

# Romeo Engineering Inc

## OEM of Composite Processing Equipment

**ROME ENGINEERING INC**

Colby Lawrence – Vice President

May of 2023

USA and International Patents Pending

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# Our Company's Ecosystem.

- We design and manufacture composite pultruders, high pressure waterjet cutters, & advanced industrial automation for civilian and military use.
- 3 factories in Fort Worth, Texas USA.
- Full implementation including engineering design, FEA analysis, materials research, machinery fabrication, product design, facility layouts & PID, programming, and servers.
- In-house engineering, fabrication, PhD nano-polymer & ceramic development.

CNC Waterjet  
Division

Aircraft  
Division

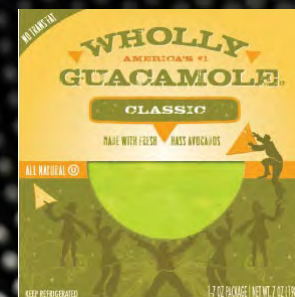
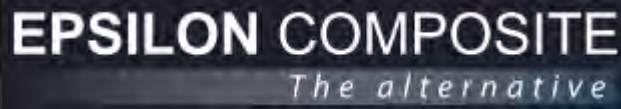
Energetics  
Division

Proton  
Accelerators

Sanitary/Cryogenic  
Division

Pultrusion  
Division





# In the Beginning

For those of you who may not know, my name is Colby Lawrence, I have worked in this industry for nearly 24 years, during that time I have had exposure in most pultrusion related tasks, from machinery installation around the world to production of complex pultruded profiles made from various resins and fibers, however most of my career has been spent with a heavy focus in the design, fabrication and operation of pultrusion related machinery.

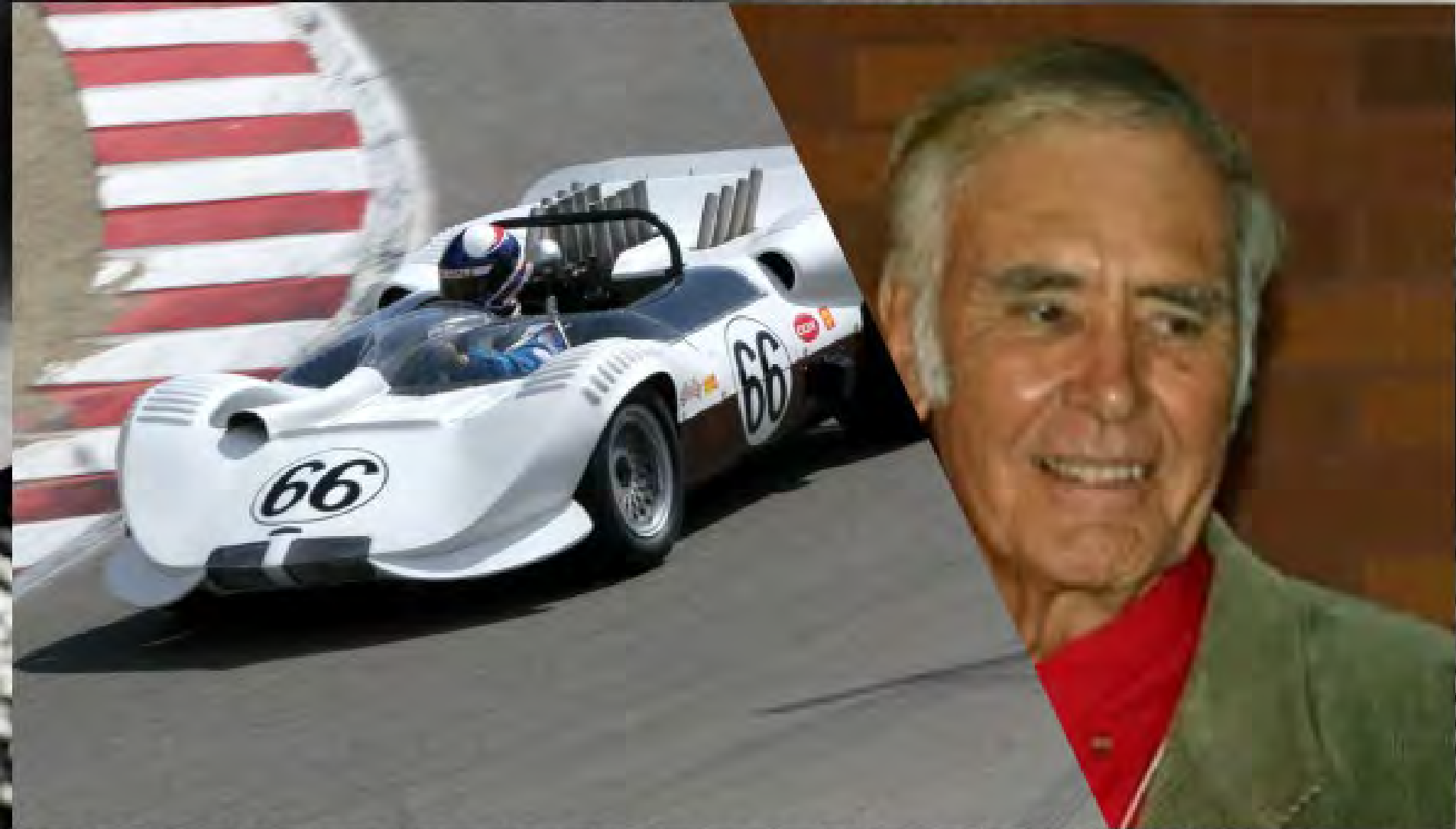
It began for me with the Green family back in 2000. Andrew Green (or Andy as most knew) had a passion for high performance FRP's, having developed many revolutionary concepts and products like the Chaparral Race Car Chassis in the late sixties, Olympic worthy sailboats, composite telescoping towers, to 100% composite buildings for companies like Apple, AT&T, and Underwriters Labs. Andy also funded the creation of a new academic chair in composites at Lamar University, Beaumont Texas, and then later in life a generous donation to the University of Texas in Arlington. His contributions were intended to promote the advancement of composite structural capabilities. Andy's late son Phillip Lee Green, also my mentor, was well known throughout our industry for providing pultrusion machinery to pultruders domestic and foreign. I was fortunate to have shared in their endeavors and to have had the opportunity to work so closely with two people that devoted their lives to what we do today.





Test design pre Chaparral Race Car Designed & Fabricated by Andy Green

# Andy Green



# Romeo Engineering Horsepower

Today, my contributions continue alongside Romeo Engineering Inc. as one of the premier providers of custom automation, with expertise in not only pultrusion but also CNC controlled waterjet cutting tables and highly customized applications associated with assembly machinery as well as pre and post processing tasks throughout various industries. For nearly 37 years owner and Professional Engineer, Frank C. Romeo and his associates have implemented some of the most complex inventions and automated systems, from the first color camera on the moon, to helicopter blade assembly cells. Once again, I find myself very fortunate to have the opportunity to work with such a talented group of Engineers while we continually improve and develop new and exciting technology for the composites industry.

For the remainder of my time, I would like to go off script and briefly discuss with you how implementing various levels of software control can effectively mitigate downtime and cut operating cost I encourage those of you interested to learn more about what we do to stop by and visit with me.

