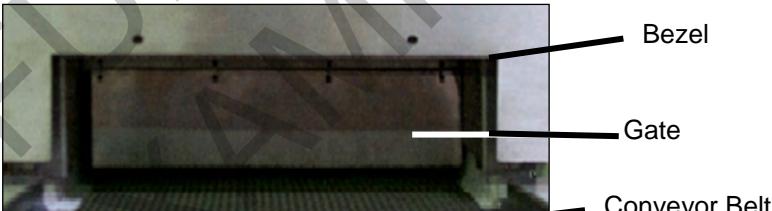
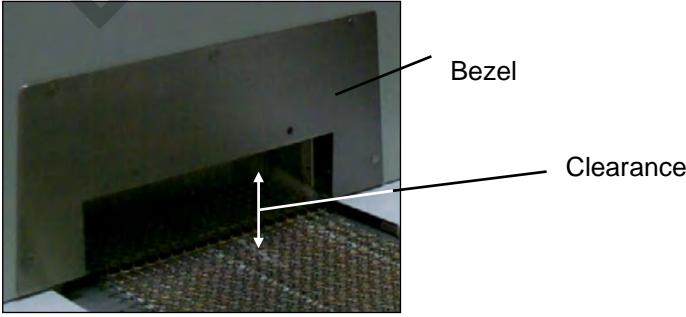
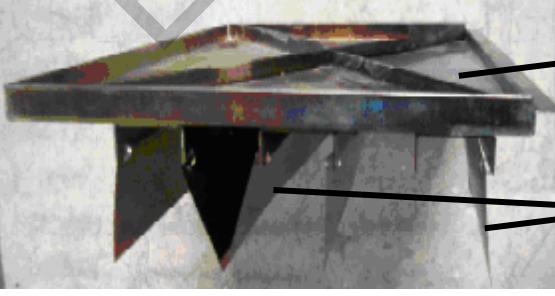
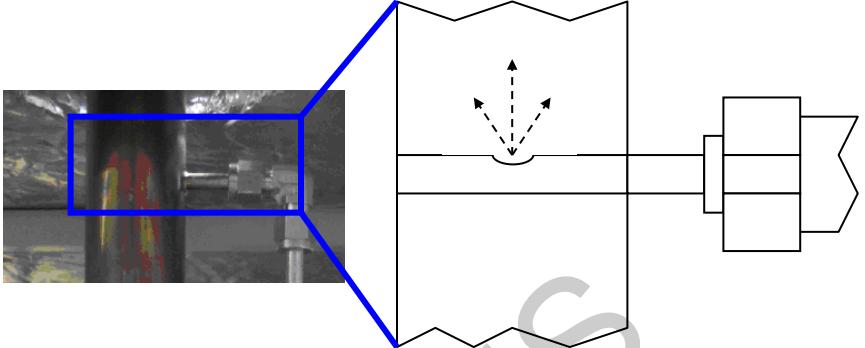
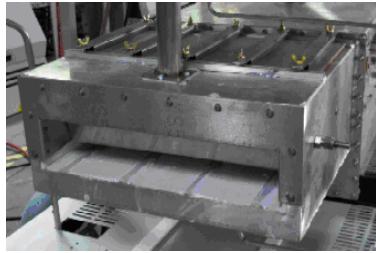


8.5 Glossary

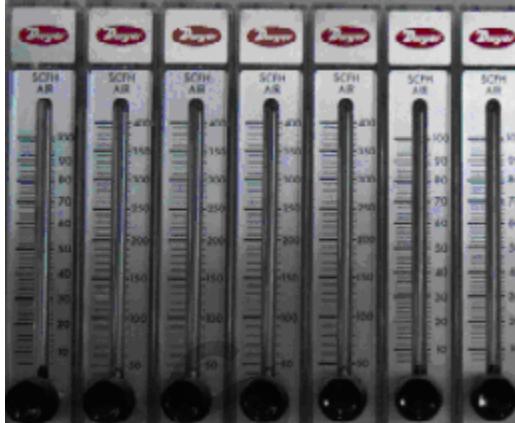
Across-the-Belt	In reference to an area perpendicular to the direction of travel through the furnace; the width of the conveyor belt.
Actual Temperature	The instantaneous temperature in the furnace as reported by the thermocouple.
Air-Rake	Long tube set across-the-belt with proportionally spaced small holes.
	
