Get Connected with Airtech’s Oven & Autoclave Connections

**Premium Multi-Valve 407**
- Leak free one piece design
- Stainless steel construction
- Hansen style connection

**Premium Multi-Valve 408**
- Leak free one piece design
- Stainless steel construction
- Parker Snap-Tite style connection

**Vac-Valve 399**
- 2-piece twist lock
- Lightweight aluminum

**Vac Valve 400**
- Twist then screw seal
- Lightweight aluminum

**Vac Valve 402**
- 3-piece design
- Steel or aluminum

**Vac Valve 406TF**
- 2-piece screw down design
- Stainless steel construction

**Vac Valve 409 SS HTR**
- High temperature cures (900°F / 482°C)
- No organic “O” rings

*Video available online

**AIRTECH INTERNATIONAL INC.**
www.airtechonline.com

**AIRTECH EUROPE Sarl**
www.airtech.lu

**TYGAVAC ADVANCED MATERIALS LTD**
www.tygavac.co.uk

**AIRTECH ASIA LTD**
www.airtech.asia

More than a manufacturer... A technical partner!
Feature Articles

Page 7
Bi-angle Tape Efficiencies for Automated Tape Laying (ATL)

Page 20
Physical and Mechanical Properties of Nickel Coated Carbon Fibers and Their Fabricated Composites

Page 34
3D Fiber Spraying – Development of an Automated, High Volume-Capable Preforming Technology for Structural RTM Parts

Page 52
Crash Performance of Variable Stiffness Braided Fiberglass Composites
Back to work again.

While I am writing, January has not ended yet, but things go so fast that our Christmas holidays seem to have passed many months ago. Here in Italy (I think you have heard about) we have had another series of earthquakes in the area where I live, the center of Italy. Although no casualties due to collapse of the buildings and houses, however the earthquake caused an avalanche which destroyed a hotel up in the mountains where people were trapped by the terrible weather conditions. My thoughts and solidarity go to people which died and to those that are still living in the small towns hit by the quake, sleeping in tents and containers in really unusual bad weather conditions. In addition, the earth does not seems to stop trembling: 48,000 quakes in six months are hard to bear. Consequently, I have been thinking what science and research can do to avoid that such phenomena which cause such damage. In particular, I was thinking of how many advantages come from the use of advanced composites for the rebuilding of the houses in a safe way, or for the restoration of the damaged ones. The lightweight composite materials are of great importance for the restoring of ancient historical buildings, as it gives the possibility to strengthen the structures without adding a great amount of load. I had the chance to see, some years ago, the amazing composite beamed structure that currently holds the inside roof with the frescos of the Assisi church, which fell down in the Umbria earthquake of 1996. It was a costly solution but was the only one possible to avoid putting a heavy weight on that ancient structure. This reminds me of the strength of composites, their versatility and their potential application in many fields. Of course, the composite application to the Assisi church could not be directly translated to the current situation. An expensive application of Kevlar and high modulus carbon fiber epoxy as a structure for buildings is not always possible, but it may be possible in the case of restoring historical and damaged buildings in areas with a heritage. I think that new composites solutions for buildings, together with the existing ones, could play an important role.

Let us talk about our society. Well, I am happy to see the new logo printed on the SAMPE Journal, in the conference brochures and on our websites. While I am writing, it is already present in the SAMPE Europe website. My new SAMPE business cards look great, and I am sure that all of you will like our new logo. Each region is characterized by a different color which will help in identification. Blue is always the primary color of the bottom of the logomark, while the color of the top of the logomark is associated to the region in the following fashion: SAMPE global is orange, SAMPE Europe is lime green, SAMPE Japan is salmon pink, SAMPE North America is light blue and SAMPE China is green. These colors were chosen by the regional presidents. I think that the people that designed the new logo did a great job. They also provided us with a logo usage guide that will allow SAMPE chapters and regions to communicate in a more uniform way than before, giving to the external a better and more professional image.

The next SAMPE event will take place in Europe in Paris, where there will be held the third SAMPE EUROPE Executive Summit. The program looks great and I think that the talks and the discussions will help us to understand better what will be the trend for advanced materials industry for the next year. The location, close to the Tour Eiffel, is perfect for business and free time, so I warmly invite you to participate.

If you cannot come to Paris, SAMPE Global Regions offer a plenty of great events in 2017: Seattle, Orlando (CAMX), Beijing and Tokyo, all places where a SAMPE member is always welcome.
When you partner with Composites One, you’ll work with a dedicated team of **PEOPLE**, from Advanced Composites sales specialists and technical market managers who understand the challenges you face, to regional customer service reps and local support teams at over 35 North American distribution centers, including those with onsite prepreg freezer storage. You’ll gain access to the industry’s broadest range of high performance **PRODUCTS**, learn about innovative **PROCESSES** that can help your business grow, and get the **PERFORMANCE** you should expect from the nation’s leading advanced composites distributor.

*That’s the power of Partnership. The Power of One – Composites One.*

North America’s most expansive advanced composites materials distribution network including prepreg freezer storage at several locations. Go to [compositesone.com/prepregfreezer](http://compositesone.com/prepregfreezer).

Get the Power of Partnership. **Composites One**

Choose from the broadest, deepest line of high performance products from the industry’s top suppliers.

---

800.621.8003 | www.compositesone.com | www.b2bcomposites.com

Find out more at *Compositesone.com/prepregfreezer.*
A Note From The Technical Director

Dr. Scott W. Beckwith, FSAMPE
SAMPE Journal Technical Editor
swbeckwith@aol.com

Recycling Technology – More Important Today Than Ever

Recycling composites and plastics is a component of many if not a majority of materials conversations today. Today, industrial nations that use composites, plastics, fibers, resins and materials find it unacceptable to just take unused or leftover material and send it to the dump. Europeans have considered recycling of thermoset composites for many years (“Reinforced Thermoset Composites,” Reinforced Plastics, October 1999). In fact, the word “recycling” showed up in publications back in the very early 1990’s. Recycling was only in its early stages then. Nothing significant moved forward until the early 2000’s.

Early recycling work focused on commercial composites applications where glass fiber and thermoset resins in automotive, marine and other markets first identified the need. Pyrolysis and grinding techniques were the major focus areas. As the wind energy market grew in size, glass fiber recycling interest grew as well (“Recycling Wind,” Reinforced Plastics, January/February 2009). Wind blade lengths have grown significantly to well over 50-75 meters in length. The amount of glass fiber reinforcement (and some carbon fiber in blades longer than 50 meters) has become very significant. While these composite blades can last significantly longer, blade damage beyond repair (lightning, handling, weather, etc.), these blades eventually reach some defined “end of life.” SAMPE has long recognized “recycling” as a major industry and community need (“Recycling Technology – Cradle-to-Grave Application of Composite Materials,” SAMPE Journal, September-October 2014).

