SJ Industrial Ovens

High-Temperature Kilns, Furnaces & Ovens for Non-Metallic Materials

Specialized Ceramic & Mineral Processing

Achieving ideal density, hardness, and dimensional control.

THERMAL PROCESSING FOR TILES, CERAMICS, GLASS, AND COMPOSITES

In the world of non-metallic materials, precise heat treatment dictates the final product's physical properties—from the sheen of a glazed tile to the strength of a technical ceramic. SJ Industrial Ovens designs and manufactures highly stable, high-temperature kilns and ovens that provide the controlled thermal environment essential for perfect **sintering**, **calcination**, and **curing** cycles.

CORE APPLICATIONS & MATERIAL INDUSTRIES

Our thermal equipment is integral to a diverse range of manufacturing processes:

Ceramic Tiles (Wall, Floor, Porcelain)

Refractory Materials (Kiln Linings, Bricks)

Technical Ceramics (Alumina, Zirconia)

Polymer Curing (Paints, Resins, Composites)

Glass Annealing (Automotive, Flat Glass)

Frit & Glaze Melting

Abrasives Manufacturing

Mineral Calcining (Gypsum, Lime, Clay)

Carbon Products (Baking/Graphitization)

PRIMARY THERMAL PROCESSES

1. Drying Ovens (Moisture Removal)

Focus: Tiles, ceramic green bodies, pre-cast concrete sections.

Benefit: Controlled, low-temperature drying removes free moisture before firing. This prevents **spalling**, **cracking**, and **shrinkage defects** caused by rapid water vaporization in the kiln.

Temp: Up to 200°C | **Equipment:** Conveyor Dryers, Tunnel Dryers, Batch Cabinets.

2. Sintering Kilns (Densification)

Focus: Porcelain tiles, structural ceramics, advanced composites.

Benefit: High-temperature firing causes fine particles to bond into a solid, dense mass without melting. SJ kilns provide the tight **temperature uniformity** and **soak time** needed to achieve specified density, hardness, and low porosity.

KEY ENGINEERING FEATURES

Heavy-Duty Refractory Design

Our furnaces are built with multi-layered, low thermal mass refractory linings (ceramic fiber, high-alumina brick) to withstand extreme temperatures and repeated thermal cycling while minimizing energy consumption.

Fuel Source Flexibility

- **Electric Heating:** Clean, precise temperature control for technical ceramics and high-purity materials.
- **Gas Fired (Natural Gas/LPG):** Cost-effective, high-enthalpy heating for large-scale tile and mineral processing kilns.
- **Hot Air Generation:** External combustion systems for contamination-sensitive drying and curing applications.

Airflow Control (Drying)

High-velocity, balanced airflow systems prevent thermal stratification and ensure uniform removal of

Temp: Up to 1800°C | **Equipment:** High-Temperature Kilns, Shuttle Furnaces.

moisture and solvents across large loads of tiles or coated panels.

ADVANCED THERMAL PROCESSES

3. Calcining (Decomposition)

Focus: Pigments, mineral powders (e.g., clay, lime, gypsum), raw ceramic batches.

Benefit: Heating materials to a high temperature to cause thermal decomposition, removing volatile components (like CO_2 or H_2O) and increasing purity. Essential for manufacturing cement, plaster, and specialty oxides.

Equipment: Rotary Kilns, Hearth Furnaces | **Key Requirement:** High throughput and effective exhaust management.

4. Annealing and Stress Relief (Glass & Composites)

Focus: Flat glass, optical components, fiber-reinforced plastic (FRP) parts, thermoset polymers.

Benefit: Controlled cooling (annealing) of glass prevents internal stresses that lead to fracture. Curing cycles for composites are precisely managed to ensure full cross-linking of the polymer matrix without exceeding the maximum exotherm temperature.

Temp: 120°C to 700°C | **Equipment:** Precision Batch Ovens, Continuous Lehr Furnaces.

5. Glaze Firing (Surface Finish)

Focus: All glazed ceramic products and tiles.

Benefit: Applying a high-gloss or textured surface finish. The kiln must precisely follow a high-speed temperature curve to achieve optimal melting, leveling, and adhesion of the glaze without damaging the underlying ceramic body.

Equipment: Roller Hearth Kilns, Tunnel Kilns | **Key Requirement:** Fast cycling, multi-zone control.

CUSTOMIZATION AND CONTROL TECHNOLOGY

PLC and Automation

Our control systems are designed for complex, multi-segment thermal profiles typical in ceramic and mineral processing:

- **Multi-Zone Control:** Independent temperature control along the length/width of the kiln to manage sintering gradients and cooling rates precisely.
- **Recipe Storage:** HMI (Human-Machine Interface) allows operators to instantly recall profiles for different tile sizes, material compositions, and glaze types.
- **Gas Flow Management:** Automated control of air/fuel mixture and flue gas damper positions for optimal atmosphere and fuel efficiency.

Material Handling Systems

We build robust material movement systems tailored to product weight and production volume:

- **Roller Hearth:** For continuous, fast firing of flat tiles and panels.
- **Shuttle Kilns:** For large, heavy batch loads (e.g., refractory bricks, specialty ceramics).
- **Car Bottom:** Heavy-duty systems for extremely large, high-mass products.

ACHIEVING QUALITY AND CONSISTENCY

The yield of non-metallic manufacturing is highly dependent on thermal control. Our systems ensure:

Dimensional Accuracy

Precise temperature control minimizes uneven shrinkage and warpage, reducing scrap rate for high-value products like porcelain tiles and technical ceramics.

Color & Surface Consistency

Controlled oxygen levels and stable temperatures during glaze firing prevent defects like pinholes, bubbles, and inconsistent color development.

Mechanical Strength

Ideal sintering time and temperature profiles maximize grain growth and bond formation, resulting in superior product strength and abrasion resistance.

TECHNICAL CAPABILITY SUMMARY

Process Type	Max Temperature Range	Temperature Uniformity	Heating Media
Drying & Curing Ovens	Ambient +10°C to 450°C	±3°C	Electric, Gas (Indirect/Direct)
Sintering & Firing Kilns	500°C to 1800°C	±5°C (High Temp)	Electric ($MoSi_2$ Elements), Gas Fired
Annealing & Stress Relief	200°C to 800°C	±2°C	Electric, Gas (Forced Convection)
Calcining Furnaces	500°C to 1200°C	Process Dependent	Gas Fired (High Efficiency)

SERVICE & CUSTOM ENGINEERING

Our commitment extends beyond installation. We provide full system commissioning, profile optimization, and ongoing support for all our thermal equipment.

- **Full Factory Integration:** Systems designed to integrate seamlessly with mixing, pressing, and handling lines.
- **Energy Audits:** Custom solutions focused on reducing the fuel/electricity consumption per finished ton of product.
- **Modular Design:** Ability to expand or modify zones as production requirements evolve.

Consult with Our Engineers for Your Ceramic, Tile, or Glass Thermal Project

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