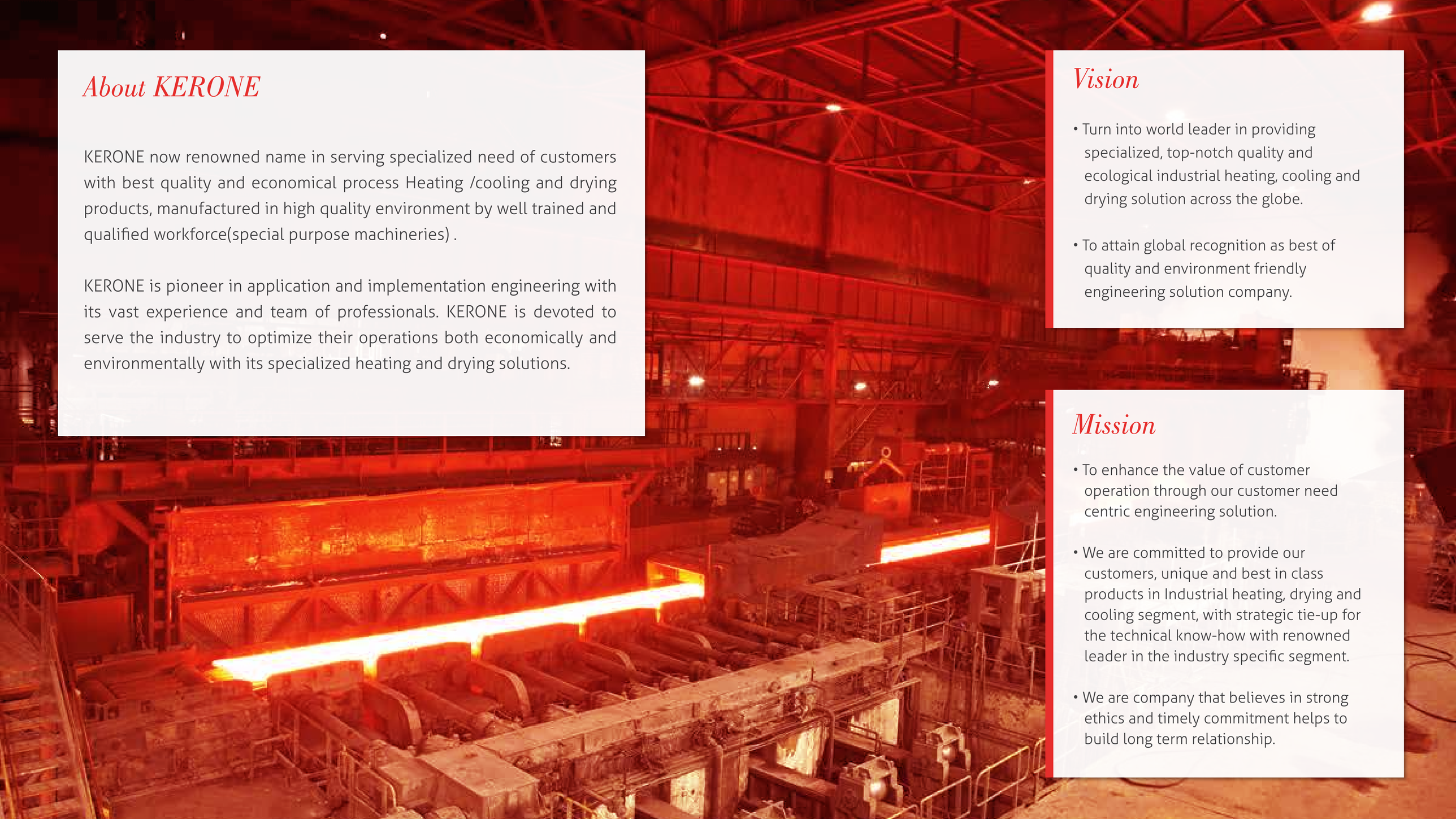
MICROWAVE
HEATING SYSTEMS

KERONE

www.kerone.com

In Association with SVCH-Technologii, Moscow (Russia)

ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001



About KERONE

KERONE now renowned name in serving specialized need of customers with best quality and economical process Heating /cooling and drying products, manufactured in high quality environment by well trained and qualified workforce(special purpose machineries) .

KERONE is pioneer in application and implementation engineering with its vast experience and team of professionals. KERONE is devoted to serve the industry to optimize their operations both economically and environmentally with its specialized heating and drying solutions.

