHIBITS OPEN**

10:45-11:15 **"Automotive Light-Weighting Using Chopped and Continuous Compression Molded Carbon Fiber Materials"**

Author: Matt Kaczmarcyk, Market Manager Aerospace / Defense & High Performance Automotive,- A. Schulman

Abstract:

In the fabrication of advanced composite structures there is an array of processes available. However when part complexity increases, performance requirements are demanding and higher volumes are essential, production options become more limited. Design engineers are enticed by placed fiber methods, such as pre-preg molding or various approaches to resin transfer molding (RTM), but find that, even with recent advances, achieving out-of the-mold part finish, and acceptable cycle times to support high volume production, are elusive.

Compression molding using random fiber SMC is well recognized to achieve rapid cycles, and to achieve net shape parts including ribs and bosses that maximize function with minimal weight. A limiting factor is that potential knit lines associated with the flow or random fibers are a concern for structural integrity in demanding applications. This paper examines the co-molding of localized unidirectional reinforcement (UD), and woven mat reinforcement, with random discontinuous carbon fiber, using compression molded sheet molding compounds (CF-SMC). This approach allows designers and engineers unique flexibility, in developing lighter weight components with tailored mechanical properties to endure highly demanding physical performance requirements.

Compression molding is the process which a charge or preform weighed out to the exact amount required to fill the volume of a given tool of a matched metal mold. CF-SMC along with UD reinforcement is molded under heat and high pressure to form complex parts with non-uniform nominal walls otherwise unattainable with other lightweight moldable materials such as injection molded thermoplastics. CF-SMC can replace forged and machined metal parts and be processed at lower overall manufacturing costs in higher volumes. CF-SMC competes with prepreg materials where higher volume and

lower scrap rates are needed. CF-SMC unique ability to flow and fill ribs and bosses allows for design and manufacturability that prepregs are unable to accomplish without tedious hand labor, high risk for manufacturing defects, long cycle times and potential shear planes.

Biography:

Matthew Kaczmarczyk is currently the Market Manager for Aerospace, Defense and High Performance Automotive at A. Schulman Engineered Composites. He is responsible for identifying market trends, opportunities, and products which will allow the technology team to successfully deliver advanced materials and support new applications. Matthew previously held the position of Senior Design Engineer for Quantum Composites Inc. and served the firm (recently acquired by A. Schulman) for the past 10 years in the role of technical lead for design and development of lightweight composite structures. In that position, Matthew was responsible for managing composite part design, simulation analysis, testing and structural validation of composite components.

Prior to joining the Quantum team Matthew held the positions of Engineering Manager at Key Plastics LLC and Project Engineer at Titian Plastics. Matthew has over 15 years of aerospace and automotive experience in product design and development using thermoset and thermoplastic materials. He holds a Bachelors of Science Degree in Plastics Engineering from Ferris State University.

Matthew has co authored several white papers including a submission to the 2013 SPE Automotive Composites Conference & Exhibition (ACCE) titled "The Application of Composite Design Principles for Light Weighting Structural Components using Discontinuous Carbon Fiber Materials". He participated in the 2014 SPE Automotive Composites Conference with his work titled "The Numerical Analysis & Validation of Compression Molding Process" and the 2016 JEC Composites International Conference on Automotive Technology addressing "Automotive Light Weighting Using Chopped and Continuous Compression Molded Carbon Fiber Materials". Matthew most recent work was presented at CompositesWorld's Carbon Fiber 2016 conference on "Automotive Light Weighting With Thermoset Composites".

11:15 - 11:45 **"The Role of Thermosets in Mass Produced Carbon Fiber Reinforced Composites"**

Author: Alex Walk, Manager Technical Sales - Americas SGL Group

Abstract:

This presentation will review the history of CFRP in the automobile industry, describe current mass production efforts and look at what future applications may look like. The role of thermoset resins will be covered as well as understanding the threats to thermosets' role. The battle with thermoplastics will be reviewed and applications compared.

Biography:

Alex Walk is Manager – New Products and Technology for SGL Carbon where he is tasked with the promotion, implementation and development of new material applications based on SGL's fully integrated product line. Mr. Walk's area of responsibility is the Americas with primary focus on automotive and industrial applications including light weighting, alternative energy, pressure vessels, and recycling efforts.

