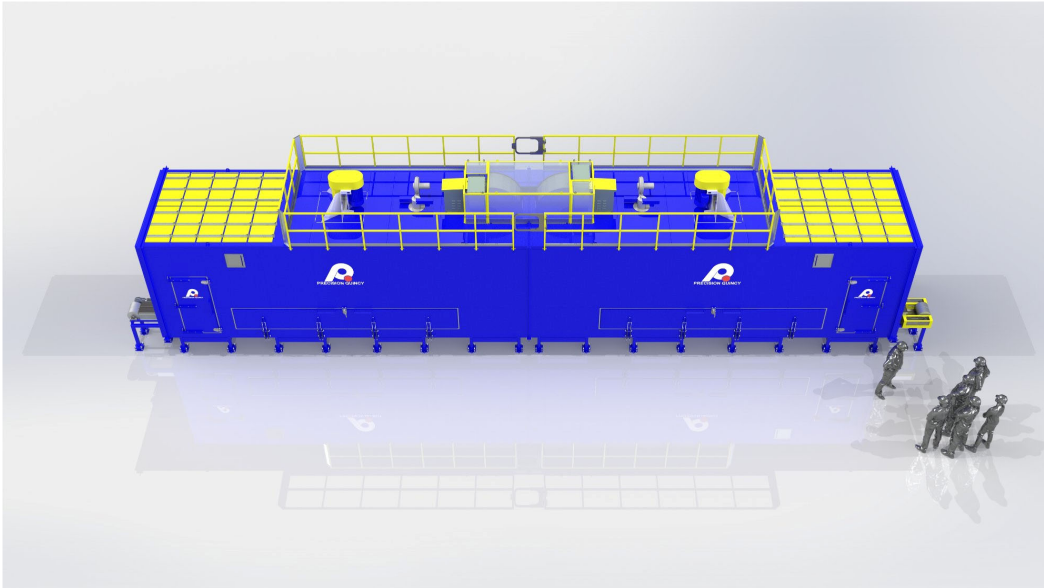
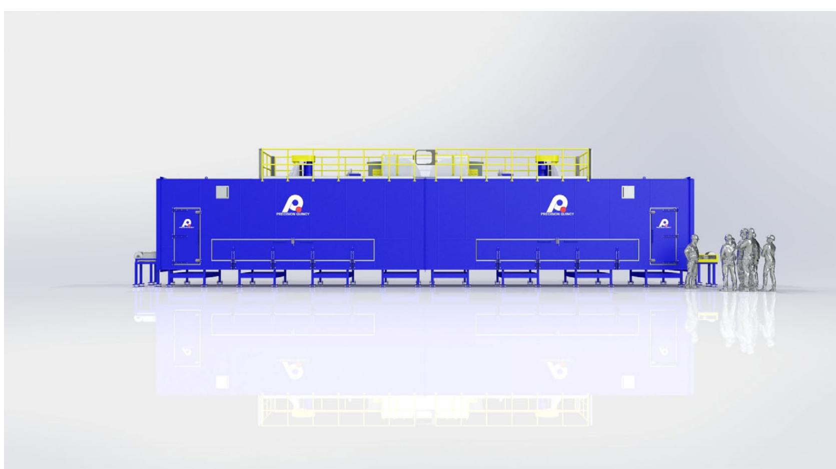


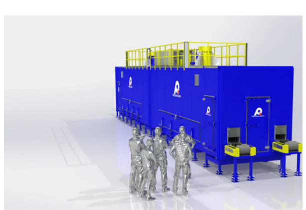
PRECISION QUINCY

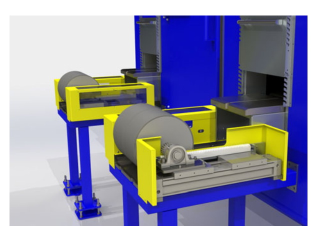
CASE STUDY

Dual-Zone Continuous Curing Oven for High-Volume Trim Finishing

Dual-path, two-zone inline curing module engineered for edge-applied coatings on high-volume trim—delivering ~152,000 lb/hr with edge-focused vertical-down airflow at a 212°F operating process (450°F max capability), low-NOx combustion, and service-forward access in a compact footprint.