Air-Regulator Tubes	Air rakes charged with air or N2 installed in the entrance and exit baffles, used in establishing a controlled atmosphere.
Blade	Hinged flaps at entrance and exit of furnace that help prevent furnace atmosphere from escaping. See also figure under Drip Trays.
	
Bezel	Semi-permanent entrance guard at furnace entrance and exit. See also Gate.
	
CDA	Clean dry air – filtered, dry compressed air used as process gas.
Chamber	See heating chamber.

Section 8

Clearance	The distance at furnace entrance between the conveyor belt and the bezel. See diagram under bezel.
Contaminants	Anything present in the process section that could negatively impact product quality including but not limited to O ₂ , moisture or particulate matter.
Convection	The process of heating a product via indirect transmission of heat from adjacent high-temperature air.
Controller	Control system that stabilizes temperature, monitors belt speed, alarm conditions and other functions.
Controlled Atmosphere	The atmosphere generated from the process gas, and gas flow patterns within the process section.
Cooling Section	The portion of the furnace that includes the transition tunnel, if any, exit baffle and any additional modules provided for the purpose of cooling the product.
Derivative	The calculated temperature rate of change; used in the PID equation.
Dilution Purge	The continuous process of adding clean gas while exhausting contaminated gas.
Dominant Wavelength	The wavelength of highest occurrence emitted by a radiating element at a specific temperature as described by Wein's Displacement Law.
Drip Trays	Trays positioned beneath stacks with attached baffle gates; used to catch condensation or residue produced by the process.  Drip Tray Baffle Gates
Edge Heater	Heaters along edge of chamber used to maintain uniform temperature across-the-belt in a designated part of the heating chamber.

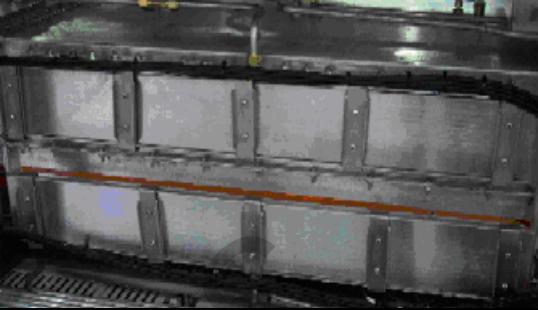
Eductor	Metered gas exit used to draw exhaust gas out of the chamber and through the stack. See also stack.
	
Effluents	Contaminants expelled from a product during a thermal process. See also volatiles.
EMO	An Emergency off switch.
	
Entrance Baffle	The section at the entrance of the furnace incorporating an air-regulator tube, hanging gates and an exhaust stack; used to establish a controlled atmosphere inside the process section.
	
Exhaust Gas	Spent process gas.
Error	Difference between actual temperature and setpoint.
Flash	The point at which organic vapors have reached the temperature and concentration necessary for spontaneous combustion.

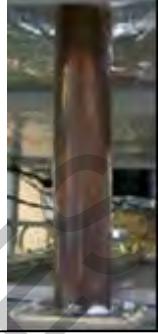
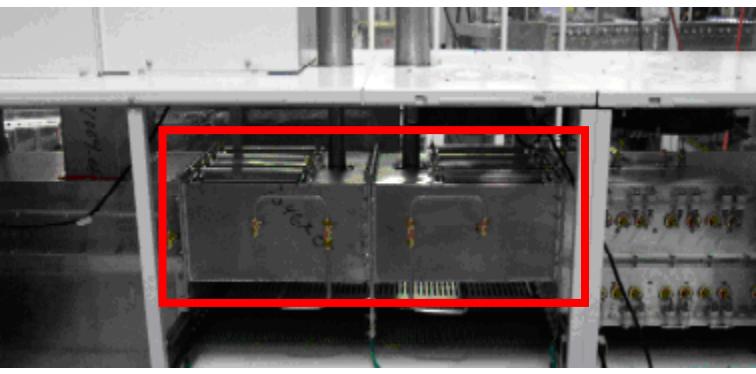
Section 8

Flow Meter	A manually adjustable gauge used to control the flow of gas or liquid to the process section.	
FG or Forming Gas	A type of process gas that consists of any mixture of H ₂ and N ₂ gasses.	
Furnace Length	The length of the entire furnace. The sum of the process section and any loading and unloading stations.	
Gain	Term in PID equation to calculate how far temperature is from setpoint.	
Gate	Plate that divides furnace into sections that can allow better control of the processing environment. See Blade and Drip Trays for picture.	
H₂	Hydrogen gas.	
Heat Lamp	Double ended metal sleeve clear quartz infrared (IR) heat lamp element or emitter.	
Heated Length	See "Heating Chamber", next.	
Heating Chamber	Furnace area where heating takes place. Also referred to as the chamber, or heated length.	
Heating Section	The portion of the furnace including the entrance baffle and the heating chamber.	
Hydrogen Detector	Detect hydrogen escaping from furnace.	
Integral	Mathematical operation that is one term in the PID equation.	
Interlocks	Switches on some cabinet doors that stop furnace operation and removes power when doors are opened.	