Mr. Walk has over 25 years of carbon fiber experience having enjoyed multiple assignments and successes in product development, large capital project management and leadership of business, operations and engineering activities. Mr. Walk earned a Bachelor's Degree in Mechanical Engineering from the South Dakota School of Mines and Technology.

11:45 -12:15 **"S-2 Glass, A Designer's Toolbox for Lightweight Parts"**

Author: Iain Montgomery, Director of New Business Development - AGY Holding Company

Abstract:

AGY is a specialty glass fiber producer of multiple advanced composite reinforcements featuring S-2 GLASS, S Glass, S-3 HDI, L GLASS, S-1 HM and other high performance fiber systems. Additionally, we make E glass fine and ultra fine yarn and chopped fiber. Our S-2 GLASS systems are used in light-weighting efforts where designers need to do more with less material. The

outstanding balance of properties from S-2 GLASS reinforcements are valued where there is need for thinner cross sections than commodity E glasses can provide, or there is a need for both lighter weight and impact and damage resistance where carbon fiber is not a good fit. We will review automotive and other light-weighting applications that leverage the balance of S-2 GLASS properties and our the broad array of fiber forms and sizings customized to application specific processes and resin systems.

Biography:

Iain Montgomery is currently employed by AGY as the Director of New Business Development and has been working at AGY for 8 and a half years in a number of New Business Development roles. He previously work at GE Plastics latterly SABIC Innovative Plastics where he held roles in both Product and Market Management. Iain has experience in composites and polymers from his work with AGY and SABIC IP and also in markets such as Transportation, Automotive, Aerospace and Medical applications. Iain's degree is in Mechanical and Production Engineering from the University of West Yorkshire in the UK.

12:15-1:15 **Lunch Sponsored by A. Schulman - Paradise Park Lawn**

1:15 - 1:45 **"An Overview of Engineered Braided Fabrics Designed To Increase Performance While Reducing Weight and Cycle-Time"**

Author: Billy Wood, Program Manager- A&P Technology

Abstract:

The architecture of braided fabrics can be tailored to meet specific part requirements. This flexibility in braid architecture enables the manufacture of composite parts with superior impact performance, increased damage tolerance, and improved resistance to fatigue. Throughout part design and build, significant reductions in material cost and manufacture time are realized. Explanation of the design flexibility offered by braided fabrics will be given, and the costs and performance benefits will be examined.

Biography:

Billy Wood, Program Manager- Braided Fabrics at A&P Technology, based in Cincinnati, OH has over 10 years' experience in the composites industry. Billy is responsible for A&P Technology's broad good product line consisting of QISO, 0/±60° inherently quasi-isotropic triaxial, BIMAX, ±45° bias and ZERO, non-crimp unidirectional braided fabrics. Prior to joining A&P Technology he held commercial, quality, and technical positions at the Cytec Solvay Group where he helped manage the characterization, qualification and launch of multiple resin systems. Billy holds a BS in Chemistry and Biology from the University of South Carolina and an MBA from the University of Delaware.

1:45 - 2:15 **"Deeply Understanding Glass Fiber Reinforcements-Drive Performance And Efficiency in Composites Manufacturing for Maximum Profitability"**

Author: Daryl Wernette, Product Development R&D Leader- Owens Corning Composite Solutions

Abstract:

The thermoset industry is indelibly linked to the fiber-reinforced composite market space as reinforcement provides huge gains in end product mechanical properties and robustness. As the library of thermoset chemistries continues to grow, the composites industry looks to leverage thermoset value in commodity spaces for material substitution as well as specialty applications for premium performance in strength, corrosion resistance, minimum lifetime cost and more. This final composite performance will not be dominated by the resin matrix, nor by the reinforcement fiber alone, but by the interfacial properties created between the reinforcement fiber and matrix. This talk will focus on Owens Corning's perspective of the principles of glass fiber reinforced thermosets to maximize performance in the composites and how that links to the innovation that goes into the fibers to maximize operating efficiency in industrial composite manufacturing. From wet out to line speed and adhesion strength to part failure scrap, a review of what to look for during and after manufacturing can help drive selection of best-in-class glass fiber reinforcement to match to the thermoset matrix. In turn, the result is the best performance-to-cost ratio for composite products!

