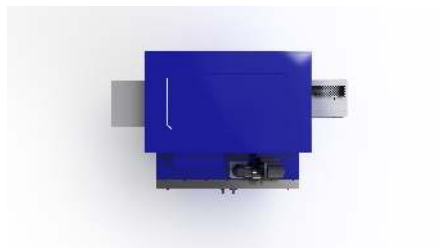
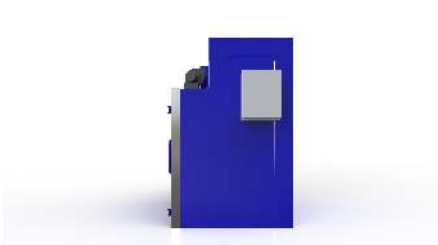




CASE STUDY

Electric Class A Truck Oven for Recycled Magnet Demagnetization

Precision Quincy engineered this oven as a high-temperature electric Class A truck oven for the batch demagnetization of recycled magnets. The customer operates in advanced magnetic materials, electromagnetic technologies, and recycled rare-earth material processing, and this project supported a controlled thermal step within that broader magnetic-material workflow. The documented design basis combined 800°F capability, full horizontal airflow, 54 kW electric heat, powered Class A exhaust, and programmable ramp/soak control in a compact cart-loaded batch oven platform.



OVERVIEW

The project was developed as a 74-800 electric Class A truck oven for the customer, an company focused on magnetostrictive materials, electromagnetic technologies, and rare-earth material processing. The project supported a recycled magnet demagnetization application requiring a repeatable, high-temperature batch process in a compact cart-loaded oven format.

The oven was built around a 48 in W × 48 in D × 60 in H work chamber and designed for an operating range of approximately 750°F to 800°F, with a maximum temperature of 800°F and a required work-area uniformity of ±10°F. The system uses full horizontal airflow, 54 kW total installed electric heat, a 2,100 CFM recirculation system, and a 550 CFM powered exhaust system to support the thermal and safety requirements of the demagnetization process.

The final design package shows a Watlow F4T ramp/soak controller, a NEMA 1 UL 508A open industrial control panel, a 1,500 lb capacity flatbed cart, and insulated floor guide tracks for cart positioning through the work chamber. With its 6-inch insulated wall system, aluminized steel interior, interlocked Class A exhaust and purge logic, and heavy-duty cart handling arrangement, the oven delivered a dedicated platform for high-temperature recycled magnet demagnetization.



CUSTOMER PROCESS REQUIREMENTS

The project required a cart-loaded batch oven for the controlled thermal demagnetization of recycled magnet material. The customer work in magnetic materials and recycled rare-earth processing created the need for a robust oven platform capable of handling dense product loads while delivering repeatable high-temperature batch performance.

Application requirement

- The project required a batch demagnetization oven for recycled magnets.
- The oven had to support a thermal process that removed magnetism from recycled magnetic material before downstream handling and subsequent processing.
- The system had to provide a controlled batch environment suited to magnetic-material processing rather than general low-temperature drying.

Work chamber / load requirement

- Required work chamber: 48 in W × 48 in D × 60 in H.
- The oven had to support cart-loaded batches rather than hand-loaded shelf processing.
- The documented cart package provided a 1,500 lb capacity flatbed cart with a 40 in × 40 in load surface.
- The loading system had to accommodate dense and potentially irregular recycled magnet loads in a repeatable transport format.

Operator / access requirement

- The oven had to allow front loading and unloading through two swing doors.
- The process required a guided cart-loading arrangement using the oven's insulated floor guide tracks.
- Product positioning and fixturing had to be arranged to minimize restrictions to airflow passage through the oven.

Quality / control requirement

- The process required repeatable high-temperature batch performance within the stated work-area uniformity.
- The system required programmable temperature control to support defined demagnetization profiles.
- The oven had to provide a stable thermal environment for consistent recycled magnet processing from batch to batch.

Safety / environmental requirement

- The oven had to be configured as a Class A oven.
- The documented design basis established a maximum volatile load of 0.32 gal/batch (o-xylene basis).
- The process required powered exhaust, purge sequencing, and airflow proving before heat could be enabled.
- Because of the site elevation, the allowable VOC basis was reduced by 4%.

Site / utility requirement

- Required electrical service: 460V / 3PH / 60Hz.
- Design elevation: 1,135 ft.

THERMAL / PHYSICAL PROCESS REQUIREMENTS

The project required a high-temperature forced-convection batch process capable of thermally demagnetizing recycled magnet material in a controlled Class A oven environment.

Temperature requirement

- Operating temperature basis: approximately 750°F to 800°F.
- Maximum temperature basis: 800°F.
- Required work-area uniformity: ±10°F.

Process basis

- The thermal process basis was demagnetization of recycled magnets.
- The process required a sustained high-temperature thermal environment appropriate for removing magnetic strength from recycled magnet feedstock.
- The oven had to deliver that performance in a repeatable batch format across cart-loaded product.

Airflow / heat-transfer requirement

- Airflow direction basis: full horizontal airflow.
- The process required forced-convection heat transfer across the full cart-loaded work zone.
- Using the documented recirculation airflow and chamber cross-sectional area in the airflow direction, the first-pass 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 controlled staged heat delivery through the temperature-control system.

Ventilation requirement

- The process required Class A exhaust and purge sequencing.
- Powered exhaust basis: 550 CFM.
- Maximum volatile load basis: 0.32 gal/batch (o-xylene basis).
- Airflow proving had to be satisfied before 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 source package states that fans are not to be shut down while oven temperature is above 250°F.



