STALAM

Radio Frequency Equipment

Applications for industrial bakeries

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Company Profile

Established in 1978, STALAM is the world leader in the development, design and manufacture of equipment where capacitive electromagnetic fields at I.S.M. metric frequencies (RF fields) are exploited for a variety of thermal processing and drying applications on raw materials, intermediate and finished industrial products.

As a member of AEI (Italian Electronic and Electro-technical Association) STALAM cooperates actively with prestigious universities and research institutes for the development of the RF technology both as to generation techniques and to technological applications.

STALAM also co-operates with other leading machinery manufacturers for the development of innovative technologies and for the supply of “turn key” automated and integrated processing lines.

Presently, more than 2500 STALAM Radio Frequency machines are in operation in the world, with rated power values ranging from 3 to 450 kW; from the simple, manually operated machine, to the fully automated line complete with computerised control and supervision systems.

Exporting over 90% of its production to the five continents, STALAM provides professional and prompt commercial and technical assistance in all the relevant areas throughout the world.

2500+
machines
in operation

60+
countries
global presence

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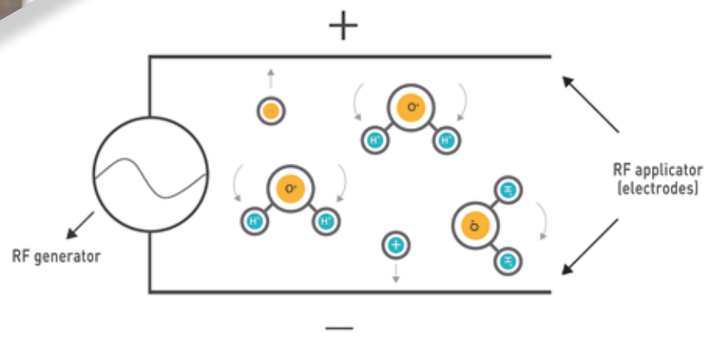
RF Technology

How it works?

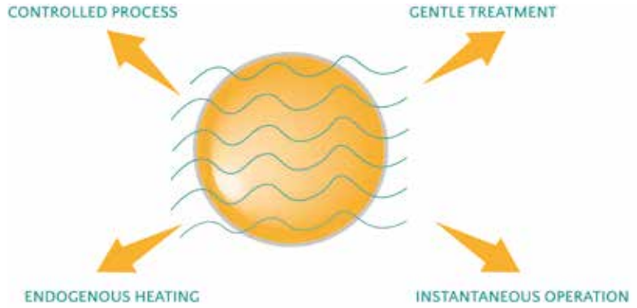
Radio Frequency dielectric heating is a drying and thermal processing technology based on the dissipation of electromagnetic energy within the product. Unlike conventional techniques, where heat is transferred to the product through its surface from an external heat source by conduction, convection or irradiation, a Radio Frequency field generates heat directly inside the entire product mass – that is why the related mechanism is called “endogenous” or “volumetric”. The heat generation is instantaneous and allows a rapid, uniform and perfectly controlled process.

The RF heating mechanism, excluding the materials (like metals) which are good conductors of electric current, is related to the so called “dielectric losses”. Dielectric losses are caused by the vibration and rotation of polar or polarised molecules and by the polarisation and translation movement of ionic particles inside the material, induced by the quick (several million times per second) polarity reversal of the RF field. This can be interpreted as if the electromagnetic field is absorbed and converted into thermal energy by the effect of the rapid movement of polar(ised) molecules and ions.



Water molecules are highly polar, more than all substrates in which water can normally be found, and many ionic species are usually dissolved in water.

Therefore, RF electromagnetic fields can heat up very quickly materials containing water. In particular, Radio Frequency has the ability to evaporate water rapidly, efficiently and selectively from many substrates, which enables their users to obtain the maximum benefits in terms of product quality, reduced operating costs, high flexibility and reliability.



