



THERMO SETTINGS

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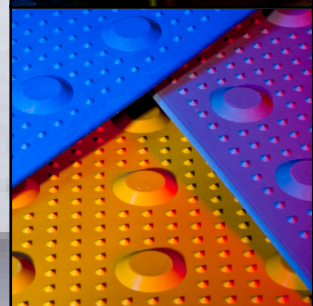
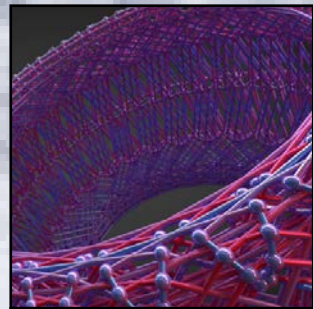
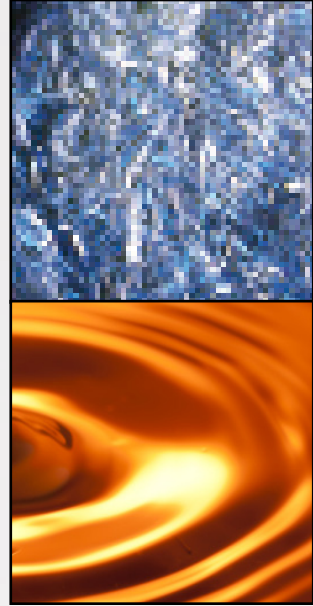
LETTER FROM THE CHAIR

MAR-BAL N.E. OHIO EXPANSION

THERMOSETS OFFER POTENTIAL
SOLUTION TO WIND TURBINE FIRES

A THINNER HIGH STRENGTH
COMPOSITE

SPE THERMOSET BOD ADDITIONS



Editor, Shelane Nunnery

Q1 2017

Letter from the Chair

Happy New Year, Fellow Thermosetters!

Allow me to begin with a quick personal note. As of January 22nd 2017, my one year non-compete/non-solicitation commitment to A. Schulman Engineered Composites came to an end. I am now free to re-engage the BMC/thermoset industry and plan to celebrate this fact by moderating the proceedings AND delivering a lecture to the Society of Plastics Engineers (SPE) Thermoset Conference being held in Scottsdale, AZ, March 21-22!

My technical presentation will focus on the development and manufacture of bulk molding compound. I will highlight the engineering techniques, production procedures/equipment, quality assurance, housekeeping and cost reduction practices that potentially contribute to the tons of molded BMC scrap landfilled each year. This paper will be of use to compounders seeking to benchmark themselves, molders/OEMs interested in discovering root causes for molding scrap, raw material suppliers endeavoring to enhance input value and equipment manufacturers seeking to confirm their value proposition within the BMC space.

About the SPE Thermoset Conference: The Thermoset Conference is an intimate (150-200 attendee) gathering built on an agenda consisting of approximately twenty technical presentations. The capabilities, enhancement, manufacture and new markets associated with thermoset materials are the primary themes of the event. Contributors include input suppliers, compounders, processors, equipment manufacturers (production and test), tool and die specialists and key leaders of other impor-



Len Nunnery, SPE Thermoset Division Chair

tant/related industry groups.

The Thermoset Board of Directors has worked hard to assemble a best in class technical agenda. We have also endeavored to establish an atmosphere of relaxed communication between conference attendees in an affordable, yet luxurious, atmosphere. Heavy in top engineering talent, purchasing management and the stakeholders/owners of leading thermoset businesses, opportunities for effective engagement with key decision makers abound.

Please note, we have two extracurricular activities including a Cubs Spring Training game (with shuttle transport) on Sunday, March 19th and a golf 'best ball' tournament on Saturday, March 20th. Information regarding these outings (as well as our full conference agenda) can be found here. **Please consider joining us at the Resort at McCormick Ranch in Scottsdale, Arizona this March 21-22nd.**