Annually, SAMPE’s global conference events have offered presentations with recycling technology papers, panels and tutorials for well over the last 10 years. Particular emphasis has focused on recycling in several markets: aerospace with its carbon fiber materials, automotive with growing carbon fiber interest as well as traditional glass fiber materials, and, wind energy which contains both materials. SAMPE’s Global community has also focused on “recycling” in its regional conference events (China, Europe, Japan, and Brazil, our rapidly growing South America entity).

Additionally, SAMPE’s Emerging Technology Committee identified “Recycling” as a key technology area. SAMPE’s Technical Excellence Committee has tactically assured that “Recycling” is a major focus area within its North America conference events each year.

Advances in both thermoset and thermoplastic recycling technology has been encouraging. Applications for “second generation composites” using these recycled materials are promising. Major material supplier and end-user manufacturing companies are engaging in these advancements.

The market is growing. Technology is advancing. New second generation applications are being developed. And – serious attempts are being made to avoid burial under tons of other “trash and dirt” knowing that the decay process is extremely slow for these materials – and perhaps not acceptable.
A NEW APPROACH FOR COMPOSITES DESIGN

Design of composite laminates can be simple, practical and more efficient.

A STRATEGY TO DESIGN COMPOSITE LAMINATES WITH OPTIMUM COMBINATION OF STRENGTH, STIFFNESS, TOUGHNESS AND SIMPLE FABRICATION.

Available Formats: Hardcover & eBook

This book presents a new design approach for composite laminated structures based on invariants: Trace of the plane stress stiffness matrix and Unit Circle failure criterion. The design of composite grid structures is discussed in details.

FOR MORE INFORMATION:
compositesdesign.stanford.edu
Abstract

The present work discusses many opportunities offered by bi-angle tapes for automated tape laying of composite parts. With bi-angle tape, \([\pi/4]\) laminates, for example, can be produced with a \([0/45]\) tape laid along the \(x\)-axis, followed by the same tape laid along the \(y\)-axis. The 2-axis layup is nearly three times the deposition rate over the 4-axis layup. In addition, there are many novel opportunities to engineer selections of hybrid materials, specialized off-axis angles, thick-thin ply combinations of the two ply angles, and others to achieve unique performance characteristics (like pseudo-plasticity, and tapered edges), and cost savings not possibly achieved by conventional unidirectional tape layup. The most efficient layup rate is achieved with 1-axis layup of laminates such as \([0/\pm 45]\), \([0/\pm 30]\), and those with other shallow off-axis angles. Such laminates are most practical for wings, shafts, rotors, and other 1-dimensional structures. Ultimately, bi-angle tapes can be laid by automated tape laying machines with several fold increase in the rate of deposition and flexibility that are not possible with the conventional unidirectional tape.

Introduction

Automated Tape Laying (ATL) is one of the main manufacturing technologies for advanced composite laminates. This process is typically used for manufacturing of high performance parts in the aerospace industry and is currently finding new applications in the wind energy industry. ATL is known as a highly productive process for prepreg layup, offering advantages such as reduced labor, high layup rates, capability to manufacture large parts, increased part quality and consistency\(^1,2\).

In a previous cost modeling study focused on manufacturing processes for large wind turbine blades, it was shown that ATL could reduce manufacturing costs by up to 8% over that of manual techniques, in spite of the high cost of the equipment. It was also shown for the case study presented that NCF (non crimp fabric) is a more cost effective material over woven fabric\(^3\).

The use of bi-angle tapes such as C-Ply by Chomarat\(^4\) with ATL manufacturing can further improve productivity of high performance parts. Bi-angle tape made using NCF is also a new layup strategy to generate many practical laminates that otherwise cannot be manufactured with unidirectional tape. A \([0/45]\) tape, for example, can make \([0/45/90/\text{-}45]\) with 2-axis layup instead of 4-axis with unit tape. Then, the rate of deposition is more than twice because off-axis plies take longer to layup than on-axis plies along the 0 and 90 axes. In addition, if thin plies are used on the bi-angle tape construction, laminates can be made tougher and more resistant to edge delamination. With thin sub-laminates, the laminate can be easily homogenized and mid-plane symmetry in stacking sequence and ply drop are no longer needed\(^5\). The resulting laminate with highly repeated sub-laminates of bi-angle plies has simpler and faster layup than laminates made from unidirectional tape and laminate optimization becomes straightforward. Simultaneous reductions in weight and cost are achievable.

The purpose of this paper is to discuss the advantages of bi-angle tape for ATL composite prepreg manufacturing, as compared to conventional unidirectional tape. Increase in the rate of deposition, flexibility and cost savings are some of the issues addressed.

Figure 1. Upper figure: Trace-normalized laminate stiffness \([A]\). Lower figure: Three materials with different trace values shown with their absolute stiffness components.
Physical and Mechanical Properties of Nickel Coated Carbon Fibers and Their Fabricated Composites

Abstract

Nickel coated carbon fibers are a well characterized staple of conductive plastics and conductive composites. When carbon fibers are coated with nickel, the traditional physical and mechanical weight specific properties of both the fiber and the resulting composite are largely preserved, while the nickel coating provides for engineered electrical properties in the composite. Due to the dense nature of the nickel, and the poor reactivity of nickel with carbon, the preservation of these properties may initially seem counterintuitive. It will be shown herein that the thin, uniform, cohesive and ductile coating of the naturally high modulus nickel acts in concert to preserve these mechanical properties.

Electron Microscopy and Physical Properties of Nickel-Coated Carbon Fibers

Electron Microscopy

Nickel coated carbon fibers have been employed in industry for several decades. Their main application is to provide for the introduction of engineered electrical conductivity in fiber reinforced composites. A set of typical micrographs of nickel coated fibers are shown (Figures 1-2).

Physical Properties- Coating Thickness, Uniformity and Ductility

By varying and controlling the coating process conditions, the thickness of the coating can be varied across a wide range, from about 15% up to about 85% nickel by weight. The next set of figures (Figures 3-4) illustrates this engineered variability, and relate it to the weight percent nickel on the fiber.