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Applications for industrial bakeries

The oven is the “heart” of any bakery. The baking oven is where the product gets its shape, texture, colour and taste. You could say it is where a basic mixture of ingredients becomes “a product”. Yet, ovens can be used not only to bake, but also to carry out other processes, all related to the supply of a certain quantity of thermal energy to the product.

So, ovens can also be “drying ovens”, “pasteurising ovens”, etc. In many cases, depending on the characteristics of the product and on the specific goals of the thermal process, providing the required energy by means of an electromagnetic field instead of a conventional system based on heat conduction, convection or radiation, may bring various technical, technological and economic benefits.

Sometimes, heating by electromagnetic waves may even deliver results that cannot be achieved under any circumstances with a traditional oven. Based on the above considerations, over the years STALAM has developed a range of specific Radio Frequency ovens to complement or even replace conventional ovens normally used in industrial bakeries.

WAVEDRY+
Post-baking drying

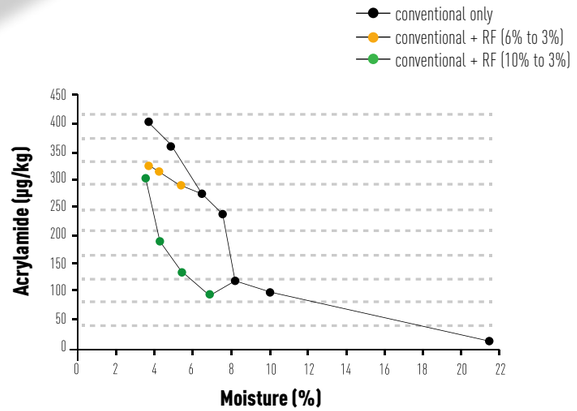
Reduce Acrylamide, enhance flavour and crispness

Radio Frequency post baking drying allows to eliminate the excess moisture from the product rapidly and efficiently, without causing over-baking (excessive browning) of the surface, with added benefits to productivity and quality.

How it works?

Removing the final excess moisture from a baked product is a challenging task: the conventional oven finds it hard to transfer heat to the centre without the risk of over-colouring, Acrylamide formation and cracks that appear in the product even without any mechanical solicitation.

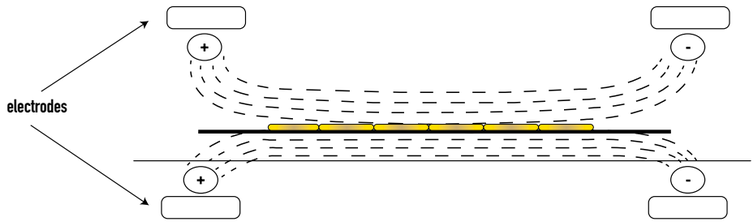
The RF electromagnetic field, due to its ability to transfer energy to the product volumetrically and selectively according to the moisture location, will overcome the low thermal conductivity and the crust heat barrier and will directly dry the (wetter) centre of the product without affecting the desired colour.



Double polarity electrode

This special patented electrode is designed to apply a highly-concentrated electric field to thin or very thin products (such as biscuits, cookies, cereals etc..) even when fed with low RF voltages.

DOUBLE POLARITY HORIZONTAL RF FIELD



- Appetiser Snacks
- Baby Cookies
- Bagel Chips
- Biscotte
- Bread Croutons
- Bread Sticks
- Breakfast Cereals
- Butter Cookies
- Cheese Thins
- Chocolate Cookies
- Choux / Éclairs
- Coconut Rings
- Cracker Biscuits
- Crispbread
- Custard Cream Shells
- Matzo
- Meringues
- Oat Flake Cookies
- Pretzels
- Puff Pastry
- Rusk Biscuit
- Shortbread
- Sponge products
- Wafers

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Benefits

Moisture reduction and leveling

RF drying allows to achieve an accurate moisture level inside the product and to reduce cross-band moisture differential at the exit of the baking oven.
The process control is instantaneous.