*“Romeo’s Entry level Artificial Intelligence”*





# OEM of Pultrusion Related Equipment and Automation

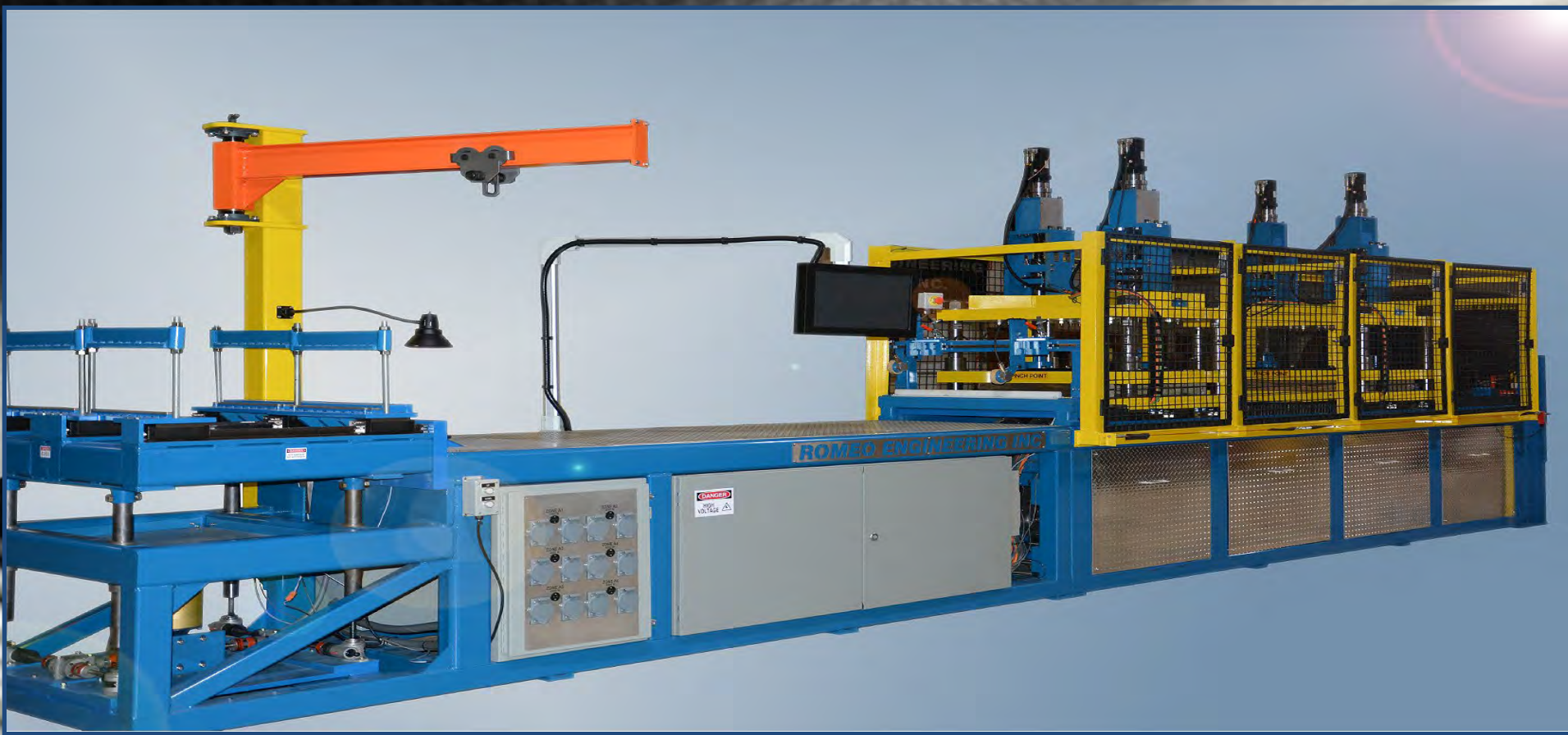


# Hydraulically Driven Machinery



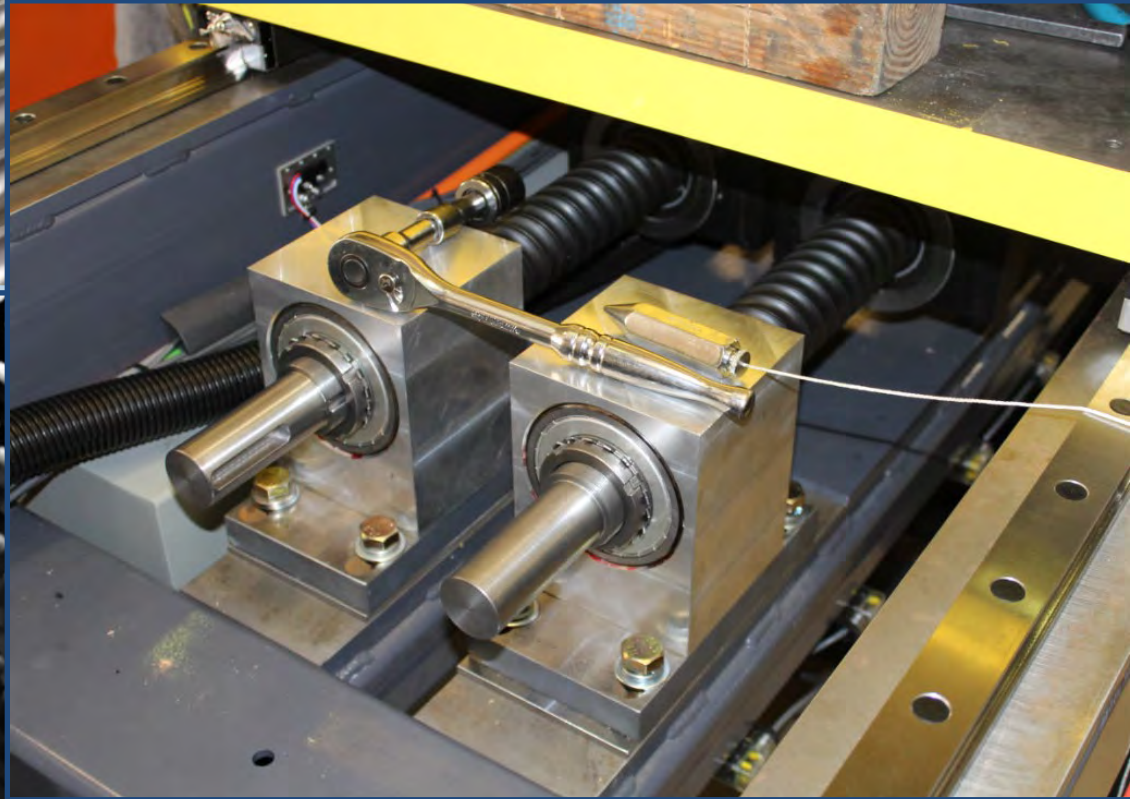
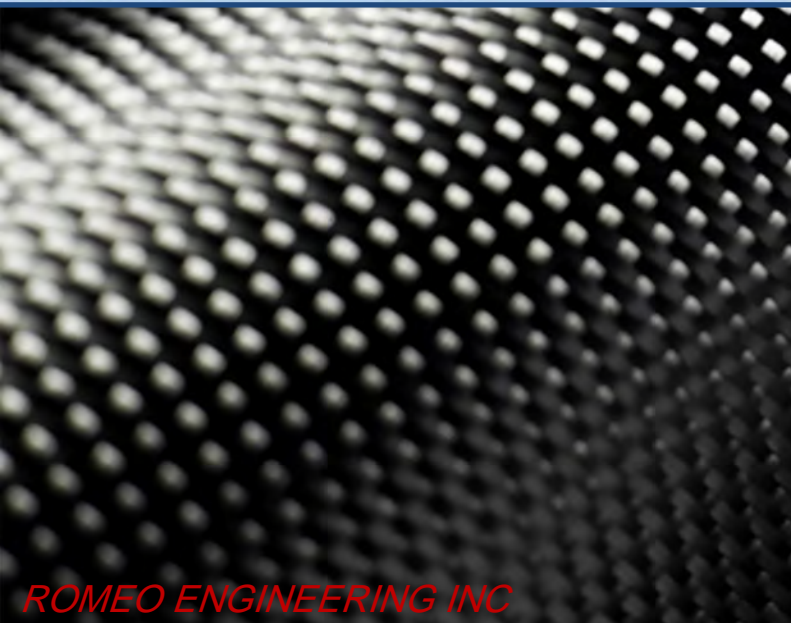
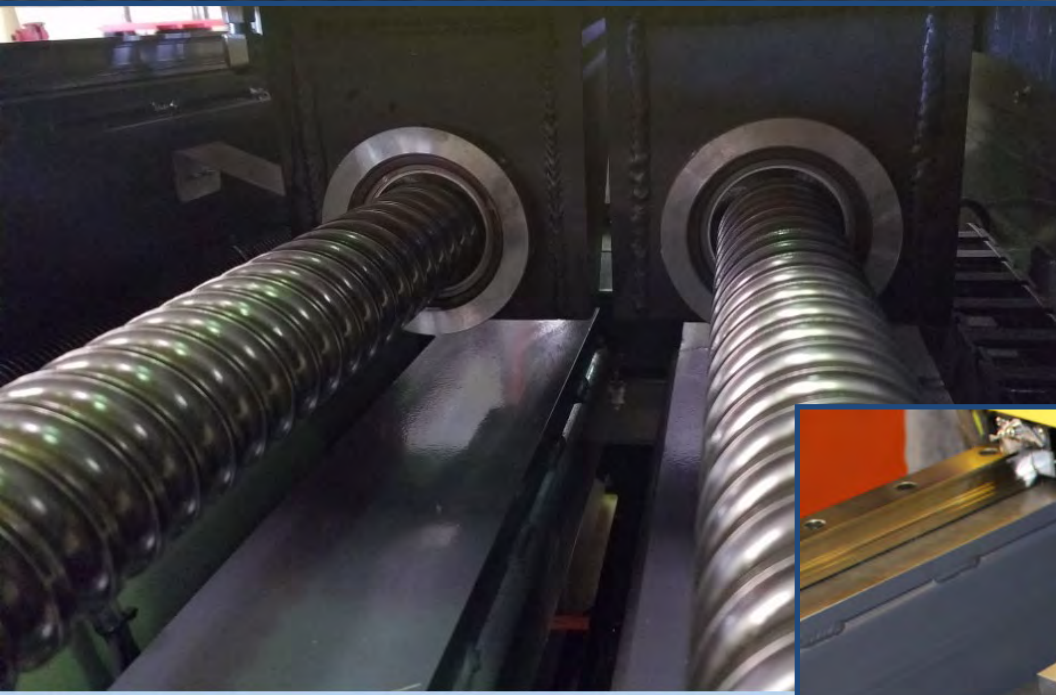


# Servo Driven Pultruders





# Dual Ball Screw Design



*Servo /Ball screw Drive*



# Total Process Control & Monitoring.

**AUTO MODE**

START STOP PAUSE

TOGGLE MODE  
AUTO MANUAL

PREPARED VALUE  
SET VALUE

**CONFIGURATION**

PULL SPEED 0 INCH/MIN  
0

CLAMP FORCE 0 POUNDS  
0

PAUSE PARAMETERS

PAUSE INTERVAL (min) 0

PAUSE LENGTH (sec) 0

SET CONFIG

TANDEM MODE

ENABLE PULLER 01 BYPASS PULLER 01

ENABLE PULLER 02 BYPASS PULLER 02

**MACHINE INFO**

PULL SPEED #1 0 in/min #2 0 in/min

PULLER POSITION #1 0 in #2 0 in

PULL FORCE #1 0 lbs #2 0 lbs

CLAMP FORCE #1 0 lbs #2 0 lbs

MACHINE HOURS 0 hrs

FEET RUN 0 ft

EFFECTIVE SPEED A 0 ipm B 0 ipm

RESET FAULTS

PLC COMMUNICATING  
MACHINE HOMED  
CONFIG SET  
MOTOR RUNNING  
PULLERS ENGAGED  
PUMP CONTACTOR  
THERMAL OVERLOAD  
HEATER CONTACTOR