Sincerely Yours,

Len Nunnery

Chair, SPE Thermoset Division

SPE Thermoset Division Board of Directors

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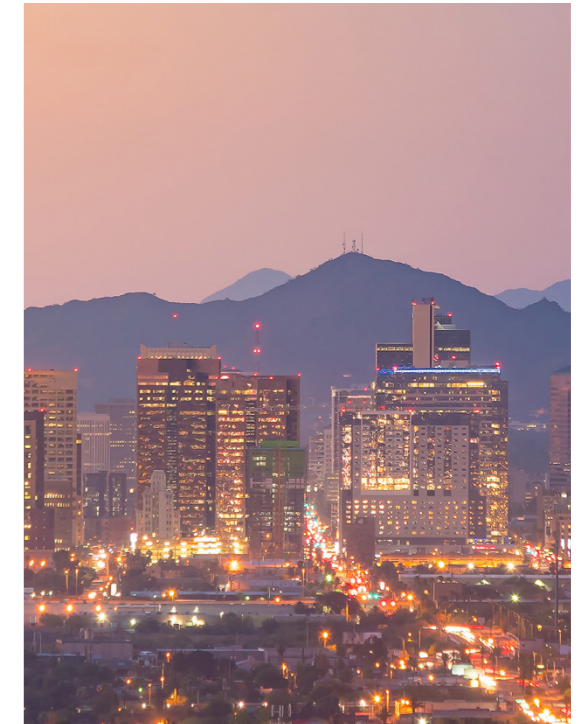
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Randy Lewis
Industrial Engineer,
P.R. Lewis Consulting



Join us in Scottsdale, AZ
March 21-22, 2017

Ron Poff
Manager, Global Marketing & Brands
Mar-Bal, Inc.

Walter 'Bud' Schutz, Jr.
President, ITC Molding Solutions

Greg Spaeth
Project Engineer, Plastics Engineering
Company (PLENCO)

Andy Stroh
Vice President & Partner,
Cornerstone Composites

Paula Watt
Director of Outreach, College of Polymer
Science and Polymer Engineering at the Univer-
sity of Akron

MAR-BAL, INC. EXPANDS IN NORTHEAST OHIO

Mar-Bal Fact:

THE LEADING INTEGRATED COMPOUNDER AND MOLDER OF BMC THERMOSET COMPOSITES

Mar-Bal, The One-Source Solutions provider of BMC Thermoset Composites, continues to research and formulate advanced materials, develop innovative products and use a portfolio of brands and proprietary products delivering composite solutions used enabling our customer's technology and success. Mar-Bal serves the appliance, electrical, industrial, food service and transportation industries from their four facilities in North America and their Asia sales office located in Shanghai, China.



HOW CAN MAR-BAL'S INTEGRATED APPROACH PROVIDE VALUE TO YOU?

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Thermoset Composites

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mar-bal.com



Mar-Bal, Inc., a Chagrin Falls, Ohio- based leader in the thermoset composite industry and innovative solutions provider has recently completed the purchase of a manufacturing facility in Painesville, OH. This new plant will be a renaissance for Mar-Bal, Inc. and the composites industry by utilizing best in class automation and manufacturing processes in BMC compounding and injection molding.

Mar-Bal provides engineering design, material formulation, compounding, molding and finishing services to original equipment manufacturers (OEMs) in the appliance, electrical, industrial and transportation industries. In addition, over the past year, Mar- Bal has expanded their business into the automotive and HVAC markets as well. This additional business growth, combined with their continued investments in innovative platforms, required Mar-Bal to invest in additional manufacturing space.

Serving our customers in a newly renovated facility with best in class technology will provide our people with the tools required to be the global quality leader," stated Scott Balogh, President and CEO of Mar-Bal, Inc. "This Painesville facility positions us for future growth in our core manufacturing processes and is an important addition to our global manufacturing footprint. Our customers are providing us opportunities to grow our current business and product offerings. Our leaders in sales, market-

ing and engineering are innovating new applications and developing new materials that will open new markets, which all leads to an expansion. This facility will have the best and safest working conditions in the company, and when completed, will be the best fully integrated BMC compounding and molding plant in the world," further stated Balogh.

By collaborating with community leaders in the City of Painesville, Lake County, JobsOhio and Team NEO, Mar-Bal will acquire and renovate the 110,669 square foot facility, which is the largest vacant industrial space in Lake County, by the end of 2017. Mar-Bal chose Northeast Ohio because of the skilled workforce required to design, build, operate and maintain a complex manufacturing operation. Within five years Mar- Bal will double their workforce and invest approximately \$15.0 million. The support of JobsOhio and the City of Painesville made this manufacturing investment possible.