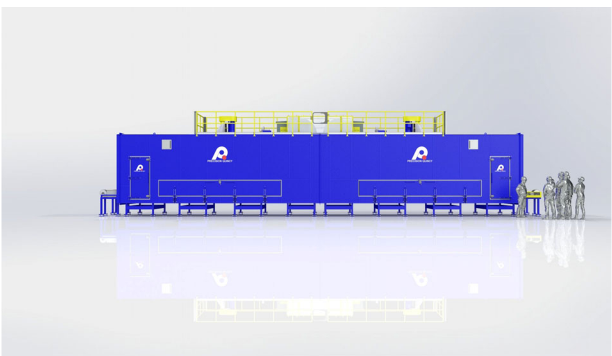



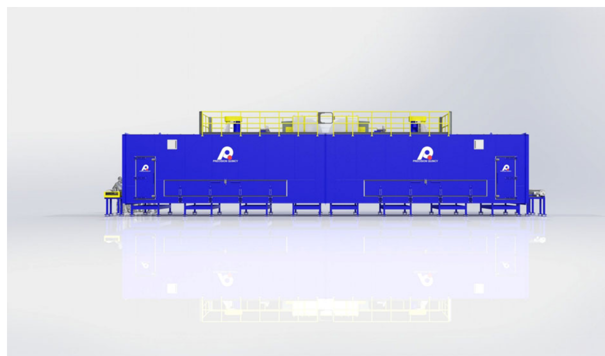


OVERVIEW

Precision Quincy engineered a high-throughput, dual-path curing module for a major North American building-products manufacturer, designed to integrate inline within a two-machine production cell. The system cures edge-applied coatings on lengthwise-oriented trim boards—focusing heat where it matters (the edges) without wasting energy on wrapped top/bottom surfaces—while delivering approximately 152,000 lb/hr across a wide product mix.

To meet the customer's requirements and belt limitations, the curing process was developed through a combination of Precision Quincy testing, customer experience, and prior application knowledge, resulting in a 212°F operating process with 450°F maximum capability for future flexibility. The final architecture uses two independently controlled zones and two side-by-side conveyor paths with fixed spacing to match the customer's layout, combining edge-focused vertical-down airflow (5,800 FPM ±870 through 3/8″ slots), modulating exhaust (5,250–17,200 CFM) for stable low-temperature operation under low-NOx constraints, and a robust service-forward mechanical layout with central walk-through access.





CUSTOMER PROCESS REQUIREMENTS

A major North American building-products manufacturer required a continuous curing module to be integrated inline as part of a larger, two-machine production cell (the curing system mechanically and controls-wise interfaces with upstream/downstream equipment).

Material flow & layout

- Product travels lengthwise (boards oriented parallel to direction of travel; "skinny way in").
- Two parallel product paths run through the curing system.
- The customer required a specific fixed center-to-center spacing between the two paths to match their production layout.

Throughput requirement (primary)

- The key requirement was mass throughput (≈152,000 lb/hr target). Line speed is secondary and is simply whatever speed is required to achieve lb/hr given product mix.

Product + upstream context

- Trim boards are wood/composite.
- Upstream, the trim is wrapped on the top and bottom surfaces.
- After trim is cut, the exposed edges must be painted; this system's job is to dry/cure the edge paint.

Energy focus / edge-only heating challenge

- The customer's process requires concentrating heat transfer on the edges without wasting energy heating surfaces that do not need it.
- The system must accommodate a wide product width range (~1.5 in to 12 in) while still directing airflow/heat where needed (edge-focused) without disturbing product.

Conveyor/belt requirement + belt temperature constraint

- The customer required a specific belt standard.
- The belt is not rated for the oven's maximum design temperature.
- Although the equipment is configured for up to 450°F max, the customer operates to keep the belt around ~212°F.
- A belt return/vestibule region is maintained cooler (as needed) to help protect the belt while still supporting production throughput.

Low-NOx burner corporate standard

- The customer requires low-NOx burners.
- This creates a control/turndown challenge, especially at low heat-load conditions (e.g., empty/lightly loaded operation) where it is difficult to maintain low temperatures while preserving needed high-temperature capability.

