Company overview

Together, we reinvent your industrial process with our MW et RF solutions

Since 1978

sairem Microwave & Radio frequency

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Who we are

A leader in microwave & RF technologies

We are improving customer processes with our high-performance electronic MW and RF solutions since 1978.

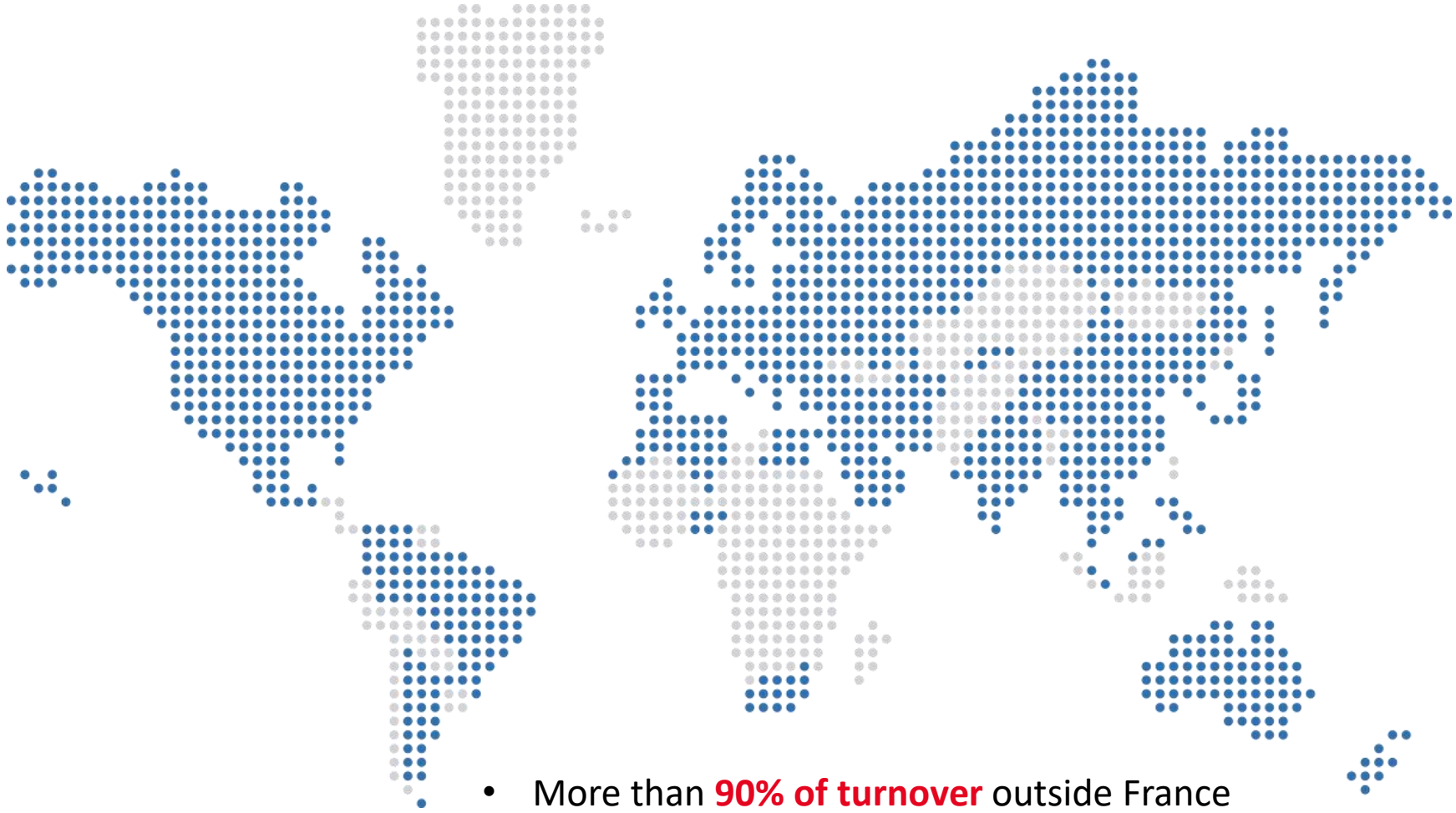
44 years of experience in Microwave and Radiofrequency

08 active patents

21 M€ of turnover in 2021
18 % growth of sales in 2021

10% of turnover spent on R&D,
7 multinational projects participation

A worlwide presence



- More than **90% of turnover** outside France
- Customers in **70 countries** around the world

A team of professionals to service your needs

20 R&D engineers

8 PhDs

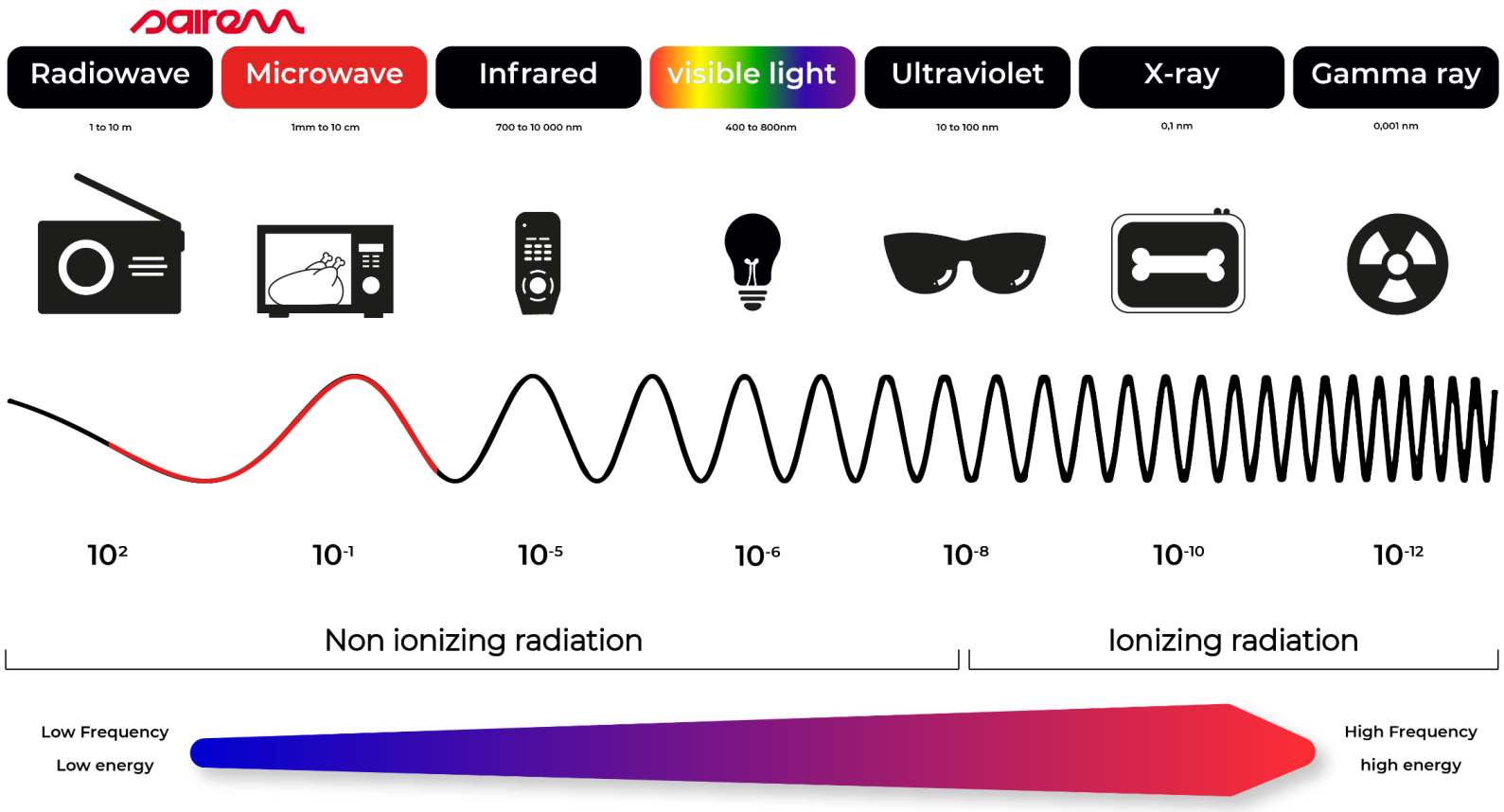
90+ people at your service

11 Field service technicians

7 nationalities

Our technologies

The electromagnetic spectrum



Our solutions

Company activities

COMPANY ACTIVITIES

FOOD PROCESSING Solutions	INDUSTRIAL Solutions	PLASMA GENERATION Solutions	LAB / R&D Solutions
Tempering Cooking Drying Extraction Pasteurization Sanitization …	**Drying** **Heating** Catalysis Polymerization Vulcanization …	**Chemical Vapor Deposition** Nitriding Gas abatement Sterilization Surface activation …	**Drying** **Extraction** Heating Sterilization Wound healing …