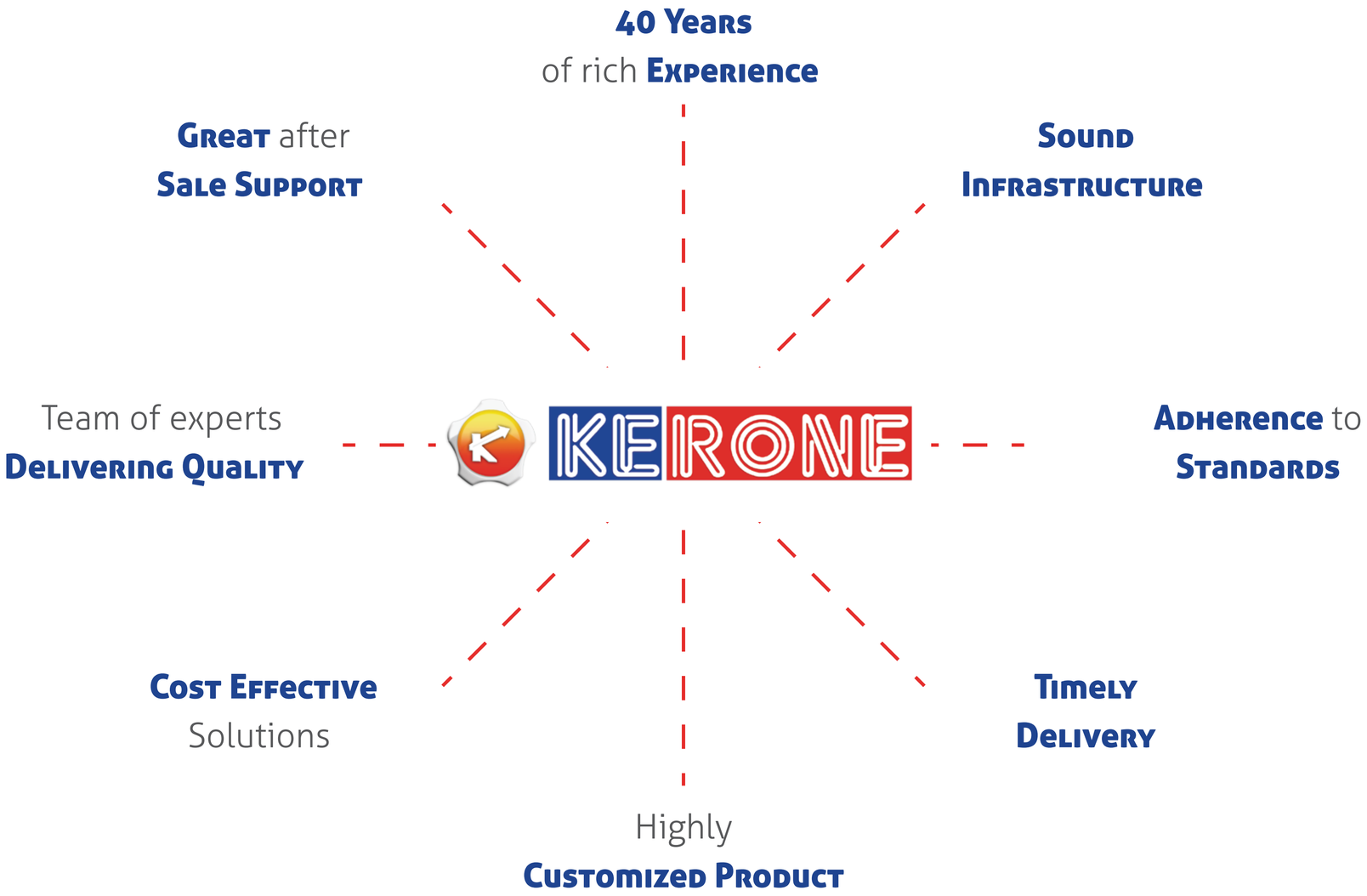
Vision

- Turn into world leader in providing specialized, top-notch quality and ecological industrial heating, cooling and drying solution across the globe.
- To attain global recognition as best of quality and environment friendly engineering solution company.

Mission

- To enhance the value of customer operation through our customer need centric engineering solution.
- We are committed to provide our customers, unique and best in class products in Industrial heating, drying and cooling segment, with strategic tie-up for the technical know-how with renowned leader in the industry specific segment.
- We are company that believes in strong ethics and timely commitment helps to build long term relationship.