Access / maintainability requirement

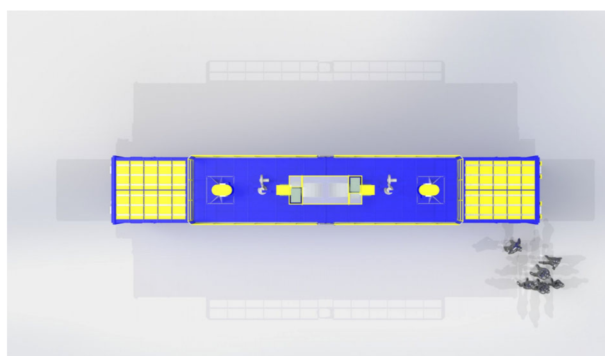
- The customer required side access so operators can quickly remove broken boards inside the oven (open side access rather than full disassembly).

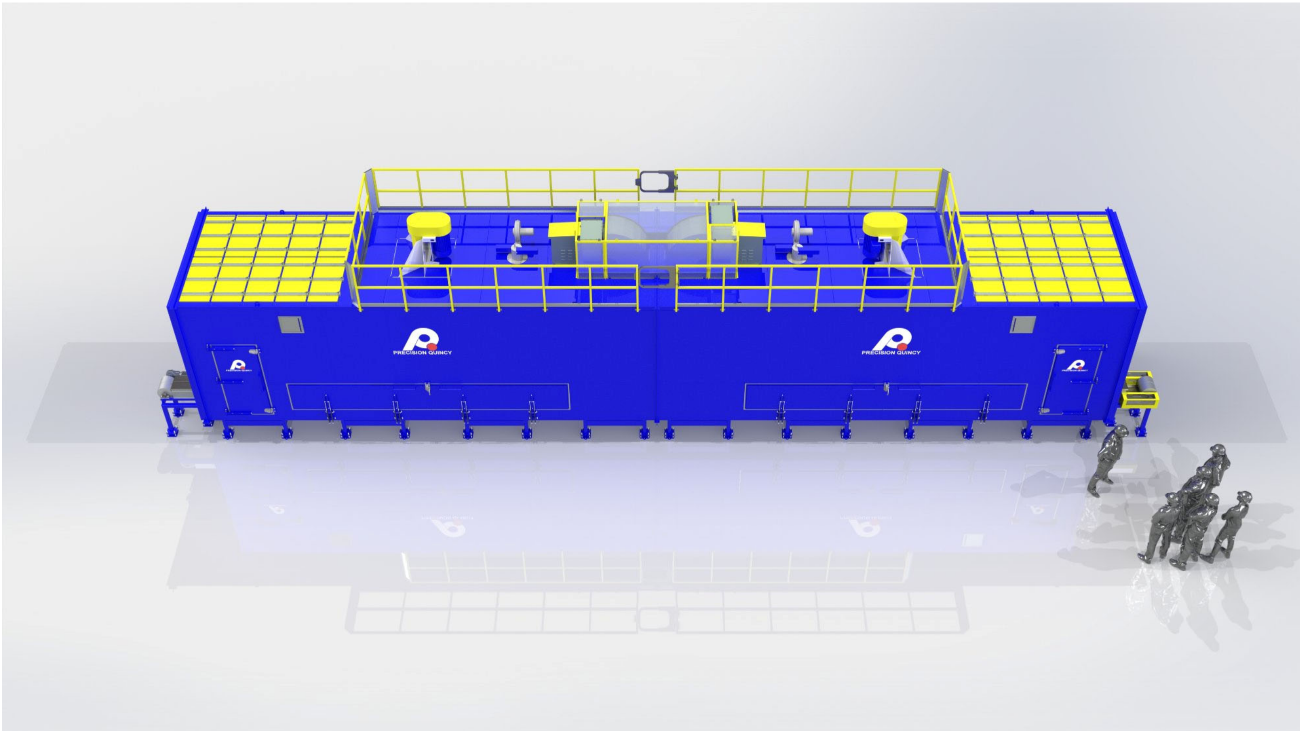
Product stability requirement

- Boards must remain stable and properly guided—no lateral drift, hopping, or airflow-induced movement—while still achieving the required edge paint cure.