Northeast Ohio has strength in materials across the entire value chain", said Walt Good, Senior Director, Business Development for Team NEO. "This coupled with our talented workforce, makes our region attractive for plastic injection molding companies".

The City of Painesville is proud to have the Mar-Bal Corporation, a strong business with quality employment opportunities, join the Painesville Renaissance Industrial Park. The Mar-Bal family will be a long-part of our city's future as one of our newest and largest employers." Cathy Bieterman, City of Painesville Economic Development Director.

Mar-Bal, Inc., headquartered in Chagrin Falls, OH, is the leading integrated compounder and molder of BMC Thermoset composite products and value added finishing services. Mar-Bal has been recognized as one of America's fastest growing companies for 2 consecutive years



(2013, 2014). Since 1970, Mar-Bal has engineered and manufactured quality, customized materials and parts while delivering unmatched client cost-effectiveness through superior customer service and commitment to the total value. Mar-Bal, an ISO 9001:2008 Registered Company, serves the appliance, electrical, industrial, food service and transportation industries from their four facilities in North America, manufacturing plant in Taizhou, China and their Asia Sales Office located in Shanghai, China. Mar-Bal, The One-Source Solutions provider of BMC Thermoset Composites, continues to research and formulate advanced materials, develop innovative products and has a portfolio of brands and proprietary products delivering composite solutions and enabling our customer's technology and success.

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ARE THERMOSET BEARINGS THE ANSWER TO WIND TURBINE FIRES?

Each year there are approximately 117 wind turbine fires, a major cause of wind farm failure, according to several reports from 2014. One of the major causes, outside of lightning, is overheated bearings and gearboxes. According to an article in Engineering Design Insider (EDI), "wind turbines often catch fire and burn much more frequently than is reported."

The publication cites a study from the UK and Sweden, and researchers at Imperial College London, Edinburgh University and SP Technical Research Institute of Sweden, who report that "while an

average of 11.7 turbine fires are reported annually, more than 117 fires actually occur worldwide. At present, there are an estimated 200,000 turbines in operation around the world."

The report notes that a wind turbine fire can be more significant than other types of energy fires such as gas or oil, and gives the example of an Australian wind farm containing 112 turbines. "When one of them caught fire during a heat wave, the entire farm was shut down, cutting power to 63,000 homes," said the report. "In addition, burning debris from the turbine ignited ground fires that destroyed 80,000 hectares

of a national park. The cause of the fire was found to be electrical failure in the nacelle. Lightning strikes are the most common cause of wind turbine fires."

Randy Lewis just might have a way to prevent some of those fires. "Lightning I can't fix, but from what I can find out, the primary fixable problem causing fires is overheated bearings," Lewis told *PlasticsToday*. Lewis has his own consulting firm, P.R. Lewis Consulting (Charlotte, NC), and is a 50% owner in ZeMC 2 (Salisbury, NC), a specialty material bulk molding compound (BMC) company that develops new materials for pump and down-hole applications, engine bearings and more.

The lubrication used in the bearings in the wind turbine nacelles is flammable, and often the lubricant overheats from friction, which can cause a fire. The BMC the company has developed may be a solution. "The BMC we use to manufacture the little two-stroke, air cooled engine we have running here in our shop is lubeless, and takes high temperatures. The engine block, piston and connections are manufactured from our BMC," Lewis said. "I would like to propose this to the wind turbine industry as a solution, but I can't even get a phone call returned. In my opinion and based on our tests, this stuff would solve the problem."

A video shows an oversized plug being forced into an undersized hole. "It generates dust and heat while it is going in. When it seats, the temperature drops back be-

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low the initial starting temperature," explains Lewis. "No friction heat at all. We are running dry in small applications relative to wind turbines, but I see no reason why it won't scale up. Ours has no lubricant and it is also one-third the weight of steel with a glass transition temperature of 246° C. In 100% of our applications we have removed friction heat from the equation."

An article in the August 2015 issue of Wind Power Monthly notes that the three things needed to start a fire are fuel, ignition and oxygen. "You can find all three of them in ample quantities within the nacelle of a wind turbine," said the article. "A 1.5-mW machine, on the small side by today's standards, can still contain up to 900 liters of lubricating and cooling oil. The nacelle itself, probably made with flammable fibre-reinforced plastic, will house acoustic insulation materials, which are also flammable. Ignition can be provided by faulty electrical and electronic components and connections, or overheating mechanical parts [especially during periods of high winds]. And high winds, the reason the turbine is there in the first place, can be guaranteed to feed the spark and fan the flames."