Value Propositions



Introduction of Microwave

Coating is a very Important process involved in Manufacture of Coated Products

Today we shall review some of these as listed below:-

Microwave heating systems are member of
ELECTROMAGNETIC HEATING FAMILY

Microwaves has frequency of
2.45GHZ AND 915MHZ

Microwave is generated from
small device known as **'MAGNETRON'**

Microwave heating system has
property to **HEAT FROM WITHIN**

Microwave heating systems heats volume of material
hence also known as **'VOLUMETRIC HEATING'**

The principles of MICROWAVE HEATING as applied to industrial processing are outlined and the basic design of applicators for material processing is described. Industrial applications range from FOOD TEMPERING to RUBBER VULCANIZATION and from VACUUM DRYING to SINTERING OF CERAMICS. Established applications to date are summarized.

Microwave heating is a process within a family of electroheat techniques, such as
- *Induction*
- *Radio Frequency*
- *Direct Resistance or Infra-Red Heating*

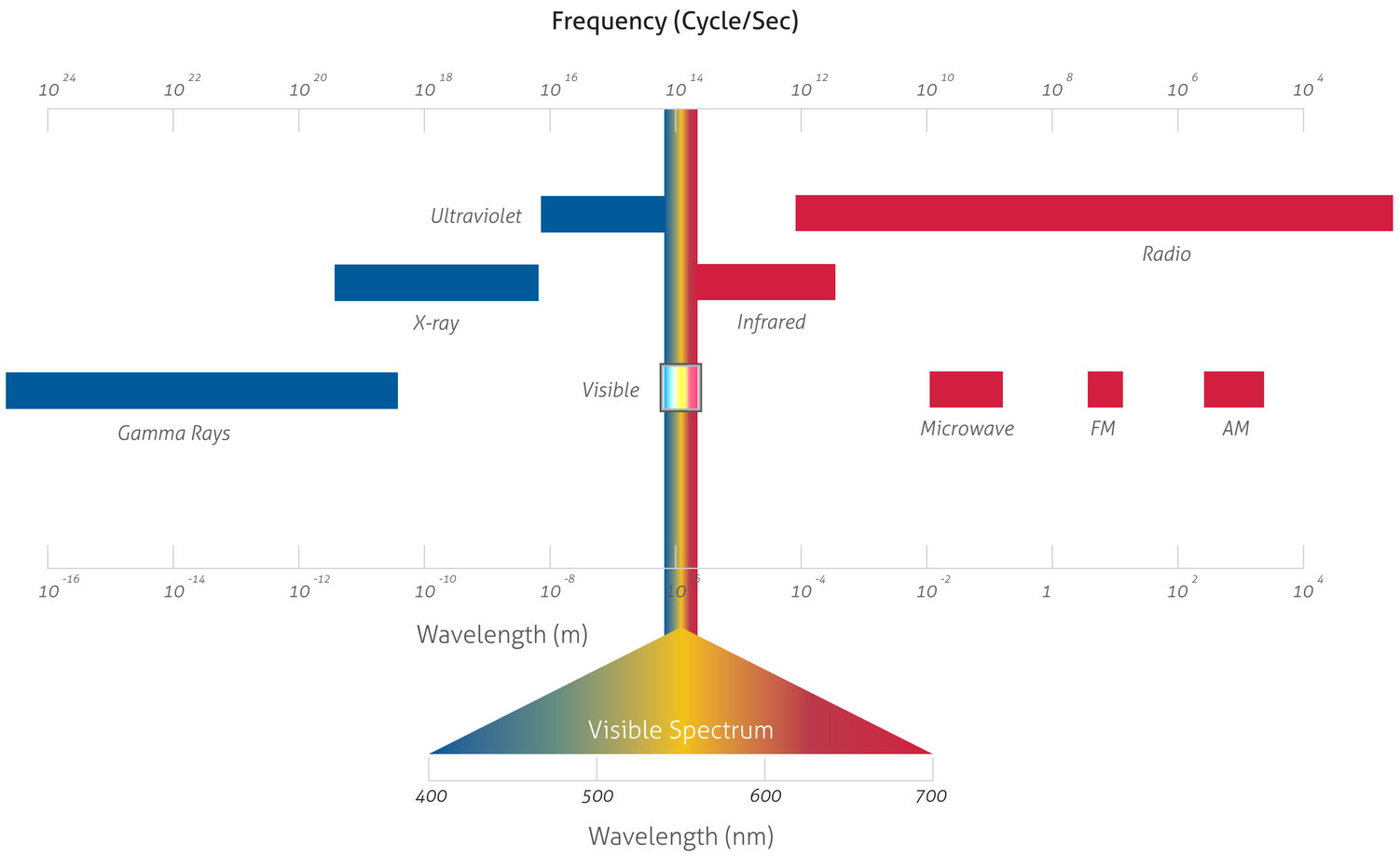
all of which utilize specific parts of the electromagnetic spectrum.

