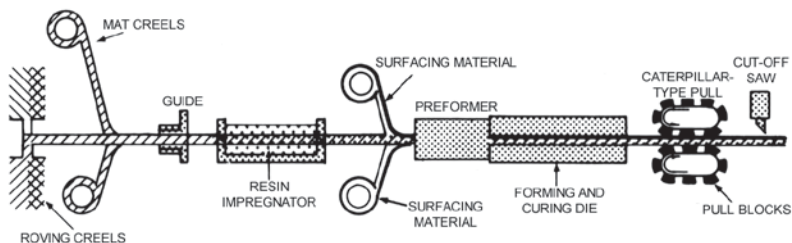
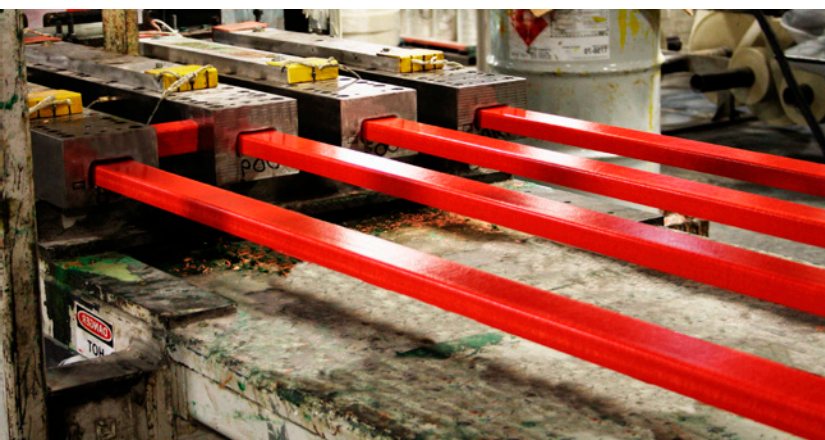
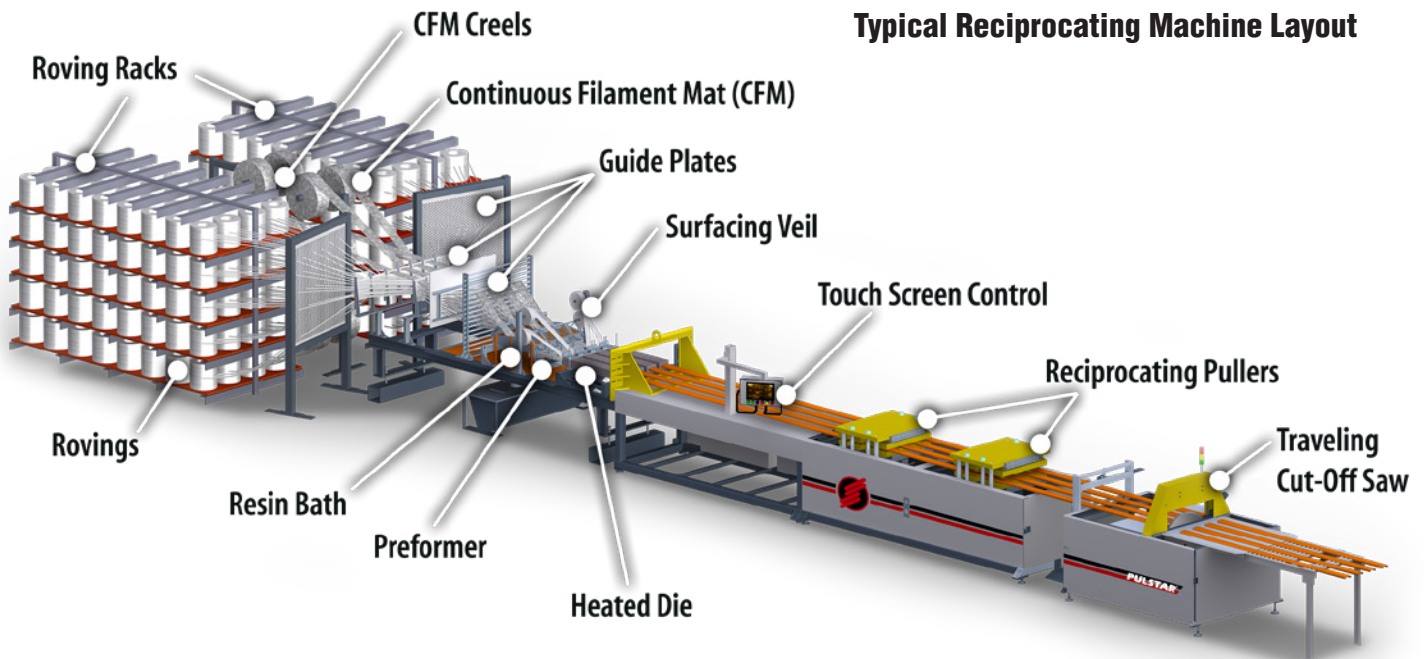