These turbine fires are expensive. Wind Power Monthly estimates that a 2-mW turbine costs nearly \$3 million and generates an estimated income of approximately \$665,000. The article noted that offshore turbines are larger and more complex, and more difficult to repair or replace, which will in-

crease costs in the event of a fire.

Lewis told PlasticsToday that his team currently has BMC bearings running in boat propeller shafts, with no cooling water or lubricant, at between 85° and 115° F at all revolutions per minute and torque. "All of the other materials, and I do mean all, use cooling water and run 190° to 215° F. The windmill has no cooling water and the bearings are full of flammable lubricants," Lewis stated. "There is also hydraulic fluid in abundance."

"Offhand, the thermoset materials are used in many areas. Epoxy with woven glass sheet is used for the blades, motor components, circuit breakers and relays because of its ability to withstand high temperatures and loads, where thermoplastics would soften and fail."

The article in EDI confirms the materials. "The nacelle is typically the main 'fuel load' within a turbine. Constructed of polymers, and containing insulation and a variety of cables and oils, nacelles are highly flammable. A single 1.5-mW wind turbine nacelle can contain up to 900 liters of lubricating oil including cooling and cleaning fluids," said the article, quoting the same report as Wind Power Monthly. "The transformer, located at the base of the tower, can easily contain an additional 2,200 liters of transformer oil. Electrical/electronic equipment failure or malfunction is a common cause of fire in turbines, often caused by overheating surfaces such as bearings, gearboxes and mechanical brakes, [which] can pose a high fire risk in wind turbines."

Lewis believes he has an excellent solution for the wind turbine industry and is currently continuing with his testing on these BMC bearings.

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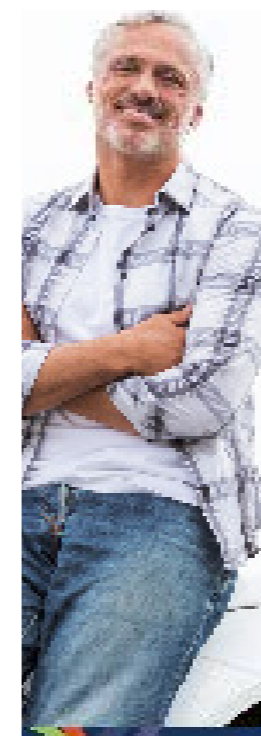
Source: Plastics Today, by: Clare Goldsberry / Injection Molding



A. SCHULMAN INTRODUCES THINNER HIGH STRENGTH COMPOSITE MATERIAL

A. Schulman introduced Quantum FORGED PREG™ COMPOSITE MATERIAL at CAMX Composites Show in September 2016. A. Schulman's Engineered Composites business has developed a next generation composite material, Forged Preg™ in collaboration with the world's largest maker of premium, performance golf goods and the Company's fiber supplier. A. Schulman's long-term customer approached the Company's R&D team to find a lightweight material with superior surface appearance. The performance characteristics of the new composite material developed by the Company include higher strength and stiffness. The material is much thinner and allows the molding in fabric form. Forged Preg™ is also suitable for use in automotive applications requiring a lightweight material with high-end look and feel.

"Once again our R&D team has addressed the customer needs and developed a next generation material which helps our customers to succeed in the marketplace," says Frank Roederer, senior vice president and general manager Engineered Composites. "This development shows our firm commitment to long-term customer partnerships and joint product development across the composites value chain."



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SPE THERMOSET DIVISION WELCOMES NEW BOARD MEMBERS

SPE's Thermoset Division is pleased to announce the addition of several new Board of Directors members. Please join us in welcoming the following individuals to our team of vetted professionals.