These processes supplement, and in specific cases totally replace, conventional heating or drying systems used in industry. This is because some conventional systems are very bulky, not easy to operate, can pollute the environment due to harmful omissions and above all can be very inefficient.

The major advantages of using microwaves for industrial processing are rapid heat transfer, volumetric and selective heating, compactness of equipment, speed of switching on and off and pollution-free environment as there are no products of combustion. Microwave leakage can certainly be kept well below government recommended levels.

Microwaves Heating System Classification

Microwave Frequency	Heater Type
915 Mhz	Batch
2450 Mhz	Continuous
	Hybrid



Microwave Heating System Vs Conventional Heating System

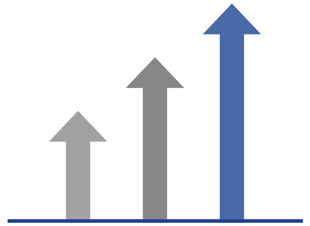
Microwave Heating System	Conventional Heating System
• Microwave heating system is generates the heat very fast within material	• Conventional heating system have slow hating rate, heat is transferred via means of air
• Heating of materials are due to molecule movements hence no chamber warm up time is required	• Instance heating does not takes place, it requires warm-up of surrounding
• Environmental friendly and green heating solution, no carbon emission	• Produces carbon or toxic gases hence not much environmental friendly heating solutions
• 100% energy utilization, as heating takes place within the material	• 100% energy utilization is not possible, as material is heated by surrounding hot air
• Better floor utilization index as it doesn't require chamber area	• Poor floor utilization index as it require bigger chamber area for material to rotate
• No Temperature loss in surrounding, ambient workplace	• Surrounding air temperature rises with rise in heater temperature

Microwave Heating System Vs Infrared Heating System

Microwave Heating System	Infrared Heating System
• Microwave heating systems utilizes electromagnetic system uses wavelength of about 1 centimeters	• IR heating systems utilizes electromagnetic system uses wavelength of about 0.01 centimeters
• Microwave heating systems does not require larges space hence offers better floor utilization index	• Compact system providing better floor utilization index
• Microwave heating systems are not substitute the conventional heaters	• Infrared heating systems are better substitution of traditional convention heaters
• Depth of heat penetration is higher in Microwave heaters	• Depth of heat penetration is lower in infrared heaters as it heats from surface
• Rate of heating depends on the moisture content within the material	• Rate of heating depends on the surface characteristics of material
• Heats the objects from within the object	• Heats the object from surface of object

Advantages of Microwave Heating Systems

- **Uniform Heating** occurs throughout the material Process speed is increased
- **Desirable** chemical and physical **Effects** are produced
- **Floor Space** requirements are **Decreased**
- Better and more **Rapid Process** control is achieved
- **Purity** in final product
- **High Efficiency** of Heating



Microwave Heating Systems

- **Process speed is increased**
- **Selective Heating** i.e. heating selectively one reaction component
- **Reduction in unwanted side** reaction (reaction Quenching)
- **Improve reproducibility**
- Environmental heat loss is save, **Reduce wastage** of heat

Microwave heating systems in Pharmaceutical Industries

Microwave based heating systems has very significant role in various process in Pharmaceutical industrial processing, some are mentioned below

- *Assists Drug Extraction*
- *Microwave Digestion*
- *Chemistry Synthesis*
- *Sterilization*
- *Drying and Powder Making*
- *Thawing*
- *Cancer Therapy*

Microwave heating systems in Plastic and Rubber Industries

Plastic and Rubber has increased its application in various application, so the demand. Below and few important applications those require heating

- *Pyrolysis Of Plastic*
- *Plastic Welding*
- *Plastic Thermoforming*
- *Vulcanization Of Rubber*
- *Preheating Of Rubber*
- *Extrusion Curing*
- *Rubber Coating*
- *Post Curing*
- *Pre Heating Of Solid Rubber Tyres*

