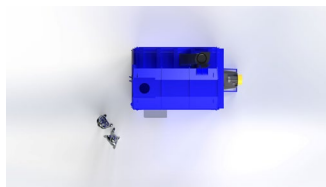
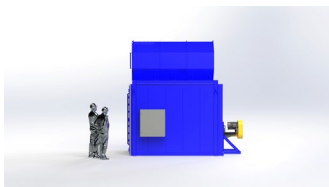


CASE STUDY

Natural Gas Heated Walk-In Oven with Integral Thermal Oxidizer

Natural-gas-heated Class A walk-in batch oven with integral top-mounted thermal oxidizer engineered for the curing of rubber gaskets in a solvent-bearing process environment.



OVERVIEW

A natural-gas-heated walk-in batch oven with an integral thermal oxidizer was engineered for the curing of rubber gaskets. The system was developed for a solvent-bearing curing process requiring controlled batch heating, compliant VOC handling, and repeatable work-area performance in a compact factory-assembled package.

The oven was built around a 69 in W × 84 in D × 88 in H internal work area and designed for an operating temperature of 351°F, with a maximum temperature rating of 482°F and a required work-area uniformity of ±10°F. To deliver that performance, a back-mounted natural gas heat chamber was used with an Eclipse RatioMatic RM0100 burner rated at 950,000 BTU/hr and an NYB 248PLR plug fan delivering 12,600 CFM at 2.5 in. w.c. through a full-height horizontal-vertical airflow pattern with high-velocity supply nozzles.

Because the curing process carries a significant solvent load, the equipment was configured as an NFPA 86 Class A oven with a PQ25 exhaustor and a dedicated top-mounted thermal oxidizer. The oxidizer uses an Eclipse RatioMatic RM0200 burner rated at 2,000,000 BTU/hr and is designed to operate at 1,400°F to 1,550°F with a 0.5-second dwell time.

The oven uses 4-inch-thick insulated panel construction with 6 lb density mineral wool insulation, aluminized steel interior and exterior wall surfaces, 4-inch-thick bi-parting doors, a 2-½-inch insulated floor with continuous cart guide tracks, and a NEMA 12 control enclosure with a WATLOW F4T ramp/soak controller and data acquisition. The complete system was designed as a one-piece shipped assembly with the oxidizer mounted above the oven.



CUSTOMER PROCESS REQUIREMENTS

The equipment was developed for a curing application requiring the batch processing of rubber gaskets in a controlled thermal environment. The summary below focuses on the equipment performance and architecture delivered for this application.

Application Requirement

- The equipment processes rubber gaskets through a batch curing process.
- The system supports a solvent-bearing gasket-curing application requiring controlled heating and compliant handling of process exhaust.

Work Chamber / Load Requirement

- Required internal work area: 69 in W × 84 in D × 88 in H.
- Maximum product load basis: 861 kg per batch.

- The oven was designed around cart-based loading with guided travel through the insulated floor track system.

Process Requirement

- The system supports repeatable batch curing of gasket loads with stable temperature control and uniform heat delivery across the work area.
- The process requires accommodation of solvent-bearing loads, with ventilation and oxidizer architecture matched to the application basis.

Safety Requirement

- The oven was required to be designed as an NFPA 86 Class A unit.
- The equipment required compliant combustion, purge, exhaust, and VOC-handling architecture appropriate for the process basis.

Utility / Site Requirement

- Required electrical service: 380V / 3PH / 50Hz.
- Required fuel: natural gas. Natural gas inlet pressure: 2 PSI. Natural gas flow basis: 3,000 CFH.
- Design elevation basis: less than 1,000 ft above sea level.

Installation / Shipment Requirement

- Approximate overall shipped oven dimensions: 110 in W × 180 in L × 182 in H.
- Installation access basis: 12 ft W × 16 ft H dock/door size.
- The equipment was designed to ship factory assembled.

THERMAL PROCESS REQUIREMENTS

These thermal process requirements were established from the need to cure rubber gaskets in a controlled Class A batch environment.

Temperature Capability

- Operating temperature: 351°F (177°C).
- Maximum operating temperature: 482°F (250°C).
- Required work-area temperature uniformity: ±10°F (±5.6°C).

Process Basis

- The thermal process basis is batch curing of rubber gaskets.
- The application involves a solvent-bearing VOC load and required compliant thermal processing and exhaust handling.

Heat Input Requirement

- Heat source: natural gas.
- Oven burner: Eclipse RatioMatic RM0100. Oven burner heat input: 950,000 BTU/hr.
- Natural gas inlet pressure: 2 PSI. Natural gas flow basis: 3,000 CFH.