Methods of Measuring Nickel Content or Thickness

These engineered variations in coating thickness can be studied and reported by several methods, such as:

• Weight percent nickel on the fiber vs. electrical resistance.
• Weight percent nickel on the fiber vs. nickel coating film thickness
• Weight percent nickel on the fiber vs. volume percent nickel in the composite
• Density of the composite as a function of weight percent nickel on the fiber

These methods are illustrated in the following four figures (Figures 5-8).
Abstract
Fiber reinforced composites are increasingly being applied in aircraft and automotive applications for structural lightweight components. Accordingly, one of the central challenges for the application of thermoset composites in large series is the development of preforming technologies for the automated, scrap-optimized production of components in short cycle times, because the preforming process can cause up to 50% of the component costs. In order to reduce preforming costs and cycle times, the 3D Fiber Spraying process is being developed at the Institute of Plastics Processing at RWTH Aachen University. This process technology allows for the automated production of three dimensional shaped preforms in one process step. In the 3D Fiber Spraying process, textile rovings are cut to a defined length (12-100 mm), oriented by an air jet in a fiber guiding unit and sprayed on an air permeable layup mould. The fiber guiding unit, which is specifically developed for the process, facilitates an adjustment of the local flexural strength with an anisotropic ratio of up to 2.8:1. Furthermore, functional elements like inserts and stiffening profiles can be integrated without further sub processes. This allows for a precise adaption of the fiber structure to the mechanical requirements for the envisaged component. Thereby, mechanical strengths comparable with continuous fiber reinforced composites can be achieved. Conclusively, process steps like textile manufacturing and draping of textiles are avoided. This paper presents the different fields of application, processing characteristics and current results of investigations regarding the mechanical properties compared to commonly used preforms with continuous fiber reinforcement.

Introduction
In many fields of application, fiber reinforces plastics (FRP) are increasingly being applied for structural lightweight components in aircraft and automotive applications. FRP lead to a significant weight reduction compared to conventionally used construction materials, coupled with their outstanding mechanical properties. This allows for a reduction of the energy consumption (e.g. fuel) during the product lifetime, which is necessary due to increasingly strict regulations regarding CO2 emissions in many parts of the world. Especially for structural components, thermoset FRP offer the highest potential for the reduction of weight, fuel consumption and emissions. Low viscosity thermoset resin systems, enable a production of FRP by impregnating near-net shape preforms. Furthermore, the large scale use of FRP in high volume markets is enabled by new production technologies (e.g. High Pressure RTM, Gap-Impregnation). These technologies allow for the production of structural FRP-parts in cycle times of 3-5 min.

Initial Situation
For the manufacturing of structural thermoset FRP parts in the Resin Transfer Moulding (RTM)-process or its derivates (High Pressure RTM, Gap-Impregnation), dry fiber preforms are necessary. These preforms are impregnated with a low viscosity resin system in a closed RTM-mold. After the impregnation, the curing of the resin system takes places in the mold at elevated temperatures. In general, the preforms are made from non-crimped or woven fabrics, which are cut, draped and thermoformed in a multistage process, which leads to high labor expenses and up to 30% scrap from the cutting processes. The costs for the preforming of monolithic composite parts with simple geometries may thus be up to 50% of the entire manufacturing costs. Due to this cost distribution, new cost saving and high volume capable preforming technologies are mandatory for high volume production processes of structural thermoset FRP-parts. Therefore, different preforming technologies were developed to reduce process and part costs. One approach is the preforming by fiber spraying technologies. All fiber spraying technologies have in common, that a dry fiber roving is chopped in a chopper unit and sprayed on an air permeable layup mold. Together with the fibers, a binder is sprayed onto the mold. To temporary fix the fibers on the layup mold, a vacuum is applied. After the activation of the binder, the preforms are manageable and can be processed to structural parts in a subsequent process. First investigations and implementations of the fiber spraying process were done in 1950 by Chevrolet, Detroit, USA, where the “Direct Fiber Preform Process” was used to manufacture shells of the Chevrolet Corvette. A further development of this process is the “Programmable Powdered Preform Process” (P4-
Crash Performance of Variable Stiffness Braided Fiberglass Composites

Abstract
This paper evaluates the energy absorbing behavior of braided fiber glass composites made with novel fiber glass reinforcements to simulate their performance during low speed crash events. Fiber glass/epoxy tubes were braided with axial and bias reinforcements (30°, 60°, and 75° off-axis) and three fiber glass compositions: E-glass, a high-modulus fiber, and a high-elongation fiber. Five to seven specimens from fifteen sample types were destructively tested with an instrumented drop-weight impact tower at speeds of approximately 6400 mm/s. Subsequent analysis of force-time history showed that some architectures exhibited the desirable characteristic for this application wherein energy is absorbed very uniformly during crush. Tubes comprising the high-elongation fiber in the bias direction exhibit up to 29% increase in energy absorption rate compared to E-glass equivalents. High speed video and post-mortem photographs provided insight to the failure modes that were critical to making comparisons of material response.

Introduction
Due to their high specific strength and stiffness properties, low cost, and global availability, glass fiber reinforced plastics continue to be attractive materials for various automotive applications. While usually limited to injection molded parts and sub-assemblies in under the hood and secondary load bearing structures, their potential for body in white and primary structures is yet to be tapped by major auto OEMs. Difficulties with high volume production processes and handling of continuous reinforcements have so far kept the use of these materials out of high volume vehicle platforms. However, recent developments with high pressure RTM processes and reactive thermoplastics coupled with the global need to reduce greenhouse emissions/increase fuel economy as a response to environmental regulations, has opened the door to these materials to new and more demanding applications. Novel low-cost fiber glass compositions have been developed at PPG with mechanical properties that offer benefits over traditional E-glass for automotive applications. One composition is a high modulus fiber originally developed for the wind energy market that could offer benefit to stiffness-critical automotive structures (e.g., seats) and will be referred to as “XM-glass” in this paper. Another developmental composition exhibits improved elongation and thus offers value for crashworthy structures requiring energy absorption and will be referred to as “HP-glass” in this paper.

More than three decades, many experimental studies have been conducted to understand the energy absorption behavior of glass, carbon, and aramid fiber / polymer matrix composites for crash applications. These studies typically investigate braided or fabric-wrapped round or square tubes that are crushed under quasi-static or dynamic axial compression. The scopes of these studies is the exploration of any number of relationships between the parameters of material type, specimen geometry (i.e. tube diameter / wall thickness), reinforcement architecture, loading rate, failure modes, and specific energy absorption1-6. Jacob et al.7 provides a comprehensive review that categorizes previous research in crush tubes and summarizes characteristic trends in the experimentally observed energy absorption behavior as a function of the various parameters described above. Feraboli reviews previous attempts to develop standard coupons and fixturing to characterize the energy absorption of composite materials, and further proposes a corrugated plate specimen that overcomes the shortcomings of previous efforts8. More recently, researchers have performed analytical development of braided crush tube material models for finite element implementation with associated experimental validation9-10.