PAUSED  
E-STOPPED  
CLAMPING FAULT  
HEATER FAULT  
FILTER  
OIL TEMP  
PULL SPEED  
PULL FORCE

**SAFETY CAGE**

A B

1 2 3 4 1 2 3 4

BYPASS SAFETY CAGE

**MANUAL CONTROLS**

CLAMP 1

CLAMP 01 UP PULLER 01 FWD

CLAMP 01 DOWN PULLER 01 REV

CLAMP 2

CLAMP 02 UP PULLER 02 FWD

CLAMP 02 DOWN PULLER 02 REV

HOME MACHINE

TOGGLE HYDRAULIC PUMP

WINCH

WINCH FWD

WINCH REV

MAIN HEATERS SAW A SAW B **ROMEO ENGINEERING INC** DATA MAINT



# Customizable Interface

**SPEED (IN/MIN)**

#1 #####.## #2 #####.##

**PULL FORCE (LBS)**

#1 ##### #2 #####

**CLAMP FORCE (LBS)**

#1 ##### #2 #####

**MACHINE HOURS**

#####

CLAMP 01 DRIVE

CLAMP 02 DRIVE

PULLER 01 DRIVE

PULLER 02 DRIVE

WINCH DRIVE

PULLER CAGE

PULL SPEED

PULL FORCE

HEATERS

E-STOPPED

PAUSED

MACHINE READY

MACHINE RUNNING

PULLERS ENGAGED

**CLEAR ALARM**

**HEATER FAULT DETECTED**

**AUTO CONTROLS**

**START**

**STOP**

**PAUSE**

**MAIN** **A1-A3** **A4-A6** **B1-B3** **B4-B6**

**ROMEO ENGINEERING**



# Customizable Interface

The interface is a dark blue panel with various controls and displays. At the top left, there are two rows of indicator lights: a red row labeled 'PRESET' and a green row labeled 'SET'. To the right of these are 'AUTO' and 'MANUAL' mode indicators, each with a white slider, and a 'MODE' button below them. Further right, there are three columns of digital displays for 'SPEED (IN/MIN)', 'PULL FORCE (LBS)', and 'CLAMP FORCE (LBS)', each with two rows labeled '#1' and '#2'. A 'MACHINE HOURS' display shows '####'. A yellow bar in the center reads 'SYSTEM NORMAL'.

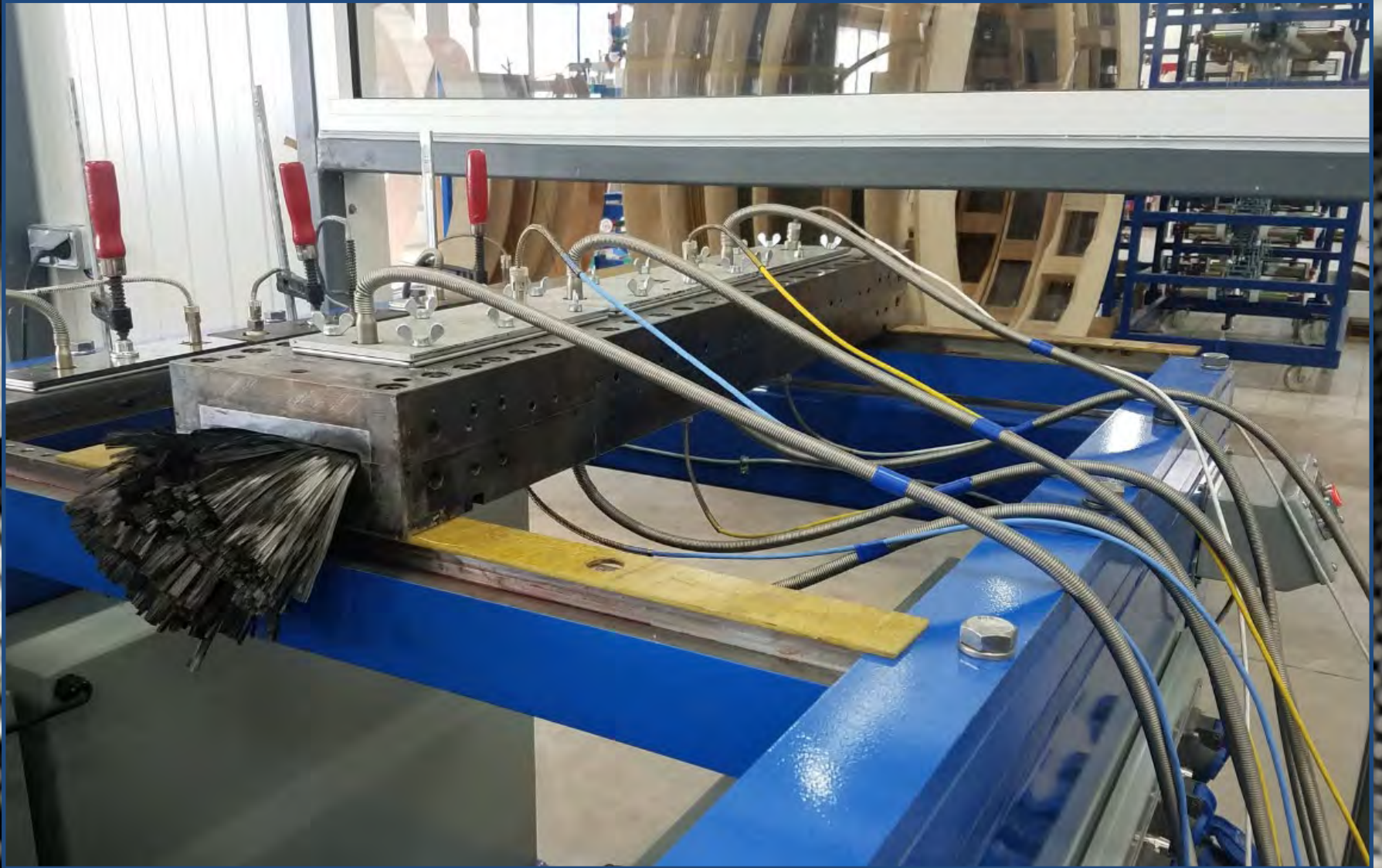
The main section is divided into several functional areas:

- AUTO CONTROLS:** Features three large circular buttons for 'START' (green), 'STOP' (red), and 'PAUSE' (olive). To the right is a 'SET PROGRAM' indicator with a white slider and a 'SET' button.
- Filter and Status Indicators:** A grid of small square indicators for 'HP FILTER 1', 'HP FILTER 2', '10 GAL FILTER', '20 GAL FILTER', 'LIGHT CURTAIN', 'PULL SPEED', 'PULL FORCE', 'E-STOPPED', 'MACHINE PAUSED', 'MACHINE READY', 'MACHINE RUNNING', 'PULLERS ENGAGED', 'SAW STATUS', and 'RUNOFF STATUS'.
- Temperature and Winch Controls:** Displays for 'OIL TEMP' (###) and 'PUMP 1 TEMP' (###), 'PUMP 2 TEMP' (###). Buttons for 'WINCH FORWARD', 'WINCH REVERSE', and 'CLEAR ALARM'.
- Pause Parameters:** Two rows of digital displays for 'PAUSE INTERVAL MINUTES' and 'PAUSE LENGTH SECONDS', each with a green circular indicator.
- Puller Controls:** Two columns for 'PULLER 1' and 'PULLER 2'. Each has buttons for 'OPEN CLAMP', 'CLOSE CLAMP', 'FORWARD PULLER', and 'REVERSE PULLER'. Status indicators for 'CLAMP 01 OPENED' and 'CLAMP 02 OPENED' are shown.
- Other Controls:** 'TANDEM MODE' and 'BYPASS CAGE' indicators with white sliders. 'HOME' and 'HOME MACHINE' buttons. A digital display showing '01' and '02'.

At the bottom, there are five large blue buttons: 'MAIN', 'HEATERS', 'SAW A', 'SAW B', and 'MAINT'. The 'ROMEO ENGINEERING' logo is in the bottom right corner.



# Carbon Fiber, Fiberglass and Basalt Applications



*Direct inject or open bath*



# Pressurized Cabinets For Hazardous Environments







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# Customized Heating Systems