Footprint constraint

- The customer provided a very limited installation envelope; the full solution had to fit within ~800 inches total length.





THERMAL PROCESS REQUIREMENTS

These thermal process requirements were jointly developed to meet the customer's process needs, based on a combination of Precision Quincy testing, customer experience, and Precision Quincy's prior experience with similar product lines.

Temperature requirements

- Normal operating temperature: 212°F.
- Maximum capability: 450°F (future flexibility for product line changes; may require belt retrofit).

Conveyor exposure / time-in-heat

- Conveyor speed must be adjustable to achieve different time-in-heat values based on product size.
- Speed range includes up to ~350 ft/min.

Edge-focused airflow delivery

- Airflow must be delivered vertically downward at the board edges.
- Target nozzle discharge velocity: 5,800 FPM, with allowable variation ±870 FPM.
- Nozzle geometry: 3/8-inch-wide slots.

Exhaust requirements (temperature control + process removal)

- Minimum exhaust: 5,250 CFM (water removal from drying + products of combustion).
- Maximum exhaust capability: 17,200 CFM to support stable low-temperature operation given low-NOx turndown limitations.

Heat input requirement

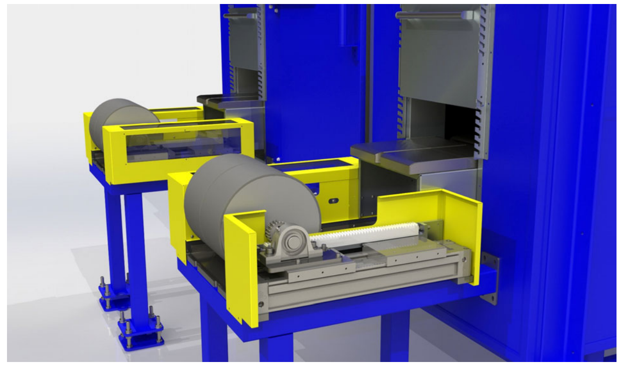
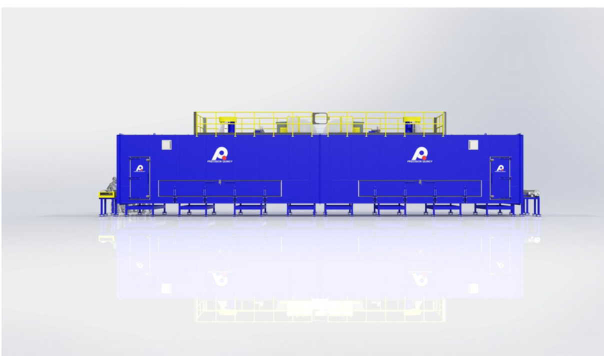
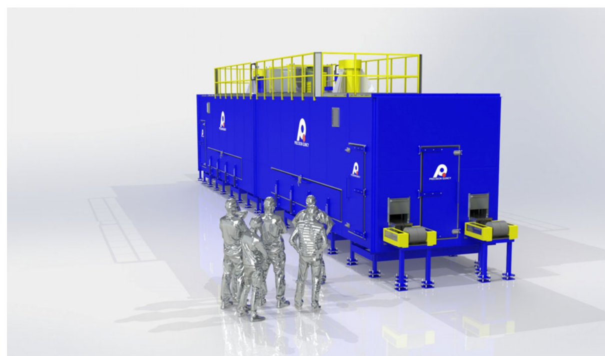
- Required heat input: 5,000,000 BTU/hr.

Moisture load

- Maximum water load capacity: 8 gallons/hr.

Temperature uniformity

- ±10°F from setpoint at the nozzle discharge (sufficient to meet even-heating requirement).

EQUIPMENT CONCEPT & ARCHITECTURE

To deliver the thermal process requirements (which deliver the customer process requirements), Precision Quincy settled on the following equipment concept and architecture.

