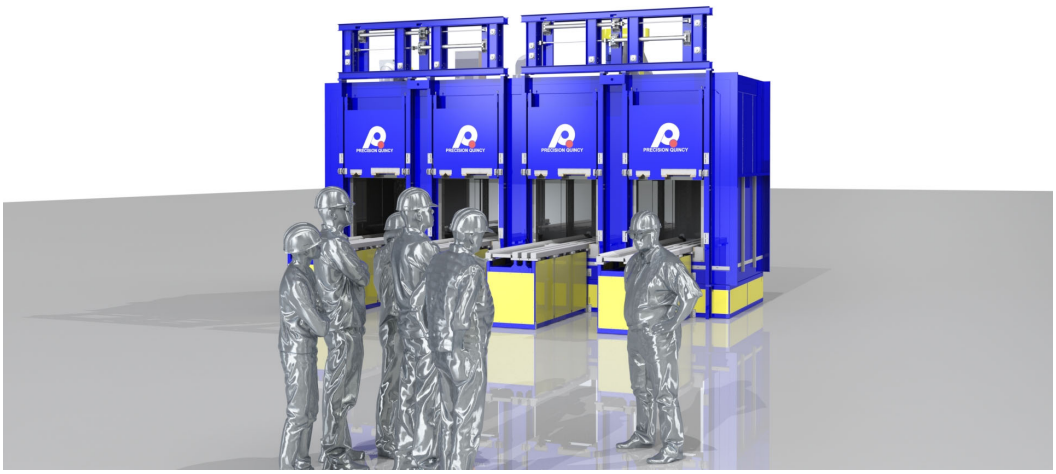
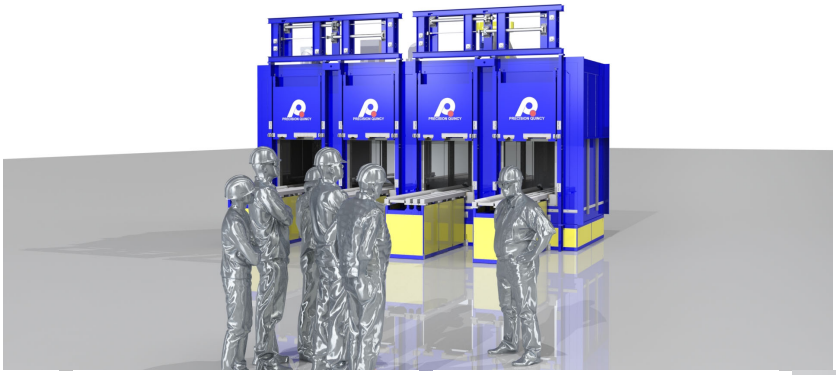


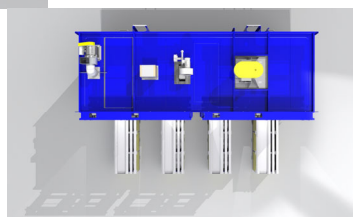
PRECISION QUINCY

CASE STUDY

Dual-Oven Natural Gas-Fired Convection Curing System for Laboratory Sink Mold Partial Cure

Precision Quincy engineered a dual-oven, natural gas-fired, recirculating convection curing system to perform the partial-cure step for laboratory sinks formed in aluminum molds—delivering top-down vertical downflow convection via slot-nozzle supply ducting, ±10°F temperature uniformity at a 265°F operating setpoint (450°F max capability), 1.5 MMBTU/hr per oven (3.0 MMBTU/hr total for 8 cavities), and NFPA 86 Class A compliance.



