



## Ovens





## The basic ingredient. We know how.

Ever since we first started, in 1962, we have always felt ourselves to be part of our customers' recipes. This is why we have always given them our technology, passion, reliability and quality.

Being “**the basic ingredient**” is not just a motto for us but a real, constant commitment. We have put innovation at the heart of our business, always pushing the boundaries of our experience. We never take it for granted, always making it available to our customers around the world.

Expanding our expertise, broadening our scope, always driven by passion and daring: what we call **Know-how** is a goal that we shift forward by one step every day. This is positive energy and one that we want to share with all our partners.

The baking process turns the dough into an edible and tasty product. Cracker, soft or wire-cut dough have different baking needs in terms of heating methods and temperature profiles.

The range of heating systems which can be supplied are:

- direct gas-fired;
- radiating – cyclotherm – with or without turbulence;
- direct or indirect gentle convection;
- electric oven;
- working width ranging from 1000 mm to 2000 mm in the case of biscuit and cracker production, or even wider for baking products in trays;
- on request pre-assembled of modules oven chambers can be supplied.

The conveyor systems vary according to the type of products to be baked:

- continuous metal band for soft dough, cookies or batter, wire mesh (light or heavy mesh) in the case of hard sweet biscuits or crackers;
- slat-type or wire mesh linked to lateral side chains in the case of products baked on trays;
- stone tiles in the case of fast-baking pizza products.



Our ovens are made using the most advanced design software including 3D modelling and a thermo-fluid dynamic simulator which makes it possible to speed up the innovation process of the equipment, or to test new solutions first on the computer and then in field tests in our pilot oven. The advanced technological level of the design, the high standard of the finishing verified by our strict quality standards, ensures the supply of a baking oven of great reliability, working efficiency and uniform baking.

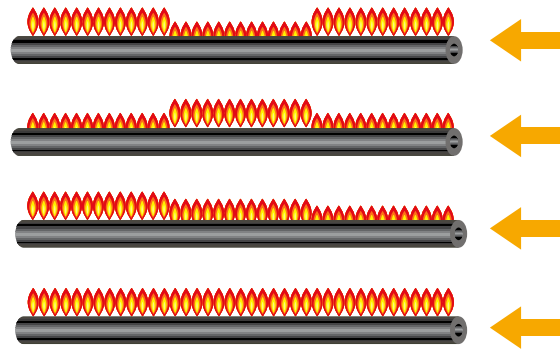
# Ideal baking

# Direct gas fired oven

The **direct gas fired** oven is used for those products that require great heating power. They can burn natural gas or LPG. The gas is mixed with air in a special mixing pipe based on the "Venturi tube" principle: the gas flows at zero pressure, i.e. it is the air which sucks the stoichiometric amount of gas required to generate the ideal combustion.



In each zone, the heat at top and bottom can be independently set by regulating the two **combustion air fans** which control the volume of gas fed to the burners. A bar graph displayed on the HMI can be set by the operator to select independent top or bottom heat ratio. Each zone is managed by a suitable automatic **humidity extraction system**.



Sketch showing same of the different flame heights at left, right or centre across the width of a tri-zone burner.

Direct gas fired burner complete with its dedicated control system for ignition and flame detection.

Direct gas fired oven with stainless steel covers.



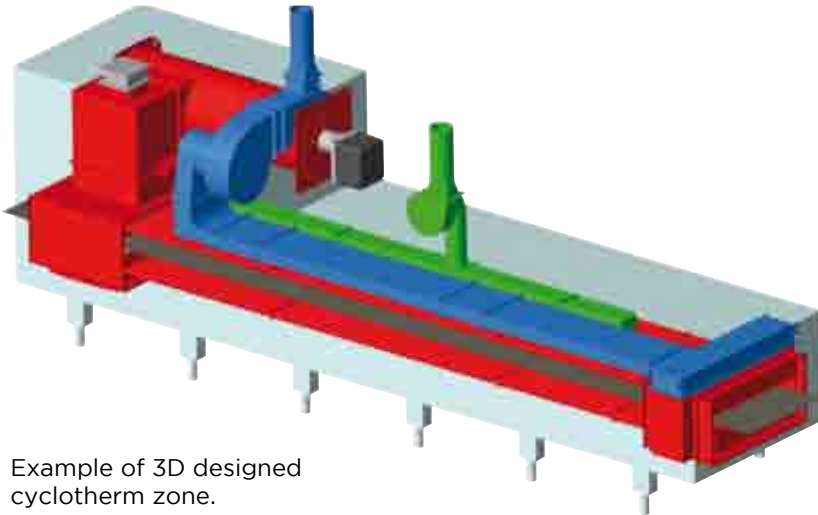
# Radiating - cyclotherm oven

The **indirect radiating** oven – also known as a cyclotherm oven – transfers the heat to the product by radiation.

Each zone consists of a set of tubes at the top and at the bottom of the baking conveyor, through which the hot air, that has been previously heated by a burner, flows.







Example of 3D designed cyclotherm zone.

Cyclotherm oven with stainless steel covers.



At the end of each baking zone the hot gases are collected by a plenum and return by a blowing fan to the burner, where they are heated up again to the working temperature and sent back to the tube circuit.

The heating system is therefore **completely independent**, and the products of combustion in fact never come in contact with the dough being baked.