Our Team

44 years of expertise

- Unique **expertise on all RF & MW wavelengths** to quickly determine the feasibility of a project
- Offering of a **mix of innovative and proven solutions** according to the specificities of each customer
- **Experience,** with the founder still being the Chief Technology Officer (CTO) today

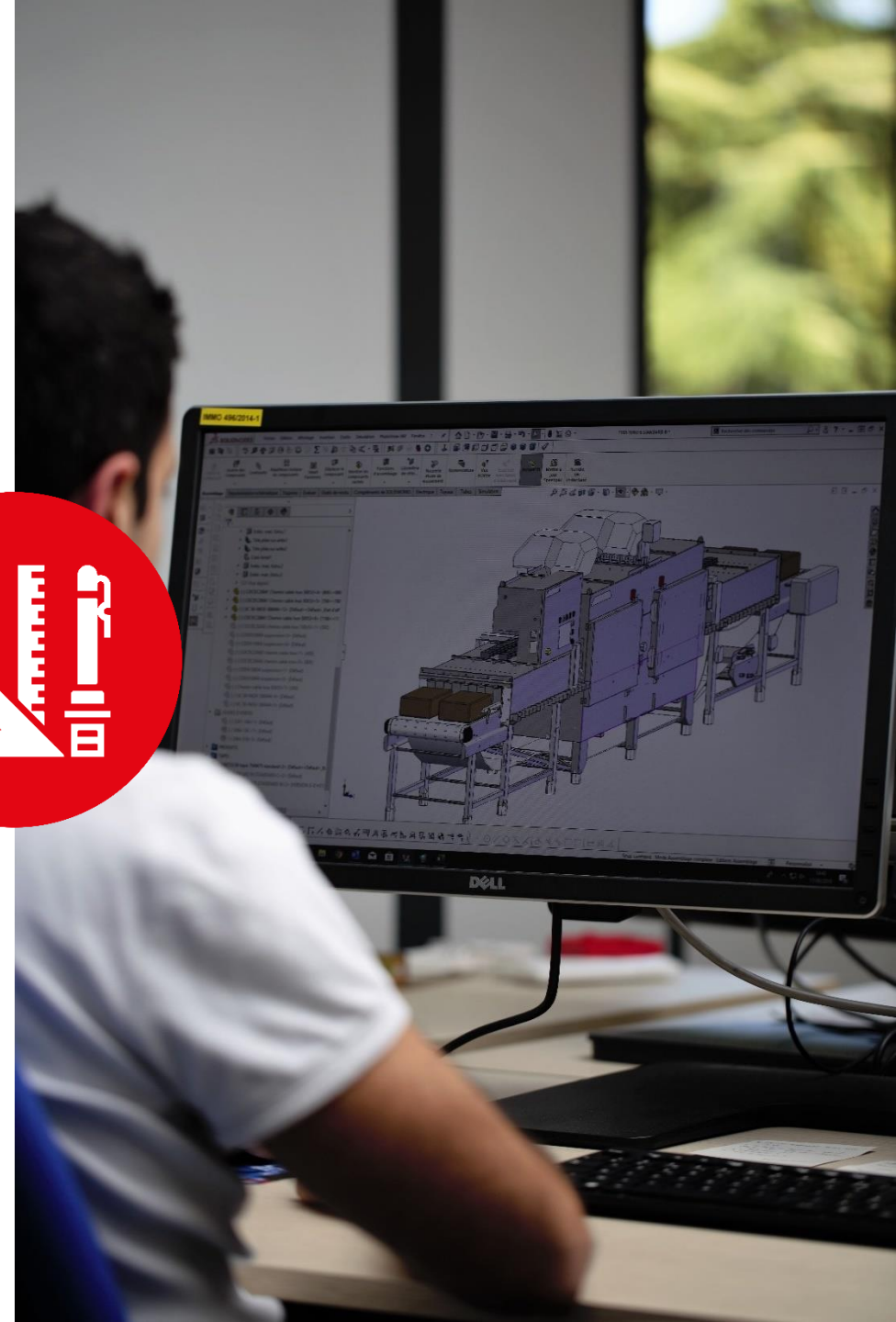
Integrated testing lab

- **400 m²** space and more than **20 equipment**
- **Quick and easy** way to evaluate your process
- **Various** equipment at industrial or lab scale
- **Dedicated team** to perform the necessary tests

Integrated design office

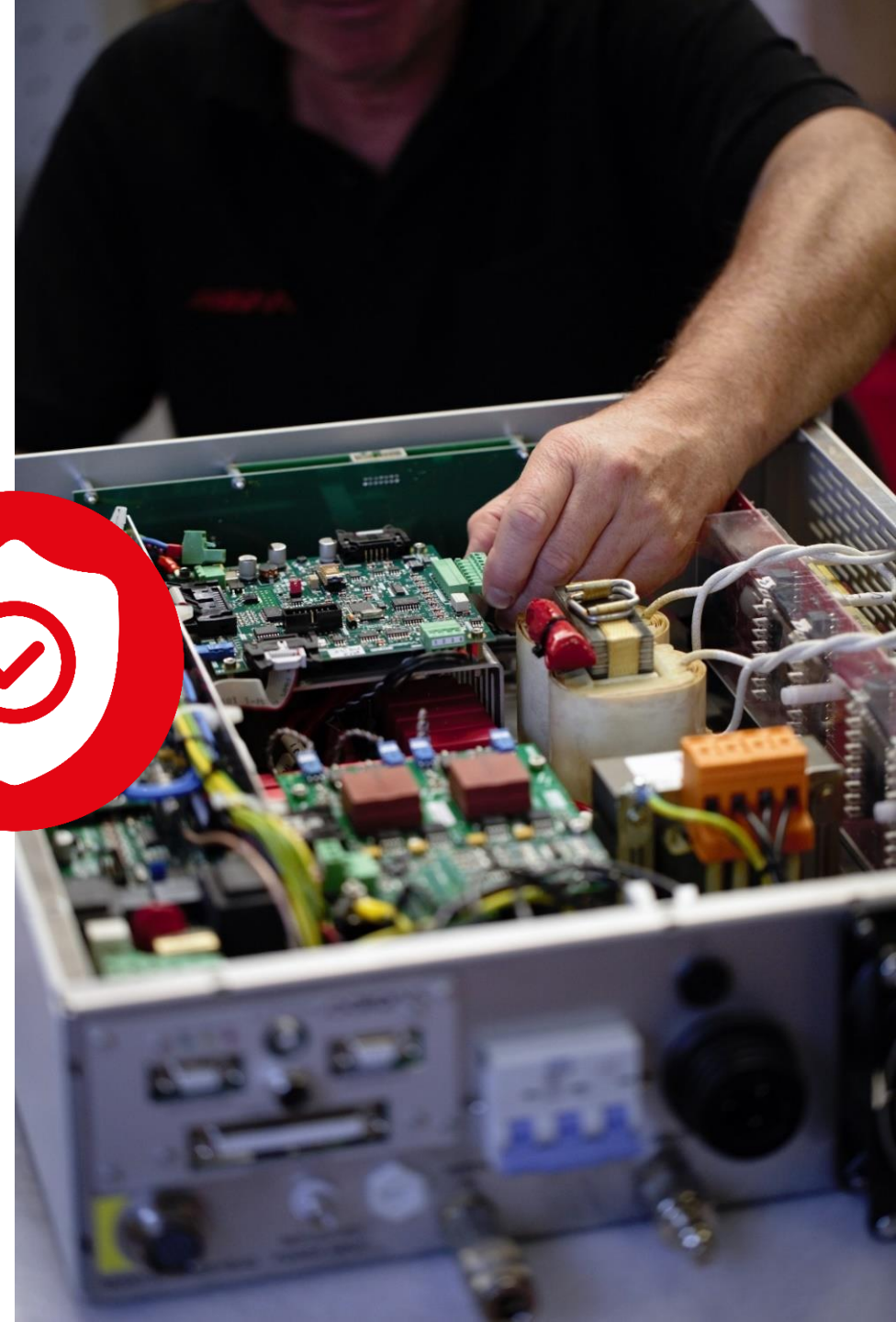
Dedicated design offices in :

- **Electronics**
- **Mechanics**
- **Automation**
- **Simulations**



Unrivalled reliability

- All the equipment are **installed by our engineers,** providing customer training
- **Thousands of machines** work round the clock worldwide
- **Unique 50 ohms technology** on RF machines for unrivalled frequency stability and full conformity to regulations

