Continuous Microwave Cylindrical Heating System

The IMS Cylindrical Heating System employs microwave technology that features a unique, ultra-rapid method of heating aseptic and extended-shelf-life pumpable food products and biomaterials. The system's patented heating technology enables liquid and semi-liquid pumpable foods and beverages to be uniformly and volumetrically heated on a continuous flow basis while pumped through a product heating tube manufactured from food-grade materials. By providing uniform high-intensity electromagnetic energy to the flowing components, the IMS Cylindrical Heating System solves the problem of hot spots experienced with traditional surface-heating technologies.

The result: benefits that allow manufacturers currently using conventional heat exchangers an opportunity to greatly improve product quality while reducing floor space and increasing operational efficiency.

Applications

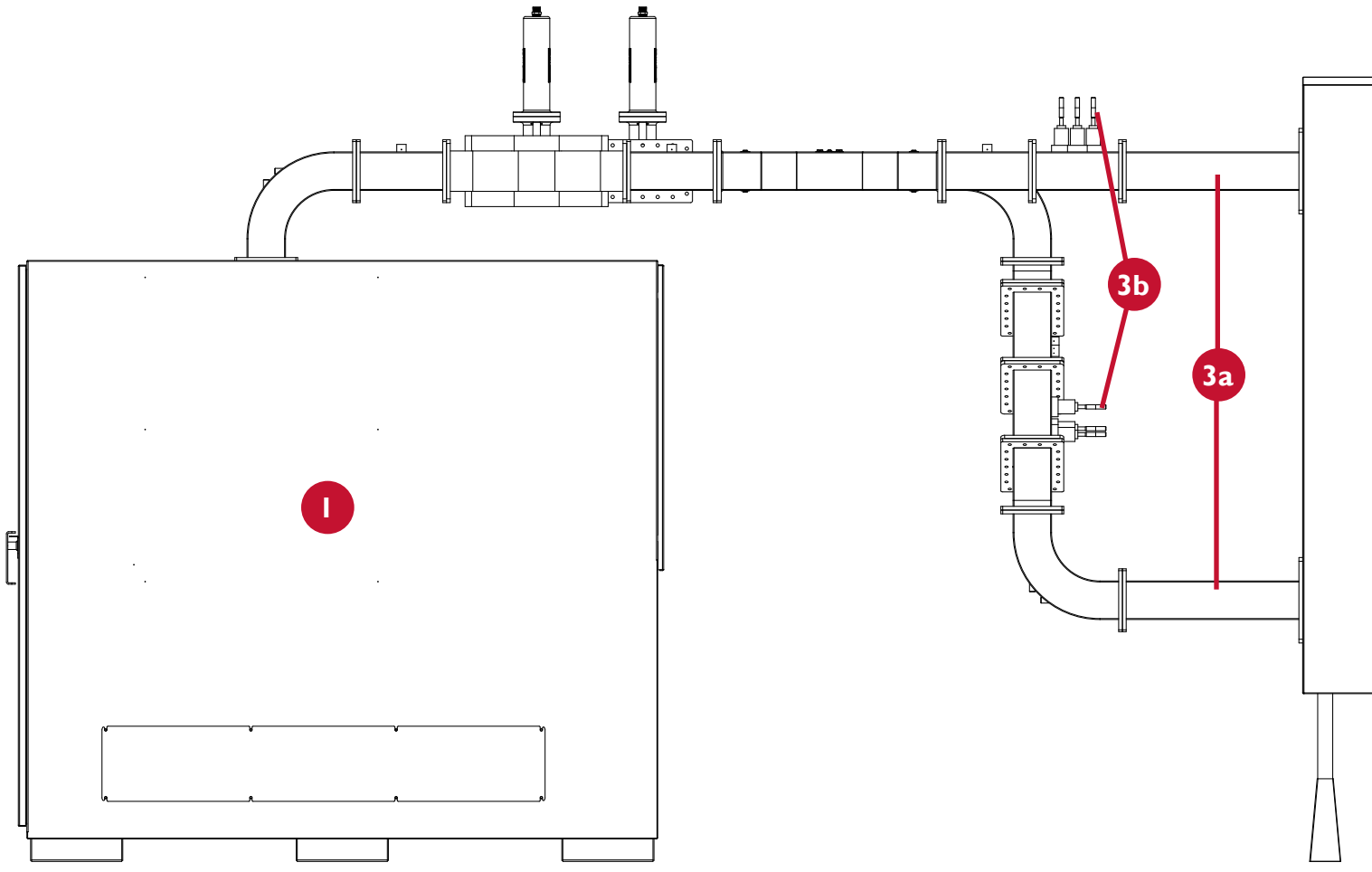
The IMS Cylindrical Heating System has been used for thermal processing of over sixty food products, including:

- Cheese sauces
- Coffee-based drinks
- Dairy-based foods and desserts
- Fruit purees
- Meat slurries
- Particulate soups
- Pasta sauces
- Poultry emulsions
- Salsa
- Smoothies
- Soy milk
- Surimi
- Tomato-based products
- Vegetable purees

IMS Industrial Microwave Systems

Why is the IMS Cylindrical Heating System the best choice for pumpable food products?

- Cool tube wall surfaces, fast product heating, and short residence times minimize fouling deposits and product degradation, increasing product run times
- Superior products with minimal color change and better nutrient retention and organoleptic properties
- Due to volumetric heating, center of particulate products may achieve higher temperature than the surrounding carrier fluid, enhancing adequate thermal processing
- Requires minimal formulation changes to achieve even temperature distribution during heating
- Ideal for thermal processing of high-value and/or shear-sensitive high-viscosity and multiphase fluids
- Excellent method for thermal treatment of high- and low-acid products, particularly when enzyme deactivation is important
- Non-intrusive continuous process is easy to control, clean in place, and inspect
- Low maintenance system with no moving parts
- Can be combined with other technologies to optimize final heater retrofits or new production lines
- Standard design modules can be added to expand production throughput or increase heating range



1 Microwave Generator

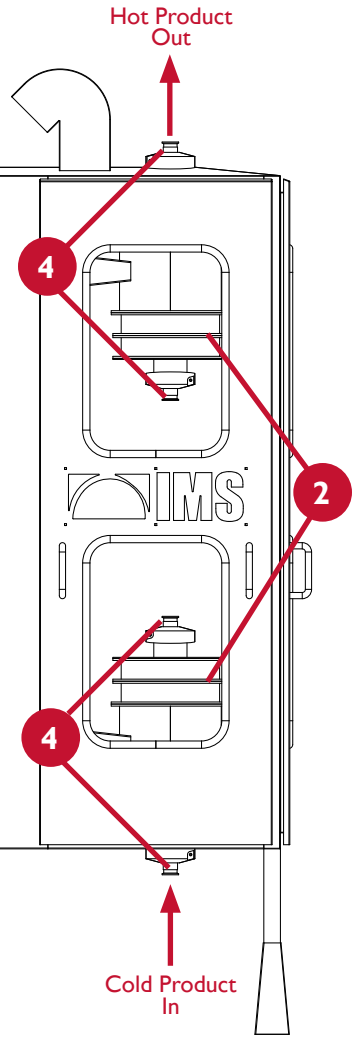
Converts electrical power into electromagnetic energy. High-voltage output from a transformer and switch-mode power supply unit powers a magnetron that emits a stable source of 915 MHz microwave energy. Typically, a magnetron is warranted for a minimum life of 2,500 hours at an output of 100 kW. The microwave generator is housed in an epoxy-painted carbon steel NEMA 12 cabinet. Chilled water is required to cool the magnetron and other components in the cabinet.

2 Applicator

The heart of the Cylindrical Heating System—a cylindrical cavity that surrounds the microwave-transparent tube through which product is pumped. The patented, single-mode applicator design ensures that a uniform energy field is located at the exact position of the product heating tube. The result is a very efficient conversion of electrical energy to sensible heating of the product.