Biography:

Daryl P. Wernette graduated from the University of Illinois, Urbana Champaign with a Ph.D. in Chemistry in 2007. He has been with Owens Corning since graduating, spending over half of his career in composites including Non-wovens, Thermoplastic and Thermoset rovings. He has held positions as product development scientist, process developer, business developer and project manager. He currently owns responsibilities for partnering with customers to develop new, novel solutions for thermoset composites from rovings in the process areas of vacuum infusion, pultrusion, SMC, filament winding, and other open and closed mold processes. Products recently developed by his team are used in the markets of automotive, wind, low pressure and high pressure pipes, structural parts, infrastructure, marine and sanitary.

2:15 -2:45 **"Next Generation Recyclable Epoxy Thermosets for Fast Resin Transfer Molding Applications"**

Authors: Mohammed J. Nasrullah, D. Rey Banatao, Szymon Kosinski, Stefan J. Pastine, Ulhas Bhatt

Abstract:

Connora Technologies (Hayward, CA) is an advanced materials startup solving the thermoset recycling problem for the composite industry by reengineering thermoset plastics using smart chemistry. We have recently developed a series of next generation of high performance, recyclable epoxy curing agents, called Recyclamines®, suitable for achieving demold Tgs above 110 °C in short cycle times. Currently, the wide-scale adoption of composites for automotive applications will be contingent on effective cost-reduction strategies. The advent of High Pressure Resin Transfer Molding [HP-RTM] has helped move the thermoset composite industry toward this goal, enabling cycle times of minutes. However, the cost of composites remains artificially high since thermosets are not recyclable, and the value of the manufacturing waste is lost. Recyclable epoxy thermoset technology will enable OEMs to meet shifting regulatory end-of-life compliance, while also moving them toward "zero-landfill" operations via the recycle of manufacturing waste.

This presentation focuses on recyclable epoxy systems for use in HP-RTM processing and Compression Molding applications, which can be used to manufacture inherently recyclable carbon fiber parts for automotive and sporting goods applications. Aspects of chemical resistance, processing speed, and mechanical performance will be presented for the next generation recyclable systems and compared to the current state-of the art non-recyclable systems used in automotive production. Additionally, some details on recycling and reintegration of recyclable thermoset materials will be discussed.

Biography:

Dr. Mohammed Nasrullah, Senior Scientist for Connora, oversees formulation development and characterization related to the projects involving Recyclamine® technology. He has 10 years of experience in polymeric research in the materials industry. Prior to joining Connora, Dr. Nasrullah worked at Neopad (Changed to Nexplanar, now Cabot Microelectronics), and Intermolecular Inc. developing microelectronic materials for the semiconductor industry. He also contributed as a Director of Polymer Research at Graphene Technologies for the development of graphene based coatings and composites. Dr. Nasrullah holds a PhD in Polymer/Material Science from IIT Madras. He was a postdoctoral fellow at Rensselaer Polytechnic Institute (RPI) and a research fellow at North Dakota State University with a focus on controlled free radical polymerization, polyurethane dispersions.

2:45 -3:15 **BREAK- EXHIBITS OPEN**

3:15- 3:45 **"Development of Polyurethane Sheet Molding Compound"**

Authors: Dr. Daniel Park (Presenter), R. Maertens[2], M. Connolly[3], K. Gleich[4], V. Ugresic[1], F. Henning[2-] Fraunhofer Project Center, Department of Polymer Engineering, Fraunhofer Institute for Chemical Technology ICT, Germany

Abstract:

The rapid increase in viscosity and relatively short shelf life of polyurethane (PU) resins have been prohibitive for use in sheet molding compound. Recent advancements in catalyst chemistry in conjunction with direct sheet moulding compound (D-SMC) technology has allowed for the continuous compounding and molding of polyurethane based SMC. The PU system in this study maintains a low viscosity during compounding for effective fibre impregnation. The tunable viscosity of PU-SMC facilitates the uniform transport of fibers during the flow phase of molding, with a snap-cure at molding temperature. A molding window of up to several hours is attainable. A filled, glass fiber reinforced PU system has been investigated with fire retardant additives to comply with regulations for rail applications. Very good molding, de-molding and surface appearance was observed in demonstration parts. The best PU formulations showed a 23% increase in tensile strength, 25% increase in tensile strain at break and an increase in energy absorbed in impact over conventional polyester

SMC formulations. It is expected that improved formulations incorporating engineered fillers will show further improvements in mechanical properties. The work to date has demonstrated the production of PU-SMC with attractive properties on an industrial scale.

