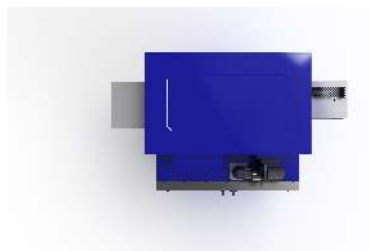




CASE STUDY

Electric Class A Truck Oven for Spool-Loaded Curing

Precision Quincy engineered this oven as a 74-500 electric Class A truck oven for controlled curing of spool-loaded materials in a high-precision manufacturing environment. The system combined 260°F operation, full horizontal airflow, 36 kW electric heat, powered Class A exhaust, programmable ramp/soak control, and part-temperature data acquisition in a compact batch platform.



OVERVIEW

The customer develops automated manufacturing solutions and contract manufacturing capabilities for precision stamping, forming, welding, and assembly across demanding industrial markets. This oven supported that environment with a batch curing platform sized around large reel-based loads and repeatable process control.

The oven was built around a 48 in W × 48 in D × 60 in H work chamber with 80 cubic feet of capacity, a 260°F operating temperature, a 500°F maximum temperature, ±10°F uniformity, and full horizontal airflow. The final configuration paired 36 kW of electric heat with an 1,800 CFM recirculation system and a 550 CFM Class A exhaust package.

The load-handling concept centered on a purpose-built cart designed to carry eight 36 in × 4 in spools in a stable, track-guided arrangement. That gave the customer a practical batch format for curing reel-based materials or components while preserving airflow through the load.

The control package added another layer of process discipline. A Watlow F4T ramp/soak controller with non-encrypted data acquisition, twelve thermocouple jack positions, a wall port for product thermocouples, and a tri-color visual/audio alarm gave the system the programmability, monitoring, and operator feedback needed for repeatable curing work.



CUSTOMER PROCESS REQUIREMENTS

The project required a spool-loaded batch oven suited for a precision manufacturing environment where repeatability, load control, and safe handling of cure-related off-gassing all mattered.

Application requirement

- The oven supported batch curing in the customer automated manufacturing and contract manufacturing environment.
- The process had to handle reel-based materials or components associated with precision stamping, forming, welding, and assembly operations.

- The thermal platform needed to support consistent batch processing rather than a one-off lab or maintenance application.

Load and handling requirement

- The oven had to process spool-based loads on a dedicated truck-style cart.
- The cart was designed to hold eight 36 in × 4 in spools.
- The work chamber had to provide enough width, depth, and height to accept the loaded cart while maintaining clear airflow paths through and around the product.
- The floor and track arrangement had to support stable cart movement into and out of the chamber.

Operator and access requirement

- The oven required front loading and unloading through two swing doors.
- The loading arrangement had to be simple, repeatable, and practical for large spool-based batches.
- The process required thermocouple access for product monitoring without disrupting normal oven use.

Quality and control requirement

- The customer needed repeatable curing performance at a defined operating temperature with controlled cycle execution.
- The system needed programmable ramp/soak capability for process flexibility.
- The process required multi-point thermocouple capability so product temperatures could be checked and recorded during cure cycles.
- The oven had to maintain work-area uniformity tight enough to support consistent results across the batch.

Safety and environmental requirement

- The process required a Class A oven configuration.
- The oven needed powered exhaust, purge sequencing, and airflow proving to support curing work with a volatile load basis.
- The system had to provide clear operator indication for normal running, setpoint status, cycle completion, and fault conditions.

Utility requirement

- The oven was designed for 460V / 3PH / 60Hz electrical service.

THERMAL / PHYSICAL PROCESS REQUIREMENTS

The project was built around a controlled curing process that required stable temperature, cross-chamber airflow, Class A ventilation, and documented part-temperature monitoring.

Temperature requirement

- Operating temperature basis: 260°F.

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

Airflow and heat-transfer requirement

- Airflow pattern basis: full horizontal airflow.
- The process required forced convection across the full spool-loaded work zone.
- Based on the chamber cross-section in the airflow direction and the recirculation volume, the bulk chamber air velocity is approximately 90 FPM before product loading.
- Airflow had to remain effective with a loaded spool cart in the chamber, making load spacing and open flow paths important to the process.

Heat-input requirement

- Heat source: electric resistance heat.
- Installed heat basis: 36 kW.
- Heating system basis: twelve 3 kW elements.
- Heat output had to support controlled warm-up, stable hold conditions, and repeatable curing cycles at the operating setpoint.

Ventilation requirement

- Oven classification basis: Class A.
- Powered exhaust basis: 550 CFM.
- Volatile load basis: 0.44 gal/batch o-xylene.
- Safe operation required purge completion and airflow proving before heat could be enabled.

Process monitoring requirement

- The process required ramp/soak temperature control.
- The process also required work-temperature control plus part-temperature monitoring through multiple thermocouple inputs.
- Non-encrypted data acquisition allowed cure-cycle and thermocouple information to be recorded as part of the process workflow.

Sequence and cooldown requirement

- The operating sequence required exhaust fan start, recirculation fan start, purge completion, and then heater enable.
- Minimum purge time basis: 2 minutes.
- The oven required continued fan operation during cooldown.
- Fans remain in operation until oven temperature drops below 250°F.



