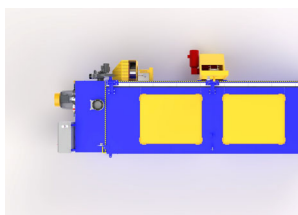
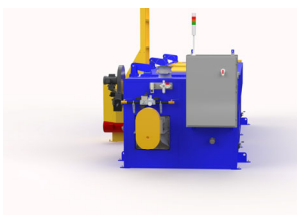
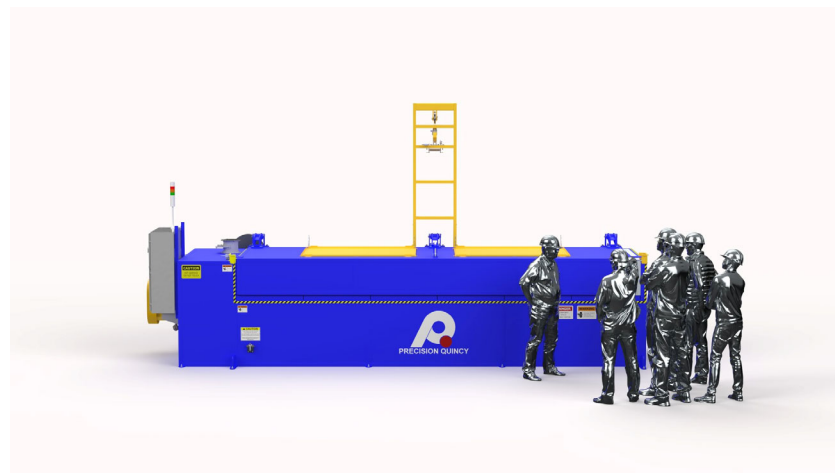


CASE STUDY

## Heavy-Duty Gas-Fired Batch Curing Oven with Rotating Roller System

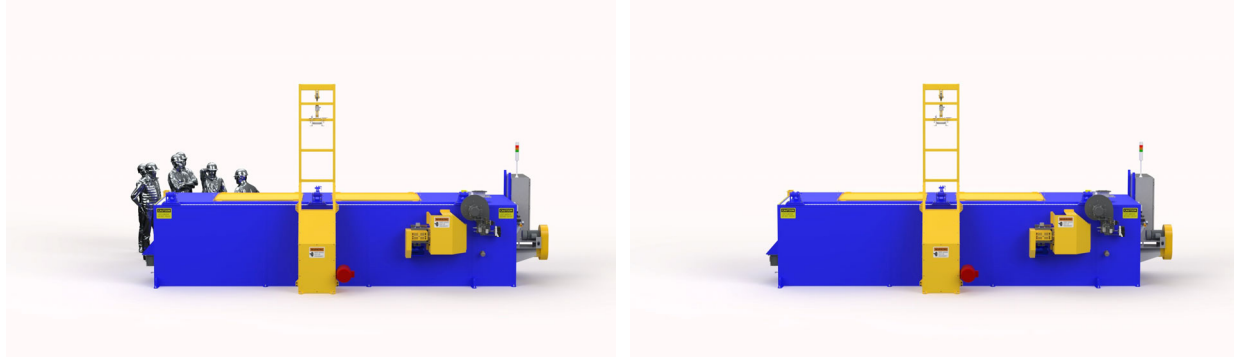
*Top-loading batch oven with electric winch/gearbox door (self-locking), dual powered rollers, and 500,000 BTU/hr direct-fired natural gas heating (Maxon OvenPak 405) for curing epoxy-coated stators—11,000 lb per batch; up to 5,500 lb per part—with  $\pm 10^{\circ}\text{F}$  uniformity at 350°F.*



## OVERVIEW

Precision Quincy engineered a Class-A, direct-fired natural gas batch curing oven with an electric winch/gearbox door (self-locking) and a dual-roller rotation system for curing epoxy-coated motor stator assemblies. The oven handles 11,000 lb per batch (up to 5,500 lb per part), delivers  $\pm 10^{\circ}\text{F}$  temperature uniformity at 350°F operating temperature using full horizontal airflow (front-to-back), and meets NFPA 86 Class-A requirements for safe VOC processing.

