



CASE STUDY

Electric Class A Truck Oven for Rubber Component Post-Curing

Precision Quincy engineered this oven as a 75-500 electric Class A truck oven for repeatable post-curing of molded rubber components. The system combines a 60 in × 60 in × 60 in work chamber, full horizontal airflow, 45 kW electric heat, programmable ramp/soak control, and Class A exhaust to deliver controlled batch processing for shelf-loaded elastomer parts.



OVERVIEW

The project was developed for the customer Rubber Products operation in. The customer serves rail and industrial markets, and this oven supported the controlled post-curing of rubber components used in transportation and industrial service.

The final design centered on a cart-loaded 60-inch cube work chamber, a 375°F operating basis, a 500°F maximum temperature, $\pm 10^\circ\text{F}$ uniformity, and full horizontal airflow tailored to shelf-loaded product. That airflow approach matched a multi-shelf load format and delivered even forced-convection heating across the work chamber.

The oven uses a 45 kW electric heat package, a 2,496 CFM recirculation system, a 550 CFM PQ1 powered exhaust, and a Watlow F4T ramp/soak controller with non-encrypted data acquisition. The load-handling package includes floor guide tracks and a 1,500 lb shelf cart with twelve shelf positions. Controls, airflow proving, purge timing, excess-temperature protection, and heater-bank control are integrated in a side-mounted NEMA 1 UL 508A open industrial control panel.



CUSTOMER PROCESS REQUIREMENTS

The project required a cart-loaded batch oven for the post-curing of molded rubber components in a manufacturing environment serving transportation and industrial markets. The process needed repeatable thermal performance across shelf-loaded batches and a chamber format that supported flexible product loading.

Application requirement

- The oven had to support the post-curing of molded rubber components after primary forming.
- The process had to bring each batch through a controlled final heat cycle for consistent finished-part condition.
- The equipment had to support repeatable batch processing for rubber product families with varying shapes and sizes.

Work chamber / loading requirement

- Required work chamber: 60 in W × 60 in D × 60 in H.
- The oven had to accept a multi-shelf cart load rather than a simple single-level load.
- The loading package had to support a 1,500 lb cart arrangement with twelve shelf positions.
- Product positioning had to allow air to move freely through the load during processing.

Operator / access requirement

- The oven had to allow front loading and unloading through two swing doors.
- The chamber floor had to support guided cart movement into and out of the work zone.
- The control package had to give operators direct control of the exhaust fan, recirculation fan, and heater banks.

Quality / control requirement

- The process required repeatable temperature control at a 375°F operating basis.
- The oven had to maintain $\pm 10^\circ\text{F}$ work-area uniformity.
- The process required programmable ramp/soak control.
- The thermal cycle required recorded work-area temperature data for process visibility and repeatability.

Safety / environmental requirement

- The oven had to be configured as a Class A process oven.
- The documented volatile basis required powered exhaust and purge sequencing.
- The process required interlocked operation so heat could run only when safe operating conditions were proven.

Site / utility requirement

- Required electrical service: 460V / 3PH / 60Hz.
- Design elevation basis: 1,017 ft.

THERMAL / PHYSICAL PROCESS REQUIREMENTS

The project required a controlled moderate-temperature post-cure process based on forced convection, Class A ventilation, and programmable heat control.

Temperature requirement

- Operating temperature basis: 375°F.
- Maximum temperature basis: 500°F.
- Required work-area uniformity: $\pm 10^\circ\text{F}$.

Airflow / heat-transfer requirement

- Airflow direction basis: full horizontal airflow.

- The process required forced-convection heating across a shelf-loaded cart.
- The airflow pattern had to move heated air evenly across the full work chamber and through multiple shelf levels.

Heat-input requirement

- Heat source: electric resistance heat.
- Installed heat basis: 45 kW total.
- The process required staged electric heat input capable of supporting repeatable ramp/soak profiles.