Microwave heating systems in Food Industry

The Food and Packed Food industry has multiple application that require microwave heating are as follows

- *Blanching*
- *Drying / Dehydrating*
- *Cooking*
- *Tempering of Frozen Products*
- *Thawing*
- *Baking*
- *Pasteurization and Sterilization*

Microwave heating systems in Ceramics

Glass and Ceramics find multiple applications those require Microwave heaters

- *Plasma Processing*
- *Liquid State Processing*
- *Solid State Processing*

Microwave Dryer - Continuous Type

Can add to the performance of the machine by choosing from various additional optional features like Temperature control, Pulsating power, Hot air assisted RF / MW system, Heater temp control, Air assisted RF/MW system, Air velocity control, Vacuum assisted RF/MW system, Vacuum / pressure control, Alarm system after RF OFF, PLC base control system, Data logger with computer interface.

- *Microwave Magnetron*
- *PID Indicator / Controller*
- *Stainless Steel Chamber*
- *RF / MW Choke / Timer Provision*
- *Variable Frequency*
- *Variable Power output*
- *Electrical & Thermal Safety Features*

Microwave Dryer - Batch Type

Completely Stainless Steel chambered - Batch Type Dryers have Microwave Magnetron from leading Brands with some more unique features like Temperature Indicator, Provision for RF/MW Choking, Provision for Timer, Power Control ranging from 10% to 100%, and has all required electrical & Thermal safety features for RF/MW generator. Above all, this can be designed completely custom and sized as per the end users requirement specifications.

Additional Features - Optional

- *Temperature Control*
- *Pulsating Power*
- *Heater Temp Control*
- *Air Assisted Rf / Mw System*
- *Plc Base Control System*
- *Air Velocity Control*
- *Vacuum Assisted Rf / Mw System*
- *Vacuum / Pressure Control*
- *Alarm System After Rf Off*
- *Data Logger With Computer Interface*

Microwave Batch Oven

Our MICROWAVE BATCH OVEN are available in different shapes and sizes as per customer's requirements. For industry aluminium ovens are used and steel ovens are useful in food industry. The most important specialty of these ovens is uniform heating throughout

It is immaterial which industry you belong to, because our microwave batch ovens are useful in every industry, in pathology laboratories, industrial laboratories, hospital laboratories and so on.

- *Food Industry*
- *Production Laboratory*
- *Pharmacy Laboratory*
- *Medical Laboratory*
- *R& D Laboratory / Quality Control Laboratory*

Batch Microwave Heating System

1. Microwave heating is one of the most rapid and energy efficient ways of heating materials and its usage for food processing is continuously developing globally. Shorter processing time, high energy efficiency and faster heating are the main advantages that the microwave heating propose.

2. Microwaves are electromagnetic waves in the frequency range between 300 MHz and 3000 MHz (wavelengths from 1 meter to 1 mm, respectively). However, 0.915GHz and 2.45GHz frequencies are commonly used for microwave heating. When incident upon different materials, microwave radiation interacts in different ways, dependent on the electrical properties of the material.

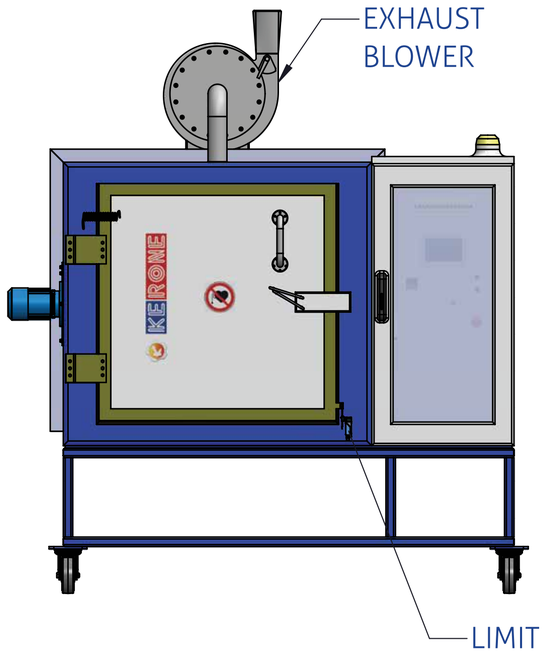
3. Microwave based batch heating systems has very significant role in various process in Pharmaceutical, Plastic and Rubber, Food, Ceramic and many other industrial processing systems. Generally used for drying, heating, pre-heating and pasteurization, sterilization (in food industry) many other applications.

