AMALGA COMPOSITES, INC.
Facilities and Capabilities

Location: Amalga Composites, Inc. is located at 10600 West Mitchell Street, West Allis, Wisconsin, 53214

Telephone: (414) 453-9555; FAX (414) 453-9561; (800) 262-5424

Web Address: www.amalgacomposites.com

Plant and Grounds: Our modern plant has 82,568 square feet of manufacturing space (73,740 square feet plant, 8,828 square feet office) including: a 120' x 20' temperature and humidity controlled molding area, three 200' x 40' bays with overhead traveling cranes, two shipping docks with cranes for overhead open bed loading and levelers for truck loading. The grounds are located on 3.9 acres of land with adequate on-site parking for employees and customers, and easy access to shipping and receiving docks. The grounds also include rail facilities, and offers expansion of an additional 50,000 to 100,000 square feet. Amalga Composites, Inc. is located less than one mile from the interstate highway system. In addition to our primary factory ACI has access to an adjacent 60,000 square foot building to accommodate future expansion.

Engineering

Filament Wound Structures
- Pressure vessels-Internal and External
- Tanks
- Cylinder tubing (low to high pressure)
- Booms
- Drive shafts
- Rollers and cores
- Insulating structures
- Spheres
- Conical, elliptical, ovoid shapes
- Bushings
- Cylindrical and rectangular structures

Net Shape Process Capabilities
- Vacuum bag cures
- Adhesive bonding
- Compression Molding
- Light Resin Transfer Molding
- Closed Contact Bag Molding
- Vacuum Assisted Resin Transfer Molding

Materials
- Reinforcements: E-glass, S-glass, carbon, Kevlar, broad goods
- Matrices: epoxy, vinyl ester

Process Engineering
- Process specifications
- Manufacturing plans
- Customized process/design approaches

Design Criteria
- Impact loads
- Ballistic requirements
- Joints and attachments
- Corrosion prevention
- Fatigue resistance
- Thermal stresses

- Random stresses: static and dynamic loads
- Section properties
- Drive shaft: critical speed/deflection criteria
- Beams stress and deflection
- Shell stresses: orthotropic, thick wall, Sandwich-wall, ring stiffened

Manufacturing

Winding Capability
Amalga Composites has capabilities to produce tubing from ½ to 44-inch diameters and lengths to 30 feet.
Gel Coating Machine
Magnum Venus automated gel coat application machine used to produce Black Amalgon cylinder tubing.

Resin Transfer Molding
Magnum Venus automated epoxy resin transfer pumping system used in Light Resin Transfer Molding (LRTM), Closed Contact Bag Molding (CCBM), and Vacuum Assisted Resin Transfer Molding (VARTM).
Cannon automated polyurethane foam dispensing system.
Sterling Hot-Water Mold heater

Winding Machines (11 machines)
Two four-axis computerized machines
Seven two-axis computerized machines with off line computer programming capabilities
One six-foot computer control multi-spindle machine
One fifteen-foot computer control multi-spindle machine

Compression Molding
One Verson 150 ton compression press
One Wabash 30 ton compression press
One Sterlco 2 zone oil heater
Steel rule clicker die

Curing Equipment
One two stage continuous conveyor rotating oven 12 feet wide by 60 feet long with 20 inch diameter capacity
Two rotating ovens 4 feet wide by 36 inches high by 40 feet long; computerized controls
Two overhead continuous conveyor ovens for curing up to 24 inch diameter, 6 foot lengths
One cabinet oven 6.5 feet by 6.5 feet by 6 feet
One walk-in cabinet oven 5 feet high by 5 feet wide by 15 feet long
One walk-in cabinet oven 5 feet high by 5 feet wide by 20 feet long
One walk-in cabinet oven 5.5 feet high by 5 feet wide by 10 feet long
One walk-in cabinet oven 8 feet high by 8 feet wide by 20 feet long
All ovens have 24 hour temperature controls and read-out devices with temperature indicators for QA monitoring

Finishing Operation Capabilities
Amalga has complete facilities to grind, cut and machine to exact specifications. Available equipment includes computerized machine centers (8), computerized center-less grinding machine to produce tapered sections (1), center-less grinding (5), on-center grinding (3), cut-off (5), milling (4), drilling, roller balancing and other necessary equipment to handle composite fabrication (4 facing centers, 4 chamfering centers). ACI uses a 60 ton Eitel straightening press to straighten mandrels and steel tubing. Amalga also uses a state-of-the-art machine to process our waste products. Custom painting is done in one of two available spray booths. Included in the machining equipment are a 20 x 240 inch Poreba engine lathe, a Knuth 12 x 60 engine lathe, an ENCO 12 x 80 engine lathe, a 14 x 118 inch Toolmex CNC engine lathe, a Tree Journeyman milling machine an Okuma LB15 slant bed CNC lathe, (2) Haas manual /CNC engine lathes, an Haas ST20 slant bed lathe and (2) Milltronics vertical machining centers.

Testing Equipment
Differential scanning calorimeter
Megohm resistance module
Hydrostatic burst strength and proof test module
Granite Inspection Tables
Vibration Analyzer

Muffle furnace and analytical balance
Customized measuring equipment
Pressure Cycling Test Stand
Dynamic Balancer

Design Equipment
Computer Aided Design (SolidWorks) package
Gibbs CAM Computer Aided Manufacturing software

Composite laminate analysis software
**Process Control Equipment**
Local Area Network software providing computerized estimating, quoting, order entry, scheduling, production control.

**Handling Equipment**
One 12,000 pound and two 8,000 pound overhead traveling cranes on bays that are 200 feet long by 40 feet wide and 25 feet high. Other standard and special handling equipment, forklifts, mobile cranes, etc.

**Shipping Facilities**
Two forty foot enclosed docks with a two ton overhead traveling crane capable of extending over open bed trucks. One automated stretch wrap machine used to package tubular products.

**Quality Assurance**
For over 45 years Amalga has been involved in and committed to the design and fabrication of advanced composite structures. Our quality control system provides repeatability and traceability on all composite components. Amalga Composites, Inc. was certified to the ISO 9001/2008 Quality Standard in 2010. Our ANAB certification number is 2010-010.

**Raw Material Control**
The raw materials used in our products can be traced back to specific certified sources to assure that product quality is maintained. Our raw material control includes:

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<th>Lot or batch number</th>
<th>Supplier certifications</th>
<th>Raw material testing requirements</th>
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<tr>
<td>Manufacturing date</td>
<td>Incoming inspection</td>
<td>Expiration date</td>
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<td>Temperature limitations</td>
<td>Inspection plan</td>
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**In-Process Inspection**

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<th>Inspection data sheets</th>
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<td>Wall thickness</td>
<td>Construction sequence</td>
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<td>Bandwidth</td>
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<td>Cure cycle (time/temperature)</td>
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<td>Roving laydown</td>
<td>Number of rovings</td>
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**Final Inspection**

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