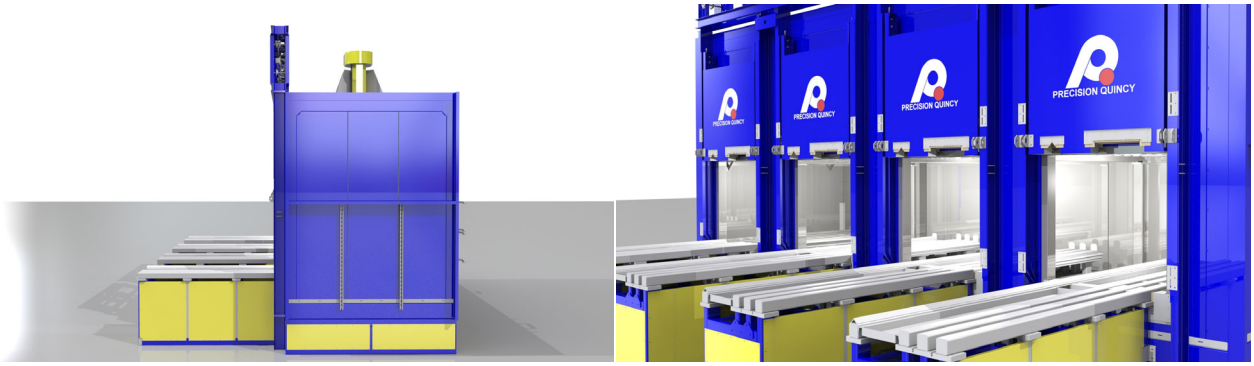


OVERVIEW

The customer manufactures chemically resistant laboratory sinks and countertop components for educational and industrial lab environments. To support reliable production using a proprietary resin system in aluminum molds, Precision Quincy engineered a dual-oven convection curing system that performs the partial-cure step prior to a separate post-cure process. Each oven provides four sink cavities and is designed around top-down vertical downflow airflow delivered through slot-nozzle supply ducting.

This airflow architecture provides strong, even convection heat transfer while avoiding high-intensity impingement that could disturb the product surface. Convection performance is produced by a roof-mounted New York Blower (NYB) 27 PLR recirculation fan (15 HP) rated at 14,000 CFM @ 4.0 in. w.c., delivering approximately 2,800 FPM discharge velocity and supporting ±10°F air temperature uniformity at a typical operating setpoint of 265°F (maximum capability 450°F). Heat is supplied by an Eclipse AH150 burner providing 1.5 MMBTU/hr per oven (3.0 MMBTU/hr total installed for two ovens).

VOCs generated during curing are managed using a dedicated exhaust system with a PQ15 exhaustor providing 1,065 CFM total exhaust per oven, with purge and safety interlocks implemented per NFPA 86 Class A compliance. For production handling, molds are loaded onto built-in carts/trolleys that ride on V-groove rails with V-groove casters and are moved by hand in and out of each oven. The ovens are elevated on a stand with a 38 in cart/rail load height; loading rails extend 78 in outside the oven for staging, with an internal track length of 72.5 in. Each oven uses a low-headroom vertical lift door actuated by four horizontally mounted pneumatic cylinders through an engineered chain-and-sprocket mechanism. Removable drip pans beneath the load path support safe containment and cleanup of resin drips. Oven construction uses structurally reinforced insulated wall panels, 4 in thick, filled with 6 lb/ft³ mineral wool. Overall oven dimensions are 270 in W × 172 in D × 168 in H. System controls use an Allen-Bradley Micro850 PLC with a 10 in touchscreen HMI and an SSI 804 temperature controller.



CUSTOMER PROCESS REQUIREMENTS

The customer required a curing system to support production of chemically resistant laboratory sinks (e.g., drop-in and undermount styles) used in laboratory countertops, where parts are produced using a sand + proprietary resin system placed in aluminum molds, and this equipment performs a partial-cure step before parts proceed to a separate post-cure process in other equipment.

Process Objective (Partial Cure)

- Advance molded sink parts to the required partial-cure state (stable for handling and downstream post-cure)
- Maintain consistent results across multiple sink styles and mold geometries

Capacity / Production Concept

- Capacity basis: 8 cavities total (implemented as (2) ovens, each with (1) 4-cavity chamber)

Product Integrity Constraint

- Airflow must provide heat transfer without disturbing the product surface (basis for avoiding high-intensity impingement)

Load Handling / Material Handling

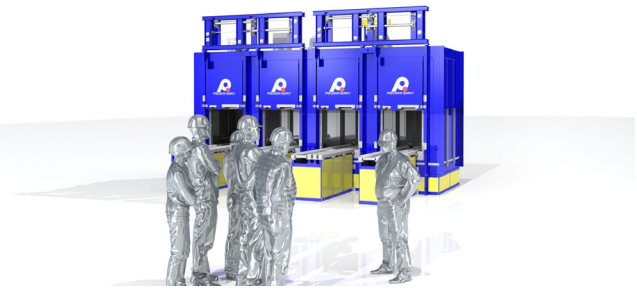
- Molds are placed onto built-in carts/trolleys that ride on V-groove rails with V-groove casters
- Carts/trolleys are moved by hand in and out of each oven