4. Microwave heating offers distinct benefits in heating because of its penetration depth results in uniform and even heating.

5. Microwave heating is rapid and more energy-efficient compared with conventional heating. In microwave heating, the removal of moisture is accelerated and, furthermore, heat transfer to the solid is slowed down significantly owing to the absence of convection.

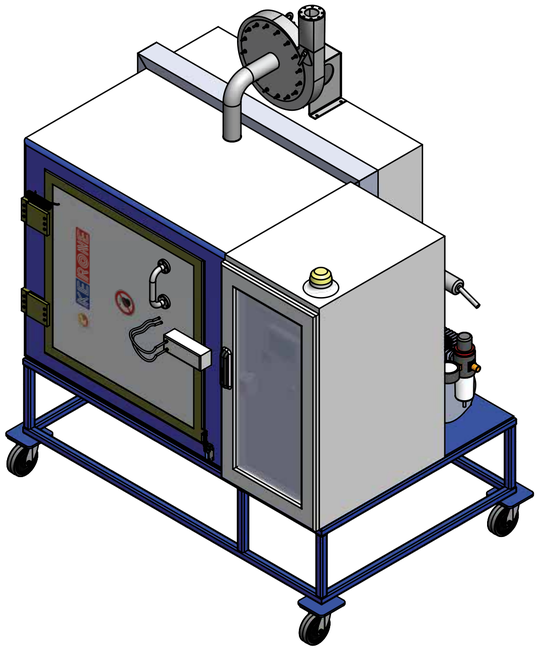
Advantages:

- Lower Processing Time
- Fast and Uniform Heating
- Selective Heating/Drying
- Better Production Quality
- Energy Efficiency
- Compact in Size
- Assure clean operation, avoid creation of dust, smell, noise, vibrations and irradiation.
- Highly Controllable



Application:

- Microwave pasteurization and sterilization.
- Microwave blanching.
- Microwave baking
- Microwave drying
- Thawing and tempering
- Curing



Batch Rotary Mw Heating System

Most processed foods today are heat treated to kill bacteria. Prolong exposure to high heat often diminishes product quality. Microwaves interact with polar water molecules and charged ions. The friction resulting from molecules aligning in rapidly alternating electromagnetic field generates the heat within food. Since the heat is produced directly in the food, the thermal processing time is sharply reduced. The colour, texture and other sensory attributes of foods processed by microwave sterilization are often better compared with those of conventionally retorted foods while meeting microbial safety requirements.

In sterilization of food material, the primary objective is preservation. food industry has been largest consumer of microwave energy, where its application has been utilized in drying, pasteurisation and sterilization of various foods. It offers shorter processing time which maintains original nutritional and sensory properties of food. US Federal Communication Commission (FCC) allocates 915 MHz and 2450 MHz bands for industrial and domestic microwave heating applications.

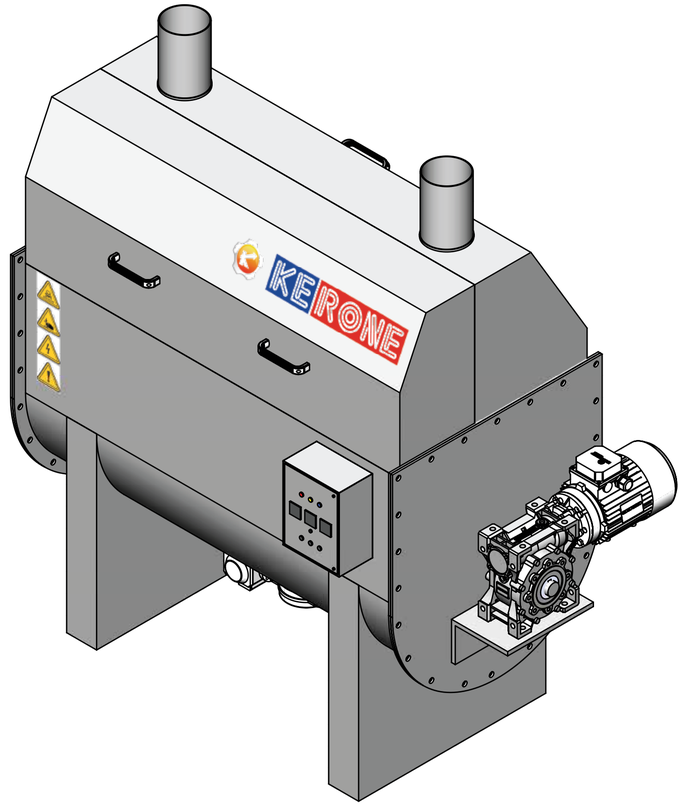
Our Batch Rotary Microwave Heating System is designed to achieve commercial sterility of the products, giving it long-term shelf stability. A significant reduction in the thermal processing time while making food safe for consumption is the major advantage of microwave sterilization processing

