Empowering the world to conceptualize, manufacture and implement advanced composite solutions.

Spoolable Composite Tubing
Designing and manufacturing continuous length composite-reinforced tubes

The rising need for lightweight, durable components has brought composite materials to the forefront of Oil & Gas. Thermoplastics offer lighter weight, higher temperature capabilities, and greater corrosion resistance for improved performance in challenging environments.

Comparatively, traditional steel tubing is inefficient in assembly, subject to increased labor requirements and safety risks. Spoolable composite tubing reduces these labor and deployment costs by using lighter materials and limiting the need for jointed pipe.

Automated Dynamics offers engineering services and patented processing equipment for the design and manufacturing of continuous length composite-reinforced tubulars.

**Cost Savings**
- Reduced labor costs
- Reduced transportation costs
- Lower safety risks

**Composite Performance**
- High-strength composites
- Chemical resistance
- Corrosion resistance

**Engineered Solutions**
- Custom designs
- Metal fittings at connections
- Integrated electrical lines

**Material Selection**
With composite materials, matrix and fiber options must be considered. Matrix material selection is often based on the temperature and chemical resistance requirements. Fiber selection is typically driven by strength and stiffness requirements, but other factors such as electrical conductivity, environmental resistance, and damage tolerance are also taken into account.

**Manufacturing**
The general manufacturing approach involves utilizing an extruded liner which is then wrapped with composite material. The material is then consolidated to bond the layers. This is achieved with multiple winding stations and heaters as shown in the Automated Dynamics’ patent image (page 2).
Spoolable Composite Tubing

Tubing Construction
The configuration of the tubing will depend on the application requirements. Often, a neat resin liner is used on the ID of the tubing to prevent leaking. Composite material can be bonded or unbonded to the liner to provide reinforcement. An outer resin jacket may also be used to protect the tubing and incorporate hydraulic and/or electrical lines into the wall of the tubing.

Laminate Design
The composite laminate will be designed in accordance with the tubing specifications for loading requirements such as tension, compression, torsion, and internal/external pressures. The design will also take into account the minimum bend radius for spooling.

Metal End Fittings
Connections must often be made from the composite tubing to metal end fittings. Automated Dynamics has developed a proprietary design for a metal fitting. The general engineering problem is to transition the loads between the dissimilar materials to prevent stress risers. It is desirable to place the composite in compression to prevent delamination. Furthermore, it is preferred to make the OD of the fitting as small as possible for deployment and the ID as large as possible to minimize flow restriction.
Spoolable Composite Tubing

Custom Tubing Design
Based on existing concepts for composite tubing, Automated Dynamics works with clients to develop a design that meets the needs of specific applications. Consideration is given to every design element, from initial material selection to finishing details.

From Concept to Production
Typically, a program for developing spoolable composite tubing is initiated with a feasibility study. This preliminary phase investigates the viability of designing and manufacturing continuous composite tubing for a specific application and given requirements. Subsequent steps will involve material level testing and detailed laminate design.

Upon completion of the design, subscale prototypes are manufactured and tested for validation. This will involve multiple iterations of the proposed part. Final stages of development include the creation of a manufacturing plan and setting up facilities for fabrication of the composite tubing.

About Automated Dynamics
For over 30 years, Automated Dynamics has been a global leader in automated composite production. We specialize in the manufacturing of high-performance composite structures and the development of advanced automation equipment.

Through the use of a true out-of-autoclave (OoA) process, we bring additive manufacturing to continuous-fiber thermoplastic composite parts, saving weight and improving reliability in today’s most demanding engineering environments. We offer patented Automated Fiber Placement (AFP) technologies, and, as recognized innovators, we have produced hundreds of thousands of composite parts for over 500 clients in 17 countries.

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