Objective and Approach
The objective of the present work is to answer two specific questions about the value of the novel fiber glass compositions recently developed at PPG in the braided crush tube application: First, does the high-elongation glass composition (HP) provide beneficial energy absorption characteristics compared to E-glass when used as the bias reinforcement? Second, does the high-modulus glass composition (XM) provide any benefit compared to E-glass when used as the axial reinforcement? The approach to answering these questions is to use tube specimen geometry and fixturing based on general design guidelines provided.
The use of composites in the aerospace industry has increased dramatically in the past few decades. To keep up with this growth, Mokon offers a full range of quality temperature control equipment from -20°F to 700°F (-29°C to 371°C).

Visit us at SAMPE Booth #F37 in Seattle May 23-24 to find your process control solution.

To learn more, download our technical flyer at mokon.com/composites

Precise control you can rely on.

Designed to Perform. Built to last.
DOING BUSINESS SINCE 1981
With over 4,000 hot bonders delivered to over 800 customers, over 3,000 are still in service.

Dual Zone HCS9200B Rev-16
The Acknowledged Industry Standard

For over 30 years, HEATCON Composite Systems has been at the forefront in supporting advanced composite repair and manufacturing. We achieve thermal uniformity through Heat and Control.

To find out more visit www.heatcon.com or email info@heatcon.com

Contact Heatcon for hot bonders, heat blankets, and materials
Authorized Distributor for 3M and Hexcel

480 Andover Park East Seattle, WA 98188 | P: 206.575.1333 | F: 206.575.0856
info@heatcon.com | www.heatcon.com

Coast-Line International
Your One Stop Tech Shop

- Woven Cloth & Prepreg
- Sealants
- Potting Compound
- Vacuum Bag & Release Film
- Tooling Materials
- Vacuum Pumps
- Core Material
- Clean Room Consumables
- Film Adhesives
- Core Splice
- Hot Bonders
- Breather
- Connections
- Infusion Resins
- Specialty Tapes
- Penetrants

Stocking Locations in NY, GA, MA
With Same Day Shipping

Ph: 631-226-0500 ~ Fax: 631-226-5190
e-mail@coast-lineintl.com ~ www.coast-lineintl.com

“Advanced” Composite Solutions... Delivered Daily.

Our large inventory and short lead times on Prepregs make us the choice supplier to the Composites Industry.

We specialize in small quantity prepreg orders.

Contact us today to discuss your particular application.

REVCHEN COMPOSITES, INC. • Toll Free: (800) 281-4975 • email: prepreg@revchem.com • visit: www.revchem.com
DE-COMP COMPOSITES, INC.

1519 Eastgate Drive
Cleveland, OK 74020

918-358-5881
Fax : 918-358-3750

E-mail: email@decomp.com
Web Site: www.decomp.com

VIRTUALLY A ONE-STOP SHOPPING CENTER

CARBON, FIBER GLASS, & KEVLAR FABRICS
BAGGING FILM
BREATHER/BLEEDER
RELEASE FILMS
RELEASE FABRICS/PEEL PLIES
TAPES
VACUUM VALVES & HOSES
SEALANT TAPES
RELEASE LIQUIDS
CUTTING TOOLS
RESINS
TOOLING FABRICS, STRUCTURES, & SUPPLIES
MANY, MANY MORE PRODUCTS

Northern Composites

Complete Vacuum Bagging Consumables Line
Technical Sales and Service for:

LOCTITE® FREKOTE®: Mold Release Products
LOCTITE®: Film and Paste Adhesives, Resins
BONDERITE®: Surface Treatment Systems

Peel Ply and Release Fabrics
Woven Reinforcements
Epoxy and urethane tooling resins
and component systems.

www.northerncomposites.com

Hampton NH | 603.926.1910
Greensboro NC | 336.373.5933

AS9120A | AS9100C
ISO 9001: 2008
**Take your career to the next level**

Advanced composite engineers and technicians are in high demand across all industries. We offer accelerated learning and active training courses in engineering, manufacturing and repair of composites. One 5-day course can provide the applicable skills needed to advance your career. Gain the Abaris Advantage, take the first step here – [www.abaris.com](http://www.abaris.com)

---

**SAFE AND LIGHTWEIGHT STRUCTURAL FOAM CORE MATERIAL**

**LAST-A-FOAM® FR-3800 FST**

Composite core material that is **FST compliant** and **meets heat release standards** for aerospace interior applications.

- Withstands process temperatures up to 310°F (154°C)
- Can be thermoformed and easily machined
- Custom densities, sizes, and thickness available
- Bonds well to FRP or decorative skins

[www.generalplastics.com](http://www.generalplastics.com) (866) 825-1378
**PRODUCT SPOTLIGHT**

**Airflow 65R**

The all-purpose vacuum hose for workshops, ovens and autoclaves

**Benefits:**
- Safer vacuum for part curing with heavy duty hose construction.
- End fitting selection makes loading ovens and autoclaves easy and fast.
- Elbow end fittings help reduce strain on hose and vacuum bags.

Available in straight or 90° end fittings on one or both ends. Available in standard lengths for fast delivery or custom sizes to meet your exact requirement.

**Video available online**

**AIRTECH INTERNATIONAL INC.**
www.airtechonline.com

**AIRTECH EUROPE Sarl**
www.airtech.lu

**TYGAVAC ADVANCED MATERIALS LTD**
www.tygavac.co.uk

**AIRTECH ASIA LTD**
www.airtech.asia

*More than a manufacturer... A technical partner!*
ANOTHER DR. ADAMS HAS JOINED US. TWO EXPERTS ARE BETTER THAN ONE

Dr. Donald F. Adams
President
50 years of Composite Testing Experience
email: wtf@wyomingtestfixtures.com
www.wyomingtestfixtures.com

2960 E. Millcreek Canyon Road
Salt Lake City, UT 84109
Phone (801) 484.5055
Fax (801) 484.6008

Expert consultation with Dr. Don and Dr. Dan

V-NOTCHED RAIL SHEAR
FIXTURE NO. WTF-NR
ASTM D 7078

COMBINED LOADING SHEAR
FIXTURE NO. WTF-NR-(CLS)

DR. DANIEL ADAMS, VICE-PRESIDENT STANDS BEHIND THE FIXTURES HE DEVELOPED... AND EVERY FIXTURE WE SELL.

Wyoming Test Fixtures INC.