Advantages:

- Reduction In The Thermal Processing Time
- Fresh-like Taste And Texture, And Improves Visual Appeal Of The Food.
- Instantaneous Turn-on And Off.
- Provides Contamination Free High Quality Product By Eliminating Microbial Load Which Further Results In Increasing Its Shelf Life.
- Safe To Operate And Is Safe For Environment
- High Throughput Of Processed Foods.
- Possibility Of Incorporation Of Microwave Processing Equipment In The Existing Processing Lines.

Application:

- Microwave sterilization and disinfestation of food solids.
- Microwave drying of powders i.e. spices.



Batch RF Heating System

Radio frequency (RF) heating is a promising technology for food applications because of the associated rapid and uniform heat distribution, large penetration depth and lower energy consumption.

During RF heating, heat is generated within the product due to molecular friction resulting from oscillating molecules and ions caused by the applied alternating electric field. RF heating is influenced principally by the dielectric properties of the product when other conditions are kept constant.

The Radio Frequency (RF) band of the electromagnetic spectrum covers a broad range of high frequencies, typically either in the kHz range (3 kHz< f ≤ 1 MHz) or MHz range (1 MHz < f ≤ 300 MHz).

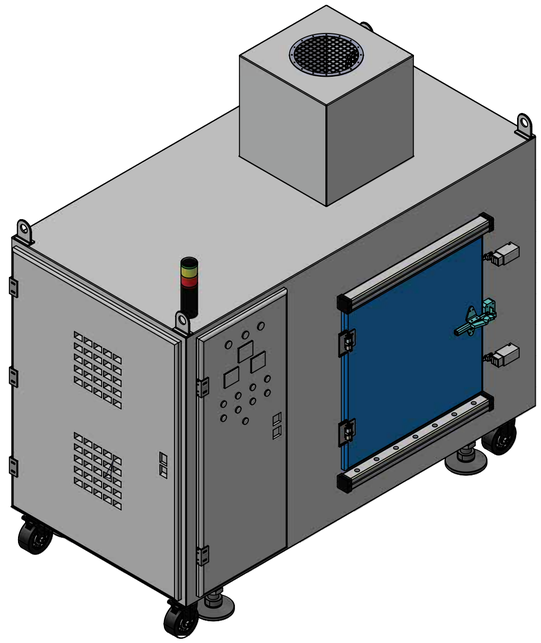
These waves lie in the radar range and can interfere with communication systems, only selected frequencies are permitted for domestic, industrial, scientific and medical applications. These frequencies are 13.56, 27.12 and 40.68 MHz

Unlike conventional systems where heat energy is transferred from a hot medium to a cooler product resulting in large temperature gradients, RF heating involves the transfer of electromagnetic energy directly into the product, initiating volumetric heating due to frictional interaction between molecules (i.e., heat is generated within the product).

The use of RF heating also can result in reduced energy consumption which can be considered as great advantages over traditional methods of heating over traditional methods.

Advantages:

- Contactless heating
- Higher heating rate.
- Design freedom.
- Environmental friendly and green heating solution, no carbon emission.
- Possible to heat only one part of a composite material, which improve product quality by not heating sensitive materials.
- No warm up & cool down time required.
- Shorter process lines.
- Improved energy efficiency.



Application:

- Designed to handle wide range of Products
- PLC control with fault identification
- Superior quality processed product at highest rate of production
- Flexible, accurate and effective at low rates of energy utilization
- Meets appropriate regulations all through the world
- Volumetric heating keeps the temperature low and uniform throughout the web to prevent overheating.
- Batch Type Front Opening Radio Frequency (RF) Heater/ dryers
- Residual humidity restricted within +/- 1%.

Trusted Partner

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