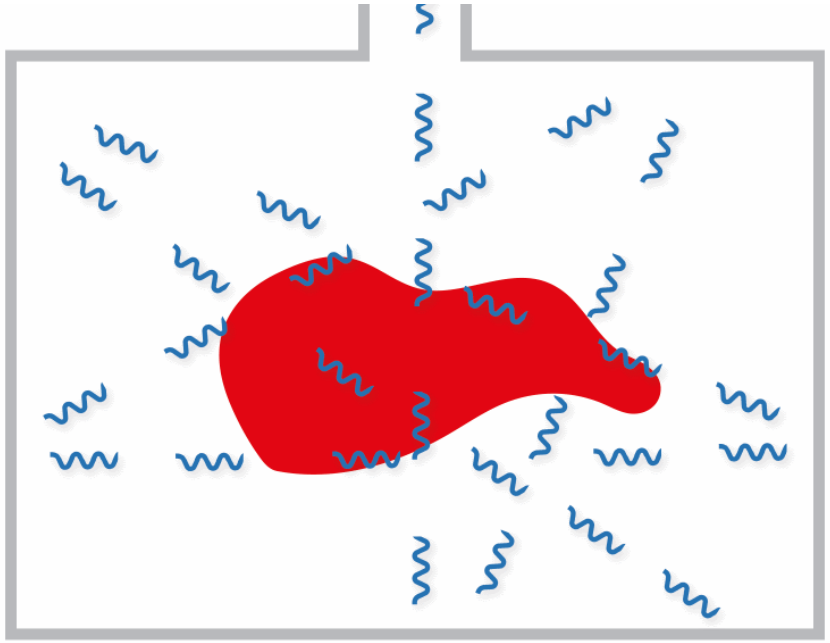


A structured process to satisfy our customers

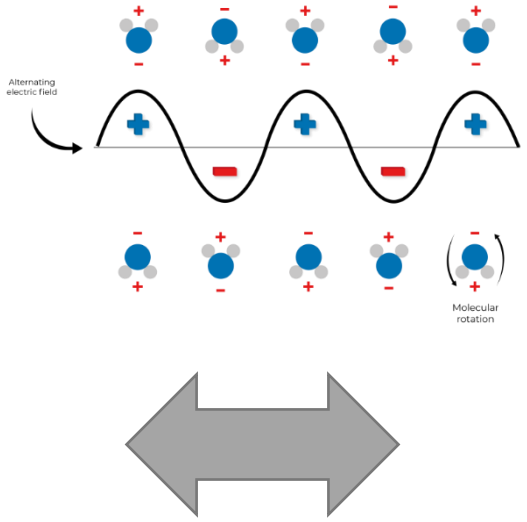
1. **Project :** sales & development engineers support our customers during the design phase
2. **Extensive testing** is performed in our lab
3. **Equipment designing & assembly** based on our standards modules
4. **Factory acceptance test**, installation, and start-up at customers facilities
5. **Training** of customers technicians
6. **Maintenance** performed by our multilingual customer service team

Food solutions

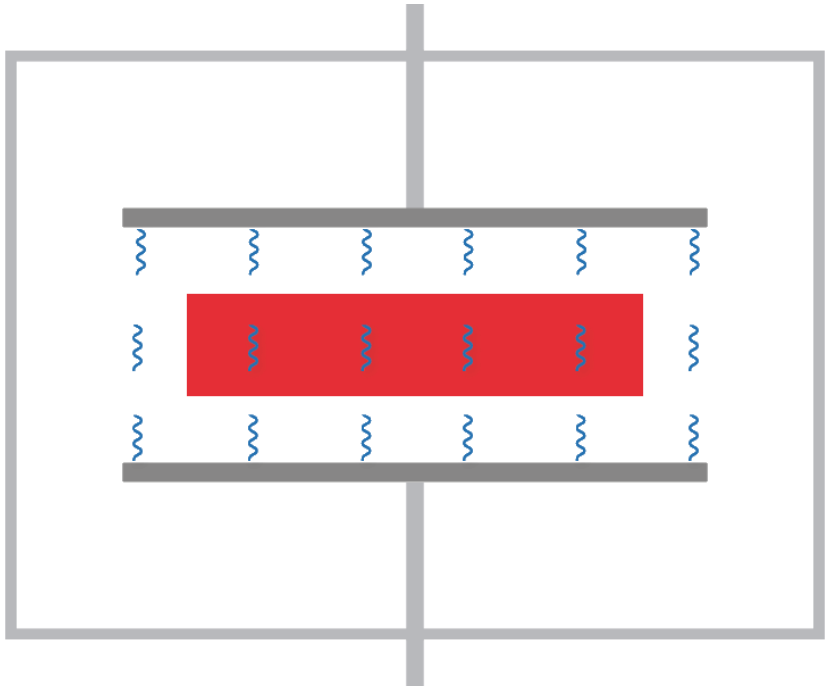
Microwave & RF Principles



Microwave



Dielectric heating



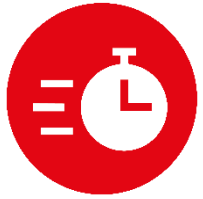
Radio Frequency

Microwave heating key benefits

Heating selectivity

Excellent control of temperature

Inside out heat (homogeneous volumetric heating)



Instantaneous heating

Electrical efficiency (>80% for MW)

Any form of food

Any form of food : liquid, powder, paste …

Any packaging : in bulk, in boxes, or packed

Industrial scale : up to 20 tons per hour

Reinventing food processing for higher performance

- **Pasteurization** of fresh food, jam, ready meals …
- **Drying** of vegetables, fruits, insects …
- **Cooking** of ready meals : spring rolls, flans …
- **sanitation** of ingredients …
- **Extraction** of natural ingredients : flavors, perfumes …
- **Roasting** of beans : coffee, cocoa …
- **Tempering** of frozen food : meat, fish, vegetables, fruits, …

Food safety

- Pasteurization
- Sanitization

Food safety

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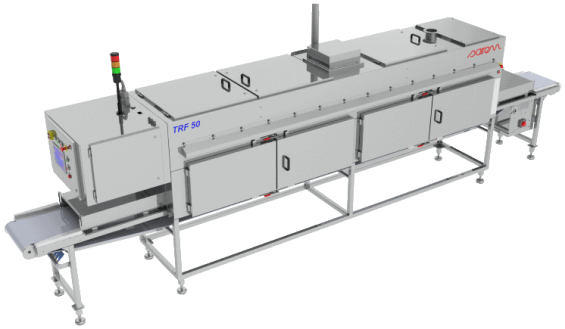
Pasteurization

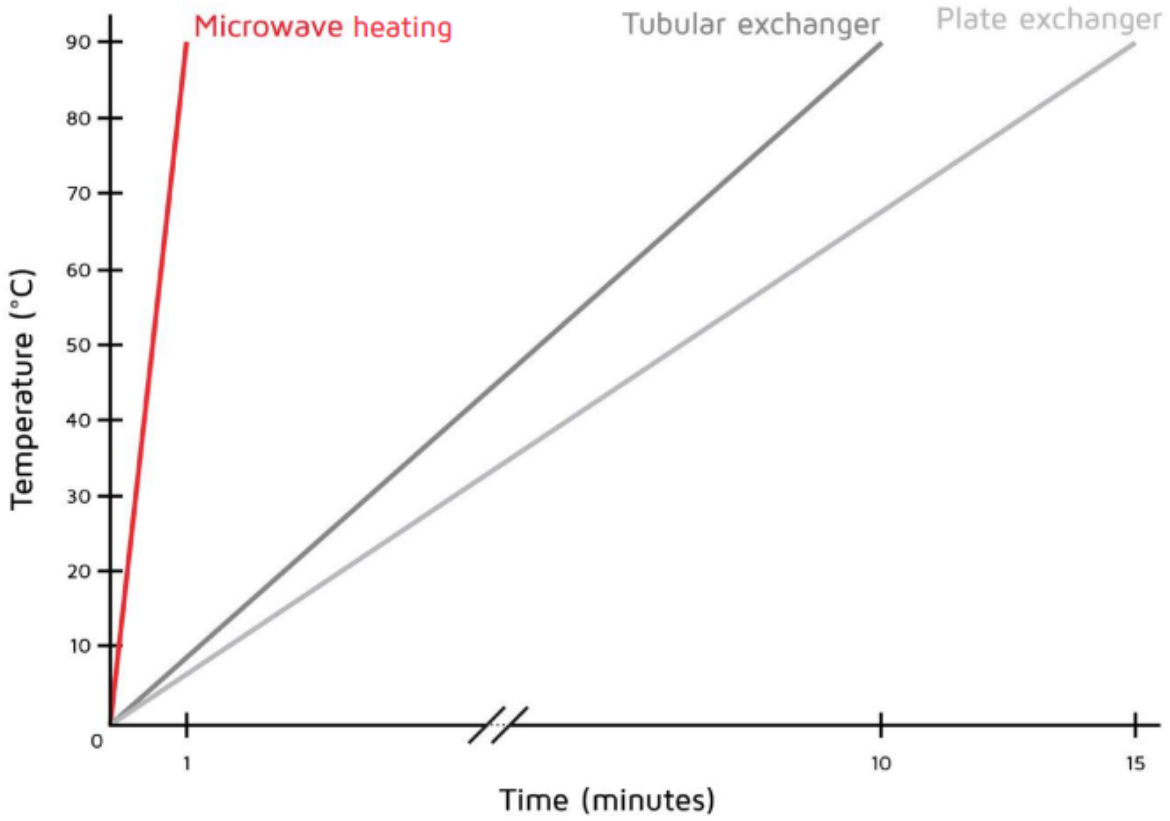
The pasteurization process is one of the main food preservation methods.
It aims to limit spoilage of the product by reducing the presence of micro-organisms in it.