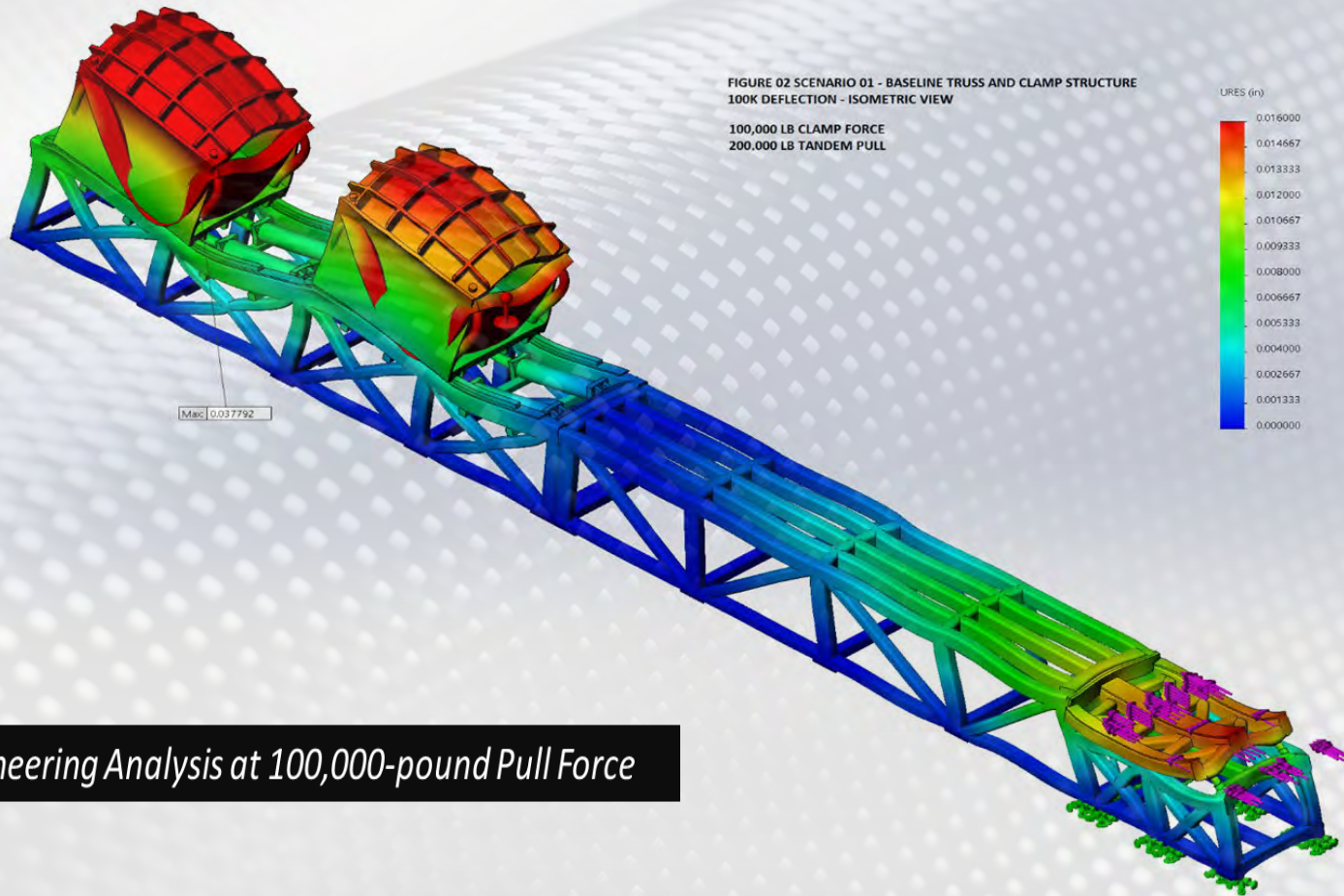
# High Performance Series





# Finite Element Analysis (FEA)

Model name: REI 24-FA-ASSEMBLY  
Study name: Static 3(-Default-)  
Plot type: Static displacement Displacement1  
Deformation scale: 1300

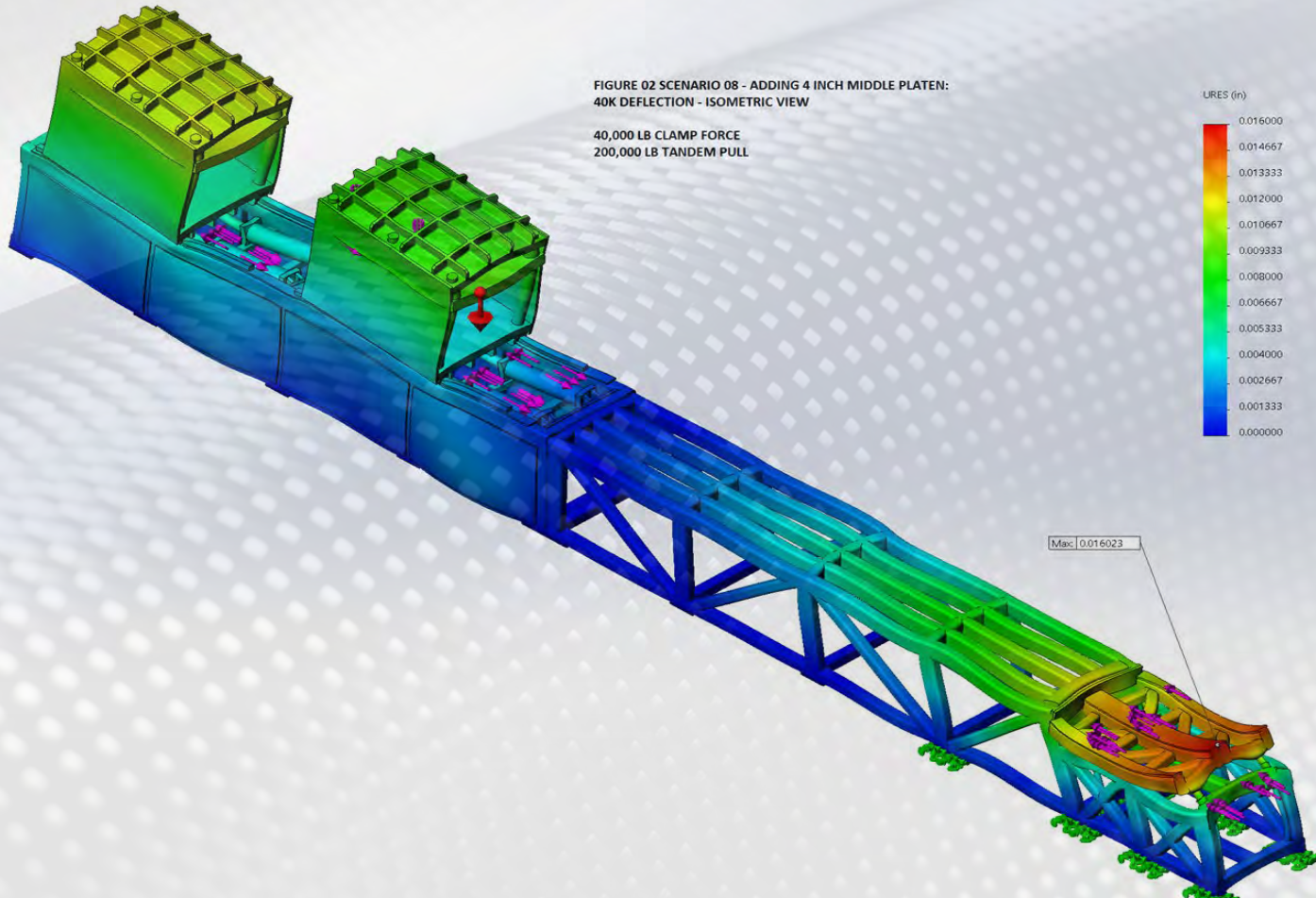


*Engineering Analysis at 100,000-pound Pull Force*



# Isometric Deflection View

Model name: REI 24-FEA-ASSEMBLY  
Study name: Static 3(-Default)  
Plot type: Static displacement Displacement1  
Deformation scale: 1300



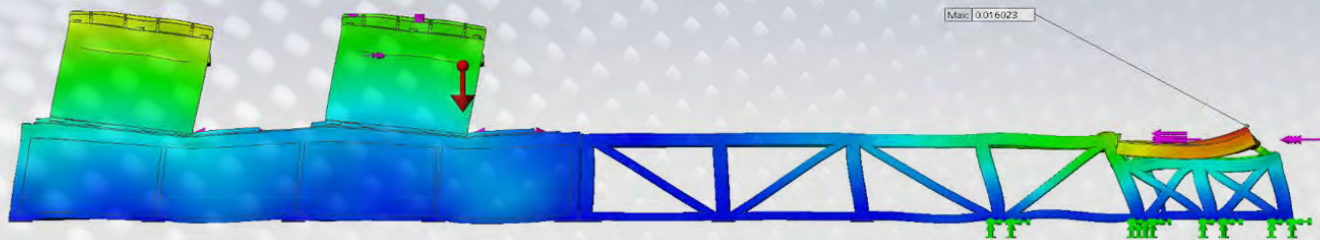
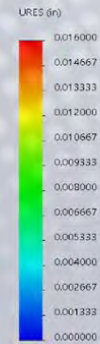


# Side View Deflection

Model name: REI 24-SEA-ASSEMBLY  
Study name: Static 3 (Default)  
Plot type: Static displacement Displacement1  
Deformation scale: 1300