Biography:

Daniel Park works at the Fraunhofer Project Center for Composites Research as a research engineer specializing in sheet molding compound and compression molding technologies. At the project center, his work focuses on new resins, material systems and processing technologies related to the SMC and Direct-SMC process. He holds a B.E.Sc in mechanical and materials engineering as well as a M.E.Sc in chemical engineering from the University of Western Ontario.

3:45 -4:15 **"BMC: Variation in Compounding Contributes to the Potential for Molding Idiosyncrasies"**

Author: Len Nunnery, Vice President of Sales and Marketing-Minnesota Rubber and Plastics/Quadion, LLC

Abstract:

"Compounding is a process of…blending plastics (or base resin polymers) with other additives. This process changes the physical, thermal, electrical or aesthetic characteristics of the plastics. The final product is called a compound or composite" (RTP Company).

In many cases, the raw materials employed to manufacture compounds/composites are stand alone 'finished products' in the sense that they require no further chemical exploitation other than the compounding/mixing process itself. Logic would dictate that a compound blended using raw materials that meet the specifications associated with formulation and development should provide consistent processing and end-use performance.

The batch blending of Bulk Molding Compound (BMC) can be accomplished via decidedly unsophisticated means. Unlike thermoplastics, the base polymer does not require controlled temperatures for melt/mix flow and certain key raw materials can be operator fed employing primitive tools such as paper cups and paint sticks. Batch to batch quality can be contingent on test

metrics that simply demonstrate the consistency of key ingredient load weights. Often the condition/temperature of raw inputs, the consistency/inconsistency of torque loads associated with input feed, the homogeneity of the mix, product viscosity/ flow rates at the time of molder consumption, etc. are not analyzed,, certified or under product warranty.

In cases where BMC products demonstrate batch to batch variation in molding, the material manufacturer can be held accountable for only the quality data that exists/the Certificate of Analysis. The compounder can then leverage certified data as proof of quality, even if said date is incapable of measuring root cause. This presentation studies BMC product development and production with focus on inconsistencies and the molding ramifications that may result.

Biography:

Len Nunnery is an experienced leader of international product development, sales and marketing teams. Globally recognized as an authority in reinforced composite materials (BMC/SMC), Len was an integral contributor to the mixed organic/inorganic growth of Bulk Molding Compounds, Incorporated and Citadel Plastics. A Six Sigma Black belt, Len was granted a U.S. patent for anovel, gas-assisted molding technique, is a published technical author and an accomplished public speaker. A marketing architect with a notable ROI to investment ratio, Len also possesses substantial experience with sophisticated, technology driven M&A, integration and exit processes.

Len is currently the Vice President of Sales and Marketing at Quadion, LLC. Quadion, a global manufacturer of engineered rubber and rubber components, also processes LSR and ultra-high performance thermoplastics. Quadion serves the Medical, Transportation, Water/Food and Beverage and Hydraulic Power industries (among others). He resides in Park City, Utah, with his wife, Shelane, and enjoys skiing, hiking and the great outdoors.