Ventilation requirement

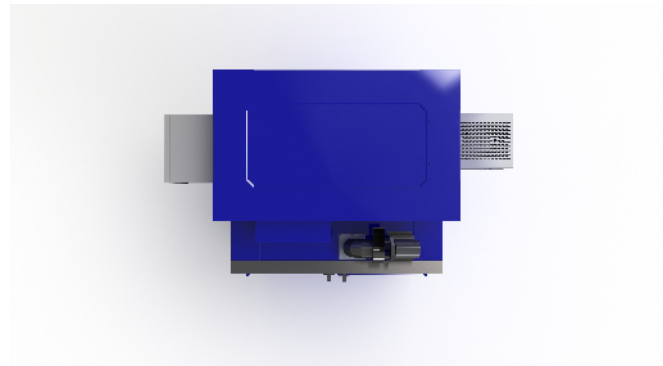
- The process required Class A exhaust and purge sequencing.
- Powered exhaust basis: 550 CFM.
- Maximum volatile load basis: 0.42 gal/batch o-xylene.
- The process required verified ventilation before heat could be enabled.

Control / sequencing requirement

- Primary control basis: ramp/soak temperature control.
- The process required work-area temperature monitoring and recording.
- Minimum purge time basis: 3 minutes.
- Documented operating sequence:
 - Start exhaust fan
 - Start recirculation fan
 - Complete purge
 - Turn on heater bank(s)
 - Run at temperature or programmed profile

Cooldown requirement

- The process required continued fan operation during cooldown.
- The oven was designed to cool below 250°F before fan shutdown.



EQUIPMENT CONCEPT & ARCHITECTURE

To satisfy those requirements, Precision Quincy configured the project as a 75-500 electric Class A truck oven with horizontal airflow, powered exhaust, guided cart loading, and interlocked controls.

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Overall concept

- One electric Class A truck oven
- Cart-loaded batch configuration
- 60 in × 60 in × 60 in work chamber
- Shelf-loaded airflow strategy built around full horizontal circulation

Heating architecture

- Heat source: electric resistance heat
- Total installed heat: 45 kW
- Heating split into two heater banks
- 18 kW bank
- 27 kW bank
- Element basis: fifteen 3 kW heating elements
- Heater control through solid-state relays with backup contactors

Airflow architecture

- Airflow pattern: full horizontal airflow
- Recirculation system based on a 13.5 in × 5 in FC fan assembly
- Recirculation performance: 2,496 CFM at 2 in. W.c.
- Recirculation fan motor: 3 HP
- Fresh-air damper integrated into the airflow path

Exhaust / ventilation architecture

- Exhaust fan: PQ1 exhauster
- Exhaust performance: 550 CFM at 1 in. W.c.
- Exhaust fan motor: 0.75 HP
- Purge timer and airflow switches interlocked with the heat system

Chamber / construction architecture

- Welded steel construction
- 4-inch insulated wall construction
- Insulation: 4 in of 6 lb mineral wool
- Interior: unpainted aluminized steel

- Exterior finish: PQ Blue
- Control enclosure finish: ANSI 61 gray
- Insulated floor with integrated cart guide tracks

Door / loading architecture

- Two swing doors
- 42 in cart-track center-to-center spacing
- Shelf cart rated for 1,500 lb total capacity
- Twelve shelf positions on the documented cart package

Controls architecture

- Watlow F4T ramp/soak controller with non-encrypted data acquisition
- Gefran 650L work-area excess-temperature controller
- Type J thermocouples for work-area sensing
- NEMA 1 UL 508A open industrial control panel
- Operator controls for:
 - Exhaust fan
 - Recirculation fan
 - Heater bank #1
 - Heater bank #2
- Panel indication for:
 - Purge complete
 - Exhaust fan on
 - Recirculation fan on
 - Heater bank on

Safety architecture

- Applicable standards basis:
 - NFPA 79
 - NFPA 86
 - UL 508A
- Safety logic includes:
 - Exhaust airflow proving
 - Recirculation airflow proving
 - Timed purge before heat enable
 - Excess-temperature shutdown
 - Heat shutdown if safe operating conditions are not met
- Door hardware includes FM-approved pressure release latches