Overall concept

- Two-zone, dual-path conveyor oven.
- Top-mounted recirculation with burners located upstream of each recirculation fan.
- Conditioned air is directed down from nozzles above each conveyor, then returns down the sides back to the heat source/fan loop.

Airflow/ducting architecture

- Return air flows back to a heat source located upstream of the recirculation fan.
- The recirculation fan pressurizes a duct with outlets to each side, feeding a supply plenum directly over each conveyor.
- Nozzles above each conveyor deliver the required edge-focused vertical-down airflow.

Zone architecture (one fan + one burner per zone)

- Recirculation fan: 40-inch fan, 33,000 CFM @ 3 in. w.c. (concept-point), 25 HP motor (selected via fan curve analysis).
- Heating: Burners fire into a diffuser that mixes burner heat with incoming return air prior to fan pressurization. (2) Maxon OvenPak LE25 burners (one per zone), each 2.5 MMBtu/hr (5.0 MMBtu/hr total). SmartLink MRV servo-driven emissions control (NOx <30 ppm).

Exhaust concept

- Exhaust system located at the center of the oven.
- Equipped with modulating dampers to support the required exhaust turndown/capability.

Serviceability / access

- Two independently operable conveyors run side-by-side with a central walk-through pathway for service.
- The center pathway also serves as part of the return-air space.
- Explosion relief incorporated, with as much relief area as practical placed in the roof.
- Total of 10 access doors. Large side access openings supported by an overhead truss concept enabled by the shell architecture.

Shell / structural architecture

- Shell built around a structural steel frame that integrates the conveyor support structure.
- Interior construction uses free-floating sheet-metal pans designed to accommodate thermal expansion/contraction while minimizing through-metal.
- Construction: 16-gauge interior pans (aluminized), insulation outside the interior pans, 16-gauge exterior cladding (mild steel), two-part epoxy paint, light gray specified by the customer.

Shipping architecture

- The oven ships as two main pieces (two zones).
- Full assembly supported on bolt-on stands removed for shipment to maintain legal over-the-road shipping height.

Conveyor / mechanical concept highlights

- Belt return runs through a vestibule and can be configured for additional cooling air (if needed) to protect the belt.
- Belt tracking uses a V-guide / V-groove on the back of the belt (no active tracking system).
- Drive: Each conveyor has its own gearbox on a torque arm. Drive motor: 2 HP per conveyor, VFD-controlled. Lag pulleys used to grip/drive the belt.
- Take-up: Rack-and-pinion synchronized take-up with pneumatic cylinders (one system per conveyor/zone). Bearing blocks on slides maintain pulley shaft alignment.

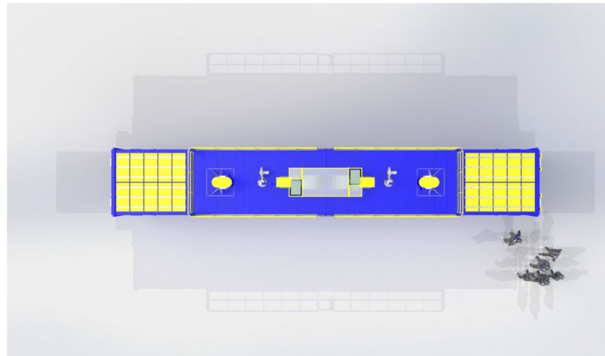
Controls architecture

- Controls are remotely located.
- Allen-Bradley CompactLogix PLC controls this curing module and the adjacent paired equipment.
- VFDs are Yaskawa (customer-specified).
- Burner safety hardware uses a Karl Dungs-based safety system with Maxon/Honeywell burner control components.

Other noted attributes

- Coating is non-VOC.
- Roof areas not occupied by explosion relief are outfitted with guard rails for service access.

- Equipment was fully tested and accepted via FAT at Precision Quincy; a future widening retrofit was requested by the customer but has not been executed.