IR	Electromagnetic wave. Wavelengths between 0.78 and 1000 μm in the electromagnetic spectrum.
Lamp Strings	<p>A single lamp circuit which may include one lamp, or two or more lamps in series.</p> <p>LA-309 Standard Power furnaces are wired with two lamps per string in zones 1 and 3. Zone 2 is wired with 3 lamps per string at all voltages above 240 Vac*.</p> <p>LA-309 High Power furnaces are wired with two lamps per string in all zones at all voltages above 240 Vac*.</p> <p>*208-240 Vac LA-309 furnaces are wired with one lamp per string in all zones.</p>
LPM	Liters per minute. Units of flow equivalent to 2.119 CFH.
Micron	One millionth of a meter, $1.0 \times 10^{-6} \text{ m}$, $1.0 \mu\text{m}$
MMI	Man machine interface software development tool for creating user interface to PLC controller.
Module	A section of the furnace designed for a specific function; may be 15, 30, 45 or 60 inches in length.
N₂	Nitrogen gas.
O₂	Oxygen gas.
Oxygen Analyzer	Detects oxygen content at predetermined locations. Usually installed to read process gas source, and up to three locations in the heating chamber.
Phase Angle Firing	Technique that activates AC power to be applied for only certain times during AC cycle.
PC	Personal computer. The PC provides the main operator interface for operating the furnace. The PC interfaces with the PLC.
PID	Proportional+Integral+Derivative: Three-term closed loop control equation that adjusts power sent to heat lamps. See also Gain, Integral and Derivative.
PLC	Programmable Logic Controller. An industrial computer which provides input and output control of the furnace.

Section 8

Plenum	Cutout area of chamber insulation where process gas is injected.
Plenum Box	Pressurized region, enclosing ends of heat lamps, part of the hermetic seal option.
	
PPM	Parts per million. Useful ratio for measuring small amounts of one gas in an area dominated by another.
Process Gas	The gas used in creating a controlled atmosphere. Some examples are CDA, N ₂ , H ₂ , forming gas or other N ₂ /H ₂ mixtures.
Process Environment	The description of the area inside the furnace at any time including the temperature, flow patterns, and the presence or absence of product, process gas, process effluents, or contaminants.
Process Section	The physical area inside the furnace from the entrance bezel to the exit bezel. The sum of the heating section and cooling section.
Profile	See Temperature Profile.
Proportional Band	The temperature range used in the PID equation in applying a portion of the available power to the heat lamps based on the deviation of the actual temperature from the setpoint.
Recipe	Instructions, including temperatures and belt speed that the furnace follows.
Resonant Frequency	The frequency at which the atomic structure of a material is easily excited into physical vibration resulting in excellent heat transfer characteristics.
SCFH	Standard Cubic Foot per Hour. Measurement for gas flow volume. Equivalent to 0.472 standard liters per minute.
SCR	Silicon Controlled Rectifier. The electronic device used to regulate power to the heat lamps through signals sent by the PLC controller.
Setpoint	The target temperature for a zone.

Sparger Tubes	Highly porous, sintered metal tube charged with process gas; typically used in controlled atmosphere cooling modules.
Stack	Exhaust stack containing eductor. See also eductor.
	
STP	Standard temperature and pressure: 21.1 C (70 F) 1 Atm, 1.013 Bar (14.7 psig)
Temperature Profile	Temperature recorded over a period of time.
Thermal Process	The idealized process description for a particular product as it passes through the process section, including the product temperature profile and process environment.
Thermal Process Profile	Empirical record of the thermal process
Thermocouple	An electronic device that measures temperature.
Throat	The throat of the furnace describes the maximum height of any product allowable through the process section.
Transition Tunnel	Chamber section between heat and cooling section. 

Section 8

Volatiles	Hydrocarbon based product effluents.
With-the-belt	In reference to the area of the conveyor belt that extends through the process section.
Zone	Area within the chamber where temperature can be independently controlled.

LCI FURNACES
EXAMPLE