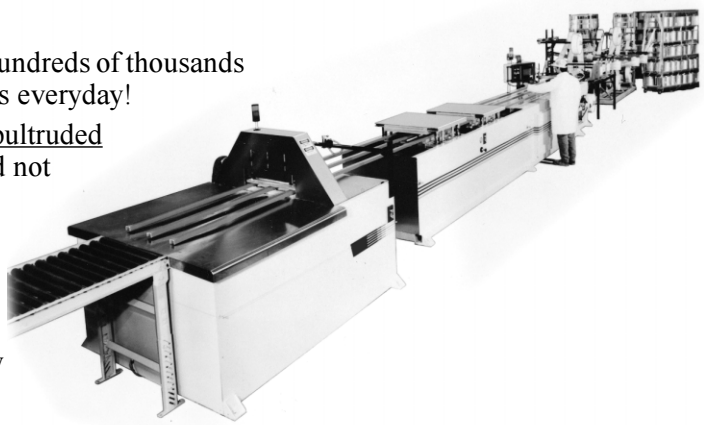
PULTRUSION BASICS



Strongwell is the world's leader in pultrusion producing hundreds of thousands of feet of pultruded fiber reinforced plastic (FRP) shapes everyday!

The unique advantages possible with FRP have enabled pultruded profiles to penetrate markets where other materials could not meet the design or end use requirements efficiently.

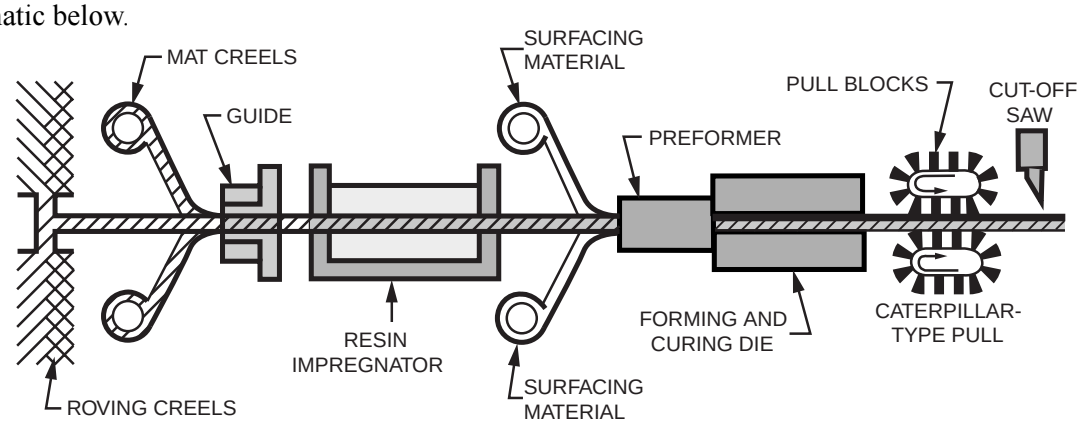
What is Fiberglass Reinforced Plastic?

Fiberglass reinforced plastic is most often referred to simply as "fiberglass". Used in this context "fiberglass" composites consist of a plastic resin matrix reinforced by embedded glass fibers.

The strength of an FRP part is determined primarily by the type, orientation, quantity, and location of the reinforcing fibers within the part. The type of resin used determines corrosion resistance, flame retardance, and maximum operating temperature as well as contributing significantly to certain strength characteristics including resistance to impact and fatigue.

What is Pultrusion?

Pultrusion is a manufacturing process for producing continuous lengths of reinforced plastic structural shapes with constant cross-sections. Raw materials are a liquid resin mixture (containing resin, fillers and specialized additives) and flexible textile reinforcing fibers. The process involves pulling these raw materials (rather than pushing, as is the case in extrusion) through a heated steel forming die using a continuous pulling device. The reinforcement materials are in continuous forms such as rolls of fiberglass mats or doffs of fiberglass roving. As the reinforcements are saturated with the resin mixture ("wet-out") in the resin bath and pulled through the die, the gelation, or hardening, of the resin is initiated by the heat from the die and a rigid, cured profile is formed that corresponds to the shape of the die. While pultrusion machine design varies with part geometry, the basic pultrusion process concept is described in the schematic below.



The creels position the reinforcements for subsequent feeding into the guides. The reinforcement must be located properly within the composite and this is the function of the reinforcement guides.

The resin bath saturates (wets out) the reinforcement with a solution containing the resin, fillers, pigment, and catalyst plus any other additives required. The interior of the resin bath is carefully designed to optimize the "wet-out" (complete saturation) of the reinforcement.

On exiting the resin bath, the composite is in a flat sheet form. The preformer is an array of tooling which squeezes away excess resin as the product is moving forward and gently shapes the materials prior to entering the die. In the die the thermosetting reaction is heat activated (energy is primarily supplied electrically) and the composite is cured (hardened).

On exiting the die, the cured profile is pulled to the saw for cutting to length. It is necessary to cool the hot part before it is gripped by the pull block (made of durable urethane foam) to prevent cracking and/or deformation by the pull blocks. Strongwell uses two distinct pulling systems, one that is a caterpillar counter-rotating type and the other a hand-over-hand reciprocating type.

In certain applications an RF (radio frequency wave generator) unit is used to preheat the composite before entering the die. When in use, the RF heater is positioned between the resin bath and the preformer.