Over 40 fixtures in stock, ready to be shipped.
Email or call today to discuss your fixture and custom design needs.
**Unique Polyamide**

- High Modulus and Strength
- Easy Molding
- Water Resistance
- Good Surface Appearance

MITSUBISHI GAS CHEMICAL AMERICA

www.mgc-a.com
composite@mgc-a.com

---

**SAMPE CALL FOR VIDEOS**

SAMPE YouTube channels aim to educate and connect materials and process engineering professionals and students for the purpose of sharing ideas and best practices, evaluating research and new applications, and generally informing members and non-members of SAMPE’s mission and goals.

Submit your video online at tinyurl.com/SAMPE-youtube

---

**Video Topics**

- Advances in Thermoplastics
- Bonding and Adhesives Technology
- Next Generation Coatings
- Design, Analysis, and Testing
- Process Modeling
- Simulation, and Computational Modeling
- NDE and Structural Health Monitoring
- Textiles
- Market Applications - Aerospace and Automotive
- Market Applications - Energy and Sporting Goods
- Market Applications - Biomaterials
- Space Structures and Materials
- Green Technologies
- Additive Manufacturing
- Advances in Composite Manufacturing Technologies
- Emergent Materials & Technologies
The Only Event Dedicated to the Advanced Materials & Processes community.

Focus on What Matters Most

SAMPE Seattle 2017 isn’t your average materials conference. From education and learning from industry experts, to networking, and parties, you’ll gain the insights and inspiration you need to elevate your projects and your career.

With an explicit focus on advanced materials and processes, SAMPE Seattle is your destination for the latest technologies and research advancements concerning aerospace & aircraft, defense, manufacturing, and more!

Conference Categories:
- Additive Manufacturing
- Advances in Composite Manufacturing Technologies
- Advances in Thermoplastics
- Bonding and Adhesives Technology
- Design, Analysis, and Testing
- Design, Simulation, and Computational Modeling
- Emergent Materials & Technologies
- Green Technologies
- Market Applications - Aerospace and Automotive
- Market Applications - Energy and Sporting Goods
- NDE and Structural Health Monitoring
- Next Generation Coatings and Sealants
- Process Modeling
- Space Structures and Materials
- Textiles

Make Connections that Will Power Your Business All Year Long

Find the new solutions and innovative applications you need to take your projects and career to the next level.