4:15 - 4:45 **"Understanding Thermoset Molding; a Deep Investigation into Polymer, Mold, and Process."**

Author: Gabriel Geyne, Application Engineer- SIGMA Plastic Services, Incorporated

Abstract:

Using a case study, SIGMA Inc presents a detailed look into just how complicated the thermoset molding process can be. The curing reaction, and resulting curing shrinkage, are a critical part of this molding process and final part quality. Failure to control the direction of the cure can often result in underfed or less dense regions in the polymer which are subject to premature failure. However, what actually goes into accurate predictions about where the curing will initiate and what directions it will follow? How much pressure is the material subject to before it enters the mold? How much heat is absorbed during filling, and does it begin to cure and skid across the surface? What is the curing degree gradient at the end of filling? How will the curing reaction progress through the cavity? Are there any isolated areas which can sink? What is the thermal gradient of the mold and what role does it play? Is our mold temperature controlled or do we just use what we get and make it work? Are there overmolded inserts and are they preheated? Does it matter if they are placed all at once vs individually for a multi-cavity operation? How do thick and thin sections in the same part behave? As you can see, this only scratched the surface of the process and already there are numerous questions. This presentation will focus on a 2 part epoxy compound, but will also touch on BMC related issues.

Biography:

Gabriel Geyne is an Application Engineer at SIGMASOFT Virtual Molding. He holds a bachelor's degree in Mechanical Engineering from Texas A&M University, and a Masters' degree in Plastics Engineering from the University of Massachusetts at Lowell. During his stay in Lowell, he worked in a research lab from Metabolix doing extrusion of PLA materials. He was also a T.A. for the UMASS Lowell Fundamentals of Plastics Testing seminar. His Master's thesis involved signal conditioning noise of injection molding machines for an in-cavity multivariate sensor capable of measuring temperature, pressure and velocity of the melt. Gabriel has conducted simulations of thermosets, thermoplastics, elastomers, LSRs, and thixo projects at his current job at Sigmasoft. He is a soccer fan of the Real Madrid Football Club, he enjoys traveling, and driving his Mustang.

5:00- 6:30 **SPE RECEPTION - EXHIBITS & BALLROOM FOYER**

WEDNESDAY, MARCH 22, 2017

7:30 Registration Opens

7:15 - 8:15 Breakfast - Paradise Park Lawn (near ballroom)

8:00 - 8:30 **"Get Your Cure On;" Practical Methods to Characterize the Thermoset Cure Process"**

Author: Jeffery Gotro, Ph.D., President and Founder- InnoCentrix, LLC

Abstract:

With the ever increasing pressure to reduce costs, have you ever wondered if you could shorten your cure time but didn't know how to determine if the process change would negatively impact the degree of cure? The good news is that there are many methods available to provide insight into the thermoset curing process. This paper will provide practical tips for characterizing thermoset cure using case studies. There are two important concepts in thermoset curing that must be understood to ensure proper curing; gelation and vitrification. The case studies will demonstrate how to characterize gelation and vitrification and demonstrate the importance of both of these concepts in thermoset processing. The use of thermal analysis (such as DSC, DMA, and TMA) and rheological methods will be highlighted in the case studies. The first case study will cover the role of cure temperature on the conversion of an epoxy-amine system. The conversion is dependent on the relationship between the cure temperature and the ultimate glass transition temperature (Tg). A second case study will highlight the advantages and disadvantages of room temperature curing and demonstrates the role of vitrification during room temperature curing.

Biography:

Jeff Gortro, Ph.D. is the President and Founder of InnoCentrix, LLC. InnoCentrix provides a wide range of consulting services to the polymer industry. Jeff helps his clients "turn polymers into profits" with a focus on improving financial performance by reducing the time to market for new products, process optimization, developing new business opportunities and managing Intellectual Property. Jeff has over thirty two years of experience in polymers having held scientific and leadership positions at IBM, AlliedSignal, Honeywell International, National Starch Electronic Materials as VP of R&D (Ablestik Laboratories and Emerson and Cumming), and InnoCentrix. Jeff brings to his clients a solid proficiency in managing the research, development and commercialization of new products. He has consulting experience with over 40 clients ranging from early-stage start-ups to Fortune 50 companies. His unique combination of deep technical knowledge and business experience allow him to drive projects to commercial success.

Jeff holds 15 U.S. Patents and has 4 patent applications currently filed and pending in the United States Patent and Trademark Office. He has published four book chapters including Thermosets with Dr. R. Bruce Prime in Encyclopedia of Polymer Science and Technology (Third Edition, J. Kroschwitz, Editor), John Wiley & Sons, 2004. Jeff has published over 50 papers in technical journals and conference proceedings. Jeff has a Bachelor of Science in Mechanical Engineering and Materials Science from Marquette University and and Ph.D. in Materials Science from Northwestern University with a specialty in polymer science (polymer chemistry, physics and characterization).