FIGURE 03 SCENARIO 08 - ADDING 4 INCH MIDDLE PLATEN:  
40K DEFLECTION - SIDE VIEW

40,000 LB CLAMP FORCE  
200,000 LB TANDEM PULL



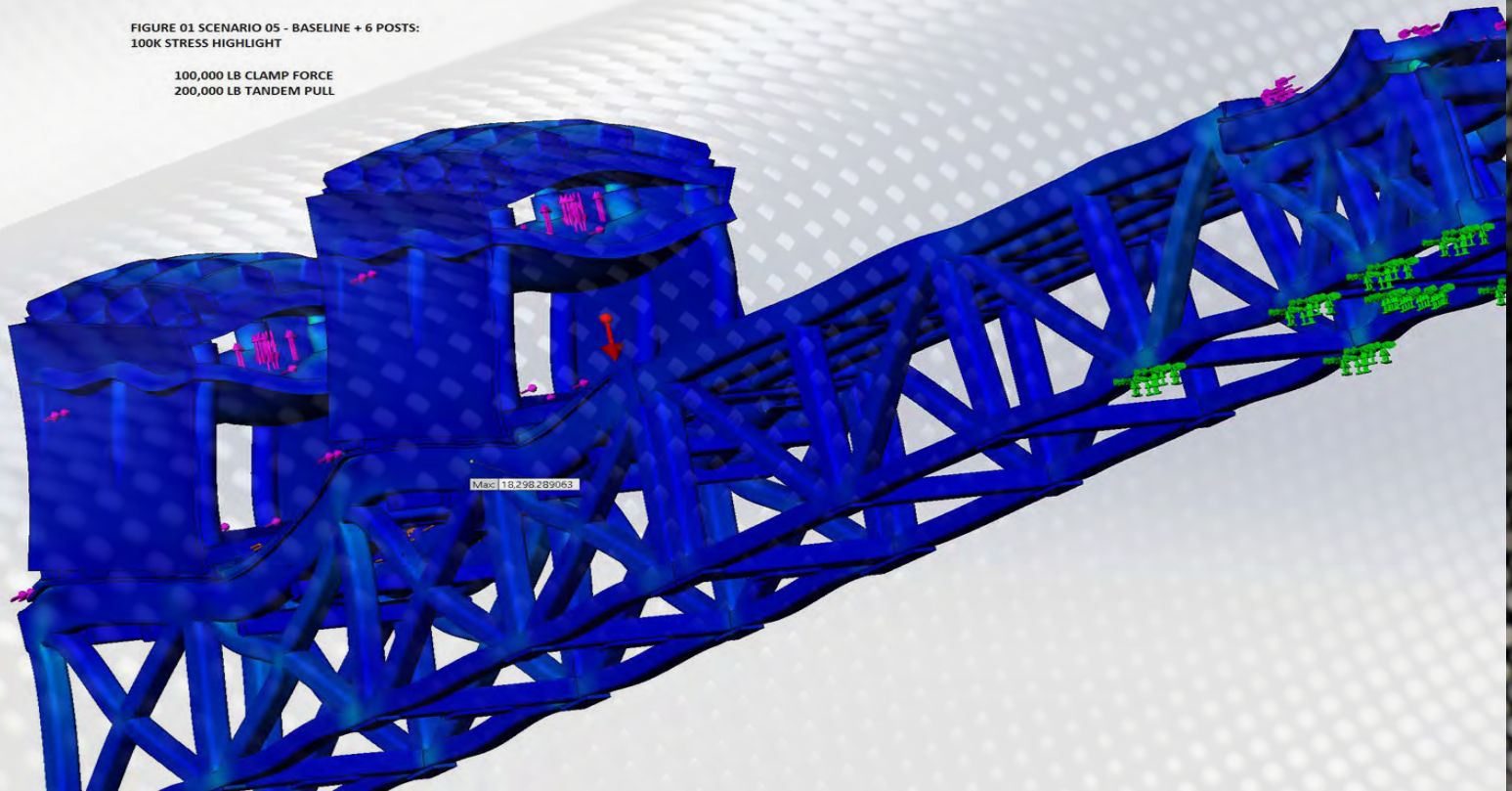


# Stress Analysis

Model name: REI 24-FA-ASSEMBLY  
Study name: Static 3(-Default-)  
Plot type: Static nodal stress Stress1  
Deformation scale: 1300

FIGURE 01 SCENARIO 05 - BASELINE + 6 POSTS:  
100K STRESS HIGHLIGHT

100,000 LB CLAMP FORCE  
200,000 LB TANDEM PULL





# Automatic Saws, Gang Drills, Grinders.



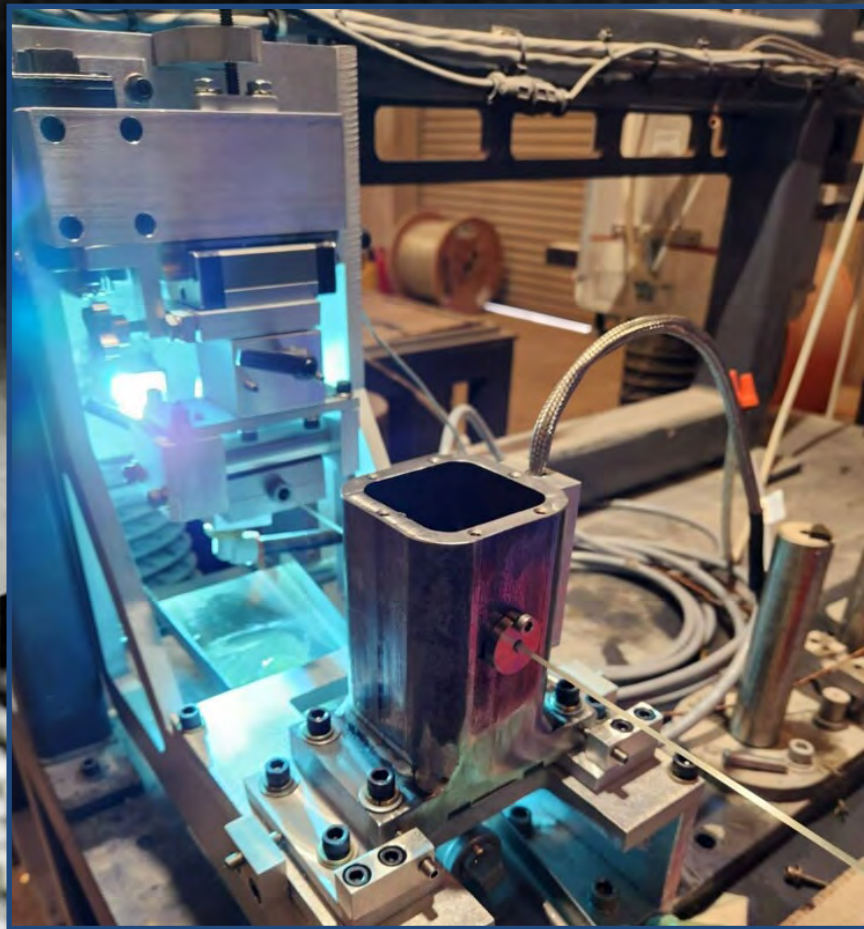


# Innovative

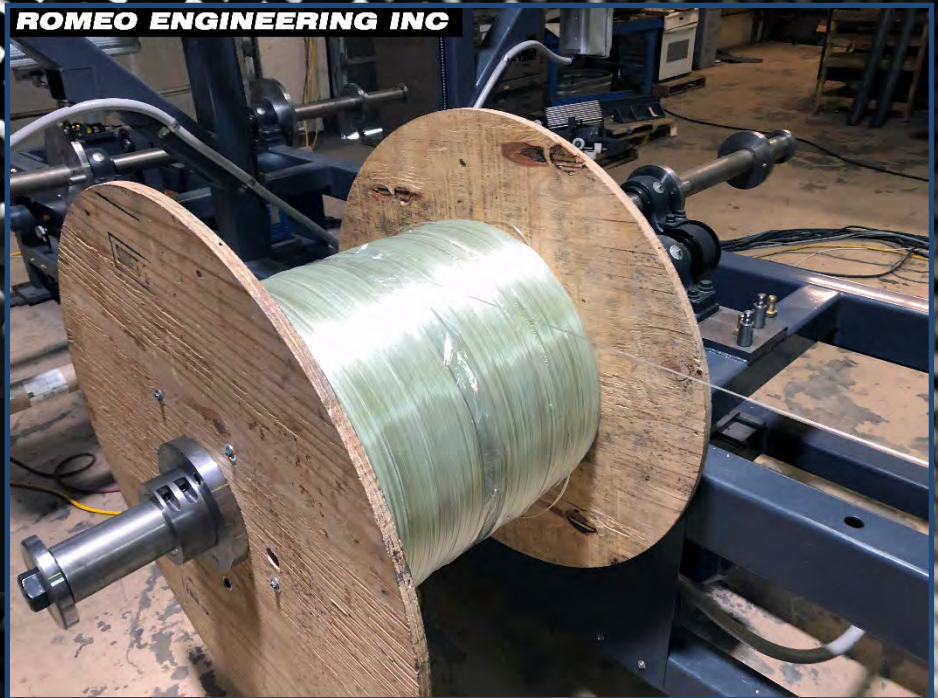
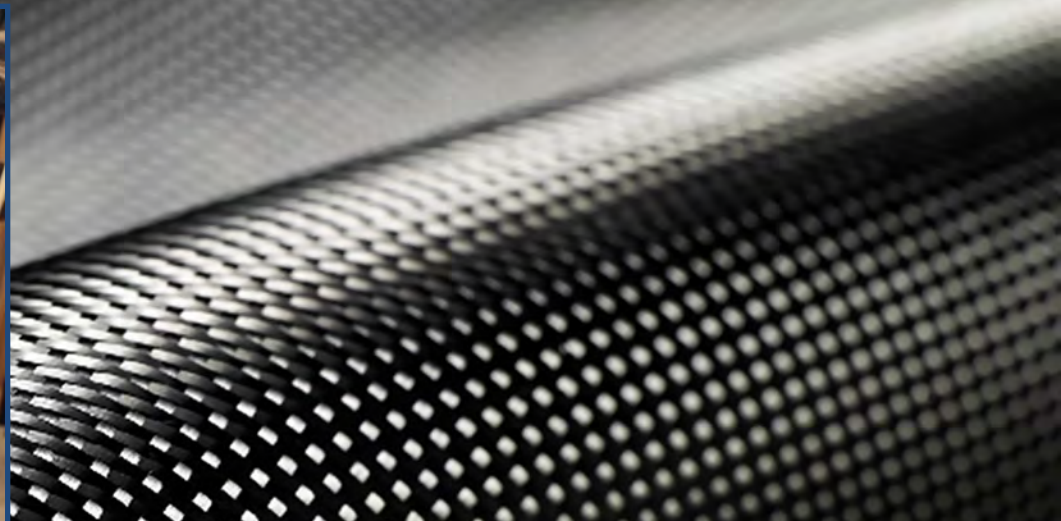




# Custom Cure & Winding at 300 Feet/Minute.



*Rapid cure, on the fly inspection & winding of a multi-lane fiber optic strength cable pultruder*