The project combined the customer's need for heavy-load batch processing with tight thermal uniformity requirements on large, dense stator masses. The final design integrates a Maxon OvenPak 405 burner at 500,000 BTU/hr, a belt-driven 4,000 CFM recirculation fan, and a 1,225 CFM Class-A exhaust system. Construction features a structural steel frame with 16-gauge internal pans for thermal expansion/contraction, 6-inch walls with 6# mineral wool insulation, and an electric winch/gearbox door system with door slack sensor and pneumatically actuated safety latch.



## CUSTOMER PROCESS REQUIREMENTS

A motor manufacturer required a reliable thermal processing solution for curing epoxy coatings on large stator assemblies. The application imposed demanding requirements across load capacity, temperature uniformity, safety compliance, and site constraints.

### Application & product type

- Product: epoxy-coated motor stator assemblies (large, heavy cylindrical components).
- Process: batch curing in a controlled thermal environment to polymerize epoxy coatings.
- Stators are cylindrical; rotation during curing is required for uniform coating distribution across the part surface.

### Load requirements

- Maximum batch load: 11,000 lb per batch.
- Maximum individual part weight: up to 5,500 lb per part.
- Loading method: top-loading via an overhead door; overhead lifting equipment (customer-supplied) positions stators onto powered rollers inside the oven.

### Thermal requirements

- Operating temperature: 350°F typical.
- Maximum temperature capability: 400°F.
- Temperature uniformity:  $\pm 10^{\circ}\text{F}$  at operating setpoint across the work area.

**VOC / safety compliance requirement**

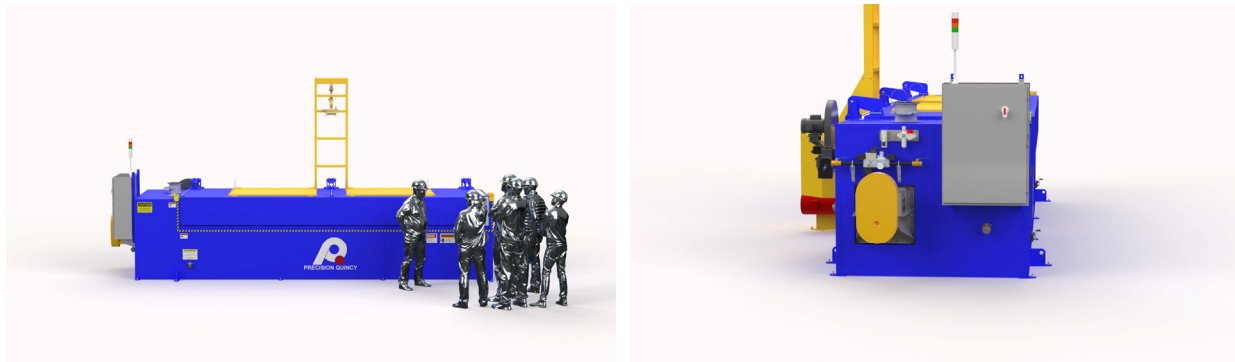
- VOC loading: 1.0 gallon per batch of standard solvent emitted during epoxy cure.
- Required: NFPA 86 Class-A oven compliance with appropriate exhaust, purge, and safety interlock systems.

**Site conditions**

- Fuel: natural gas heating specified.
- Site altitude: 1,170 feet above sea level (requires combustion system altitude adjustment).
- Electrical service: 460V / 3-phase / 60 Hz.

**Accessibility constraints**

- Equipment must enter facility through a 12' x 16' dock door.



**THERMAL PROCESS REQUIREMENTS**

These thermal process requirements were developed to meet the customer's curing process needs for epoxy-coated stator assemblies, based on the application conditions and operating parameters.

**Temperature requirements**

- Normal operating temperature: 350°F.
- Maximum temperature capability: 400°F.