Advantages of MW/RF pasteurization

1. Preservative-free yet micro-biologically safe products.
2. Preserve fresh taste and safe food with a long shelf-life.
3. It works with any form of food: powders, liquids, pasty, bulk or packaged.
4. Pasteurization of ready meals is possible directly in their sealed packaging.
5. High speed process. Pasteurise in seconds.

Case study pasteurization

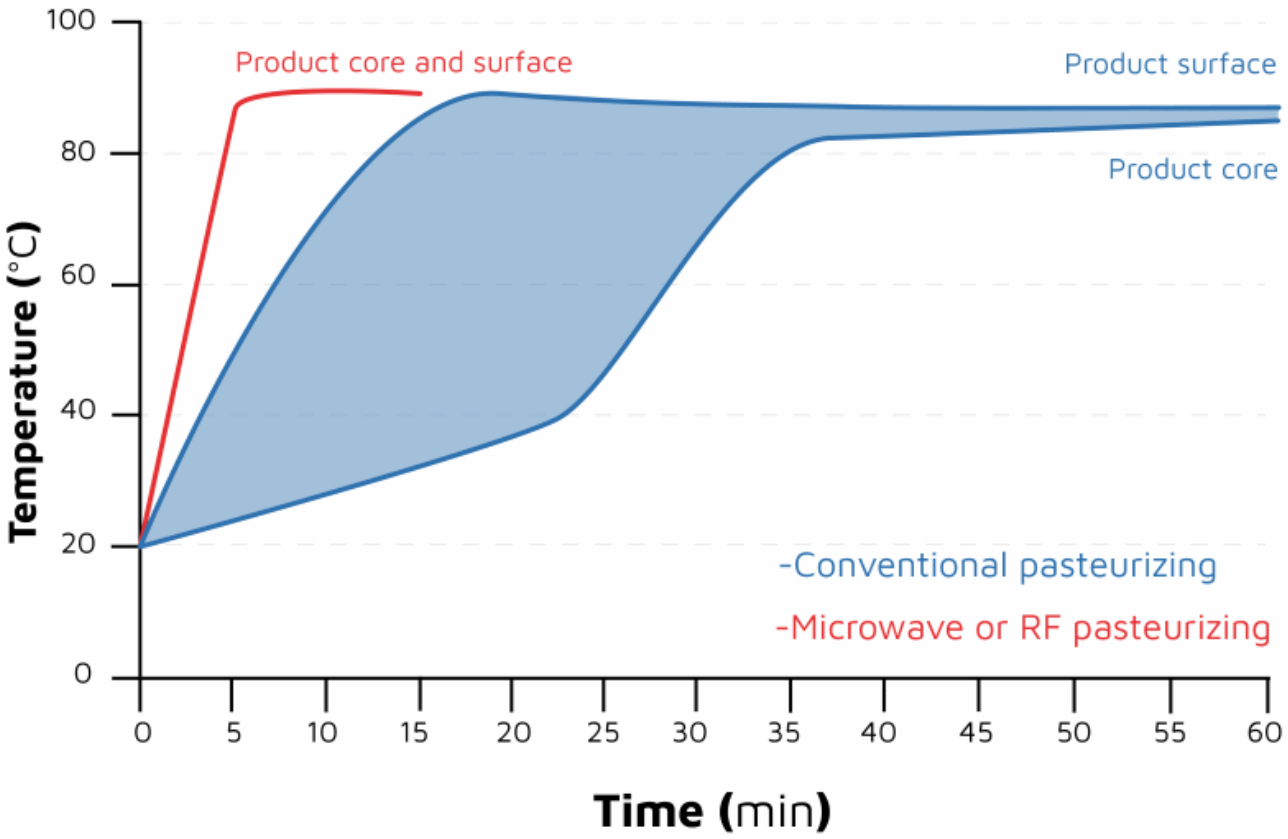


Continuous jam pasteurization

- Preserve characteristic of products.
- Rapid process.
- Homogeneuous heating.

In-line microwave heating for liquid product

Case study pasteurization



Packaged ready meal pasteurization

- Preservation of color and taste.
- Freedom in the choice of the shape and the material of the packaging
- Continuous process.

TMW tunnel for pancakes pasteurization

Food safety

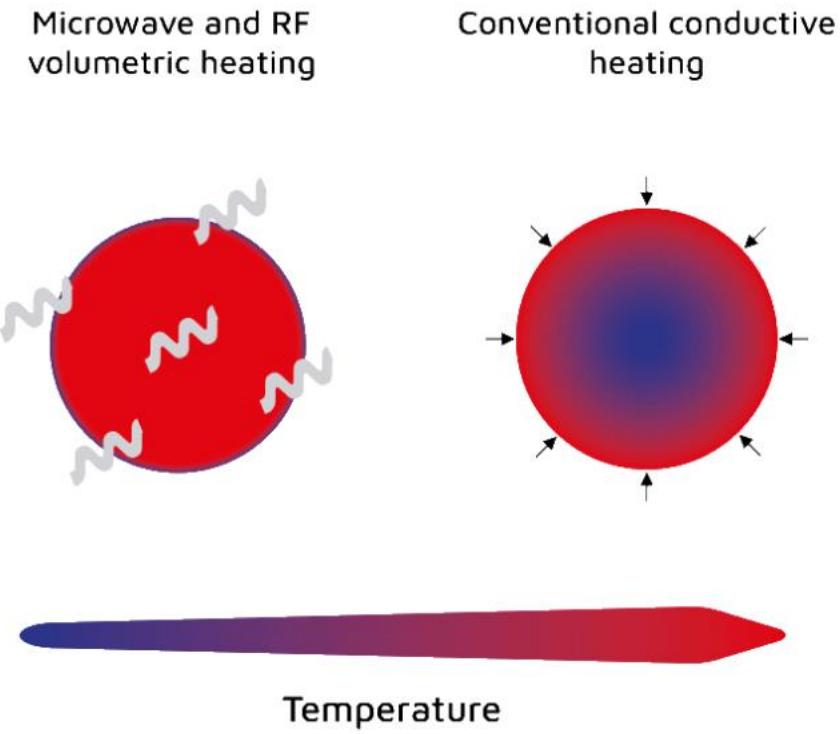
- Pasteurization
- Sanitization

Sanitization

One of sanitization process is a disinfestation treatment targeting to eliminate the risk of insect contamination in products.

Advantages of MW/RF disinfestation

1. Eco-friendly process: compatible with organic certification.
2. Selectivity heating for low water content product.
3. Economical and particularly effective on insects.
4. Works well with large volume products.