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# Ancillary Systems

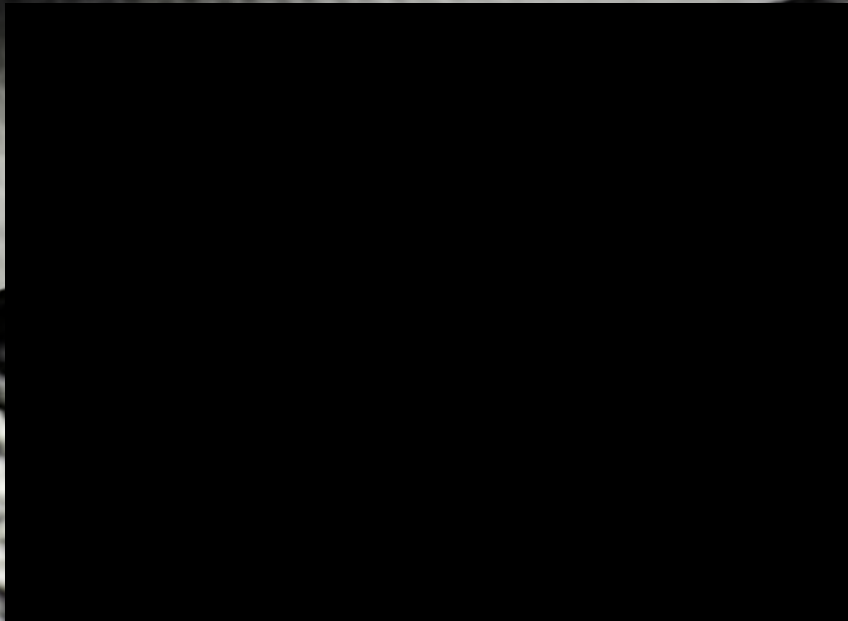
Full Factory Resin Heating, Cooling, Distribution.





# Ancillary Equipment

Gang Drills



Post Processing





# Capabilities

1. In - House 26' x 5' x 5' Planar Mill
2. In - House Waterjet 14'x 7'
3. Modeling Software
  - CAD
  - Solid Works
  - Catia
4. Full Time Staff
  - Software Engineers
  - Mechanical Engineers
  - Electrical Engineers
  - PhD Chemist
  - Technicians
  - Assemblers
  - Machinist
5. Pultrusion Services
  - Consultation
  - Process Optimization
  - Product Design
  - Pre and Post processing tasks
6. Remote Access
  - Efficient Troubleshooting and Repair
  - Integrated Camera Systems for Evaluation
  - 24/7 support and service contracts available





# Testimonials and Service

*Team Romeo,*

*“Romeo Engineering’s remote access into our machinery has been very helpful from a cost savings standpoint. They can access the machinery 24/7 while the machine is in operation. The Romeo group have always been extremely helpful anytime day or night. There has not been an occurrence when the phone was not answered, and the problem resolved in a timely manner.”*

*Brent Davis | Maintenance Mgr.  
Maclean Power Systems*

*“The access service you provide has been a game-changer for our operations. Accessing Since implementing your service, we have experienced significant cost savings and a  
Dear Romeo Engineering,*

*“I am very thankful for your exceptional service to our company through your remote access technology. Since implementing your service, we have experienced significant cost savings and a notable increase in productivity and efficiency.*

*Your team's responsiveness and availability have been outstanding. I have never experienced a time when my calls or emails went unanswered, and the problems we encountered were always resolved promptly and professionally. Your technicians were knowledgeable and experienced, and they were able to quickly diagnose and fix any issues we had with our machinery.”*

*Sincerely,*

*Brent Williams*

*Our team's responsiveness and availability have been outstanding. I have never experienced a time when my calls or emails went unanswered, and the problems we encountered were always resolved promptly and professionally. Your technicians were knowledgeable and experienced, and they were able to quickly diagnose and fix any issues we had with our machinery.*

*The remote access service you provide has been a game-changer for our operations. Accessing our machinery 24/7 while in the process has allowed us to maximize our production capacity and minimize downtime. Your service has indeed been a reliable and effective partner for our company.*

*Since implementing your service, we have experienced significant cost savings and increased productivity. We look forward to continuing our partnership with Romeo Engineering and highly recommend*

*Sincerely,*

*Brent Williams*

**ROMEO ENGINEERING INC**





# OEM of Ultra High-Pressure Waterjets



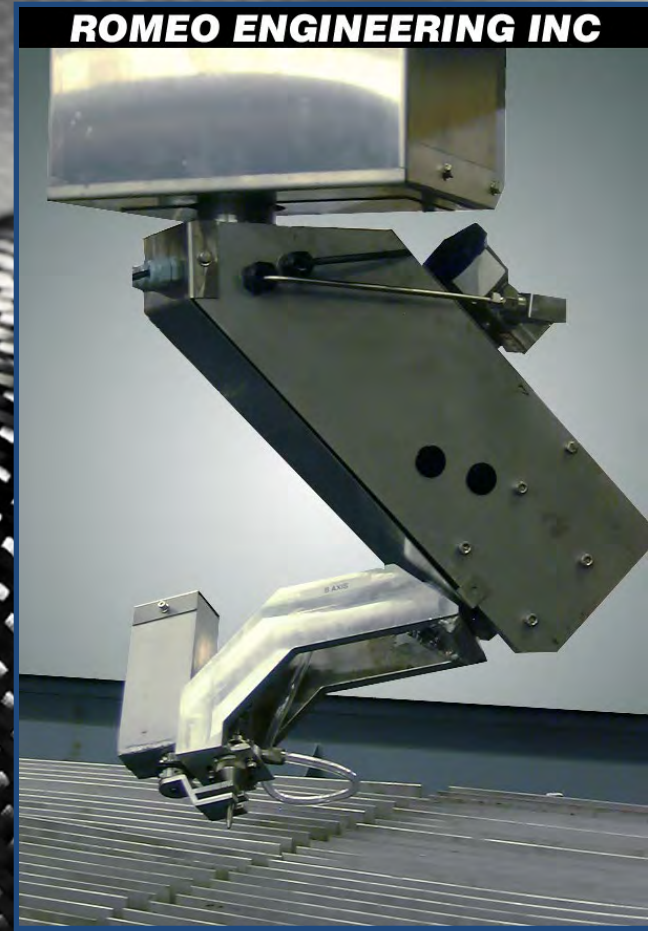
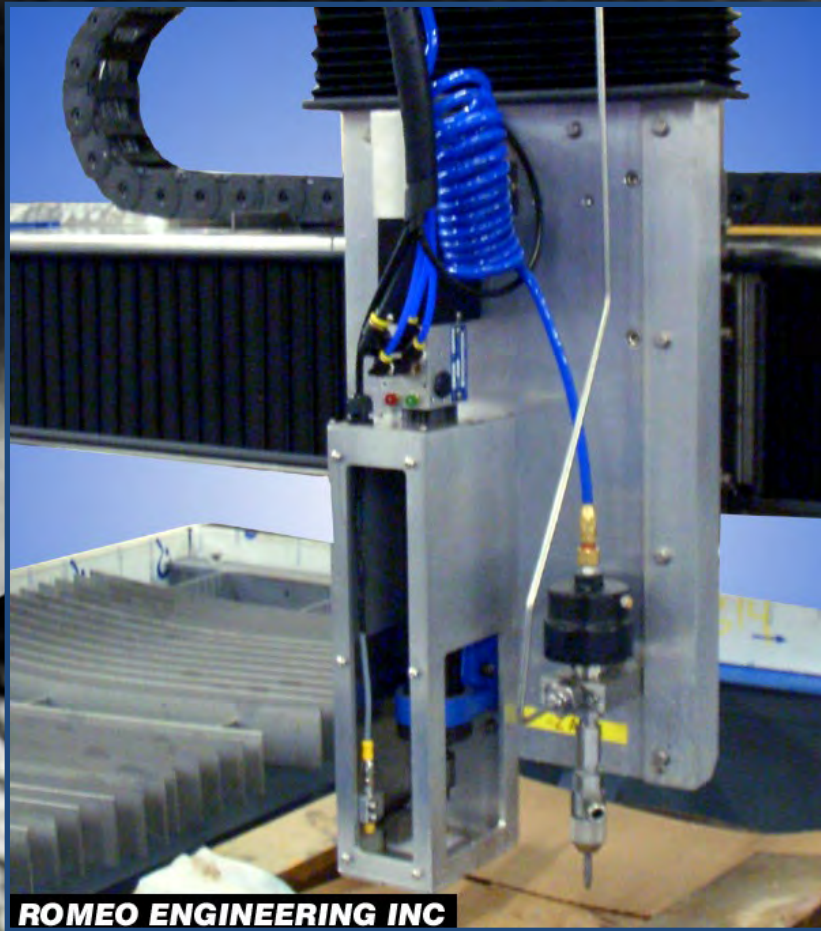
# OEM of Ultra High Pressure Waterjet Cutters.



- REI builds 60,000-psi to 90,000-psi waterjet and abrasive waterjet cutting machines.
- Cut unidirectional fiberglass, carbon fiber reinforced plies, blown fiberglass, etc.
- Combo machines available trimming, drilling, 5-axis, lathes, etc in same machine.
- 6 models available up to 8x8-meters long per section. Huge variety of custom models (portable, explosion-proof, etc).



# Abrasive Waterjet Cutting and Drilling.



- REI builds 60,000-psi to 90,000-psi waterjets.
- Many sizes, configurations, options available.



# Router Cut Surface Quality.



100  $\mu$ m 100X

ROMEO ENGINEERING INC



# Abrasive Waterjet Cut Surface – CFRP.

- 75-125 rms finish for fine
- 250-350 rms rough



100  $\mu$ m 100X

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A large industrial waterjet cutting system in a factory. A worker in a blue shirt is standing next to the machine, which is cutting a large metal plate. The machine has a long bed with a cutting head and a large tank. The background shows a large industrial building with a high ceiling and various pipes and lights.