TECHNICAL SPECIFICATIONS

Oven Configuration	
Type	Continuous conveyor, two-zone, dual-path, vertical-down edge-focused airflow
Heated Zone Length (per zone)	366 in (total: 732 in)
Width (per conveyor path)	12 in
Clear Height Above Belt	5.5 in
Equipment Overall Dimensions	186.9 in W × 800 in L × 189.5 in H
Inlet/Outlet Vestibules	18 in each end
Overall Length / Shipping	~60 ft total; shipped as (2) ~30 ft zone sections bolted together
Footprint Constraint	Must fit within ~800 in total length installation envelope
Service Access	Central walk-through pathway + side access; 10 access doors total
Explosion Relief	Roof-mounted relief where practical; roof guard rails for access

Thermal Heat Power System	
Operating Temperature	212°F
Maximum Temperature	450°F (future flexibility; may require belt retrofit)
Temperature Uniformity	±10°F from setpoint at nozzle discharge
Heating Zones	2
Heat Source	(2) Maxon OvenPak LE25, 2.5 MMBtu/hr each (one per zone)
Heat Power	5,000,000 BTU/hr
Emissions Control	Servo-driven SmartLink MRV (Maxon/Honeywell), mapped to maintain NOx < 30 ppm

Recirculation / Airflow System	

Airflow Pattern	Vertical-down, edge-focused discharge from overhead nozzles; side returns to heat source/fan
Nozzle Geometry	3/8 in wide slots
Nozzle Discharge Velocity	5,800 FPM ±870 FPM
Fans (Per Zone)	40 in fan; 33,000 CFM @ 3 in. w.c. (concept point)
Fan Motor (Per Zone)	25 HP
Burner Location	Upstream of fan, firing into a diffuser for mixing prior to fan pressurization

Exhaust System	
Location	Center of oven
Minimum Exhaust	5,250 CFM
Maximum Exhaust Capability	17,200 CFM
Control	Modulating dampers
Basis	Supports low-temperature stability with low-NOx turndown limits; removes water from drying + products of combustion

Conveyor / Handling System	
Configuration	Two independently operable side-by-side conveyors (dual-path)
Drive (Per Conveyor)	2 HP motor with gearbox on torque arm, VFD-controlled
VFDs	Yaskawa (customer specified)
Take-Up	Rack-and-pinion synchronized take-up with pneumatic cylinders; bearing blocks on slides
Tracking	V-guide / V-groove on belt back (no active tracking system)
Drive Interface	Lag pulleys for belt grip
Belt Return	Return runs through vestibule; can be configured for additional cooling air if required
Conveyor Capacity	300 lb evenly distributed per conveyor

Construction Materials / Finish	
Primary Structure	Structural steel frame integrating conveyor supports
Interior	16-gauge aluminized free-floating pans (expansion/contraction tolerant)
Exterior	16-gauge mild steel cladding
Paint	Customer-specified light gray, two-part epoxy coating
Thermal Isolation	Insulation outside interior pans; minimized through-metal architecture

Safety & Compliance (Burner / System)	
NFPA 86 Classification	Class A
Burner Safety Hardware	Karl Dungs-based safety system
Burner Controls	Maxon/Honeywell components

Controls & Electrical	
PLC	Allen-Bradley CompactLogix (controls this module + adjacent paired equipment)
Control Cabinet Location	Remotely located

Process Notes	
Coating	Non-VOC
Testing	Equipment completed FAT at Precision Quincy; customer accepted
Future	Customer requested a widening retrofit concept (not executed yet)

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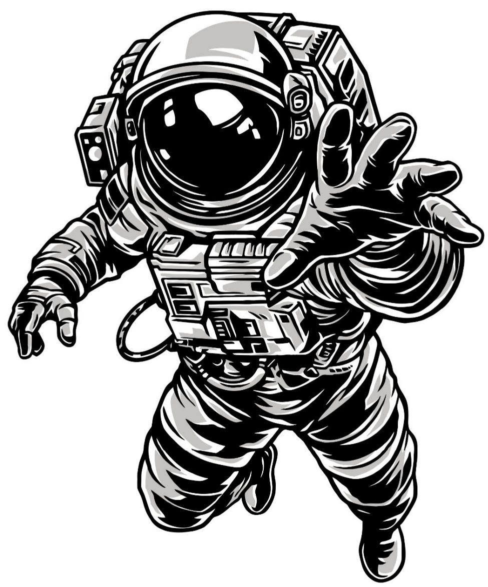

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