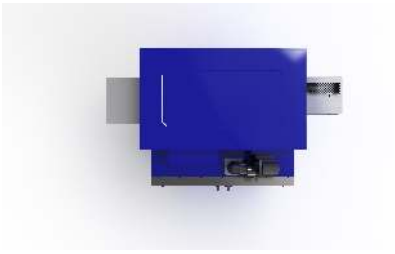
PRECISION QUINCY

CASE STUDY

Electric Class A Truck Oven for Blade Curing in Aeroderivative Turbine Component Processing

Precision Quincy engineered this oven as a 74-800 electric Class A truck oven for repeatable batch curing of blades used in aeroderivative turbine component processing. The finished package combined 600-650°F operation, 800°F maximum temperature capability, full horizontal airflow, 54 kW electric heat, powered Class A exhaust, and ramp/soak temperature control in a compact truck-oven format built for controlled, repeatable thermal cycles.

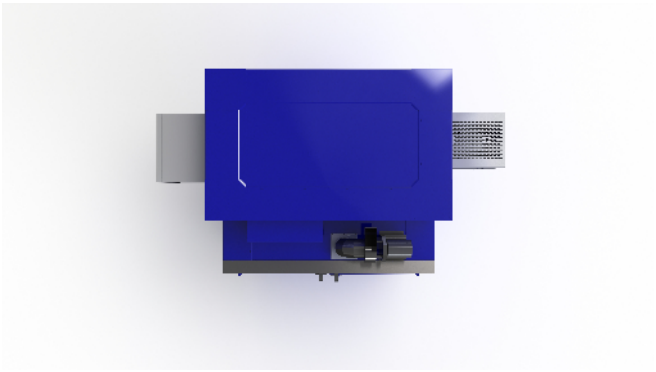


OVERVIEW

The customer operates in the aeroderivative power market, supporting turbine equipment, component processing, and lifecycle care for critical power assets. The project was developed to support blade-curing work within that environment, where repeatable thermal processing, controlled airflow, and disciplined safety logic are essential to consistent part quality.

The oven was built around a 48 in W x 48 in D x 60 in H work chamber and designed for an operating range of 600°F to 650°F, with a maximum temperature of 800°F and a required work-zone uniformity of ±10°F. The thermal package uses 54 kW of electric resistance heat, a full horizontal airflow pattern, a recirculation fan delivering 2,100 CFM at 2 in. W.c., and a PQ1 powered exhauster rated for 550 CFM at 1 in. W.c.

The final design package also incorporated a Watlow F4T ramp/soak controller, Type J thermocouples, a NEMA 1 UL508A open industrial control panel, and Class A purge and airflow-proving logic. The oven shell uses 6-inch insulated wall construction, an aluminized interior, and a traffic gray exterior finish, giving the customer a durable batch-processing platform for controlled blade-curing cycles.



CUSTOMER PROCESS REQUIREMENTS

The project was developed to support batch curing of blades in an aeroderivative turbine component environment. The customer needed a thermal-processing platform sized for blade-related work that required controlled curing temperatures, repeatable cycle management, and safe handling of a solvent-bearing Class A process.

Application requirement

- The project required a batch curing oven for blades.
- The oven had to support thermal processing in a facility environment centered on aeroderivative turbine equipment and component work.
- The process required a machine format suitable for repeatable batch loading and unloading, rather than a continuous conveyorized system.

Work chamber / loading requirement

- Required work chamber: 48 in W x 48 in D x 60 in H.
- The chamber had to accommodate blade-processing loads while preserving airflow across the work zone.
- Product and fixture positioning had to support clear airflow passage through the oven during operation.

Quality / control requirement

- The customer needed repeatable curing performance within the stated work-zone uniformity.
- The process required programmable ramp/soak temperature control for defined thermal cycles.
- The system had to provide stable airflow, controlled heat delivery, and dependable batch-to-batch process repeatability.

Safety / environmental requirement

- The oven had to be configured as an NFPA 86 Class A unit.
- The documented volatile-load basis required powered exhaust and purge logic.
- The process required heat to remain interlocked to proven safe operating conditions.

Utility requirement

- Required electrical service: 460V / 3PH / 60Hz.
- Design elevation basis: below 1,000 ft.

THERMAL / PHYSICAL PROCESS REQUIREMENTS

The project required a controlled curing process built around elevated-temperature forced convection, programmable cycle control, and Class A ventilation.

Temperature requirement

- Operating temperature basis: 600°F to 650°F.
- Maximum temperature capability: 800°F.
- Required work-zone uniformity: ±10°F.

Airflow / heat-transfer requirement

- Airflow direction basis: full horizontal airflow.
- The process required forced-convection crossflow through the work chamber to deliver repeatable heat transfer across blade loads.
- Using the documented recirculation airflow and the chamber cross-sectional area in the airflow direction, the first-pass average chamber air velocity is approximately 105 FPM.

Heat-input requirement

- Heat source: electric resistance heat.

- Installed heat basis: 54 kW total.
- Heating arrangement basis: two 27 kW heater banks.
- The process required staged heater-bank control to maintain the curing temperature window.

Ventilation requirement

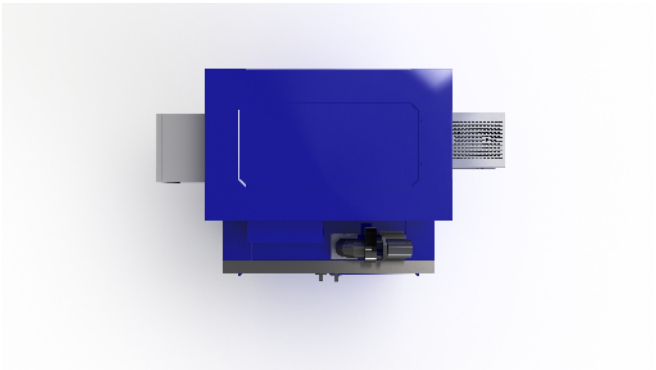
- The process required Class A exhaust and purge sequencing.
- Maximum volatile load basis: 0.32 gal/batch o-xylene.
- Ventilation had to be proven before electric heat could be enabled.