# Waterjet Cutting System

***ROMEO ENGINEERING INC***





# OEM of Pre-Preg Systems



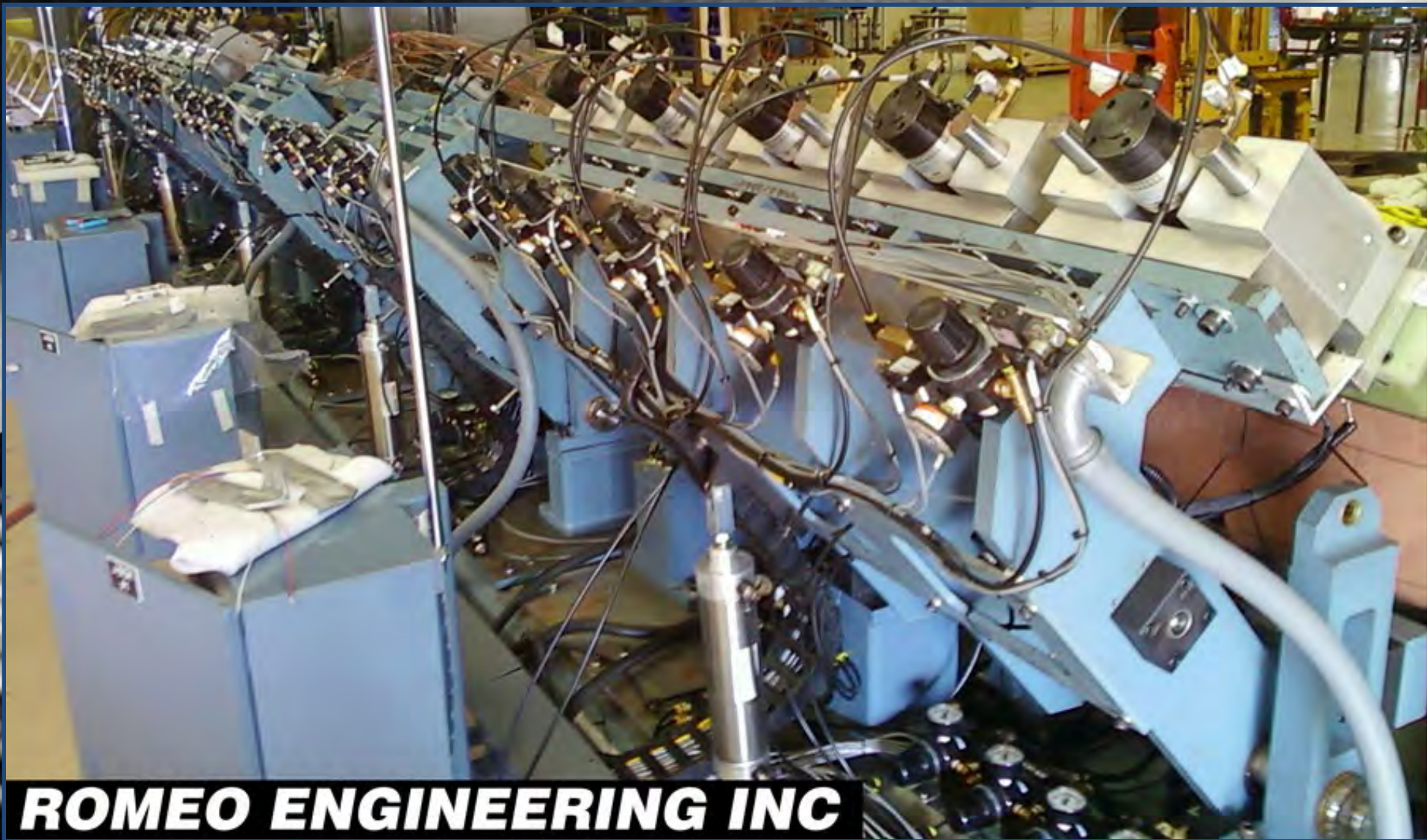
# New Technology in 3D Pre-Preg.



- New method to form 3 dimensional shapes. Romeo Engineering Inc has **patent pending**.
- Used on blade spars for UH-60 Blackhawk, V-22 Osprey, CH-53K, Bell 525, etc.
- No voids, wrinkles, or marcls.
- New. Not an automated tape layer; not a single-tow fiber placement method.
- Works with any material like fiberglass, carbon fiber, Bismaleimide, honeycomb, etc.
- Lay-down rate 17 kg/hour (38 lb/hour) on complex 3D shapes. Faster on simpler shapes.



# Out-of-Autoclave Bond & Cure Tools.



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# Custom Compaction Tables & Bags.

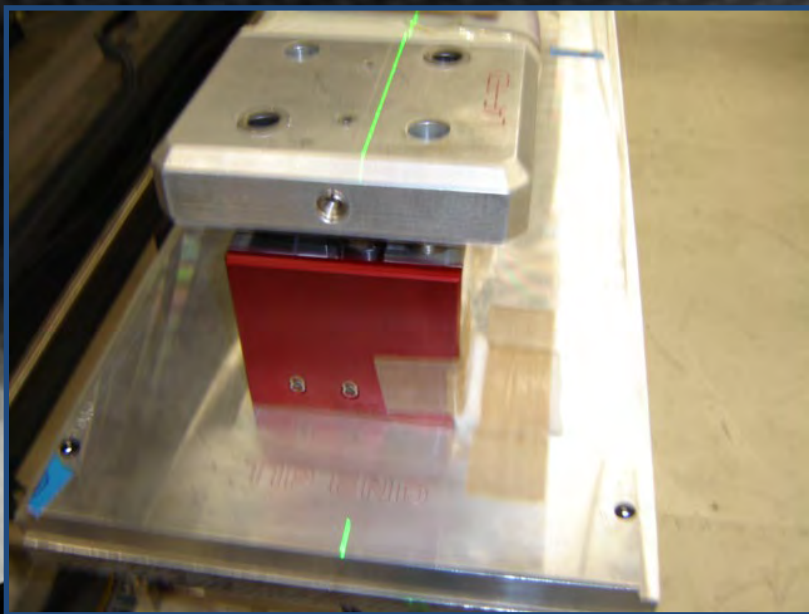


- REI makes custom silicone bags (regular or platinum cured).
- More features and superior controls than competitive brands.

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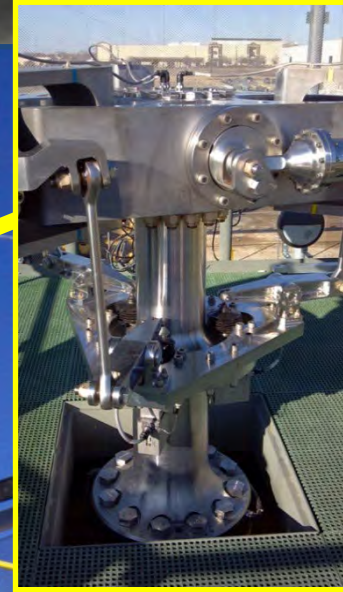
# Ply Placement Laser Projection.



- Multi-tasking controller operates 8 LaserGuide projectors on multiple jobs simultaneously.
- Wireless remote control.
- Bright green beam.
- 0.020" - .075" wide, +/- 30 degrees projection angle.
- Typical accuracy within 0.030" of the intended line over a 10 x 10' @ elevation of 10'.
- Imports files from competitive brands like Virtek® without need for conversion.
- Interfaces available for FiberSim™, CATIA™, Verisurf™, Simulate™, etc.



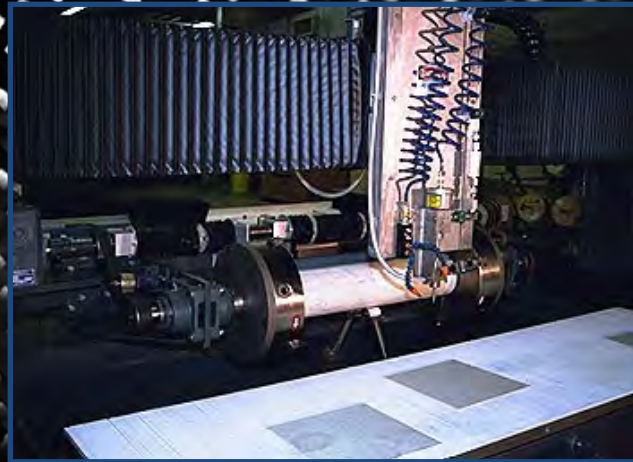
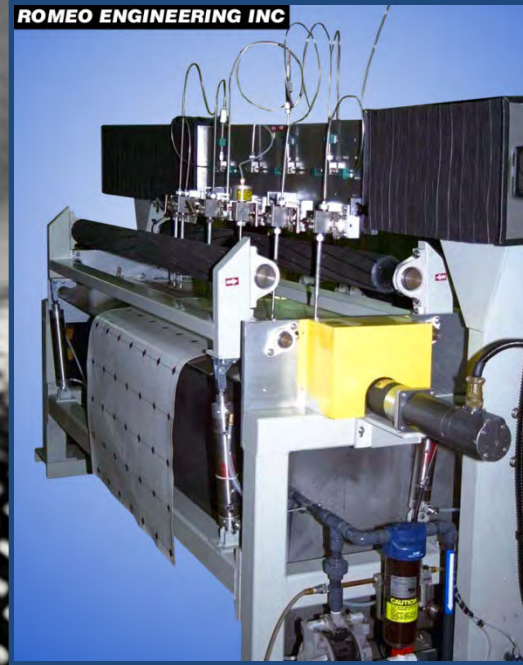
# 6,000 Horsepower Blade Test Cell.



