



# Composite Fiber Winding and Pultrusion

**Composite fiber winding** (also known as filament winding or wet winding) is a process used to fabricate cylindrical objects such as pressure vessels, golf clubs, underground storage tanks, and pipes.

In this process, continuous carbon or fiberglass fibers are coated with catalyzed resin and wound around a male mandrel or mold with specialized equipment. This equipment rotates the male mandrel, saturates the fiber in resin, and applies the fiber to the mandrel in a controlled fashion so that the entire work piece is completely enclosed in resin-coated fiber. The mandrel or mold is removed from the machine and the resin-coated fibers are allowed to cure. Once the part is cured, the mandrel or mold is removed or becomes part of the finished product. The piece may be complete or require a secondary process to complete it.

The amount of fiber used and the orientation of the fiber plies varies according to the requirements of the final product. The size of the part can vary from the size of a small tank to a large underground fuel tank.

**Pultrusion** uses similar continuous fiber and resin feeding but instead of fibers being wetted then wound on a mandrel, the fibers are pulled straight through a forming die to make continuous composite products. Typical products produced in this manner are rods, I-beams, window frames, and leaf springs. Resin can be either injected continuously into a pressure die to wet the fibers, or dispensed into a reservoir where the fibers are drawn through before being formed in a heated die.

Graco products are usually two-component meter mix machines or batch pumping into containers for manual mixing and pouring.