Airflow Delivery Requirements

- Required airflow style: full-height horizontal-vertical airflow.
- Recirculation airflow basis: 12,600 CFM. Recirculation static pressure basis: 2.5 in. w.c.
- Supply delivery basis includes high-velocity nozzle discharge with design airspeed targeted at 4,000 FPM.

Exhaust / Ventilation Basis

- Exhaust fan: PQ25 exhauster. Exhaust airflow basis: 2,427 CFM at 1 in. w.c.
- Maximum VOC load basis: 1.73 gal/batch of o-xylene. Oven classification basis: NFPA 86 Class A.

Thermal Oxidizer Basis

- Oxidizer operating temperature: 1,400°F to 1,550°F. Oxidizer maximum temperature: 1,550°F.
- Oxidizer burner: Eclipse RatioMatic RM0200. Oxidizer burner heat input: 2,000,000 BTU/hr.
- Oxidizer dwell time: 0.5 seconds. Oxidizer operating airflow basis: approximately 2,317 CFM.

Thermal Instrumentation / Control Basis

- Primary oven temperature controller: WATLOW F4T ramp/soak controller with non-encrypted data acquisition and graphical trend chart.
- Oxidizer temperature controller: Super Systems SSI 804.
- The process temperature control architecture uses Type K process thermocouples with dedicated high-limit protection circuits.

Safety / Classification Basis

- Oven classification basis: NFPA 86 Class A.
- The thermal process was delivered within a natural-gas-fired safety framework with dedicated combustion safeties, airflow proving, gas pressure monitoring, purge sequencing, and thermal protection.

EQUIPMENT CONCEPT & ARCHITECTURE

To deliver the customer and thermal process requirements for this rubber gasket curing application, the following equipment concept and architecture was developed.

Overall Concept

- One natural-gas-heated Class A walk-in batch oven with integral thermal oxidizer designed for rubber gasket curing in a solvent-bearing batch process.
- The design uses a back-mounted heat chamber and a top-mounted thermal oxidizer.

Heating Architecture

- Oven heat source: natural gas. Oven burner: Eclipse RatioMatic RM0100 at 950,000 BTU/hr.
- Oxidizer burner: Eclipse RatioMatic RM0200 at 2,000,000 BTU/hr.
- Both gas trains are designed to NFPA 86 requirements and use FM-approved components.

Airflow / Recirculation Architecture

- Airflow pattern: full-height horizontal-vertical airflow.

- Recirculation fan: NYB 248PLR plug fan — 12,600 CFM at 2.5 in. w.c.; 10 HP motor; plug fan diffuser.
- Exhaust fan: PQ25 exhauster — 2,427 CFM at 1 in. w.c.; 2 HP motor.
- Supply ductwork uses straight four-sided duct construction with high-velocity nozzles to drive even air distribution.
- Return ductwork is designed to provide additional airflow control within the work area.

Chamber / Construction Architecture

- Internal work area: 69 in W × 84 in D × 88 in H.
- Construction style: tongue-and-groove interlocking insulated panel construction with structural steel reinforcement.
- Wall system thickness: 4 inches. Insulation: 4-inch, 6 lb density mineral wool.
- Interior and exterior wall material: 18 gauge aluminized steel. Exterior finish: Sherwin-Williams RAL-9010.
- Oven floor: 2-½-inch insulated floor with two sets of continuous cart guide tracks.

Door / Access Architecture

- Door style: 4-inch-thick bi-parting doors on one end.
- Doors use double-wall reinforced construction.
- The door system includes gasketing, drag seals, roller-bearing hinges, and FM-approved pressure-release latches.

Thermal Oxidizer Architecture

- The oxidizer is individually dedicated to the oven.
- Shop assembled, pre-wired, pre-tested, and mounted above the oven on a structural frame.
- Oxidizer construction: PQ octagonal design with 3/16-inch plate exterior and 7 inches of high-temperature insulation.

Controls Architecture

- Primary oven controller: WATLOW F4T ramp/soak controller with data acquisition and graphical trend chart.
- Oxidizer controller: Super Systems SSI 804.
- Control enclosure: NEMA 12, approximately 42 in × 30 in × 12 in; UL 508A Open Industrial Control Panel labeled.
- Control package includes: digital/manual-reset high-limit controllers; airflow switches; gas pressure switches; Dungs flame safeguards; Siemens SQM41.25 burner control valve actuators; panel-mounted USB connection for controller data access; three-tier stack light.