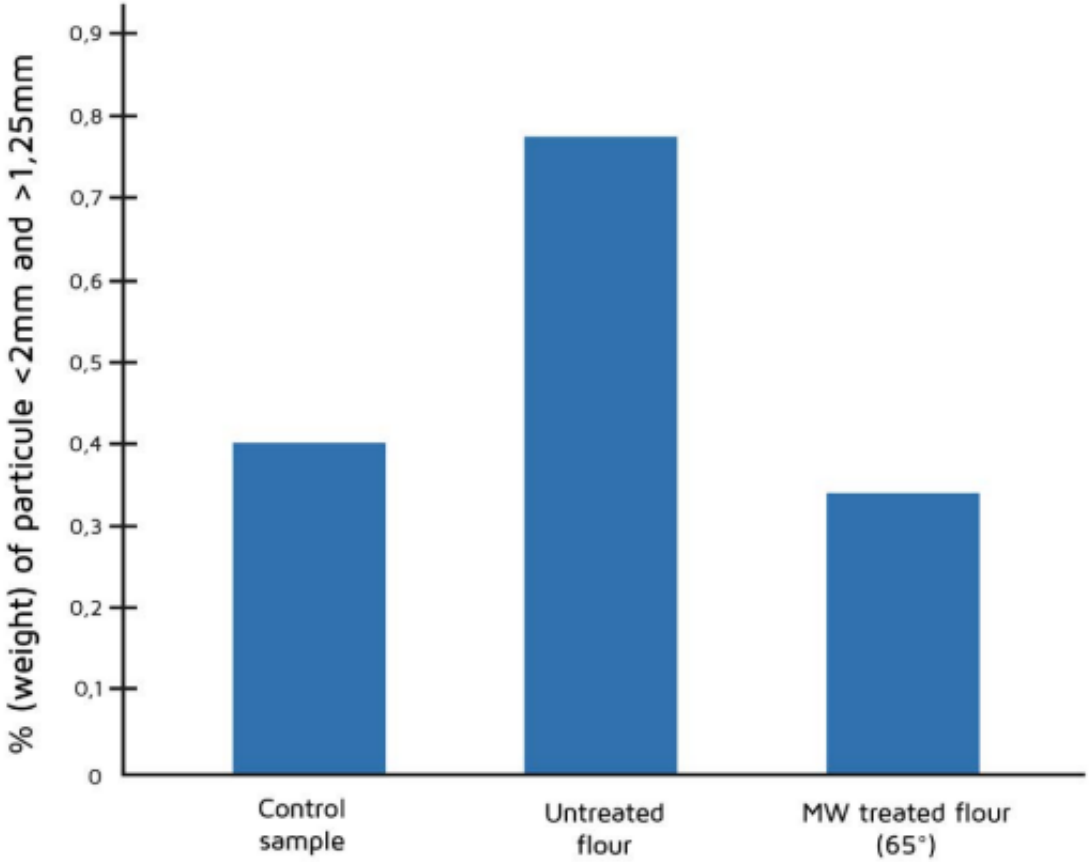


Case study disinfestation

Flour disinsectization

Microwave solution:

- Protection against insects.
- Chemical free solution.
- Fast process and Eco-friendly.



Case study disinfestation

<u>Dates contaminated by parasites (insect)</u>

Traditional method:

- Fumigation of methyl bromide or phosphine.
- Highly toxic and dangerous to ozone layers.

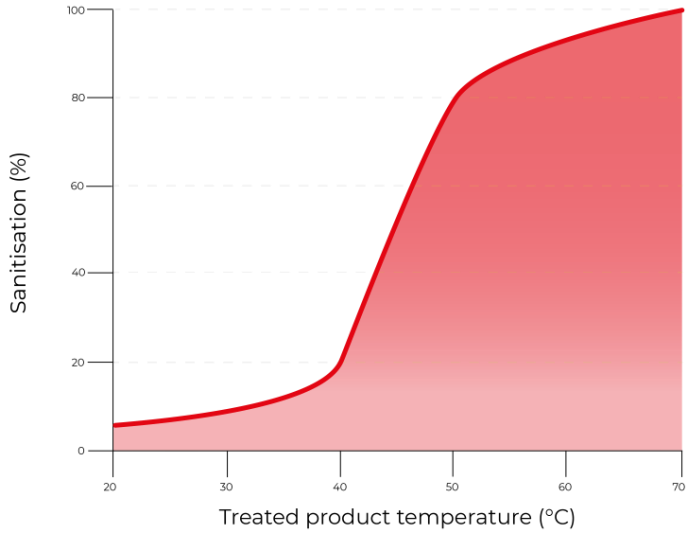
Microwave solution:

- a microwave tunnel at 915 MHz who can treat up to 1200 kg/h of product
- Chemical free solution.
- Kill mold and pest.

Sanitization

The sanitization is a process performed to prevent food contamination or bacteria which can cause illness.

Sanitization



- Fast continuous processing
- Reduction of the bacterial load

Advantage of MW/RF Sanitization

1. Quick way to reduce bacteria load.
2. Very precise temperature control, the product quality is preserved
3. This sanitation process reduce contaminated products, meaning less losses for the company.
4. Extended shelf life.

Case study Sanitization

Sanitization of plants and herbs

Traditional method:

- No sanitizing treatment

Microwave solution:

- Batch treatment adaptable for different sizes of product from 5 to 20 kg.
- 5 minuites decontamination process.
- Works with hundreds of different plants powders.

Case study sanitization

Walnut decontamination

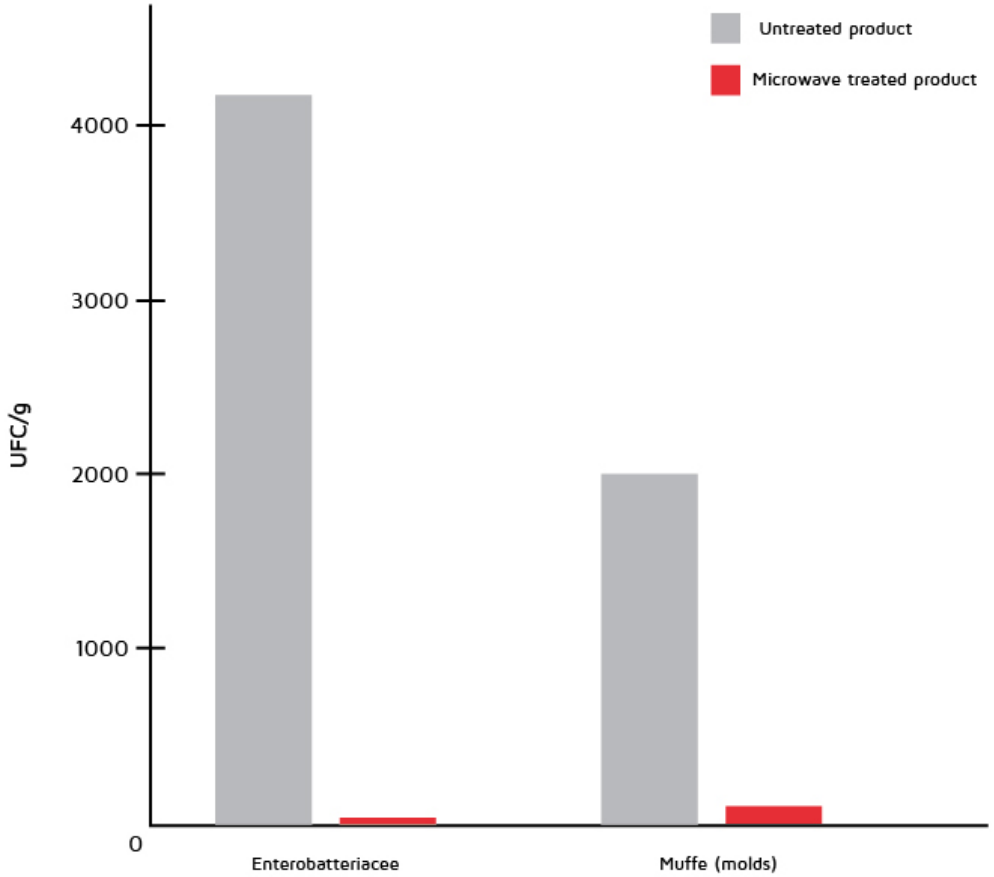
Risk contaminated by microorganism like molds, or bacteria.

Traditional method:

- Steam treatment.
- increase moisture levels.
- affect the organoleptic properties of the treated product.

Microwave solution:

- The nuts are treated in cardboard or PE boxes of roughly 10 kg.
- Few minutes quick process.



Food process

- Drying
- Cooking
- Extraction

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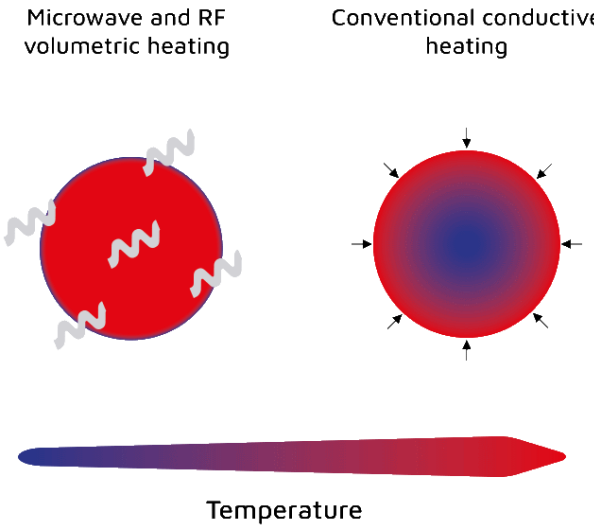
Drying



- Fast continuous processing
- Homogeneous controlled drying

Advantages of MW/RF in drying process

1. With MW or RF drying, the process will occur at the same rate inside the product and on the surface, avoiding burnings, preserve fresh taste and safe food with a long shelf-life.
2. Selective heating dries a specific part of your product, without to damaging the final product properties or quality.
3. Combination with hot air or steam for excellent results

Case study drying

Drying of insects

Traditional method:

- Hot air or freeze drying.
- Slow performance.
- Low quantity.