EQUIPMENT CONCEPT & ARCHITECTURE

To satisfy those requirements, Precision Quincy configured the project as a 74-500 electric Class A truck oven with track-guided spool-cart loading, horizontal airflow, process-ready instrumentation, and fully interlocked safety controls.

Pages 6–8 — Technical Specifications

Overall concept

- One electric Class A truck oven.
- Truck-style batch loading for spool-based work.
- Full horizontal airflow through a 48 in × 48 in × 60 in work chamber.

Heating architecture

- Electric heating package rated at 36 kW.
- Heating system built around twelve 3 kW elements.
- Heater power controlled through solid-state relays with backup contactor protection.
- Roof-mounted heater package integrated with the recirculation assembly.

Airflow architecture

- Full horizontal airflow pattern.
- Jan-Air 13.5 × 5 FC recirculation fan assembly delivering 1,800 CFM at 2 in. W.c.
- Fresh-air inlet integrated into the oven body.
- Airflow architecture arranged to move heated air across the loaded cart and return it through the recirculation circuit.

Exhaust and ventilation architecture

- PQ1 powered exhauster delivering 550 CFM at 1 in. W.c.
- Class A exhaust and purge arrangement integrated into the safety sequence.
- Exhaust and recirculation airflow switches verify safe operating conditions before heat is enabled.

Chamber and shell architecture

- 4-inch-thick insulated wall construction.
- 4 inches of 6 lb mineral wool insulation.
- Aluminized steel interior.
- Traffic Gray exterior finish with gray control enclosure.
- Floor-mounted cart guide tracks with tapered entry.

Load-handling architecture

- Dedicated cart sized for eight 36 in × 4 in spools.
- Cart constructed from unpainted mild steel structure and aluminized steel plating.
- Removable handle for practical movement and loading.
- Track-guided geometry sized to align the cart consistently within the chamber.

Controls architecture

- Watlow F4T ramp/soak temperature controller with non-encrypted data acquisition.
- Four F4T thermocouple modules.
- Twelve thermocouple jack positions for part monitoring.
- 1.5 NPT wall port for routine thermocouple routing.
- Gefran 650L excess-temperature controller for high-limit protection.
- Tri-color visual/audio alarm for operating status and notifications.
- NEMA 1 UL508A open industrial control panel with panel-mount USB access.

Safety architecture

- Designed to NFPA 79, NFPA 86, and UL508A requirements.
- Safety chain with purge timer, airflow proving, excess-temperature shutdown, and heat disable on unsafe conditions.
- Exhaust fan, recirculation fan, and heater status clearly indicated at the control panel.

TECHNICAL SPECIFICATIONS

Oven Configuration

Model	74-500
Type	Electric Class A truck oven
Application	Spool-loaded batch curing
Work chamber	48 in W × 48 in D × 60 in H
Capacity	80 cu ft
Airflow pattern	Full horizontal
Doors	2 swing doors

Thermal Performance

Operating temperature	260°F
Maximum temperature	500°F
Uniformity	±10°F
Heat source	Electric resistance
Installed heat	36 kW
Heating elements	12 × 3 kW

Recirculation / Airflow System

Recirculation fan	Jan-Air 13.5 × 5 FC fan assembly
Recirculation airflow	1,800 CFM
Recirculation static pressure	2 in. W.c.
Recirculation fan motor	1.5 HP
Estimated bulk chamber air velocity	~90 FPM

Exhaust / Ventilation System

Exhaust fan	PQ1 exhauster
Exhaust airflow	550 CFM
Exhaust static pressure	1 in. W.c.
Exhaust fan motor	0.75 HP
Oven classification	Class A
Maximum VOC load	0.44 gal/batch o-xylene
Design elevation	<1000 ft
Minimum purge time	2 minutes

Electrical System

Power supply	460V / 3PH / 60Hz
Full load amps	50.5 A
Control enclosure	NEMA 1
Enclosure listing basis	UL508A Open Industrial Control Panel
Enclosure size	36 in × 30 in × 12 in
SCCR	5,000 amps

Construction

Wall thickness	4 in
Insulation	4 in of 6 lb mineral wool
Interior material	Unpainted aluminized steel
Exterior finish	Traffic Gray (RAL 7042)
Control enclosure finish	Gray (ANSI 61)
Overall width	84.31 in
Overall depth	64.53 in
Overall height	91.97 in

Cart / Load Handling

Cart quantity	1
Cart construction	Unpainted mild steel structure with aluminized steel plating
Cart capacity basis	Eight 36 in × 4 in spools
Cart overall width	42.00 in
Cart overall depth	46.00 in
Cart overall height	42.50 in
Cart feature	Removable handle
Cart guide track center-to-center	32.00 in

Controls / Instrumentation

Main temperature controller	Watlow F4T ramp/soak
Data acquisition	Non-encrypted data acquisition
High-limit controller	Gefran 650L
Thermocouple modules	4
Thermocouple jack positions	12
Thermocouple type	Type J
Wall port	1.5 NPT
Operator notification	Tri-color visual/audio alarm
Panel feature	Panel-mount USB

Safety / Compliance

Applicable standards	NFPA 79, NFPA 86, UL508A
Airflow proving	Exhaust and recirculation airflow switches
Heat control protection	SSR with backup contactor
Safety sequence	Exhaust start → recirculation start → purge → heat enable
Cooldown protection	Fans remain on until oven temperature is below 250°F



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