Enhanced flavour and crispness

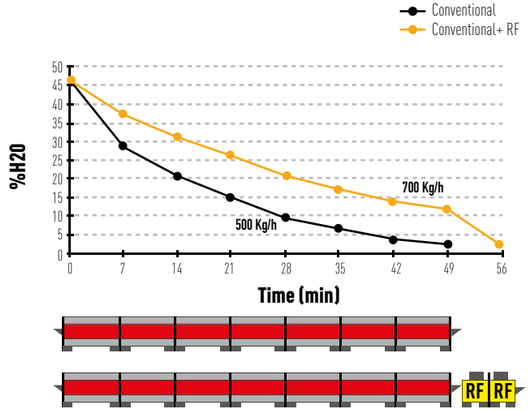
The RF treatment improves flavour retention, colour control, crispness and shelf-life. It also reduces checking problems.

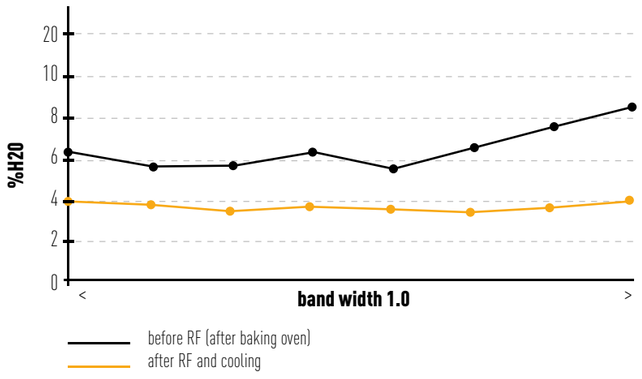
Reduced Acrylamide formation

Final drying by RF allows to reduce surface browning and Acrylamide formation.

Higher oven throughtput

Final RF drying increases conventional oven throughput and reduces bakery floor space requirements and energy consumption.





Up to 35% less Acrylamide

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WAVEBAKE+
Baking of white-crust bread

Baking fast with no crust

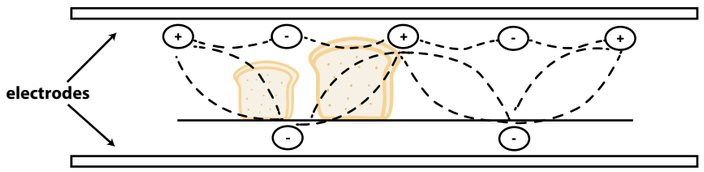
STALAM has developed WAVEBAKE+, a revolutionary oven based on the RF technology that ensures a perfectly even and controlled baking process with virtually no crust formation.

How it works?

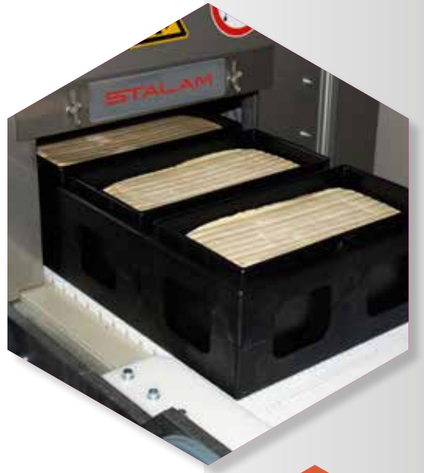
The possibility of using electromagnetic waves for a full baking process without conventional heat depends on the ability of the equipment to deliver and spread uniformly the energy onto the dough pieces.

STALAM has designed a special "variable configuration" electrode (patented), which is capable of delivering controlled quantities of RF energy in different positions between the electrodes where the product is still "developing" (ie. changing its volume), as required by the baking process. Moreover, STALAM Radio Frequency ovens are equipped with an extremely accurate system to control the energy transmitted to the electrodes from the RF generators, through variable capacitors fitted in independent and consecutive oven "modules".