Microwave solution:

- 75 kW microwave power tunnel with an air extraction system.
- High capacity, dry up to 140kg of mealworms per hour.
- Preserves the organoleptic properties with drying temperature below 100°C

Case study drying

Case study : cheese puffing

This test was done on a cheese intially containing 10% of water.

After a 2 minutes microwave treatment, all the cheese cubes were puffed with 1 kW power.

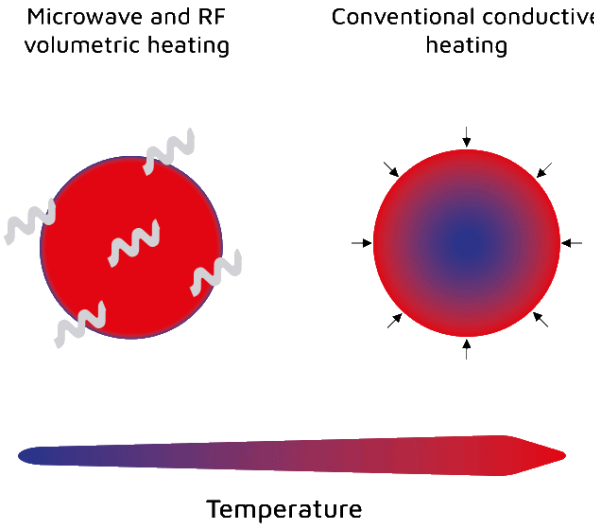
Case study : biscuit checking (cracking) reduction

The checking effect is brodly present in the biscuit industry. A post-baking microwave treatment allows the water to be homogeneously distributed, reducing this effect from 60% breakage to only 2%.

Food process

- Drying
- Cooking
- Extraction

Cooking



- Fast continuous processing
- Homogeneous & controlled process

Advantages of MW/RF in cooking process

1. Precision and homogeneity.
2. Process combination.
3. Time-savings.
4. Healthy way to cook.

Case study cooking

<u>Pre-cooking of spring rolls.</u>

Traditional method:

- Fry
- Time consuming.

Microwave solution:

- 2450 MHz microwave power tunnel.
- Perfectly and homogeneously cooked in less in less than 10 minutes.
- Continuous line of cooking.

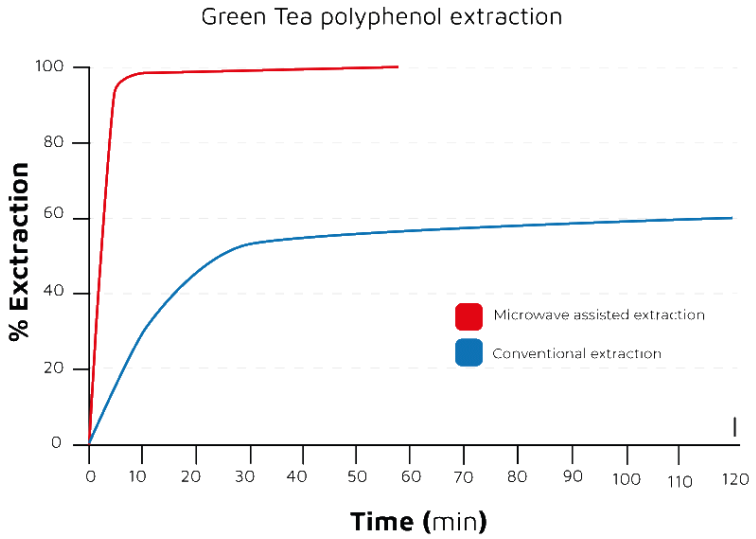
TMW tunnel for pre-cooking spring rolls

Food process

- Drying
- Cooking
- Extraction

Extraction

- Huge reduction of extraction time
- Great increase of extraction yield
- Solvent free extraction



Advantages of MW in extraction

1. Shorten extraction time.
2. Lower amount of solvent use.
3. Higher extraction rates.
4. Offers Eco-friendly extraction.

Case study compound extraction.

<u>Extraction of black pepper and greentea.</u>

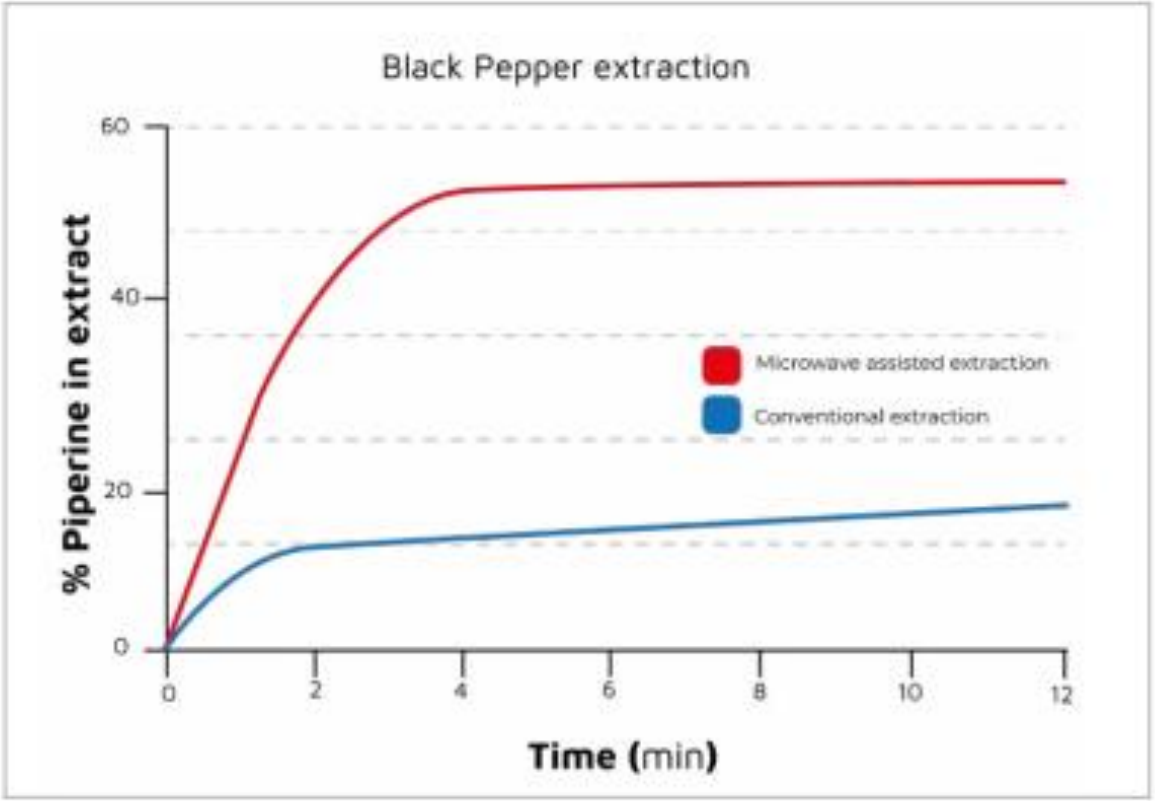
Traditional method:

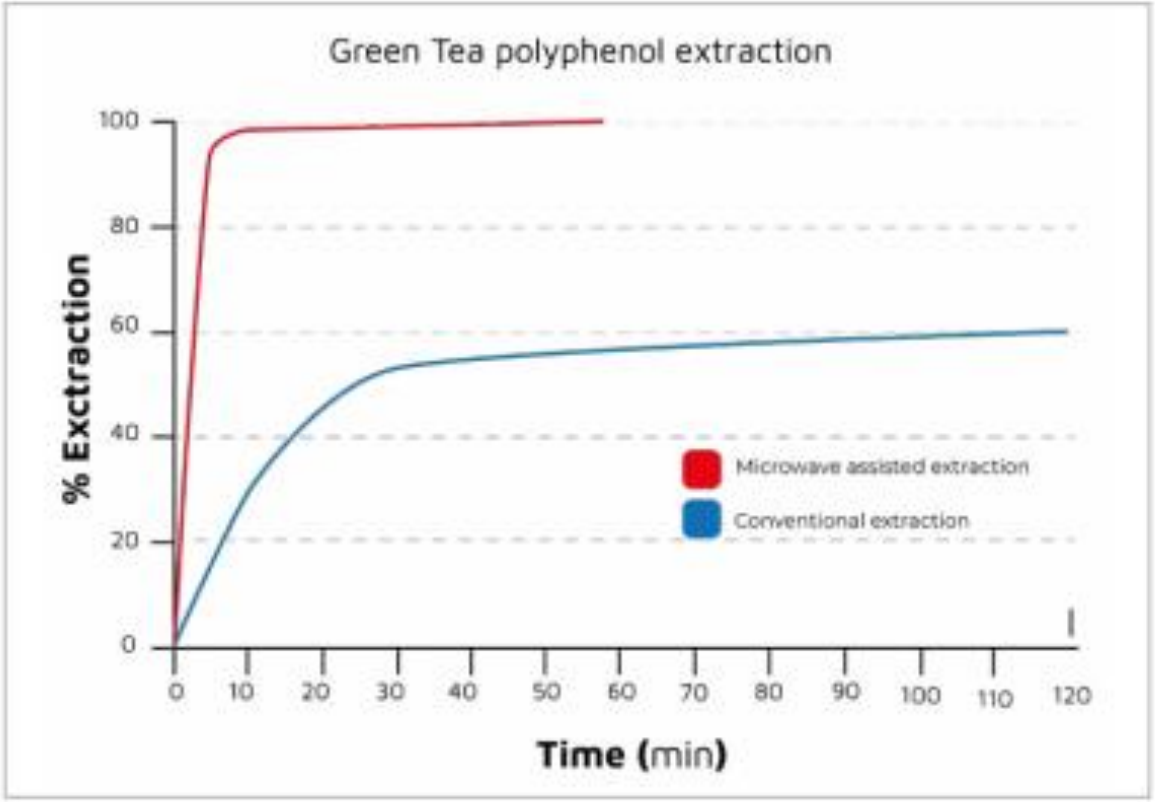
- Slow
- Required larger amount of solvent.