**PULTRUSION MACHINERY, EQUIPMENT, & SERVICES**



# Pultrusion Resources & Capabilities



## The PULSTAR® Machinery Lines

The PULSTAR® product line allows customers to tailor the system to meet their current needs as well as prepare for future growth.

**EX Pultrusion Machines** - an extensive line with multiple options available to fit the needs of beginning and high volume production pultruders

**Custom Pultrusion Machines** - designed for special speed, pull force, large profile requirements, or special applications and unique data acquisition needs.

## Introduction

PULSTAR® pultrusion machines, equipment, and tooling are manufactured by Strongwell, the world's largest pultrusion company. PULSTAR® machines are manufactured to the same high standard that Strongwell has used in its daily operations since 1956. All PULSTAR® machines are built from the ground-up on site at Strongwell's Bristol, Virginia, facility. PULSTAR® tooling and equipment have been developed from years of experience in producing high quality parts day-after-day, year-after-year.

PULSTAR® machinery incorporates the latest technology, with the ability to focus on the end user's needs. With over 200 PULSTAR® pultrusion machines sold into 25 countries, PULSTAR® is recognized worldwide for its high quality, versatility, and user-friendly operation. Strongwell understands that an untimely breakdown will completely halt production, causing the loss of valuable time and raw materials.

## Pultrusion Experience and Engineering

Engineers experienced in pultrusion build productivity into PULSTAR® pultrusion systems at every step in the process. Attention to operating detail distinguishes PULSTAR® systems from ordinary pultrusion machines. Each component is engineered for simple operation, while providing the flexibility to adjust to the special requirements of individual profiles.

## Capabilities

Strongwell can offer complete turnkey pultrusion systems or individual components of the pultrusion package. In addition to the PULSTAR® pultrusion machines, an entire array of support equipment, services, and programs are available.





# PULSTAR® Machine Design Features

Suggestions and recommendations from machine operators running pultruded profiles on a daily basis were incorporated into the design of PULSTAR® machines. The following are some of these design features:

- **Pull Speed Control**

Closed-loop electrohydraulic speed control with feedback is standard on all reciprocating machines and ensures constant pull speed. In-line transducers constantly monitor pull force for data display. For reciprocating machines, the maximum pull force of the machine is available at all pull speeds.

- **Touch Screen Operator Interface**

Each reciprocating machine is equipped with a color touch screen operator interface. Machine operation and control is managed by a PLC and a custom software program. Various functions are controlled through toggle switches and adjustment points. Trend graph displays for pull speed and pull force are also provided.