Get Your FREE Exhibit Hall Pass Today

www.sampeamerica.org
<table>
<thead>
<tr>
<th>Company</th>
<th>Page</th>
<th>Company Web-Site/E-Mail</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abaris Training</td>
<td>33</td>
<td><a href="http://www.abaris.com">www.abaris.com</a></td>
<td>+1 775.827.6568</td>
</tr>
<tr>
<td>Airtech International, Inc.</td>
<td>IFC, 45</td>
<td><a href="http://www.airtechonline.com">www.airtechonline.com</a></td>
<td>+1 714.899.8100</td>
</tr>
<tr>
<td>APCM</td>
<td>62</td>
<td><a href="http://www.prepregs.com">www.prepregs.com</a></td>
<td>+1 860.564.7817</td>
</tr>
<tr>
<td>Bally Ribbon Mills</td>
<td>62</td>
<td><a href="http://www.ballyribbon.com">www.ballyribbon.com</a></td>
<td>+1 610.845.2211</td>
</tr>
<tr>
<td>BTG Composites, Inc.</td>
<td>68</td>
<td><a href="http://www.BTGCompositesPro.com">www.BTGCompositesPro.com</a></td>
<td>+1 801.232.5407</td>
</tr>
<tr>
<td>CAMX</td>
<td>47</td>
<td><a href="http://www.thecamx.org">www.thecamx.org</a></td>
<td>+1 626.521.9460</td>
</tr>
<tr>
<td>ChemTrend</td>
<td>IBC</td>
<td><a href="http://www.chemtrend.com">www.chemtrend.com</a></td>
<td>+1 517.545.7981</td>
</tr>
<tr>
<td>Cincinnati Testing Labs</td>
<td>62</td>
<td><a href="http://www.cintestlabs.com">www.cintestlabs.com</a></td>
<td>+1 513.851.3313</td>
</tr>
<tr>
<td>Composite &amp; Wire Machinery</td>
<td>62</td>
<td><a href="http://www.compositewire.com">www.compositewire.com</a></td>
<td>+1 401.884.4760</td>
</tr>
<tr>
<td>Composite Polymer Design</td>
<td>62</td>
<td><a href="http://www.epoxi.com">www.epoxi.com</a></td>
<td>+1 800.755.8568</td>
</tr>
<tr>
<td>Composites Distribution</td>
<td>8</td>
<td><a href="http://www.composites-distribution.com">www.composites-distribution.com</a></td>
<td>+0033 467 49 55 00</td>
</tr>
<tr>
<td>Composites One</td>
<td>3</td>
<td><a href="http://www.compositesone.com">www.compositesone.com</a></td>
<td>+1 800.621.8003</td>
</tr>
<tr>
<td>Composites Sources</td>
<td>63</td>
<td><a href="http://www.forcomposites.com">www.forcomposites.com</a></td>
<td>+1 225.273.4001</td>
</tr>
<tr>
<td>Concordia Manufacturing, LLC</td>
<td>62</td>
<td><a href="http://www.concordiafibers.com">www.concordiafibers.com</a></td>
<td>+1 401.828.1100</td>
</tr>
<tr>
<td>DeComp Composites, Inc.</td>
<td>31</td>
<td><a href="http://www.decomp.com">www.decomp.com</a></td>
<td>+1 918.358.5881</td>
</tr>
<tr>
<td>Dexmet</td>
<td>4</td>
<td><a href="http://www.expanded-materials.com">www.expanded-materials.com</a></td>
<td>+1 203.294.4440</td>
</tr>
<tr>
<td>Diab</td>
<td>4</td>
<td><a href="http://www.diabgroup.com">www.diabgroup.com</a></td>
<td>+1 972.228.7612</td>
</tr>
<tr>
<td>DuraFiber Technologies</td>
<td>62</td>
<td><a href="http://www.durafibertech.com">www.durafibertech.com</a></td>
<td>+1 704.912.3700</td>
</tr>
<tr>
<td>Elantas PDG</td>
<td>63</td>
<td><a href="http://www.elantas.com/pdg">www.elantas.com/pdg</a></td>
<td>+1 314.622.8748</td>
</tr>
<tr>
<td>Element Materials Technology Los Angeles, LLC</td>
<td>63</td>
<td><a href="http://www.element.com">www.element.com</a></td>
<td>+1 818.247.4106</td>
</tr>
<tr>
<td>Engineered Solutions</td>
<td>63</td>
<td><a href="http://www.edactechnologies.com">www.edactechnologies.com</a></td>
<td>+1 203.806.6818</td>
</tr>
<tr>
<td>Fabric Development, Inc.</td>
<td>63</td>
<td><a href="http://www.fabricdevelopment.com">www.fabricdevelopment.com</a></td>
<td>+1 215.536.1420</td>
</tr>
<tr>
<td>General Plastics</td>
<td>38</td>
<td><a href="http://www.generalplastics.com">www.generalplastics.com</a></td>
<td>+1 253.330.7782</td>
</tr>
<tr>
<td>General Sealants, Inc.</td>
<td>63</td>
<td><a href="http://www.generalsealants.com">www.generalsealants.com</a></td>
<td>+1 800.762.1144</td>
</tr>
<tr>
<td>Heatcon Composite Systems</td>
<td>19</td>
<td><a href="http://www.heatcon.com">www.heatcon.com</a></td>
<td>+1 800.556.1990</td>
</tr>
<tr>
<td>Janicki Industries</td>
<td>BC</td>
<td><a href="http://www.janicki.com">www.janicki.com</a></td>
<td>+1 360.814.1838</td>
</tr>
<tr>
<td>C.A. Litzler Co., Inc.</td>
<td>64</td>
<td><a href="http://www.calitzler.com">www.calitzler.com</a></td>
<td>+1 216.267.8020</td>
</tr>
<tr>
<td>McClean Anderson</td>
<td>33</td>
<td><a href="http://www.mccleananderson.com">www.mccleananderson.com</a></td>
<td>+1 715.355.3006</td>
</tr>
<tr>
<td>Masterbond, Inc.</td>
<td>64</td>
<td><a href="http://www.masterbond.com">www.masterbond.com</a></td>
<td>+1 201.343.8983</td>
</tr>
<tr>
<td>Matec Instrument Companies</td>
<td>31</td>
<td><a href="http://www.matec.com">www.matec.com</a></td>
<td>+1 508.393.0155</td>
</tr>
<tr>
<td>Material Testing Technology</td>
<td>35</td>
<td><a href="http://www.mttusa.net">www.mttusa.net</a></td>
<td>+1 847.215.7448</td>
</tr>
<tr>
<td>Maverick Corporation/Renegade Materials</td>
<td>65</td>
<td><a href="http://www.maverickcorp.com">www.maverickcorp.com</a></td>
<td>+1 513.469.9919</td>
</tr>
<tr>
<td>Mitsubishi Gas Chemical America, Inc.</td>
<td>54</td>
<td><a href="http://www.mgc-a.com">www.mgc-a.com</a></td>
<td>+1 212.687.9030</td>
</tr>
<tr>
<td>Mokon</td>
<td>12</td>
<td><a href="http://www.mokon.com/composites">www.mokon.com/composites</a></td>
<td>+1 716.876.9951</td>
</tr>
<tr>
<td>National Aerospace Supply Company</td>
<td>64</td>
<td><a href="http://www.nationalaerospace.com">www.nationalaerospace.com</a></td>
<td>+1 949.240.6353</td>
</tr>
<tr>
<td>NDT Solutions</td>
<td>64</td>
<td><a href="http://www.ndts.com">www.ndts.com</a></td>
<td>+1 715.246.0433</td>
</tr>
<tr>
<td>Northern Composites</td>
<td>13</td>
<td><a href="http://www.northerncomposites.com">www.northerncomposites.com</a></td>
<td>+1 603.926.1910</td>
</tr>
<tr>
<td>Precision Measurements &amp; Instruments</td>
<td>64</td>
<td><a href="http://www.pmiclab.com">www.pmiclab.com</a></td>
<td>+1 541.753.0607</td>
</tr>
<tr>
<td>Renegade Materials/Maverick Corporation</td>
<td>65</td>
<td><a href="http://www.renegadematerials.com">www.renegadematerials.com</a></td>
<td>+1 508.579.7888</td>
</tr>
<tr>
<td>Revchem Composites</td>
<td>26</td>
<td><a href="http://www.revchem.com">www.revchem.com</a></td>
<td>+1 800.281.4975</td>
</tr>
<tr>
<td>SAMPE Foundation</td>
<td>67</td>
<td><a href="http://www.sampe.org">www.sampe.org</a></td>
<td>+1 626.521.9460</td>
</tr>
<tr>
<td>Scott Bader North America</td>
<td>64</td>
<td><a href="http://www.scottbader.com/na">www.scottbader.com/na</a></td>
<td>+1 330.920.4410</td>
</tr>
<tr>
<td>SDI-Talon</td>
<td>65</td>
<td><a href="http://www.sdi-talnt.com">www.sdi-talnt.com</a></td>
<td>+1 805.987.7755</td>
</tr>
<tr>
<td>Stanford University</td>
<td>6</td>
<td><a href="http://www.compositesdesign.stanford.edu">www.compositesdesign.stanford.edu</a></td>
<td>+1 650.322.9433</td>
</tr>
<tr>
<td>Technology Marketing, Inc.</td>
<td>65</td>
<td><a href="http://www.tmi-slc.com">www.tmi-slc.com</a></td>
<td>+1 801.265.0111</td>
</tr>
<tr>
<td>Textile Products</td>
<td>65</td>
<td><a href="http://www.textileproducts.com">www.textileproducts.com</a></td>
<td>+1 714.761.0401</td>
</tr>
<tr>
<td>Thermal Wave Imaging</td>
<td>65</td>
<td><a href="http://www.thermalwave.com">www.thermalwave.com</a></td>
<td>+1 248.414.3730</td>
</tr>
<tr>
<td>TMP Inc., a Division of French</td>
<td>65</td>
<td><a href="http://www.frenchoil.com">www.frenchoil.com</a></td>
<td>+1 937.773.3420</td>
</tr>
<tr>
<td>Torr Technologies, Inc.</td>
<td>54</td>
<td><a href="http://www.torrtech.com">www.torrtech.com</a></td>
<td>+1 800.845.4424</td>
</tr>
<tr>
<td>Wyoming Test Fixtures, Inc.</td>
<td>43</td>
<td><a href="mailto:wtf@wyomingtestfixtures.com">wtf@wyomingtestfixtures.com</a></td>
<td>+1 801.484.5055</td>
</tr>
</tbody>
</table>
The CAMX Award recognizes the cutting-edge innovations that will significantly impact composites and advanced materials in the marketplace. CAMX is looking for visionary concepts and products that show strength through collaboration, while bridging low-cost materials/high-volume applications with high performance applications/low-volume materials.

www.thecamx.org/camx-award

**CAMX is looking for innovations that have the potential to:**

- Increase Manufacturing Efficiency
- Significantly impact new and emerging markets
- Shift industry expectations
- Impact sustainability and recyclability
- Utilize the power of collaboration
- Shape the future of manufacturing

**Entries are judged based on five evaluation concepts:**

- Concept and Design
- Value
- Impact
- Production and Delivery
- Collaboration

**Combined Strength Award**

This award is presented to the composites product that clearly demonstrates a team approach and effort that brings together knowledge, resources, talent to produce an incredible example of the best use of composites materials that solves a problem.