Microwave solution:

- 2450 MHz microwave extraction available both in batch and continuous.
- Drastically reduce extraction time.
- Possibility to starts from batch and up-scale to industrial capacity.

Case study compound extraction.



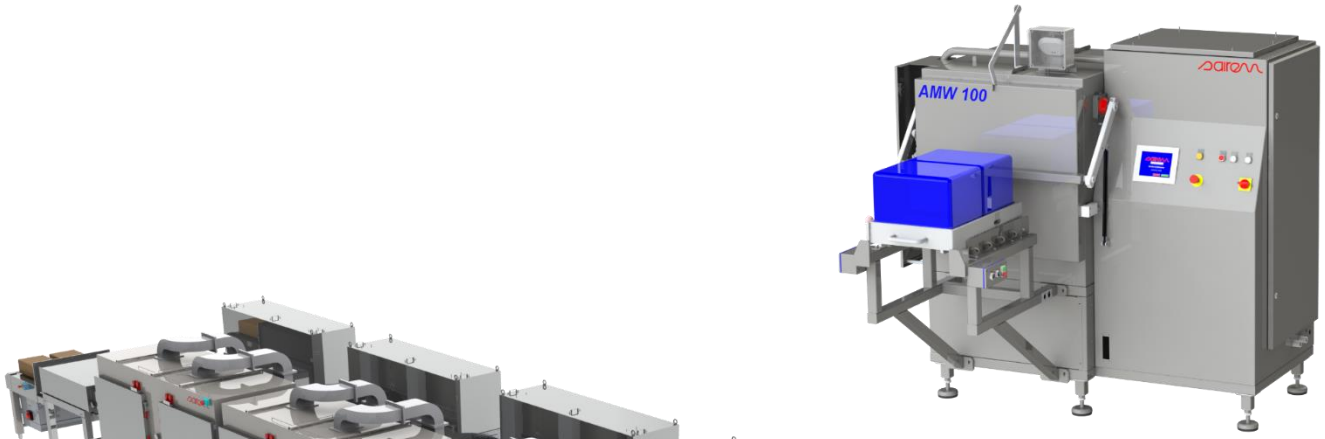


Labotron 6000 R&D up to small-scale extraction

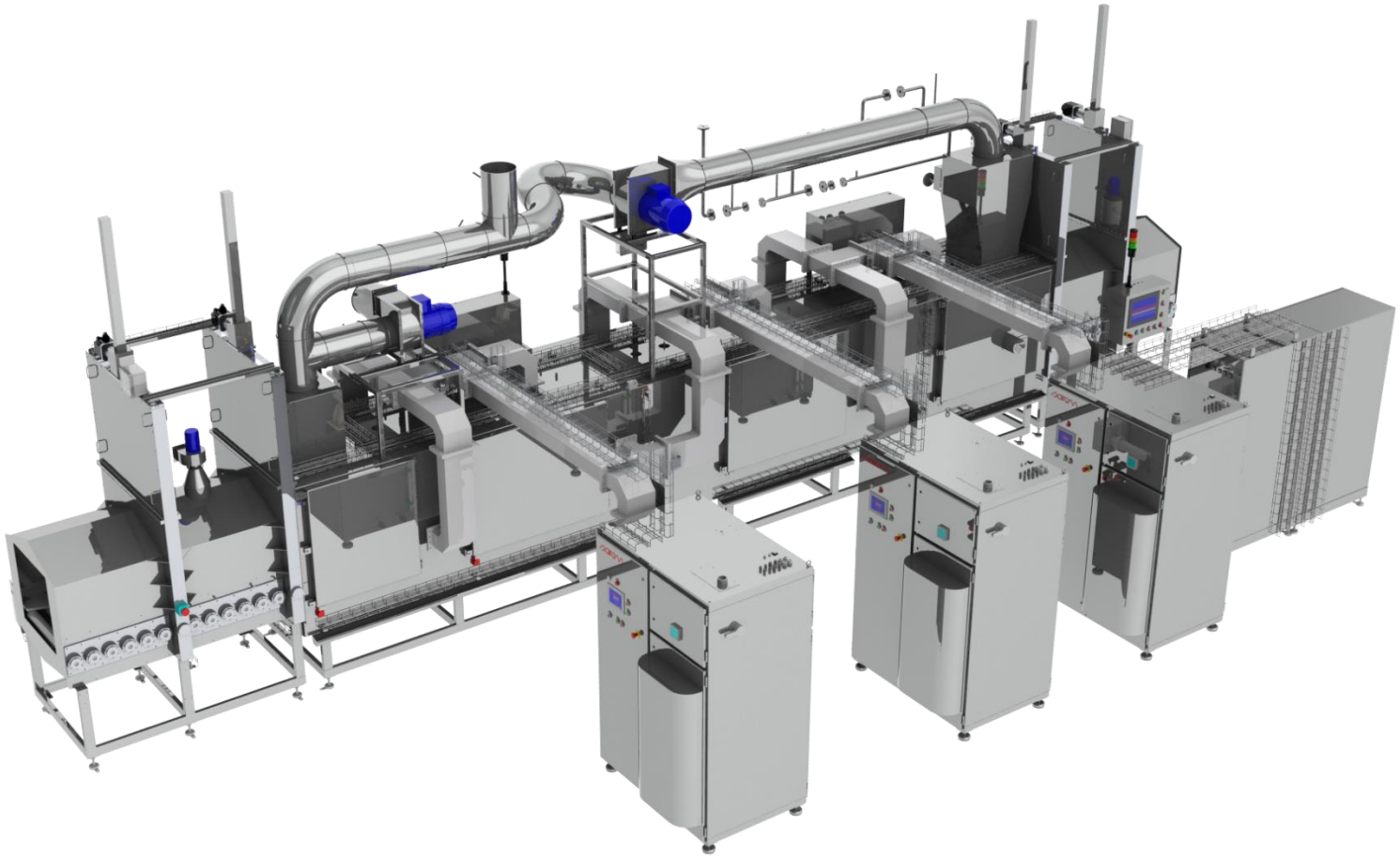
Continuous microwave extraction

Our design expertise

Reinventing food processing for higher performance



Improving your industrial process with our solutions



Invent & develop new processes with our R&D solutions

Equipment for Test or Rental

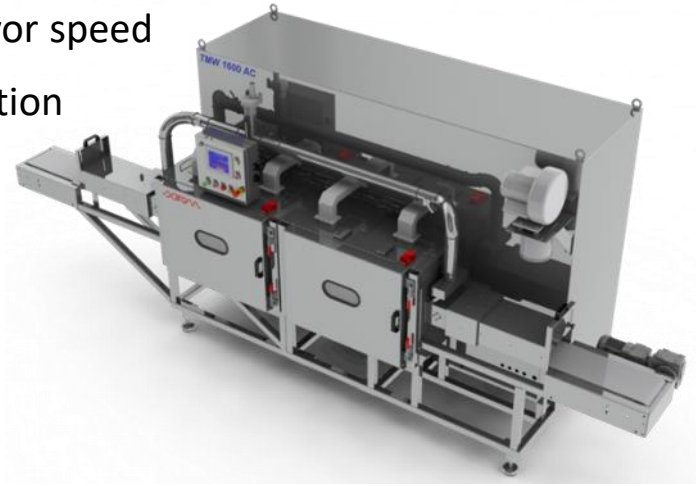
MW Drying

Multi-energy batch MW oven - 2450 MHz

- Power: 6 to 12 kW
- Hot air up to 110 °C
- Controlled humidity in the enclosure
- Variable extraction of the gases generated
- Turntable
- Industrial automation