- **Puller Section Options (EX & Custom Machines)**

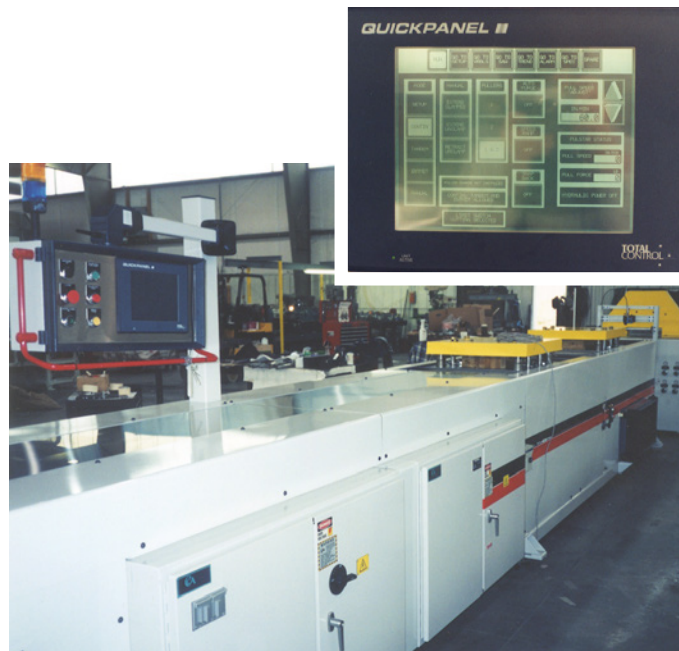
- » **Reciprocating Puller**

The dual reciprocating hydraulic puller section utilizes two clamping and pulling mechanisms synchronized by a PLC. Reciprocating pullers are generally chosen when the customer desires the capability to produce parts demanding higher pull forces and/or anticipates a need for frequent set up changes to produce parts varying in size and shape.

Pull forces are listed in the specification charts as continuous pull force (force of a single puller) and tandem pull force (force of both pullers in tandem). Puller pads must be selected for each profile being pulled and are usually obtained when securing new dies.

- » **Caterpillar Puller**

The caterpillar (also known as the continuous electromechanical) puller system uses two continuous rotating tracks which clamp and pull in the same operation. The caterpillar puller is best suited for lower pull speeds/forces and is often used for high volume, repetitive pulling of the same profile (including multiple cavities). The puller section has pneumatic clamp cylinders with automatic height adjustment. Pull force is stated as a continuous force measurement. In the case of tractor-type pullers, pull force is a function of pull speed.



# EX Pultrusion Machines

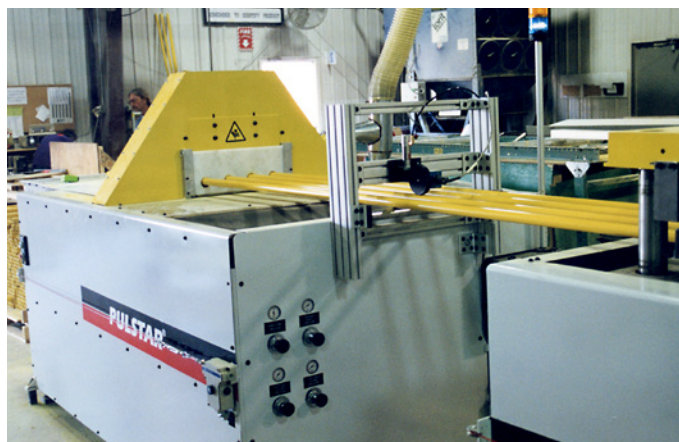
## The EX Pultrusion System

The PULSTAR® EX Pultrusion Machines utilize a standardized machine design with options based on user preferences to provide an economical yet highly capable line of pultrusion machines. A large list of user selectable options gives the EX machines enough flexibility to suit all but the most demanding processing requirements.

### EX Models

- EX806** Smallest of the standard production pultrusion machines. Offers the manufacturing features of larger machines and is excellent for laboratory/development work or production of small profiles.
- EX1606** Offers economical high volume production from a single cavity die while also accommodating multiple smaller dies for economical pultrusion of small profiles.
- EX2408** Most popular-sized pultrusion machine in the industry, the EX2408 will accept 95% of profiles currently produced and adapts to a large number of multi-cavity combinations. Provides maximum versatility.
- EX3008** Designed for multiple-cavity production of wider profiles or for single cavity dies requiring additional pull force capability.
- EX4008** Largest of the standard machines, designed to produce extra wide profiles or adaptable to economical multiple-cavity pultrusion. The 320 sq. in. (2065 sq. cm) profile envelope offers incredible flexibility for the pultruder.

*Specifications for the EX Machines are listed on page 7 of this brochure.*



Features of the EX Machines include:

**Die Bed** - An open die bed is standard on all EX models.

- Accommodates dies up to 42" (106cm) long
- Manually adjustable
- Multiple tie down points for easy removal of dies when running multiple cavities
- Integrated heater controls for strip heaters
- Dual inspection lights provided at the die exit

### Controller Section

- Total machine control through PLC utilizing custom proprietary software (Note: The caterpillar machines do not require PLC & touch screens for control)
- Swivel pendant-mounted touchscreen for easy operator control from either side of machine
- Multiple continuous data display screens of numerous functions including load and speed trending plus alarms

**Puller Section** - EX machines are supplied with a choice of either a reciprocating puller or a caterpillar puller depending on your application.