A VARIABLE CONFIGURATION RF FIELD



WAVEBAKE+ is a real breakthrough in the baking technology worldwide. The equipment's basic configuration is extremely flexible and can be adapted to small or large production capacities (say from 250 kg/h to 2,500 kg/h of dough), different type and size products (ie. not only bread loaves), to be fully baked or par-baked, etc. paving the way to the possibility of developing totally new products, not existing in the market, yet.



Reduced baking time
Drastically reduced baking time, from three to five times shorter than traditional ovens.

Shorter baking oven
Shorter baking oven, with considerable floor space savings for a given production capacity.

Energy - saving process
Energy saving process, thanks to the high efficiency of the direct heating system.

Economical and flexible system
More economical and flexible system, to produce normal crusted bread, par-baked or fully baked white-crust bread, without compromising on the production capacity.

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WAVESAN+
Pasteurisation

Pasteurise in minutes, achieve long shelf-life

STALAM is the first company in the world having developed industrial pasteurisation equipment by Radio Frequency for packaged products such as bread loaves, fresh pasta, gnocchi, etc.

High reduction of the microbial load (molds, yeasts and pathogens) can be achieved in a very short time, thanks to the fast and uniform heating process throughout the product and its packaging which does not rely on (slow) heat transmission, typical of conventional methods: the required microbial kill level is attained in a few minutes rather than one hour or more.

Rapid and uniform treatment

Thanks to the ability of Radio Frequency to rapidly generate heat volumetrically within the product, the heating process is fast, uniform and controlled, thus eliminating all the drawbacks of conventional pasteurisation methods.

No product degradation

The process speed and uniformity minimise the risk of product degradation, thus helping to preserve at best the product quality and freshness.

Benefits

In-line process

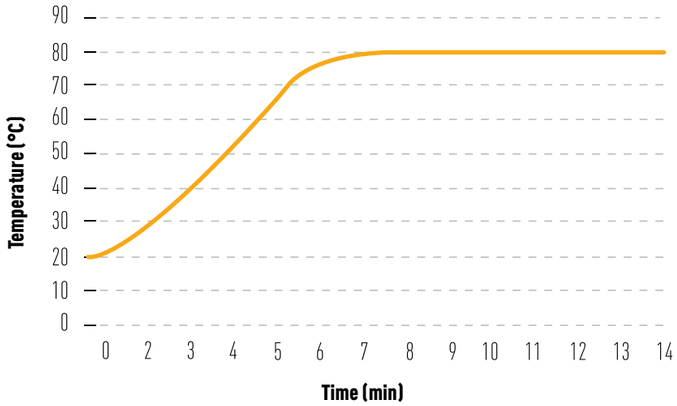
Thanks to the high process speed, Radio Frequency pasteurisation can be carried out continuously, with significant logistic advantages in product handling and production scheduling.

Energy saving technology

Considerable energy savings can be achieved, thanks to the fast and selective heating process carried out by the RF field, which transfers the energy directly into the product without losses in the surrounding ambient.

Less floor space required

The RF equipment requires less floor space compared to the traditional systems, for the same production output.



Typical RF pasteurisation process followed by a temperature holding section

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Technical data

WAVEDRY+

RF power [kW]	RF generator cooling system	Dimensions LxWxH [m]	Low moisture content range * [kg(H2O)/h]	Mid moisture content range ** [kg(H2O)/h]	High moisture content range *** [kg(H2O)/h]
7	Air	5,0 x 1,2 x 2,8	4 – 6	6 – 8	8 – 10
15	Air	6,0 x 1,8 x 3,2	8 – 12	12 – 16	16 – 20
30	Water or Air	7,5 x 2,0 x 3,4	18 – 27	27 – 33	33 – 39
40	Water or Air	7,5 x 2,0 x 3,4	24 – 36	36 – 44	44 – 52
60	Water or Air	8,0 x 2,4 x 3,4	36 – 54	54 – 66	66 – 78
85	Water	8,5 x 2,4 x 3,4	51 – 72	72 – 93	93 – 110

** Evaporation rate based on LOW (2% - 10%) in/out moisture content products: 0,6 - 0,9 [kg(H2O)/kW(RF)h]*

*** Evaporation rate based on MID (5% - 20%) in/out moisture content products: 0,9 - 1,1 [kg(H2O)/kW(RF)h]*

**** Evaporation rate based on HIGH (15% - 35%) in/out moisture content products: 1,1 - 1,3 [kg(H2O)/kW(RF)h]*

Note(1): all machines can be customised according to specific customer requirements and/or production line characteristics.