Multi-energy continuous MW oven - 2450 MHz

- Power: 8 to 16 kW
- Hot air up to 110 °C
- Controlled humidity in the tunnel
- Variable extraction of the gases generated
- Adjustable conveyor speed
- Industrial automation



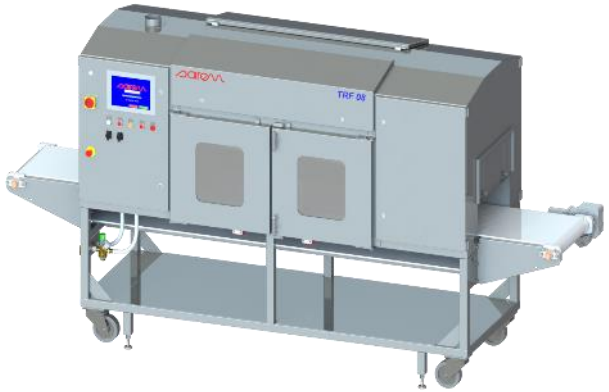
RF Drying

Multi-Energy batch RF oven - 27.12 MHz

- Maximum power: 2400 W
- Hot air up to 60°C
- Opportunity to apply uniaxial pressure on the sample
- Variable extraction of gases generated
- Industrial automation

Multi-Energy continuous RF oven – 27.12 MHz

- Power: 8 kW
- Hot air up to 60°C
- Controlled humidity in the tunnel
- Variable extraction of gases generated
- Adjustable conveyor speed
- Industrial automation



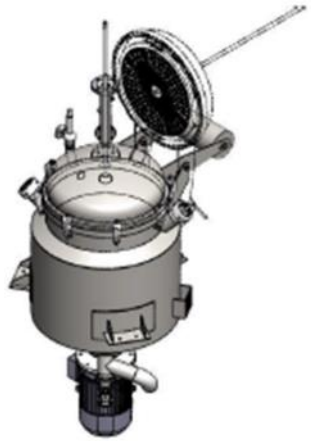
MW extraction

Labotron 3000 & 6000 - 2450 MHz

- Power: 3 or 6 kW
- Volumes from 3 to 20 L
- Continuously configurable
- Industrial automation

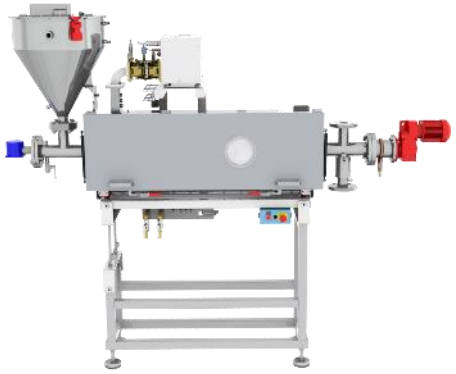
Labotron Production - 2450 MHz

- Power: 6 or 12 kW
- Volumes from 30 to 500 L
- Bespoke mechanical agitation
- Industrial automation



Contin. screw extractor – 2450 MHz

- Power: 6 or 12 kW
- Continuous treatment by screw
- Pyrex tube volume of about 3L
- Industrial automation



MW Pasteurizing of pumpable products

Continuous MW reactor - 2450 MHz

- Maximum power: 6 kW
- Manual or automatic impedance matching
- Tube size:
  - 35 mm diam.
  - 420 mm long
- Capacity tens of kg/hour
- Labview Software or industrial automation

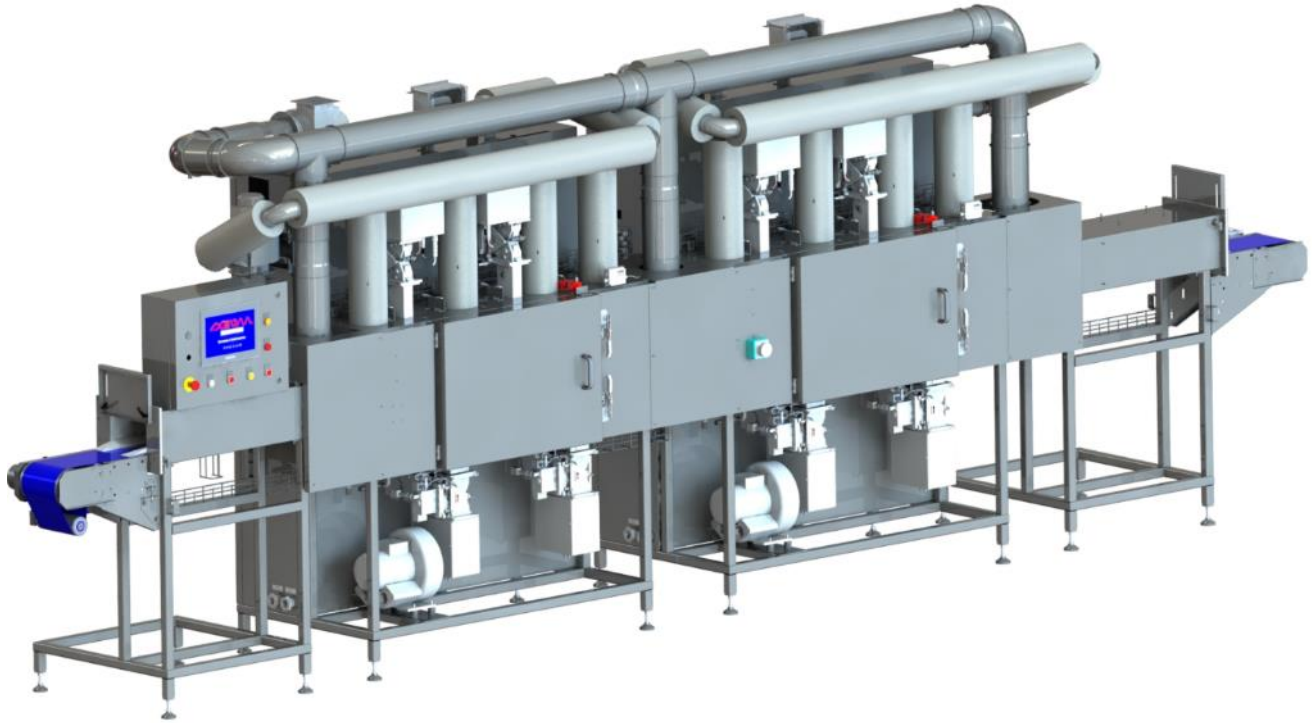
Continuous MW reactor - 915 MHz

- Maximum power: 75 kW
- Manual or automatic impedance matching
- Tube size:
  - 60-120 mm diam.
  - 1500 mm long
- Capacity: 100 kg/hour to 20 t/hour
- Industrial automation

MW Pasteurizing of solid or packaged products

Coninuous pasteurizing MW tunnel - 2450 MHz

- Maximum power: 16 kW
- Injection of hot or cold air
- Extraction
- Internal camera
- Process flexibility
- Industrial automation



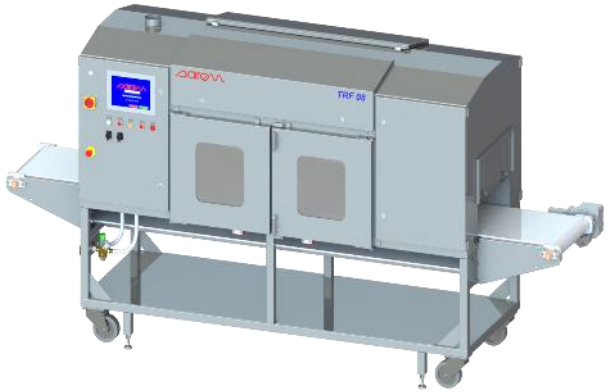
RF Disinsectization

Multi-energy RF oven – 27.12 MHz

- Maximum power: 2.4 kW
- Hot air injection up to 60 °C
- Opportunity to apply uniaxial pressure on the sample
- Variable extraction of the gases generated
- Industrial automation

TRF08 - Continuous multi-energy RF oven - 27.12 MHz

- Power: 8 kW
- Hot air injection up to 60°C
- Controlled humidity in the tunnel
- Variable extraction of the gases generated
- Adjustable conveyor speed
- Industrial automation



MW Disinsectization

AMW200 - MW oven - 915 MHz

- Variable power: 10 kW
- Turntable
- Bag treatment
- Optional air extraction
- Industrial automation

TMW35 - MW oven - 915 MHz

- Variable power: 10 to 35 kW
- Conveyor belt width 600 mm
- Bag or bulk processing
- Optional air extraction
- Industrial automation

MW Disinsectization

Multi-energy MW oven – 2450 MHz

- Power: 6 to 12 kW
- Hot air up to 110 °C
- Humidity in the controlled enclosure
- Variable extraction of gases generated
- Turntable
- Industrial automation

Multi-energy microwave oven

Thank You

Microwave & Radio frequency

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