**PAST WINNERS:**

**2016 – Multi-Material Decklid Concept**
Submitted by: Continental Structural Plastics

**2015 – BAAM CI (Big Area Additive Manufacturing – Cincinnati Incorporated**
Submitted by: Cincinnati Incorporated

**2014 – NASA-Boeing Composite Cryotank Technologies & Demonstration (CCTD) Team**
Submitted by: NASA in cooperation with Boeing

**Unsurpassed Innovation Award**

This award is presented to the composites product that clearly demonstrates a novel design that incorporates low-cost materials for high-volume applications or with high performance applications with low-volume materials which delivers a product that is innovative and has the potential to either significantly impact existing or open new markets.

**PAST WINNERS:**

**2016 – Fire-Resistant FRP Facade Cladding System for Hi-Rise Building**
Submitted by: Kreysler & Associates

**2015 – TCA Ultra Lite – The Ultimate Lightweighting Material**
Submitted by: Continental Structural Plastics

**2014 – Epitome Quality Foundation Walls**
Submitted by: Composite Panel Systems, LLC
Coast-Line International

Your One Stop Tech Shop

Woven Cloth & Prepreg, Film Adhesives, Sealants, Core Splice, Potting Compound, Hot Bonders, Vacuum Bag & Release Film, Breather, Tooling Materials, Connections, Vacuum Pumps, Infusion Resins, Core Material, Specialty Tapes, Penetrants, Clean Room Consumables

Stocking Locations in NY, GA, MA with Same Day Shipping
Ph: 631-226-0500 - Fax: 631-226-5190
e-mail@coast-lineintl.com - www.coast-lineintl.com

Epoxy and Polyurethane Thermoset Resin Systems

- Service Temperatures Up to 700°F
- Custom Formulations
- Manufacturing Expertise

Concordia Composites

Blended Continuous Filament Thermoplastic and Reinforcement Fibers for Composites

Markets Served
Aerospace, Automotive, Oil/Gas, Sporting Goods

Contact Randy Spencer at 401-828-1100 ext 111 or rspencer@concordiafibers.com

www.concordiafibers.com

Resource Center

David L. Young
ADHESIVE PREPREGS FOR COMPOSITE MANUFACTURERS
P.O. Box 264 1366 Norwich Rd.
Plainfield, CT. 06374
Ph. 860-564-7817, FAX 860-564-1535
dyoung@prepregs.com
www.prepregs.com

Cincinnati Testing Laboratories

A Subsidiary of Metcut Research Inc.

MACHINING & TESTING OF ADVANCED COMPOSITE MATERIALS

- Comprehensive Testing Expertise
- Mechanical • Physical • Thermal
- Environmental • Fatigue
- MMC, CMC, & PMC Experience

Email: info@cintestlabs.com
www.cintestlabs.com
1775 Carillon Blvd., Cincinnati, Ohio 45240
Phone: 800/811-9290 • Fax: 513/851-3336

COMPOSITE & WIRE MACHINERY, INC.

NEW & REBUILT BRAIDING MACHINE SPECIALISTS
25 Years Experience with N.E. Butt/Wardwell

Jack Dennehy - President
490 Old Baptist Road, North Kingstown, RI 02852
PHONE (401) 884-4760 • FAX (401) 885-2499

www.prepregs.com
Apex Machine Tool - dba- Engineered Solutions
Division of EDAC Technologies Corporation
Experts in molds for composite part fabrication. We specialize in designing & manufacturing precision multi-piece molds for close tolerance military & commercial applications. Our ability to produce molds for highly detailed complex parts with an experienced team of tool designers & toolmakers makes us your best choice to meet your stringent requirements for RTM, compression, duct & lay up molds.

Visit our website @ edactechnologies.com
Contact Tom Branday
tbranday@edactechnologies.com • 203.806.6819-direct
5 McKee Place Cheshire, CT 06410
203.806.2090 • 203.250.3870 (fax)

Composites Industry Recruiting & Placement
Composites Sources
Phone (225) 273-4001, Fax (225) 227-2479
P.O. Box 10086, Baton Rouge, LA 70835
E-mail: contact@forcomposites.com

Mechanical Testing
DMA, DSC, TMA, TGA
Electrical Properties
Metallography
Flammability
Smoke Toxicity and OSU Heat Release

Element Materials Technology
1857 Business Center Drive
Duarte, CA 91010
USA
element.com

EpoxyLite Hi Temp Epoxy Systems
The Global Leader in High Quality Electrical Insulation Products
www.elantas.com
314-621-5700

Vacuum Bag Sealants
Available in various temperature ranges
Used worldwide by composite manufacturers
Distributed by: AIRTECH INTERNATIONAL, INC.
714-899-8100 • Fax: 714-899-8179 Website – www.airtechintl.com
Manufactured by:

Fabric Development Incorporated
Endless possibilities in textile development
Design and Manufacture of Specialty Woven, Knit and Braided Fabrics
Carbon | Nextel™ | Nicalon™ | Kevlar™ | Fiberglass
Quartz | Spectra™ | Twaron™ | Vectran™
1217 Mill Street, Quakertown, PA 18951 • PH (215) 5236-1420 • FX (215) 536-1154
Partnerships succeed that have a shared vision.

Partnerships create new opportunities not available to any sole group.