REGGIE ALPHIN, , Director of Operations, at Globe Plastics, Inc. in Chino CA, where he is responsible for all aspects of driving the business through operational excellence. In addition, he is responsible for the Sales and Marketing team to educate the industry of composites excellence and the importance of partnerships. Reggie has been with Globe Plastics for over 19 years and held numerous positions throughout his tenure there. Reggie holds an MBA and Bachelor's degree in Marketing from California State University, San Bernardino. He is a certified Plastics manufacturing and Injection molding specialist from Cerritos College in Norwalk, CA. Reggie serves on the Board of Directors and Vice President of ALMA International (Association of Loudspeaker Manufactures and Acoustics), which he has held this position for the past 4 years. He is a current member of AES (Audio Engineering Society), SPE (Society of Plastic Engineers), AMA (American Marketing Association) and IEMC (Inland Empire Manufacturers Council).

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 appli-



Reggie Alphin



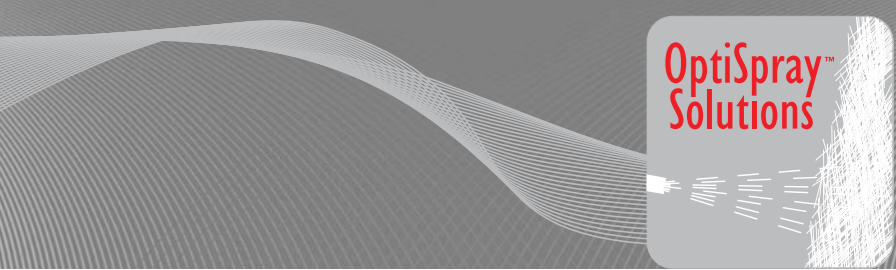
Matthew Kaczmarczyk

cations. 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 most recently the 2016 JEC Composites International Conference on Automotive Technology addressing "Automotive Light Weighting Using Chopped and Continuous Compression Molded Carbon Fiber Materials".

WALTER 'BUD' SCHUTZ is president of ICT Molding Solutions, Inc., a company he founded in 2014 which specializes in Injection / Compression and Transfer molding of Thermoset molding compounds consisting of both polyester & phenolic along with many other well-known materials including most engineered and commodity Thermoplastic resins. Over his 27 year career, Walter has been involved in many aspects of the man-



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Walter Schutz

BOD Members, continued

ufacturing & business sector of molding and all its related facets. He served as a tool and die apprentice and over the years evolved up to Production Engineer of molding and secondary sub-assemblies. To go along with the manufacturing side Walter also possesses strong leadership skills serving many years as Director of Operations and Director of New Business Development.

Moving forward Walter is eagerly pursuing many cutting edge technologies to help the Thermoset industry stay strong and prosperous, some of which include high speed molding techniques along with environmentally friendly low impact mold building design practices. He currently resides in Northwest Pennsylvania with his daughter Emily.

ANDY STROH is a Vice President and partner at Cornerstone Composites, a Milwaukee, WI molding firm. He joined the industry in 2014 after serving in the die casting industry for over a decade. Cornerstone was formed through a merger between Wisconsin Thermoset Molding and Rose Polymer. Andy is an executive team member with primary responsibility for customer relations, new business development and industry advocacy. During his career in manufacturing he has lead teams of associates in nearly every facet but focuses on sales, engineering, operations. Andy holds a degree in business administration from St. Norbert College in Greenbay, WI. He is an enthusiastic believer and spends his time promoting the use of thermosetting composites in mechanical and structural part applications.



Andy Stroh



Paula Watt

PAULA WATT Paula Watt is the Director of Outreach for the College of Polymer Science and Polymer Engineering at the University of Akron. She joined the University after 30 years of industrial research and technical management experience in the polymer industry. She has a Ph.D. in Polymer Science

from the University of Akron, an M.S. in Macromolecular Science from Case Western Reserve and a B.S. in chemistry from the University of Pittsburgh. Paula has authored numerous technical publications including two book chapters. She has prepared winning grant proposals and has been Principle Investigator for multiple industry/university collaborations. Paula served as the Industrial Advisory Board Chair for Kent State Ashtabula's Technology Department, as Chairman of the Industrial board of EPIC's Composites Center of Excellence and on the Polymer Ohio Board of Directors. She also served on the ACMA Educational and Biocomposites sub-committees, as a Business Mentor for a UA I-corp sites team, on NSF SBIR proposal review committees and she has been an adjunct professor at Kent State University.

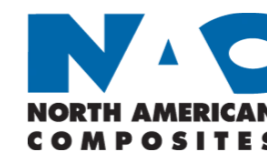
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