8:30 - 9:00 **"Simulation of Resin Transfer Molding (RTM) and Compression Molding"**

Author: Justin Courter - Autodesk

Abstract:

Developing molded components is challenging. The decisions made regarding part geometry, material, process type and mold design are interrelated. Understanding the impact of these variable influences is not easy without predictive simulation approaches. Early choices often impact the development time and success of a project. It's no longer acceptable to choose a manufacturing process based on "that's how it was always manufactured". This has refreshed old manufacturing processes and new techniques applying multi-component molding and composites. There are on-going trends of light- weighting and improving product performance while reducing manufacturing cost. This has driven increased usage of simulating process types like RTM and compression molding. In this presentation we'll take a look at the challenges facing engineers, how they can be prevented, and how simulation can help. We'll show you how to recognize possible problems and techniques to predict issues when using Moldflow techniques.

We'll answer questions including:

- What processed and materials can be simulated?

- Managing fiber angles and the effect on permeability / filling of a preform.
- How to avoid dry spots / non-fill?
- Gating and charge design impact of part performance
- Consideration to modify a mold to ensure part quality and process reproducibility

Autodesk® Moldflow will be used to illustrate these topics. The general discussion will be relevant to all faced with developing molded components designed for RTM or compression molding.

Biography:

Justin Courter is a Premium Support Specialist working in the Customer Success Services group at Autodesk, a role he's held for 5 years. Justin graduated from the Pennsylvania State University, the Behrend College with a degree in Plastics Engineering Technology and has worked at Autodesk for 8 years in a variety of roles focusing on Moldflow and simulation. He has presented a number of topics in these areas to better design, develop and optimize plastic processes, tools and parts. He has published work with the Society of Plastics Engineers, a group he has been a member of for 12 years, presenting that work at ANTEC in 2007.

9:00 - 9:45 **"Fundamentals of Rubber Technology"**

Author: Tim Reski, Materials Technology Leader- Minnesota Rubber and Plastics / Quadion, LLC

Abstract:

An introduction to rubber technology that examines the differences between natural and synthetic rubber elastomers and describes the properties and performance characteristics of the more common families, determining the suitability of each for various applications. Analysis of the formulation architecture and raw material selection of several elastomers will provide insight to the basic chemistry and performance capabilities. Finally a brief review of elastomer mixing, molding, and testing will show how a final custom molded article is manufactured.

Biography:

Tim Reski has 37 years of Material Science experience in elastomer development and manufacturing at Minnesota Rubber & Plastics. During his 12 years of manufacturing experience he has performed chemist responsibilities associated with process development and product launch. During the past 25 years Tim has directed the material development and testing activities for new product development.

Education and Committees

- BS Chemistry
- Voting member for NSF/ANSI Standard 61 Drinking Water Additives
- Area Director for Twin Cities Rubber Group
- Member – Energy Rubber Group

Areas of Expertise

- Material development and agency/regulatory topics for elastomers in food and potable water applications (FDA for food, NSF, WRAS, KTW, and ACS)
- Material topics related to the use of NBR, HNBR, and FKM elastomers in oil and gas (Energy) applications

9:45 - 10:00 BREAK - EXHIBITS OPEN

10:00 - 10:30 **"Graphene Enhanced Thermoset Components, ...Get Ready for the Future!"**

Author: Michael Rogers, Founder/Co-Owner, Director of Product Development- 1st Graphene

Abstract:

Stronger, tougher, lighter.

Graphene enhanced thermoset components can be larger or smaller, lighter, stronger, weather and corrosion resistant, more energy efficient, and more

resilient. The discussion will focus on why Graphene will contribute to "making everything better" in the thermoset components industry, this includes the cost benefit ratio.

Wednesday, March 22

Biography:

Background, Banking and Finance with primary experience in working with Industrial Manufacturers. Education includes successfully completing The University of Manchester's Course "Graphene and 2-dimensional Materials". Attended UCLA with 3 in depth field majors in Political Science and minor in Economics. Actively engaged with graphene development since 2012. Initially looking into investment possibilities then starting to work to become a distributor and manufacturer of graphene and graphene enhanced products. The main functional applications that are of interest included decentralized power generation, power storage, small scale potable water applications, coatings, structural enhancements, and transportation.