**Cut-off Section** - All EX models incorporate an automatic flying cut-off saw. Profiles are pneumatically clamped to the saw section table which moves at the process speed. The blade automatically cuts the profile, the clamp disengages, and the saw returns to its home position.

**Roll-off Section** - For ease of handling, a convenient roll-off table is included with each machine. The table consists of a series of steel rollers mounted on a sturdy open frame.

### EX Machine Options

The following options were developed to offer custom machine capabilities at a standard machine price. Multiple options allow the user to select the machine components best suited for producing the type of profiles their application requires.

- 36" or 48" heated platen die bed with hydraulic clamping and adjustment
- Auxiliary die bed heating zones
- Die entrance/exit auxiliary cooling
- Full color display monitor
- Data transfer capability using Allen Bradley Data Highway Port
- Water cooled hydraulic system (reciprocating machines)
- Dual cut saw
- Programmable cut length encoder
- Additional cut length limit switches
- Dead stop flying cut-off saw with moving roller table and part clamping
- Extended roll-off sections



# Corollary Equipment for Pultrusion



## Tooling

Dies specially designed by pultrusion specialists can be produced for even the most complex profile. Die lengths typically range from 24" to 48" (61cm to 122cm) depending on profile size, complexity, and wall thickness. Tooling can be made from a variety of steels and finished with any of several options including hard chrome plating and ion nitriding. Strongwell can also design and build in-feed systems and secondary tooling to improve operating efficiency.



## Mat Creels

Mat creels are built to hold either eight or four rolls of mat and/or surfacing veils depending on requirements. The sturdy tubular steel frame can accommodate rolls of mat, cloth, or woven roving up to 24" (610mm) in diameter and 24" (610mm) wide. Mandrel positions are vertically adjustable for process centerline control. Sufficient spacing is provided between rolls for easy splicing. Brackets are supplied to hang creel cards to orient mat and roving through the creel (creel cards not included). Mat racks are built with lockable casters for ease of movement and include bushing spacers to lock rolls of mat in position.



## Roving Creels

Two styles of roving creels are available, each designed to handle packages of rovings weighing 40 pounds or more. The larger model holds 100 doffs, arranged in five shelves, each holding 20 doffs. The smaller creel rack accommodates 48 doffs, arranged in four shelves each holding 12 doffs. Creels are built with steel tubular frames and include lockable casters that allow movement from one job to another. Abrasion-resistant bushings are located on the end of each shelf and intermediate guide rods are positioned above roving packages to ensure trouble-free delivery of rovings.



## Resin Handling Equipment

Pultrusion resin pans are available in two styles or may be custom-designed for special applications. The resin "dip" pan directs reinforcements into the back of the pan where breaker bars separate fibers for impregnation. The other style of resin pan is a straight-through ("drip") pan generally used for hollow sections and complex profiles where reinforcements are held in a simple centerline process plane. Resin pumping systems are also available. Resin tables have options of manual or hydraulic adjustments.



## Slitters

The PULSTAR® Mat Slitter is designed to provide the flexibility needed to cut large or small quantities of continuous strand mats and surfacing materials. A cantilevered mandrel supports up to a 78" x 25" (198cm x 63cm) roll of material with either 3" (76mm) or 4" (102mm) I.D. cores. A rigid cutting yoke slices through the rotating roll of material and moves to the next cut when the cut stroke is completed. A programmable control provides automatic cycling features for a preset number of cuts at operator predetermined widths. Multiple programs can be entered through the touch screen and stored in the processor.



# Custom Machines

Strongwell will build a pultrusion machine to address most any unique application or operation. Machines have been developed and are currently in operation with profile envelopes up to 60" x 30" (152cm x 76cm).



## Services and Programs



### Technology Transfer Packages

In conjunction with machinery sales, Strongwell offers highly customized programs for the beginning or experienced pultruder to make our technology yours. We can provide the tooling, expertise and training to produce one or a host of production profiles in a fraction of the time it would take a beginning pultruder to achieve successful processing of quality parts.

### Development Programs

Once you have selected your PULSTAR® system, we can help you get your pultruded products to market — fast! While your system is being built, we offer pilot production runs to help refine your operating parameters and ensure a smoother start up at your facility.