SAMPE’s Corporate Partners help fund:
• Bridge Building Contests
• Student Chapter Grants
• Faculty Advisor Meetings
• Student Exchange Programs

Become a SAMPE Corporate Partner today!
Contact Patty Hunt: sampeads@aol.com
MARCH 2017


6-9, AeroDef Manufacturing 2017, Fort Worth Convention Center, Fort Worth, TX. Web Site: www.aerodefevent.com; Phone: +1-800-733-4763; Email: service@sme.org

13, SAMPE Europe-Summit Conference Paris 2017, Pullman Paris Tour Eiffel Hotel, Paris, France. Email: artsan@euronet.nl; Web Site: www.sampe-europe.org; Phone: +33-6-5138-1263


20-24, CMH-17 and ASTM D30 PMC Spring Coordination Meeting, University of Utah, Salt Lake City, UT. Web Site: www.cmh17.org; Email: michelle@tfcevent.com

21-22, SPE Thermoset 2017 Conference, Resort at McCormick Ranch, Scottsdale, AZ. Web Site: www.spetopcon.com; Phone: +1-630-777-6656


APRIL 2017

4-5, North American Pultrusion Conference, Atlanta Marriot Marquis, Atlanta, GA. Web Site: www.acmanet.org/events-education; Email: events@acmanet.org

4-6, WCX 17: SAE World Congress Experience, Cobo Center, Detroit, MI. Web Site: https://www.WCX.org/

9-12, Aeromat 2017 Conference & Exposition, Charleston Area Convention Center, Charleston, SC. Web Site: www.asminternational.org/aeromat; Phone: +1-440-338-5151

20-21, 3rd International Symposium on Automated Composites Manufacturing, La Plaza, Montreuil, Quebec, Canada. Web Site: http://concom.encs.concordia.ca/autocompositenews_2017/index.htm; Email: autocomposites@encs.concordia.ca; Phone: +1-514-848-2424 ext 8706

MAY 2017

8-11, RAPID+tct (SME), David L. Lawrence Convention Center, Pittsburgh, PA. Web Site: www.rapid3devent.com; Email: +1-508-743-8544; Email: RAPID@xpressreg.net

10-12, SAMPE China 2017 Conference & Exhibition, China International Exhibition Center, Beijing, China. Email: jason cui@sampe.org.cn; Web Site: www.sampechina.org; Phone: +86-10-6609-5269

22-25, SAMPE Seattle 2017, Washington State Convention Center, Seattle, WA. Email: anessa@sampe.org; Web Site: www.nasampe.org


JUNE 2017

6-8, Offshore Wind Energy 2017, ExCel London, Royal Victoria Dock, London, UK. Web Site: www.offshorewind2017.com; Email: conference@offshorewind2017.com

20-22, JEC The Future of Composites in Construction, Chicago, IL. Web Site: www.jeccomposites.com; Phone: +33 (0) 1-58-36-15-01

AUGUST 2017

20-25, ICCM-21, 21st International Conference on Composite Materials, Xi’an International Conference Center, Qjiang Hotel, Xi’an, China. Web Site: www.iccm21.org

SEPTEMBER 2017

6-8, 2017 SPE Automotive Composites Conference & Exhibition (ACCE), Novi, MI. Web Site: www.4spe.org

11-14, CAMX 2017, The Composites and Advanced Materials Expo, Produced by ACMA & SAMPE, Orange County Convention Center, Orlando, FL. Web Site: www.theCAMX.org; Email: anessa@sampe.org

19-21, Composites Europe 2017, Messe Stuttgart, Stuttgart, Germany. Web Site: www.composites-europe.com; Phone: +49-211-90191-475

26-28, PINFA-NA 5th Annual Workshop, Meeting Fire Safety Requirements in Automotive Design, The Dearborn Inn Marriott Hotel, Dearborn, MI. Phone: +1-908-832-2207; Web Site: www.pinfa.org; Email: Timothy.Reilly@clarient.com

OCTOBER 2017

10-12, Additive Manufacturing Conference 2017, Knoxville Convention Center, Knoxville, TN. Web Site: www.additiveconference.com

23-25, American Society for Composites 32nd Technical Conference, Purdue University, West Lafayette, IN. Web Site: www.asc-composites.org; Phone: +1-765-494-0689; Email: relliott@purdue.edu

NOVEMBER 2017

1-3, JEC Asia 2017, COEX (Convention & Exhibition Center), Seoul, South Korea. Web Site: www.JECComposites.com; Email: strassburger@jecomposites.com

14-16, SAMPE Europe 17 Conference & Exhibition, Kongress Und Tagungszentrum Filderhalle Stuttgart, Stuttgart, Germany. Email: artsan@euronet.nl; Web Site: www.sampe-europe.org; Phone: +31-6-5138-1263

27-29, 15th Japan International SAMPE Symposium (JJSSE-15), Tokyo, Japan

NOVEMBER - DECEMBER 2017

29-1, 15th Japan International SAMPE Exhibition (JJSSE-15), Tokyo Big Sight, Tokyo, Japan. Web Site: www.bigsight.jp/english/index.html

--

BTG Composites Inc.

Over 50 years Advanced Composites & FRP Composites experience

Expert Witness, Litigation, Insurance and Patent Review Support:
➢ Composite materials and processing technologies
➢ Advanced composites and FRP composites
➢ Failure investigation and process deficiencies
➢ Pressure vessels, pipe and fittings, tanks
➢ Sports/recreational products (bikes, arrows, etc.)
➢ Composites product liability failures

Manufacturing, Processing, Design, Analysis Support:
➢ Consulting and fabrication support services
➢ Plant definition, equipment assessment and plant setup
➢ Filament winding and fiber placement technologies
➢ Resin infusion technologies (RTM, VARTM, RFI, & variations)
➢ Hand lay-up, vacuum bagging and contact molding
➢ Tooling design support and prototyping
➢ CNG, NGV, LPG, SCBA and other pressure vessels
➢ Underground/above ground tanks, pipes, fittings
➢ Infrastructure and sports & recreation products
➢ Damage assessment, protection and failure investigation

Over 550 technical publications, presentations and reports

Training Services:
-In-plant courses, tutorials, seminars, workshops, training manuals, and plant documents

Dr. Scott W. Beckwith
4956 S. Jordan Canal Road, Taylorsville, UT 84129
Phone: +1 801-262-8307 Mobile: +1 801-232-5407
www.BTGCompositesPro.com Email: swbeckwith@aol.com
Discover the right balance of release ease and part cleanliness with Chem-Trend’s full suite of release systems for composite manufacturing. With solvent- and water-based options, our Chemlease® and Zyxax® process aids are specifically formulated to minimize transfer, produce higher-quality parts and extend equipment lifecycles.

Keep it clean with Chem-Trend.
Janicki Industries is a global supplier of composite and metal tools for aerospace, industrial, ship building, wind energy, architecture, military and transportation industries. From space ship parts to wind blades to fish tanks, we work on some of the most exciting new technologies in the world.

Production Parts, Tools & Prototypes

State-of-the-Art Facilities
- Total Space 425,000 ft²
- ISO Cleanroom 9,000 ft²
- High-bay; Overhead Cranes

Certified for Aerospace Parts
- AS9100C
- Nadcap
- BAC

9 Janicki
5-Axis NC Mills
- Large-Scale
  - 100ft x 20ft x 8ft
- High Precision +-0.002

Capabilities
- Engineering Services
- Autoclave 12’ x 50’, 550°F/150psi
- Annealing Furnace
- 1,100 ton press

www.janicki.com
360.856.5143