Work Envelope Basis (Per Cavity)

- Work area: 36 in H × 36 in W × 60 in D

VOC / Safety-Driven Requirements

- The curing process produces VOC; equipment must safely manage VOC in accordance with NFPA 86 and applicable codes
- The system must tolerate possible resin drips/spills and support safe containment/cleanup



THERMAL PROCESS REQUIREMENTS

Operating Temperature Envelope

- Typical operating temperature (partial cure): 265°F
- Maximum equipment temperature capability: 450°F

Heating Capacity (Thermal Input Basis)

- Heat source: natural gas
- Heat input basis: 1.5 MMBTU/hr per 4-cavity oven
- Total installed heat input for the full system: 3.0 MMBTU/hr (2 ovens × 1.5 MMBTU/hr; basis: 8 cavities total)

Temperature Control / Uniformity

- Air temperature uniformity requirement: ±10°F
- Control temperature measurement: control thermocouple located in the middle of the supply duct
- High-limit temperature: 450°F maximum (Partlow high limit controller)

Airflow Delivery (Convection Performance)

- Airflow direction: vertical downflow (top-down) into each cavity
- Supply distribution: slot-nozzle supply ducting over the cavities
- Discharge air velocity basis: ~2,800 FPM
- Recirculation airflow basis: 14,000 CFM @ 4.0 in. w.c.
- Return air path basis: return air flows up the sides back toward the burner/heat section

VOC Management (Process-Offgas Control)

- Dedicated exhaust for VOC control: 1,065 CFM total per oven
- Exhaust device: PQ15 exhaustor
- VOC ventilation basis: exhaust/hooding maintained per NFPA 86 requirements
- Purge and safety interlocks: provided per NFPA 86 Class A compliance requirements

Spill / Drip Tolerance (Resin Handling Reality)

- The system must tolerate resin drips/spills without creating an unsafe condition; containment/cleanup provisions are addressed in the equipment architecture

EQUIPMENT CONCEPT & ARCHITECTURE

To deliver the thermal process requirements (which deliver the customer process requirements), Precision Quincy implemented a natural gas-fired, recirculating convection curing oven system with 8 total cavities (implemented as (2) ovens, each with (1) 4-cavity chamber), where each oven includes its own vertical lift door for loading/unloading.

Material Handling (How Loads Move Through the System)

- Carts/trolleys ride on V-groove rails (with V-groove casters) and are moved by hand
- Rail/track arrangement: four tracks with spacing basis noted as 15 in / 20 in / 25 in
- Cart/rail load height: 38 in above floor
- Loading rail extension outside oven: 78 in
- Internal track length: 72.5 in
- Oven is mounted on a stand to establish the rail height and loading interface

Airflow Architecture (How the Oven Achieves the Required Convection)

- Airflow direction: vertical downflow (top-down) into each cavity
- Recirculation fan arrangement: roof-mounted New York Blower (NYB) 27 PLR recirculation fan with a vertical shaft (15 HP)
- Fan discharge path: fan discharges horizontally, then airflow is turned 180° and delivered vertically downward through slot-nozzle supply ducting above the cavities
- Return path: air returns up the sides of the duct/chamber and is routed back to the heat section (burner inlet region)
- Recirculation basis: 14,000 CFM @ 4.0 in. w.c., with discharge velocity basis ~2,800 FPM

Heating System

- Burner basis: (1) Eclipse AH150 burner per oven
- Heat input basis: 1.5 MMBTU/hr per 4-cavity oven
- Total installed heat input: 3.0 MMBTU/hr (2 ovens × 1.5 MMBTU/hr; basis: 8 cavities total)

VOC Exhaust / Safety

- Exhaust for VOC control: PQ15 exhaustor, 1,065 CFM total per oven
- Explosion relief in the roof