**Load / product parameters**

- Batch capacity: 11,000 lb per batch.
- Individual part: up to 5,500 lb per part.
- Part geometry: cylindrical stators; rotation throughout the cure cycle ensures all surfaces receive consistent thermal exposure.

**Heat input requirement**

- Required heat input: 500,000 BTU/hr.
- Direct-fired natural gas; Maxon OvenPak 405 burner.

**Airflow delivery**

- Full horizontal airflow (front-to-back) through the oven chamber.
- Recirculation fan: 4,000 CFM at 4.5" WC static pressure, 5 HP TEFC, belt-driven.

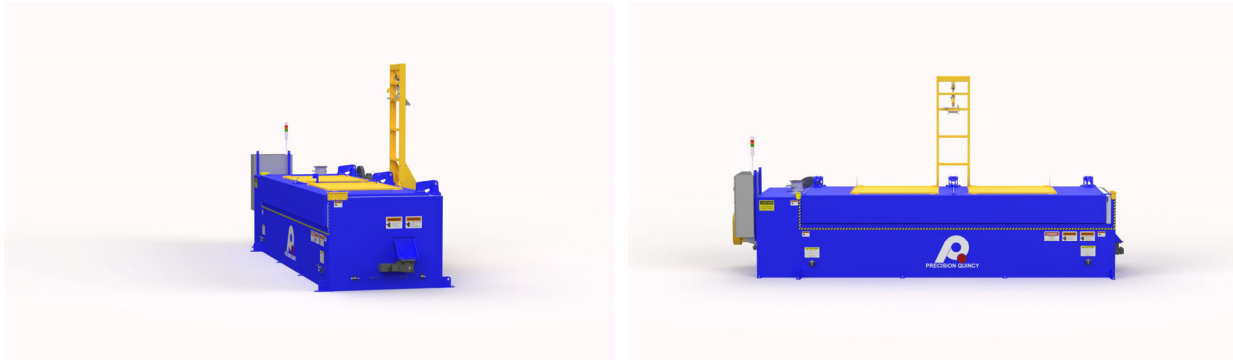
- Supply and return ductwork: 18-gauge aluminized steel with adjustable slot nozzles for airflow balancing.

**Exhaust requirements (Class-A VOC removal)**

- Class-A exhaust fan: 1,225 CFM at 1" WC static pressure, 1.5 HP ODP motor.
- Exhaust discharge: vertical (customer to vent outside building per applicable code).
- Exhaust wheel material: mild steel, polished and ground.

**Temperature uniformity**

- $\pm 10^{\circ}\text{F}$  from setpoint at operating temperature, ensuring complete and even epoxy cure across the full load.

**EQUIPMENT CONCEPT & ARCHITECTURE**

To deliver the thermal process requirements (which deliver the customer process requirements), Precision Quincy settled on the following equipment concept and architecture for the batch curing oven.

**Overall concept**

- Class-A, natural gas-fired, top-loading batch curing oven.
- Direct-fired heating via Maxon OvenPak 405 at 500,000 BTU/hr.
- Oven chamber: 117" W  $\times$  36" L  $\times$  41" H (100 cu ft interior volume).
- Overall equipment dimensions: 206.5" W  $\times$  70.5" L  $\times$  121.25" H.
- Total equipment weight: approximately 6,125 lb.

**Door system**

- Top-loading door: 4-inch thick insulated construction with aluminized steel interior and exterior.
- Operation: electric winch with gearbox; self-locking in the up position for safety.
- Safety devices: door slack sensor; pneumatically actuated safety latch to prevent door from falling in the up position.
- Seal: high-temperature door seal gasket around full perimeter.

**Product rotation system**

- Two 8-inch diameter powered rollers; variable speed 1.2 to 12 RPM.
- Drive: tensioner sprocket system with manual lead-screw adjustment for belt maintenance.
- Drip pans: aluminized steel positioned beneath rollers to contain process residue (varnish/epoxy runoff).

- End-of-oven access: access pan slides out at the end of the oven for removal of drip panels/trays during maintenance.