10:30 -11:00 **"Development of A Two-Stroke Thermoset Engine That Runs Air Cooled Without Oil"**

Author: Randy Lewis, Titan Advanced Composites

Abstract:

A Thermoset plastic composite engine has been developed. It is a two stroke, air cooled copy of an aluminum weed eater engine. The plastic engine requires no oil has shown no visual or measurable wear in initial testing which continues. The engine block, combustion chamber and connecting rod are all made from a Thermoset composite that can be molded or molded and machined to the tight tolerances needed for a functioning engine. The only metal parts are the wristpin, and a metal cap on the flat surfaces of the combustion chamber.
The flat surfaces were subject to damage from the explosion of the igniting gas. All non- flat surfaces and those not in direct contact with the impact of the explosion showed no ill effect of the 425°C exhaust gas temperature.

Testing continues.

The engine was made as a test bed for ZeMC², LLC of Salisbury, NC to find a failure point for their high temperature wear resistant Bulk Molding Compound (BMC). Pump wear rings have been in the field for more than eight years, running dry for extended periods, without wear on either the wear ring or the

shaft on which it runs. In an effort to define the failure point of the BMC the engine was constructed.

Two failure points were defined:

A 425ºC temperature and the impact of a combined explosion caused de-lamination of the molded BMC part. This was corrected with metal cap. Those flat areas not in direct line with the explosion or rounded areas exhibited no ill effects.

The connecting rod riding on a connecting rod of the same molded BMC exhibited wear. The wrist pin was replaced with steel and there was no further wear.

Development continues.

Biography:

Randy Lewis is Managing Member and Director of R&D for Titan Advanced Composites, LLC and has 40 plus years in the Thermoset Industry. Titan, concentrates on developing molding compounds that solve problems that have been unsolvable in the past.

Randy has held every job in the thermoset industry from Set Up to Division Manager for a Fortune 100 Company to Owner of a Thermoset molding company.

In SPE he is a past International Vice President and Executive Committee Member of the International Society of Plastic Engineers, and has served the Society twice as Chairman of the Council Committee of the Whole, twice Chairman of the Thermoset Division and President of the Piedmont Costal Section. He has a degree in Industrial Engineering from Gaston College. He served as a helicopter pilot in Viet Nam. His passions are heat transfer in plastic molds, recycling of Thermosets, and making BMC's that show what Thermosets are capable of doing.

11:00-11:30 **"NFPA Code 400 influences storage and use of many organic peroxides: Consulting the Authorities having Jurisdiction"**

Author: Anthony Bennett, Group Leader, Interplastics Corporation

Abstract:

Even before the release of the National Fire Protection Association, (NFPA) Code 400 in October 2015, organic peroxide manufacturers were attempting to raise awareness, of the implications of the new recommendations to the composites industry. While some in the industry jumped to comply with storage and handling recommendations, many have either ignored, or decided they can wait to make a move to a new product, or to modify conditions in their shops.

This paper will review some of the more common organic peroxides that have changed in the NFPA Code 400, and offer some reasoning for the reclassifications. The paper will address some of the of storage and handling restrictions recommended by the NFPA.

Biography:

Tony Bennett has a Bachelors in Science Chemistry from University of Wisconsin-Milwaukee, where he also attended graduate school. Tony recently moved back to work at Interplastic Corporation in Minneapolis as a Group Leader in open molding and specialty products. He had previously been at IP for 17 years in a similar role. He spent almost seven years in between at AkzoNobel as Technical Development Manager Americas, specializing in Thermoset organic peroxides. Tony is a prolific author, preparing many papers for conferences and periodicals.

Tony is also taking a Masters of Science degree in Project Management currently. He is happily married to Linda, and they have two grown children living in Minneapolis. In his free time, Tony enjoys performing with his saxophone for local community bands and camping.

11:30-12:00 **"Flex-Made" LocLux**

Author: Marcelo Mignoni

Abstract & Bio:

Unavailable at time of print.