Safety / Compliance Architecture

- Oven classification: NFPA 86 Class A. Applicable standards basis: NFPA 79, NFPA 86, UL 508A.
- The design includes dedicated purge logic, burner proving, proof-of-closure monitoring, combustion airflow proving, exhaust airflow proving, work-area and combustion-chamber high-limit protection, and visual fault indication.

Shipping / Installation Architecture

- The oven was designed to ship assembled as a complete package including the oven body, heat chamber, mounted control enclosure, and integrated oxidizer structure.

TECHNICAL SPECIFICATIONS

Oven Configuration	
Type	Natural-gas-heated walk-in batch oven with integral thermal oxidizer
Quantity	1 oven system
Application	Rubber gasket curing
Internal Work Area	69 in W × 84 in D × 88 in H
Maximum Product Load	861 kg per batch
Shipment Style	Factory-assembled shipment
Heat Chamber Arrangement	Back-mounted heat chamber
Oxidizer Arrangement	Top-mounted dedicated thermal oxidizer

Thermal Heat Power System	
Operating Temperature	351°F (177°C)
Maximum Operating Temp	482°F (250°C)
Temperature Uniformity	±10°F (±5.6°C)
Heat Source	Natural gas
Oven Burner	Eclipse RatioMatic RM0100
Oven Burner Input	950,000 BTU/hr
Natural Gas Inlet Pressure	2 PSI
Natural Gas Flow Basis	3,000 CFH
Design Elevation	< 1,000 ft above sea level

Recirculation / Airflow System	
Airflow Pattern	Full-height horizontal-vertical airflow
Recirculation Fan	NYB 248PLR plug fan
Recirculation Airflow	12,600 CFM
Recirculation Static Pressure	2.5 in. w.c.
Recirculation Fan Motor	10 HP
Supply Discharge Basis	High-velocity nozzles targeting 4,000 FPM
Diffuser	Plug fan diffuser

Exhaust System	
Exhaust Fan	PQ25 exhauster
Exhaust Airflow	2,427 CFM
Exhaust Static Pressure	1 in. w.c.
Exhaust Fan Motor	2 HP

Thermal Oxidizer System	
Oxidizer Type	Dedicated top-mounted thermal oxidizer
Oxidizer Burner	Eclipse RatioMatic RM0200
Oxidizer Burner Input	2,000,000 BTU/hr
Oxidizer Operating Temp	1,400°F to 1,550°F
Oxidizer Maximum Temp	1,550°F
Dwell Time	0.5 seconds
Oxidizer Airflow Basis	Approximately 2,317 CFM
Oxidizer Construction	PQ octagonal design with 3/16 in plate exterior
Oxidizer Insulation	7 in high-temperature insulation

Construction Materials / Shell System	
Shell Style	Tongue-and-groove insulated panels with structural steel reinforcement
Wall Thickness	4 in
Insulation	4 in of 6 lb density mineral wool
Interior Wall Material	18 ga aluminized steel
Exterior Wall Material	18 ga aluminized steel
Exterior Finish	Sherwin-Williams RAL-9010
Control Panel Finish	ANSI 61 gray
Floor Feature	2½ in insulated floor with continuous cart guide tracks
Door Style	4 in bi-parting doors

Safety & Compliance	
Classification	NFPA 86 Class A
Applicable Standards	NFPA 79, NFPA 86, UL 508A
Maximum VOC Load	1.73 gal/batch of o-xylene
Pressure Release Hardware	FM-approved pressure-release latches
Gas Train Components	FM approved

Controls & Electrical	
Primary Oven Controller	WATLOW F4T ramp/soak controller with non-encrypted data acquisition
Oxidizer Controller	Super Systems SSI 804
Process Thermocouple	Type K
High-Limit Protection	Digital/manual-reset high-limit controllers
Control Enclosure	NEMA 12, 42 in × 30 in × 12 in
Gas Train J-Boxes	NEMA 12, 16 in × 14 in × 8 in
Panel Listing	UL 508A Open Industrial Control Panel
Primary Power	380V / 3PH / 50Hz

Full Load Amperage	28.9 A FLA
Recirculation Fan Motor	10 HP
Exhaust Fan Motor	2 HP
Oxidizer Combustion Blower Motor	1.5 HP
Oven Combustion Blower Motor	0.5 HP
Stack Light	3-color tower light

Process Summary	
Product	Rubber gaskets
Market / Application	Industrial gasket curing
Process Type	Batch curing in a solvent-bearing Class A environment
VOC Handling Strategy	Exhaust and dedicated thermal oxidation matched to process basis
Key Verification Concept	Repeatable control of temperature, airflow, combustion, VOC handling, and safe operating limits



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