

Unlocking the keys to successful air flow design for heat processing applications

Industrial ovens are key workhorses of the manufacturing process and are used to process part(s). Industrial ovens are typically used for heat processing applications under 1,000°F and for a wide variety of thermal processes including drying, curing, annealing, tempering, aging and more. Once the heat process has been determined, the engineer will design the oven with specific air flow patterns, impingement and uniformity to achieve the required results.

Key 1: Uniformity

Process time at temperature, heat up rates and uniformity are all variables that need to be taken into account to help determine the most efficient design of a system. Process time and heat up rates will determine the size of the oven along with the BTU output of the heat source. Uniformity is the next major element to consider.

A basic batch oven usually will operate at an oven air temperature of +/- 10°F chamber uniformity. Oven manufacturers can lower the tolerance down as far as +/-1°F if needed. To achieve tighter chamber uniformity we need to increase the number of air changes per minute. The more times the air is recirculated, the more uniform the chamber becomes. Higher rates of recirculation require larger horse power motors and/or bigger fans which can increase the cost of the oven.

Not every process will require tight uniformity tolerances so it is important to let your supplier know what temperature variance is acceptable for your process. The engineer will design a system that not only meets the needs of your process, but is energy and cost efficient. Remember, the tighter temperature tolerance required will increase the price of the equipment.

Key 2: Air Flow Patterns

Industrial ovens are much more than heated boxes. ITS utilizes precise engineered air flow design to deliver the air to the product. There are various air flow patterns that are commonly used in the industry including top down, bottom up, horizontal, or combination. Each of these air flow patterns are an important component in oven design. Typically, certain products favor certain air flow design. **Conveyor ovens** very often have vertical air flow, while **batch ovens** favor horizontal.

ITS TECH TALK

AIR FLOW DESIGN FOR INDUSTRIAL OVENS AND WHY IT IS IMPORTANT

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The Keys to successful Industrial
Air Flow Design

Key #1: Uniformity

Key #2: Air Flow Patterns

Key #3: Nozzle Design

Key #4: Manufacturer Experience

Air Flow Design for Industrial Ovens

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Key 3: Nozzle Design

After an air flow pattern is determined the next step to consider is called impingement. Impingement increases the surface to volume ratio and heats up the product faster. Usually this is accomplished with the use of some type of slot nozzle, cone or louver. The velocity and type of nozzle is best determined by the application. The shape, texture and material type all are instrumental and contribute to the type of nozzle that will work best for the application. The impingement works best when the air hits the product perpendicular to the surface of the material to be heated.

Key: 4 Manufacturer Experience

Now that you have defined your process, it's time to partner with a manufacturer who can meet your needs and stay within your budget. International Thermal Systems (ITS) offers a wide array of air flow patterns along with nozzle designs specifically for your process.

ITS has successfully designed and installed industrial ovens with our classic HVN air flow, the ITS patented Turbo Flow, or the newly introduced Three5 and Acu-flow system. ITS has a proven track record of meeting tight temperature uniformity requirements in applications across a wide variety of industries.

ITS can also use Computational Fluid Dynamics (CFD) software to provide visual representation showing the airflow and uniformity characteristics of the proposed system. ITS also offers an onsite test facility where we can demonstrate real time testing on your parts under conditions similar to the actual application.

As described, there are many different variables that need to be considered when designing the air flow pattern for your industrial oven, connecting with a partner that understands thermal processing is vital to a successful project. ITS has been designing ovens for more than 50 years with thousands of installations across the globe.

We look forward to partnering with you.

**Contact ITS for a product proposal
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Visit our website at internationalthermalsystems.com