3 Wave Guides (3a) and Tuning (3b)

Microwave energy is conveyed from the generator to the applicator(s) by interconnecting wave guides. These allow the generator to be located in a separate area away from the applicator(s). Wave guides incorporate tuning stubs with micrometer control that can optimize the microwave energy absorption of a food product dependent on its dielectric properties and temperature.



4 Product Heating Tube

The vertically oriented product heating tube is held in the applicator by special clamps that locate it precisely and ensure that any microwave radiation leakage is at least five times lower than that specified by the FDA. Operator safety shrouds are provided in Plexiglas as standard. (The optional safety enclosure shown here is available in stainless steel.)

5 Control System

Depending on process requirements, some design configurations may use multiple applicators and microwave generators to optimize control of microwave power density and temperature rise during the thermal heating process. The closed loop PLC control system typically uses the product temperature exiting the final applicator to adjust the power output from the microwave generator. The control system and color touch screen interface are housed in a stainless steel NEMA 4 cabinet that is usually wall mounted near the applicator(s). IMS service technicians can access the system for troubleshooting through an Ethernet modem whenever a customer provides a dedicated land based phone line for the modem or VPN.

About IMS

Industrial Microwave Systems, L.L.C., (IMS) is a wholly owned subsidiary of Laitram, L.L.C., a private company based in Harahan, Louisiana. Purchased by Laitram in 2003, IMS is headquartered in the Research Triangle Park area of Raleigh Durham in North Carolina and is a leading designer and manufacturer of continuous microwave heating and drying equipment.

What differentiates IMS from other microwave equipment suppliers is its portfolio of proprietary patented technologies. These allow commercial production scale processes to achieve uniform microwave drying and moisture control for Planar Belt Systems and heating of pumpable fluids for Cylindrical Heating Systems. This uniformity improves predictability and control of the heating and drying process, resulting in a more efficient solution to a wide array of industrial applications.

CONTACT

To organize a product trial or request additional information, please contact:

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OPERATING PARAMETERS

Maximum product throughput:	Depends on physical properties of product, power output of the magnetron(s), and initial and final heating temperatures.
Example:	Each 100 kW microwave generator can increase the temperature of 3,000 #/hour (1.5 metric ton/hour) of an aqueous-like product by 108°F (60°C).
Product Heating Tubes:	Available in FDA-approved plastic or ceramic materials in sizes up to 2.5" (63 mm) internal diameter.
Max. working temperature:	302°F (150°C)
Max. working pressure:	150 psig (10.5 bar), depending on tube material and diameter

Utility requirements:

Feed for generator cabinet:	200 amps, 480 (+/- 5%) VAC, three phase 50/60 Hz
Feed for control panel:	20 amps, 120 VAC, one phase 50/60 Hz
Max. power consumption:	115 kW per 100 kW generator module
Cooling water for magnetron, circulator, and water load:	20 gallons (75 liters) per minute at 75°F (+/-5°F); 24°C (+/-3°C) inlet temperature and 45 psig (3.2 bar) minimum pressure
Optional chiller package:	This 10 TR air-cooled unit eliminates the need for once through magnetron cooling water

Operating cost:

Depending on local utility prices, the operating cost may be similar to that of a steam or hot water heated conventional heat exchanger for a given heat load.

System footprint:

The overall footprint or floor space requirements for an IMS Cylindrical Heating System will vary with local plant conditions and specific customer requirements; however, each system is designed for site installation and assembly by using standardized components or modules, such as the following:

Microwave Generator:	6'0" (1.83 m) x 2'6" (0.76 m) x 9'3" (2.82 m) height
Control Panel:	2'8" (0.81 m) x 0'9" (0.23 m) x 4'0" (1.22 m) height
Two-stage Applicator:	2'9" (0.84 m) x 2'0" (0.61 m) x 8'2" (2.49 m) height