**Heating / airflow architecture**

- Side-mounted heat chamber houses the burner and supply fan assembly.
- Supply fan: belt-driven, 4,000 CFM at 4.5" WC static pressure, 5 HP TEFC motor, mild steel polished wheel.
- Airflow pattern: full horizontal (front-to-back) via 18-gauge aluminized steel supply and return ductwork with adjustable slot nozzles.
- Class-A exhaust fan: 1,225 CFM, 1.5 HP ODP motor, vertical discharge.

**Construction / shell architecture**

- Structural steel frame (not insulated panel construction); an extremely robust and stable platform.
- 16-gauge internal pans designed to accommodate thermal expansion/contraction while minimizing through-metal paths.
- 16-gauge exterior cladding (mild steel).
- Wall thickness: 6 inches with 6-pound density mineral wool insulation.
- Finish: Precision Quincy Blue industrial enamel on body and door; white control panel.

**Controls architecture**

- Temperature controller: Watlow F4T.
- Control enclosure: E1 enclosure; UL 508A open industrial control panel.
- Thermocouple type: Type J.
- Safety interlocks: heater box hi-limit (digital/manual reset), work area hi-limit (digital/manual reset), airflow switches on supply and exhaust fans, purge timer (Karl Dungs MPA4112), flame safeguard.
- Gas train: Karl Dungs double blocking valves with mixer and proportional control.

**Safety systems**

- NFPA 86 and OSHA compliant.
- Class-A exhaust system for continuous VOC removal during cure cycle.
- Door slack sensor and pneumatically actuated safety latch on door system.
- Hi-limit controllers (heater box and work area) with manual reset.
- Airflow switches on both supply fan and exhaust fan as safety interlocks.

**Other noted attributes**

- Utilities: 460V / 3-phase / 60 Hz, 20 FLA; natural gas at 400 CFH @ 1 PSI.
- Site altitude adjustment: combustion system configured for 1,170 feet above sea level.
- Equipment dimensions designed to pass through a 12' x 16' dock door for installation.

**TECHNICAL SPECIFICATIONS**

*Note: The specifications below reflect the as-built configuration. Any fields not explicitly stated remain intentionally omitted.*

Oven Configuration	
Type	Batch curing oven, top-loading, electric winch/gearbox door (self-locking)
Product Chamber	117" W x 36" L x 41" H (2,972 x 914 x 1,041 mm)

<b>Overall Dimensions</b>	206.5" W × 70.5" L × 121.25" H (5,245 × 1,791 × 3,080 mm)
<b>Interior Volume</b>	100 cubic feet
<b>Equipment Weight</b>	Approximately 6,125 lb

<b>Thermal Performance</b>	
<b>Operating Temperature</b>	350°F (177°C)
<b>Maximum Temperature</b>	400°F (204°C)
<b>Temperature Uniformity</b>	±10°F (±5.6°C) at operating setpoint
<b>Heat Source</b>	Natural gas, direct-fired; Maxon OvenPak 405
<b>Gas Rating</b>	500,000 BTU/hr
<b>Airflow Pattern</b>	Full horizontal airflow (front-to-back)

<b>Recirculation / Airflow System</b>	
<b>Supply Fan</b>	4,000 CFM @ 4.5" WC static pressure; 5 HP TEFC motor
<b>Fan Drive</b>	Belt-driven
<b>Fan Wheel Material</b>	Mild steel, polished and ground
<b>Ductwork</b>	18-gauge aluminized steel with adjustable slot nozzles

<b>Exhaust System (NFPA 86 Class-A)</b>	
<b>Exhaust Fan</b>	1,225 CFM @ 1" WC static pressure; 1.5 HP ODP motor
<b>Exhaust Wheel Material</b>	Mild steel, polished and ground
<b>Discharge</b>	Vertical (customer to vent outside building per code)

<b>Product Handling</b>	
<b>Powered Rollers</b>	Two 8-inch diameter rollers
<b>Roller Speed</b>	1.2 to 12 RPM variable
<b>Max Load Capacity</b>	11,000 lb per batch; up to 5,500 lb per part
<b>Roller Positioning</b>	Adjustable (refer to equipment drawings for current configuration)
<b>Tensioner</b>	Sprocket system with manual lead-screw adjustment
<b>Drip Pans</b>	Aluminized steel, positioned under rollers
<b>Drip Tray Access</b>	End-of-oven access pan slides out for drip panel/tray removal