### Plant Layout

Experienced professionals at Strongwell can offer recommendations for efficient flow and operation of your plant.

### Equipment Start-up Services

Strongwell provides start-up services for your machine worldwide and instructs your staff in machine operation and maintenance requirements.

### Consulting Services

Strongwell has process experts ready to help improve existing products or develop new ones. Strongwell's expertise and worldwide service can save valuable time getting new or existing products to market.

### Machinery Repair and Field Service

Dedicated machinery repair and maintenance experts at Strongwell are available to assist whenever necessary. In most cases, replacement parts are only a phone call away. For more extensive repairs, modifications or upgrades well-trained field service technicians can quickly respond to customers' needs around the world.

# Specifications

In addition to the standard EX machines, custom machines can be built to meet specific application requirements.

All PULSTAR® pultrusion machines include:

- Touch screen control module\*
- Reduced snap-back feature\*
- Base-line run height set-up\*
- Strongwell-designed software programming with name brand control modules\*
- Closed-loop drive control system\*
- Flying cut-off saw with part clamping
- Roll-off table
- Outer galvanized sheet metal primed and painted with urethane finish
- Installation and start up support - worldwide
- After-the-sale service and support from the world's largest pultruder

\* Features applicable only to reciprocating machines.

## Specifications for EX Machines

MODEL		Caterpillar Pullers					Reciprocating Pullers				
		EX806C	EX1606C	EX2408C	EX3008C	EX4008C	EX806R	EX1606R	EX2408R	EX3008R	EX4008R
<b>Profile Envelope</b>	(in) (mm)	8 x 6 203 x 152	16 x 6 406 x 152	24 x 8 610 x 203	30 x 8 762 x 203	40 x 8 1016 x 203	8 x 6 203 x 152	16 x 6 406 x 152	24 x 8 610 x 203	30 x 8 762 x 203	40 x 8 1016 x 203
<b>Machine Length</b>	(ft) (m)	43 13.1	43 13.1	55 16.8	55 16.8	55 16.8	48 14.6	48 14.6	58 17.7	58 17.7	58 17.7
<b>Machine Width</b>	(in) (cm)	40 101.6	46 116.8	54 137.2	62 157.5	72 182.9	36 91.4	44 111.8	52 132.1	60 152.4	68 172.7
<b>Machine Weight</b>	(lb) (kg)	14,000 6,350	16,500 7,484	17,000 7,711	18,000 8,165	19,000 8,618	11,000 4,990	11,000 4,990	11,000 4,990	12,000 5,443	12,000 5,443
<b>Center/Base Line Ht.</b> (Nominal)	(in) (cm)	43 109	43 109	43 109	43 109	43 109	41.75 106	41.75 106	41.75 106	41.75 106	41.75 106
<b>Pull Force</b> (Continuous)	(lb) (kg)	8,000 3,630	14,000 6,350	14,000 6,350	14,000 6,350	14,000 6,350	12,000 5,443	16,000 7,257	16,000 7,257	20,000 9,072	20,000 9,072
<b>Pull Force</b> (Tandem)	(lb) (kg)	N/A	N/A	N/A	N/A	N/A	24,000 10,886	32,000 14,515	32,000 14,515	40,000 18,144	40,000 18,144
<b>Clamp Force</b>	(lb) (kg)	8,000 3,630	14,000 6,350	14,000 6,350	14,000 6,350	14,000 6,350	18,000 8,165	24,000 10,886	24,000 10,886	30,000 13,610	30,000 13,610
<b>Clamp Length</b>	(in) (cm)	N/A	N/A	N/A	N/A	N/A	31 78.7	31 78.7	31 78.7	31 78.7	31 78.7
<b>Pull Surface Length</b>	(in) (cm)	36 91.4	48 121.9	48 121.9	48 121.9	72 182.9	N/A	N/A	N/A	N/A	N/A
<b>Pull Stroke</b>	(in) (cm)	N/A	N/A	N/A	N/A	N/A	24 61	24 61	24 61	24 61	24 61
<b>Speed Range</b>	(in/min) (cm/min)	6-85 15.2-216	12-65 30.5-165.1	12-65 30.5-165.1	12-65 30.5-165.1	12-65 30.5-165.1	1-120 2.5-304.8	1-120 2.5-304.8	1-120 2.5-304.8	1-120 2.5-304.8	1-120 2.5-304.8



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