TECHNICAL SPECIFICATIONS

Oven Configuration

Model	75-500
Type	Electric Class A truck oven
Quantity	1 oven
Application	Rubber component post-curing
Work Chamber	60 in W × 60 in D × 60 in H
Chamber Volume	125 cu ft
Airflow Pattern	Full horizontal
Doors	2 swing doors

Process Basis

Operating Temperature	375°F
Maximum Temperature	500°F
Uniformity	±10°F
Maximum VOC Load	0.42 gal/batch o-xylene
Design Elevation	1,017 ft

Electrical System

Power Supply	460V / 3PH / 60Hz
Full Load Amps	64.0 A
Control Enclosure	NEMA 1
Enclosure Listing Basis	UL 508A Open Industrial Control Panel
Enclosure Size	42 in × 36 in × 12 in
SCCR	5,000 amps
Main Disconnect	100A non-fused disconnect switch

Heating System

Heat Source	Electric resistance heat
Installed Heat	45 kW total
Heater Bank #1	18 kW
Heater Bank #2	27 kW
Element Basis	15 × 3 kW elements
Heater Control	SSRs with backup contactors

Recirculation / Airflow System

Airflow Pattern	Full horizontal airflow
Recirculation Fan	13.5 in × 5 in FC fan assembly
Recirculation Airflow	2,496 CFM
Recirculation Static Pressure	2 in. W.c.
Recirculation Fan Motor	3 HP
Fresh-Air Damper	Integrated

Exhaust / Ventilation System

Exhaust Fan	PQ1 exhauster
Exhaust Airflow	550 CFM
Exhaust Static Pressure	1 in. W.c.
Exhaust Fan Motor	0.75 HP
Minimum Purge Time	3 minutes
Oven Classification	Class A

Loading System

Cart Type	Shelf cart
Cart Capacity	1,500 lb total capacity

Shelf Arrangement	12 shelf positions
Documented Shelf Basis	12 shelves rated at 75 lb each
Cart Track Center-to-Center	42.00 in
Track Width	4.50 in
Guide Width	2.50 in
Guide Height	1.00 in

Construction

Construction	Welded steel
Wall Thickness	4 in
Insulation	4 in of 6 lb mineral wool
Interior Material	Unpainted aluminized steel
Exterior Finish	PQ Blue
Control Enclosure Finish	ANSI 61 gray
Floor Feature	Insulated floor with cart guide tracks

Controls & Safety

Main Temperature Controller	Watlow F4T ramp/soak
Data Acquisition	Non-encrypted recording on work thermocouple
Excess Temperature Controller	Gefran 650L
Thermocouple Type	Type J
Airflow Proving	Exhaust and recirculation airflow switches
Purge Timer	Eagle BRE8A6
Indicators	Purge complete, fan on, heater bank on
Fan Shutdown Protection	Cooldown below 250°F before shutdown
Applicable Standards Basis	NFPA 79, NFPA 86, UL 508A
Pressure Relief Hardware	FM-approved pressure release door latches

Equipment Dimensions

Overall Width	101.09 in
Overall Depth	77.28 in
Overall Height	91.97 in
Oven Body Width	82.27 in
Oven Body Depth	73.32 in
Height to Top of Control Enclosure	54.00 in
Work Area Width	60.00 in
Work Area Depth	60.00 in
Work Area Height	60.00 in
Exhaust Height	81.83 in
Door Swing Clearance	R40.00
Control Enclosure Clearance	R36.00
Heat Plug Removal Clearance	32.00 in

Process Summary

Product Family	Molded rubber components
Process Type	Batch post-curing
Thermal Strategy	Forced-convection full-horizontal airflow with programmed electric heat
Key Verification Concept	Repeatable control of time, temperature, airflow, and safe operating limits



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