Note(2): all machines are modular and can be doubled or tripled to cope with higher evaporation capacity (ie. higher production capacity) requirements.

WAVESAN+

RF power [kW]	RF generator cooling system	Dimensions* LxWxH [m]	Throughput ** [Kg/h]
15	Air	6,0 x 1,8 x 3,2	200 - 300
40	Water or Air	7,5 x 2,0 x 3,4	600 - 800
60	Water or Air	8,0 x 2,4 x 3,4	900 - 1200
80	Water or Air	11,0 x 2,0 x 3,4	1200 - 1600
120	Water or Air	12,0 x 2,4 x 3,4	1800 - 2400

** RF heating equipment only - hot air holding sections excluded. When directly connected to purposely designed hot air holding sections, the RF equipment length can be shortened by 1,0 m.*

*** Based on packaged bread loaves (sliced toast bread).*

WAVEBAKE+

RF power [kW]	RF generator cooling system	Dimensions LxWxH [m]	Conveyor belt width * [m]	Dough throughput ** [Kg/h]
40	Air	13 x 1,6 x 3,4	0,8	320
80	Air	13 x 2,4 x 3,4	1,6	640
160	Water	22 x 2,4 x 3,4	1,6	1280
250	Water	31 x 2,4 x 3,4	1,6	1920
340	Water	40 x 2,4 x 3,4	1,6	2560

** Suitable to place 1 or 2 mold-sets in parallel, each composed of 4 individual bread molds.*

*** Based on white-crust bread loaves: approx. size 280x130x125mm - approx. weight 650-700g (final baked bread).*

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After-sale services

Supplying and successfully installing a Radio Frequency equipment is, at the same time, the result and the starting point of several pre- and after-sale activities. STALAM strives to establish strong, trustworthy, mutually rewarding and long-term business relationships with its prospect and existing customers by providing them the best possible technical assistance, aimed first to prove the outstanding benefits of the RF technology and then to make sure that the equipment provided will maintain its performance and profitability in the years to come.

Spare parts available in stock

Availability in stock of at least 80% of standard mechanical and electrical components of the RF equipment manufactured in the last 20 years.

Fast shipping

Shipment of spare parts available in stock at the latest within 24 hours from the order (generally, orders confirmed before h. 12:00 noon time are dispatched through selected courier services on the same day before h. 16:00). Spare parts not available in stock are manufactured in-house or procured in the shortest possible time.

On-call assistance

On-call assistance through a dedicated phone line, or via fax / E-mail, by an English speaking trouble-shooting engineer available full time during office working hours.

Prompt on-site assistance

On-site mechanical, electrical & software assistance by servicing engineers departing from STALAM or its overseas servicing centres within 12-48 hours for interventions within Europe and 48-72 hours for interventions outside Europe.

Test & Demo facilities

The STALAM testing lab is an integral part of our R&D and engineering departments. Through testing and analysis of the results, our experts can study in details the characteristics and behaviour of a product submitted to the Radio Frequency field, thus assessing the technical and economic feasibility of drying and thermal processes on specific substrates, based on customers' requirements. In the same way, our engineers can identify the best process parameters and the technical specifications of the most suitable RF equipment to perform such processes.

STALAM's R&D lab is equipped with a wide range of pilot machines available for product testing and demos. Such tests and demos can be performed in our company or at our customers' facilities as appropriate. Some of these machines are also available for rental for product and process development purposes or systematic testing sessions. Our highly qualified technical team will assist customers to develop better, more profitable and innovative process solutions.

Contacts

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