<b>Door System</b>	
<b>Type</b>	4-inch thick insulated construction, top-loading
<b>Operation</b>	Electric winch with gearbox; self-locking
<b>Interior / Exterior Material</b>	Aluminized steel
<b>Gasket</b>	High-temperature door seal

<b>Door Safety Devices</b>	Door slack sensor; pneumatically actuated safety latch (prevents door from falling in up position)
----------------------------	--

**Construction Materials / Finish**

<b>Primary Structure</b>	Structural steel frame
<b>Interior Walls</b>	16-gauge internal pans designed for thermal expansion/contraction
<b>Exterior Walls</b>	16-gauge exterior cladding (mild steel)
<b>Wall Thickness</b>	6 inches
<b>Insulation</b>	6-pound density mineral wool (in 6-inch wall)
<b>Finish</b>	Precision Quincy Blue industrial enamel (body and door); white control panel

**Controls & Safety**

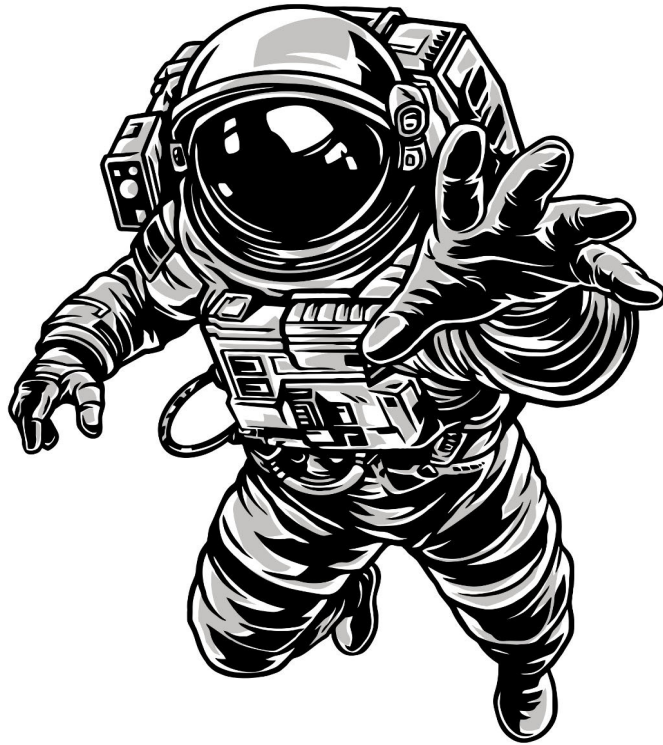
<b>Temperature Controller</b>	Watlow F4T
<b>Thermocouple Type</b>	Type J
<b>Heater Box Hi-Limit</b>	Digital / manual reset controller
<b>Work Area Hi-Limit</b>	Digital / manual reset controller
<b>Airflow Monitoring</b>	Air flow switches for supply fan and exhaust fan
<b>Purge Timer</b>	Karl Dungs MPA4112
<b>Gas Train</b>	Karl Dungs double blocking valves, mixer, proportional control
<b>Control Panel</b>	E1 enclosure; UL 508A open industrial control panel
<b>Code Compliance</b>	NFPA 86 and OSHA

**Utilities**

<b>Electrical</b>	460V / 3-phase / 60 Hz; 20 FLA
<b>Natural Gas</b>	400 CFH @ 1 PSI
<b>Site Altitude</b>	1,170 feet above sea level

**Process Specifications**

<b>Parts Processed</b>	Epoxy-coated motor stators
<b>Process</b>	Batch curing
<b>VOC Loading</b>	1.0 gal/batch of standard solvent
<b>Max Product Weight</b>	11,000 lb per batch; up to 5,500 lb per part



**MAKE BADASS  
PRODUCTS**

---

[pqovens.com](http://pqovens.com)