*Automatic loading of test specima. Retractable interferometer.*



# Other Applications.



- REI builds high pressure waterjets for manual trimming, recycle waste materials, extrusions, waterjet lathes, slitters, and many other applications.





# OEM of Energetic Systems



# Energetics Assembly Cells.



- Extruded Airbag & Rocket Propellant
- Explosive Ordnance
- LOVA Smokeless Propellants
- W76/W88 Nuclear Weapons De-Mil
- Explosives Casting Machines
- 2.75" Hellfire Potassium Perchlorate



# De-Militarization.



- M67 Grenade
- De-Mil of Sarin Munitions
- BLU 97
- GEMMS Mine
- Plastic Bonded Explosives
- CBU87 Cluster Bomb
- M75

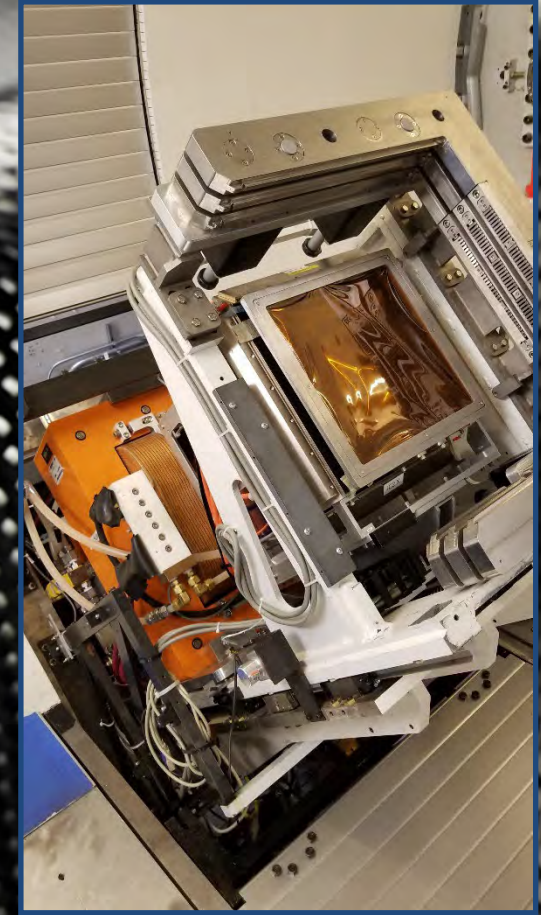
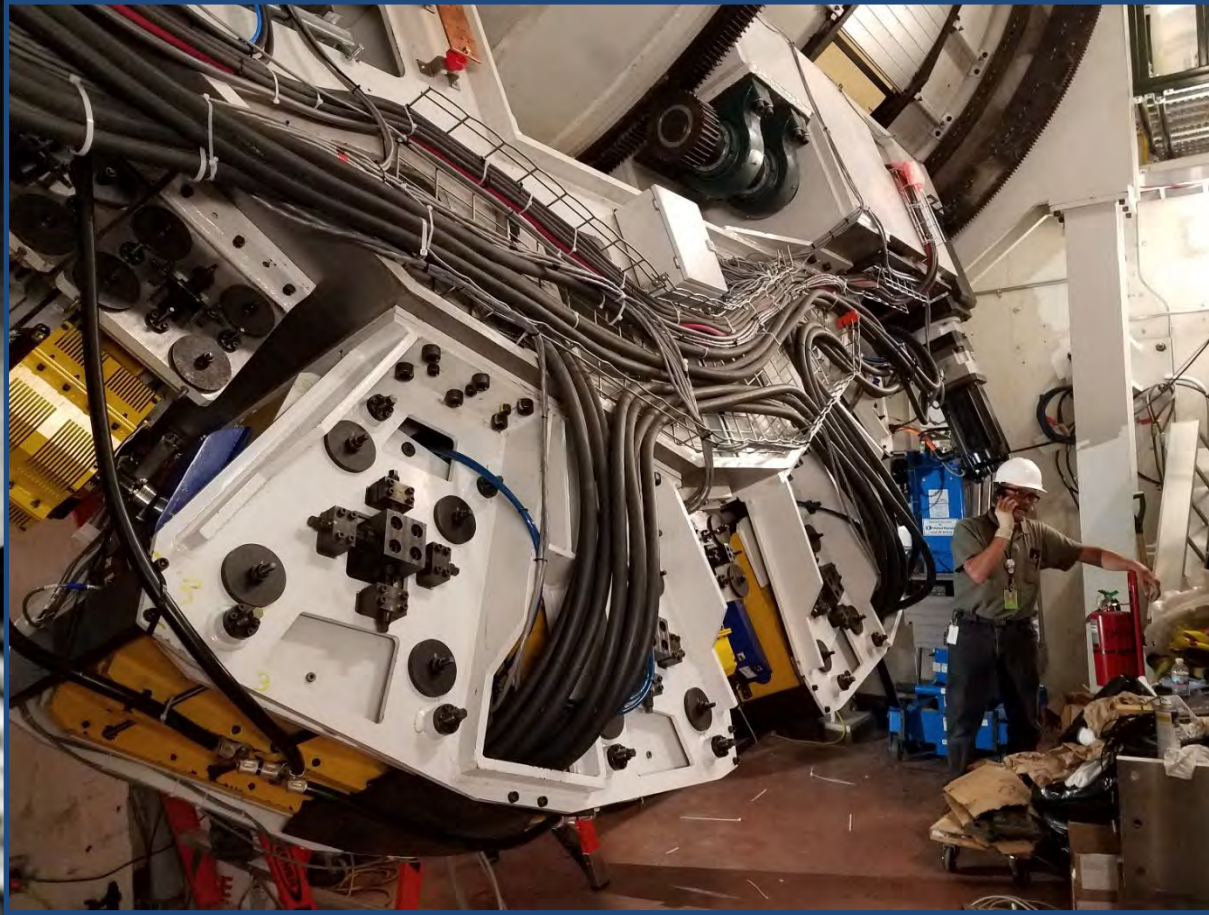




# OEM of Proton Accelerators



# Oncology Proton Therapy Division.



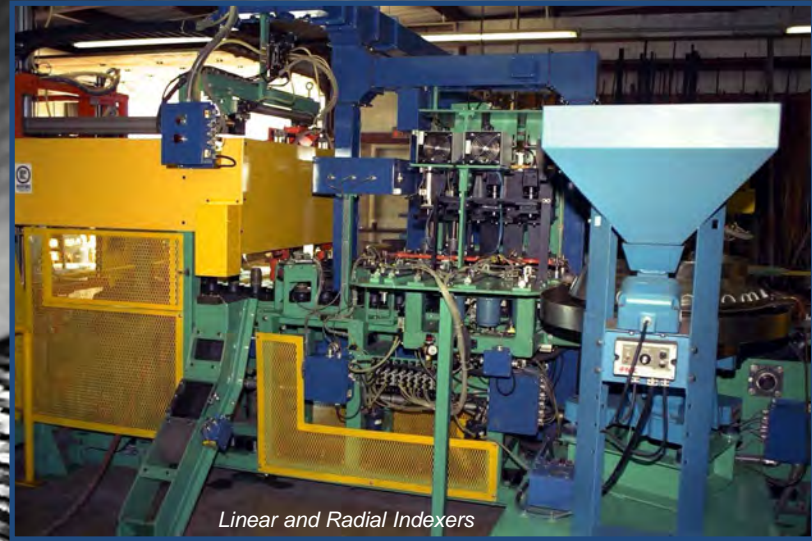


The background of the slide is a close-up, high-contrast photograph of a metallic mesh or perforated metal surface. The mesh consists of a grid of small, diamond-shaped openings. A solid black horizontal band runs across the middle of the image, serving as a background for the title text.

# OEM of Automation

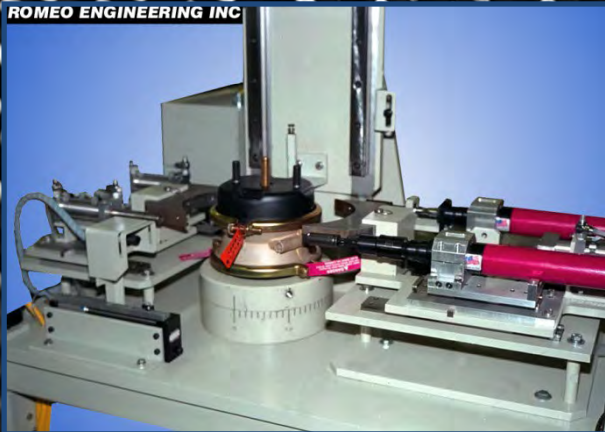
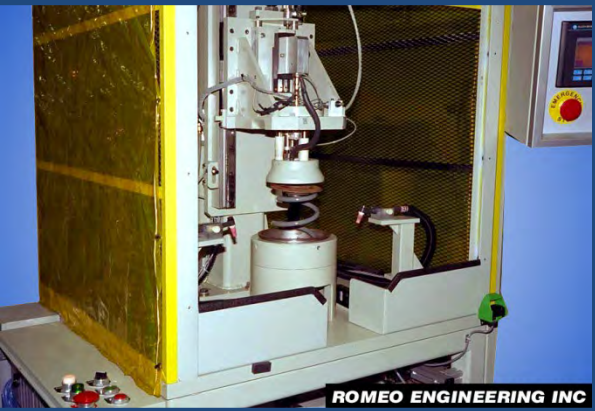


# Assembly Machine Division.





# Automotive.



Truck Brake Weld & Leak Decay Testing Systems





**ROME ENGINEERING INC**



**BGC**





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