Control / sequencing requirement

- Primary control basis: ramp/soak temperature control.
- 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 system operating basis requires fans to remain on until oven temperature drops below 250°F.



EQUIPMENT CONCEPT & ARCHITECTURE

To satisfy those requirements, Precision Quincy configured the project as a 74-800 electric Class A truck oven with horizontal airflow, two-stage electric heat, powered exhaust, integrated floor guides, and interlocked controls.

Pages 6-8 - Technical Specifications

Overall concept

- One electric Class A truck oven
- Batch-processing format for blade-curing cycles
- Front-loading double-door chamber with guided floor loading arrangement

Heating architecture

- Heat source: electric resistance heat
- Total installed heat: 54 kW
- Heating split into two 27 kW heater banks
- Heater banks built from eighteen 3 kW elements total
- Heater power controlled through solid-state relays with backup contactors

Airflow architecture

- Airflow pattern: full horizontal airflow
- Recirculation system based on a 13.5 in x 5 in fan assembly delivering 2,100 CFM at 2 in. W.c.
- Airflow package sized to support consistent crossflow through the blade-processing work zone

Exhaust / ventilation architecture

- Class A exhaust based on a PQ1 exhauster delivering 550 CFM at 1 in. W.c.
- Fresh-air damper integrated into the oven body
- Airflow switches and purge timing interlocked with the heating system

Chamber / shell architecture

- Internal work chamber: 48 in W x 48 in D x 60 in H
- 6-inch insulated wall construction
- Wall insulation: 6 inches of 6 lb mineral wool
- Heat-chamber walls: 5 inches of 6 lb mineral wool plus 1 inch of 8 lb Superwool
- Interior material: unpainted aluminized steel
- Exterior finish: Traffic Grey (RAL 7042)
- Control enclosure finish: ANSI 61 gray
- Floor design includes integrated guide tracks for truck-style loading

Door / loading architecture

- Two swing doors
- Insulated floor with guided loading path
- Chamber geometry and loading format support stable batch positioning while maintaining airflow access around the load

Controls architecture

- Watlow F4T ramp/soak controller for primary temperature control

- Gefran 650L excess-temperature controller
- Type J thermocouples
- NEMA 1 UL508A open industrial control panel
- Dedicated operator controls for exhaust fan, recirculation fan, and each heat bank
- Panel indication for purge complete, fan on, and heat bank on
- Panel layout includes enclosure cooling and USB access

Safety architecture

- Applicable standards basis: NFPA 79, NFPA 86, UL508A
- Safety logic includes:
- Exhaust airflow proving
- Recirculation airflow proving
- Timed purge before heat enable
- Excess-temperature shutdown
- Automatic heat shutdown when required safe operating conditions are not met

TECHNICAL SPECIFICATIONS

Oven Configuration	
Model	74-800
Type	Electric Class A truck oven
Quantity	1 oven
Application	Blade curing
Airflow Pattern	Full horizontal airflow
Work Chamber	48 in W x 48 in D x 60 in H
Door Configuration	2 swing doors

Thermal System	
Operating Temperature	600°F - 650°F
Maximum Temperature	800°F
Uniformity	±10°F
Heat Source	Electric resistance heat
Installed Heat	54 kW total
Heater Banks	2 x 27 kW
Element Basis	18 total elements, 3 kW each
Maximum VOC Load	0.32 gal/batch o-xylene
Design Elevation	<1,000 ft

Recirculation / Airflow System	
Airflow Pattern	Full horizontal
Recirculation Fan Performance	2,100 CFM at 2 in. W.c.
Recirculation Fan Motor	2 HP

Estimated Average Chamber Air Velocity	~105 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
Minimum Purge Time	3 minutes
Oven Classification	Class A

Construction

Wall Thickness	6 in
Wall Insulation	6 in of 6 lb mineral wool
Heat Chamber Wall Insulation	5 in of 6 lb mineral wool + 1 in of 8 lb Superwool
Interior Material	Unpainted aluminized steel
Exterior Finish	Traffic Grey (RAL 7042)
Control Enclosure Finish	ANSI 61 gray

Controls & Safety

Main Temperature Controller	Watlow F4T ramp/soak
Excess Temperature Controller	Gefran 650L
Thermocouple Type	Type J
Control Enclosure	NEMA 1
Enclosure Listing Basis	UL508A Open Industrial Control Panel
Enclosure Size	42 in x 36 in x 12 in
Full Load Amps	73.5 A
SCCR	5,000 amps

Airflow Proving	Exhaust and recirculation airflow switches
Heat Control	SSRs with backup contactors
Cooldown Protection	Fans remain on until below 250°F

Equipment Dimensions

Overall Width	88.80 in
Overall Depth	65.59 in
Overall Height	95.47 in
Oven Body Width	74.25 in
Oven Body Depth	61.64 in
Work Area Width	48.00 in
Work Area Depth	48.00 in
Work Area Height	60.00 in
Floor to Top of Control Enclosure	52.00 in

Process Summary

Process Type	Batch blade curing
Market Context	Aeroderivative turbine component processing
Thermal Method	Forced-convection electric heating with horizontal airflow
Control Method	Ramp/soak cycle control with Class A purge and airflow interlocks
Key Performance Basis	Repeatable curing in a 600°F - 650°F operating window with ±10°F uniformity

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