Door System

- Door type: vertical lift door per oven
- Low-headroom actuation: four pneumatic cylinders mounted horizontally with an engineered chain and sprocket mechanism to achieve door travel with reduced ceiling height
- Pneumatic supply: 80 PSI

Spill / Drip Management

- Removable drip pans located beneath the load path to capture resin drips/spills

Construction / Shell

- Construction: structurally reinforced insulated wall panels
- Panel thickness: 4 in
- Insulation: 6 lb/ft³ mineral wool
- Overall dimensions: 270 in W × 172 in D × 168 in H

Controls

- Temperature controller: SSI 804
- PLC: Allen-Bradley Micro850
- Operator interface: 10 in touchscreen (HMI) for door operation and system interaction

TECHNICAL SPECIFICATIONS

System Configuration	
Type	Batch, recirculating convection curing oven system (partial cure)
Process	Partial cure of laboratory sinks produced from sand + proprietary resin in aluminum molds; post-cure performed in separate equipment
System Capacity	8 cavities total (2 ovens × 4 cavities)
Oven / Chamber Configuration	4 cavities per oven ((1) chamber per oven)
Work Envelope (per cavity)	36 in H × 36 in W × 60 in D
Typical Operating Temperature	265°F
Maximum Temperature Capability	450°F
Temperature Uniformity (Air)	±10°F
Maximum Load Weight (per oven)	300 lb max
Airflow Direction at Product	Vertical downflow (top-down)
Overall Oven Dimensions	270 in W × 172 in D × 168 in H

Thermal System (Natural Gas Heating)	
Heat Source	Natural gas
Heat Input (per 4-cavity oven)	1.5 MMBTU/hr

Total Installed Heat Input (System)	3.0 MMBTU/hr (2 ovens × 1.5 MMBTU/hr)
Burner Arrangement	(1) Eclipse AH150 burner per oven
Temperature Controller	SSI 804
Control Thermocouple Location	Middle of supply duct

Convection / Airflow System	
Recirculation Fan Arrangement	Roof-mounted New York Blower (NYB) 27 PLR recirculation fan with vertical shaft
Fan Motor	15 HP
Fan Airflow	14,000 CFM
Fan Static Pressure	4.0 in. w.c.
Discharge Velocity Basis	~2,800 FPM
Supply Ducting	Slot-nozzle supply ducting above cavities
Airflow Path	Fan discharges horizontally, turns 180°, then delivers vertical downflow into cavities; return air flows up the sides back to the heat section
Airflow Proving	Airflow switch on every fan

VOC Ventilation / Exhaust	
VOC Exhaust Airflow	1,065 CFM total per oven
Exhaust Device	PQ15 exhaustor
Hooding / Ventilation Basis	VOC exhaust/hooding maintained per NFPA 86 requirements
Purge & Safety Interlocks	Provided per NFPA 86 Class A compliance requirements

Material Handling (Rails, Carts, Doors)	
Cart / Trolley Type	Built-in carts/trolleys, moved by hand
Rail Type	V-groove rails with V-groove casters
Track Count / Layout	Four tracks
Track Spacing Basis	15 in / 20 in / 25 in
Cart / Rail Load Height	38 in
External Rail Extension	78 in outside oven
Internal Track Length	72.5 in
Door Type	Vertical lift door per oven
Low-Headroom Actuation	Four pneumatic cylinders mounted horizontally with engineered chain + sprocket mechanism
Pneumatic Supply	80 PSI

Spill / Drip Management	
Drip / Spill Containment	Removable drip pans located beneath the load path

Construction / Shell	
Panel Construction	Structurally reinforced insulated wall panels
Panel Thickness	4 in
Insulation	6 lb/ft³ mineral wool
Oven Support	Oven mounted on stand

Safety & Compliance	
Applicable Standard	NFPA 86

NFPA 86 Classification	Class A
Explosion Relief	Explosion relief in the roof
High Limit Temperature Control	Partlow high limit controller (450°F maximum)
Safety Chain / Interlocks	Per NFPA 86

Controls & Electrical	
PLC / System Controls	Allen-Bradley Micro850
Operator Interface	10 in touchscreen HMI
Temperature Control	SSI 804
Electrical Service	480 V / 3-phase / 60 Hz

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