EQUIPMENT CONCEPT & ARCHITECTURE

To satisfy those requirements, Precision Quincy configured the project as a 74-800 electric Class A truck oven with full horizontal airflow, powered exhaust, guided cart loading, and interlocked high-temperature controls.

Pages 6–8 — Technical Specifications

Overall concept

- One electric Class A truck oven.
- Cart-loaded batch configuration for recycled magnet demagnetization.
- Compact high-temperature oven platform sized for guided flatbed-cart loading.

Heating architecture

- Heat source: electric resistance heat.
- Total installed heat: 54 kW.
- Heating split into two 27 kW heater banks.
- Each heater bank built from nine 3,000 W elements.
- 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 × 5 in fan assembly delivering 2,100 CFM at 2 in. W.c..
- Fresh-air damper integrated into the oven airflow system.

Exhaust / ventilation architecture

- Class A exhaust based on a PQ1 exhauster delivering 550 CFM at 1 in. W.c..
- Exhaust and recirculation airflow are monitored through airflow switches.
- Purge timer and interlocked safety logic prevent heater operation until safe operating conditions are met.

Chamber / shell architecture

- Internal work chamber: 48 in W × 48 in D × 60 in H.
- 6-inch insulated wall construction.
- Standard wall insulation: 6 in of 6 lb mineral wool.
- Heat-chamber wall insulation: 5 in of 6 lb mineral wool plus 1 in of 8 lb Superwool.
- Interior: unpainted aluminized steel.
- Exterior finish: PQ Blue.
- Control enclosure finish: ANSI 61 gray.
- The oven includes an insulated floor with cart guide tracks.

Door / loading architecture

- Two swing doors.
- Flatbed cart with 1,500 lb capacity.
- Cart load surface: 40 in × 40 in.
- Cart construction: mild steel, unpainted.
- Cart running gear: two swivel casters and two rigid casters, each 6 in diameter.

Controls architecture

- Watlow F4T ramp/soak controller for primary temperature control.
- Gefran 650L excess-temperature controller.
- NEMA 1 UL 508A open industrial control panel.
- Separate operator controls for exhaust fan, recirculation fan, heater bank #1, and heater bank #2.
- Panel indication includes purge complete, fan on, and heater-bank on status lights.
- Enclosure layout includes a panel cooling fan, USB port, and 100A non-fused disconnect switch.

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 required safe operating conditions are not met

TECHNICAL SPECIFICATIONS

Oven Configuration

Model	74-800
Type	Electric Class A truck oven
Quantity	1 oven
Application	Recycled magnet demagnetization
Airflow Pattern	Full horizontal airflow
Work Chamber	48 in W × 48 in D × 60 in H
Doors	2 swing doors

Electrical System

Power Supply	460V / 3PH / 60Hz
Full Load Amps	73.5 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

Operating Temperature	748°F to 800°F
Maximum Temperature	800°F
Uniformity	±10°F
Heat Source	Electric
Installed Heat	54 kW
Heater Banks	2 × 27 kW

Element Basis	18 total elements, 3,000 W each
Heater Control	SSRs with backup contactors
Recirculation / Airflow System	
Airflow Pattern	Full horizontal airflow
Recirculation Fan Performance	2,100 CFM at 2 in. W.c.
Recirculation Fan Motor	2 HP
Recirculation Fan Assembly	13.5 in × 5 in
Estimated Chamber Air Velocity Basis	~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
Fresh Air Damper	Included
Minimum Purge Time	3 minutes
Maximum VOC Load	0.32 gal/batch (o-xylene basis)
Elevation Adjustment	Allowable VOC reduced 4%
Design Elevation	1,135 ft
Oven Classification	Class A
Construction	
Wall Thickness	6 in
Standard 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	PQ Blue
Control Enclosure Finish	ANSI 61 gray
Floor Style	Insulated floor with cart guide tracks

Cart / Loading System

Cart Type	Flatbed cart
Cart Capacity	1,500 lb
Cart Load Surface	40 in W × 40 in D
Overall Cart Width	41.00 in
Overall Cart Depth	44.11 in
Overall Cart Height	38.56 in
Floor to Load Surface	9.68 in
Caster Arrangement	2 swivel / 2 rigid
Caster Diameter	6.00 in
Cart Construction	Mild steel, unpainted

Controls & Safety

Main Temperature Controller	Watlow F4T ramp/soak
Excess Temperature Controller	Gefran 650L
Airflow Proving	Exhaust and recirculation airflow switches
Indicators	Purge complete, exhaust fan on, recirculation fan on, heater bank on
Fan Shutdown Protection	Do not shut down fans above 250°F
Applicable Standards Basis	NFPA 79, NFPA 86, UL 508A

Equipment Dimensions

Overall Width	93.18 in
Overall Depth	65.59 in

Overall Height	95.47 in
Oven Body Width	74.25 in
Oven Body Depth	61.64 in
Height to Top of Control Enclosure	52.00 in
Exhaust Height	83.58 in
Work Area Bottom Above Floor	2.89 in insulated floor height
Track Center to Center	29.00 in

Process Summary

Product	Recycled magnets
Process	Demagnetization
Batch Handling Basis	Cart-loaded flatbed process
Thermal Control Basis	High-temperature ramp/soak batch operation
Key Verification Concept	Repeatable control of temperature, airflow, purge, and Class A safety interlocks



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