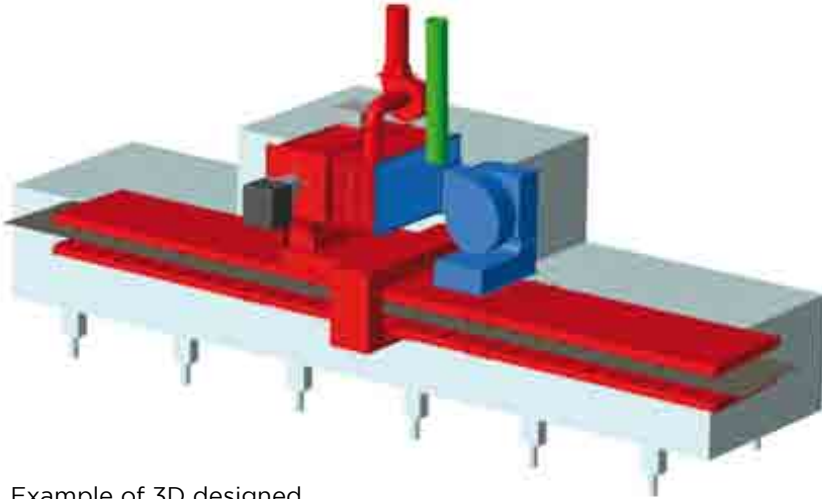
Each zone is managed by a suitable automatic **humidity extraction system**.

# Indirect convection oven

In the **indirect convection** oven the air is heated up by passing through a dedicated heat exchanger: the dough under baking never comes in contact with the products of combustion. This type of heating is suitable for baking more delicate products. Its baking chamber is constituted by a plenum duct positioned on the top and bottom of the baking conveyor where **hot air is gently blown** out of properly designed slats and comes in contact with the dough.





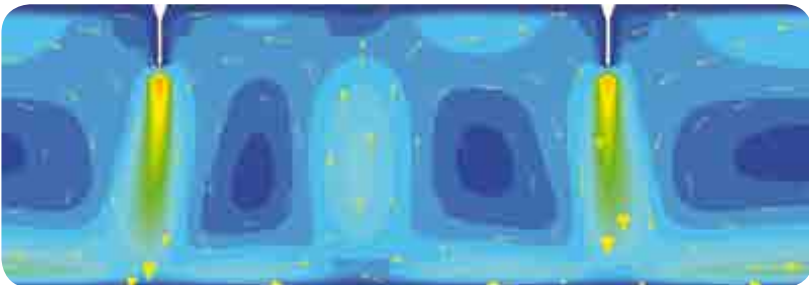


Example of 3D designed indirect convection zone.

The heat transfer is mainly by convection and it has a pronounced drying effect on the dough.

Each zone is managed by a suitable automatic **humidity extraction system**.

Picture obtained by the software of the air flow coming out of the slat nozzle.



Indirect convection oven with stainless steel covers.

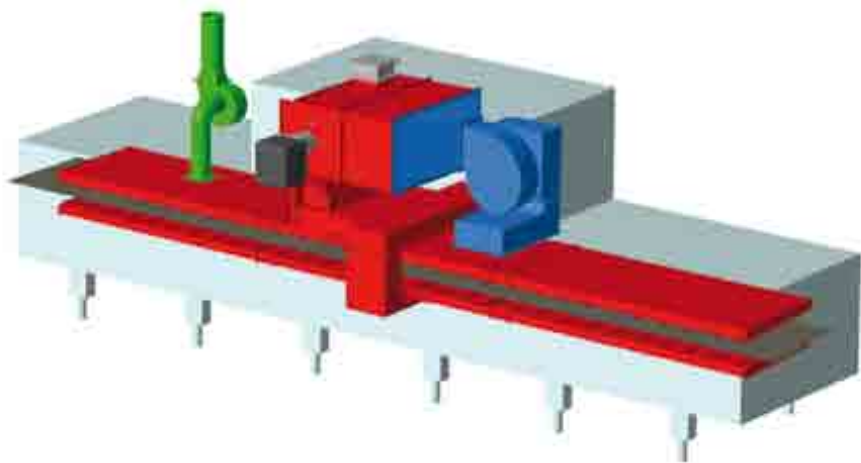


# Direct convection oven

In those cases where the fuel available is natural gas and the reduction of the baking time is a necessity, the **direct convection** oven is the right choice.

Its baking chamber is constituted by a plenum duct positioned on the top and bottom of the baking conveyor where **hot gases are gently blown** out of properly designed slats and come in contact with the dough.

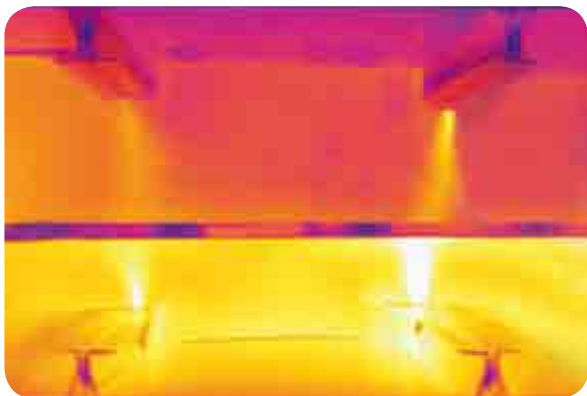




Example of 3D designed direct convection zone.

The heat transfer is mainly by convection and it has a pronounced drying effect on the dough.

Each zone is managed by a suitable automatic **humidity extraction system**.



Thermographic picture of the hot air flow coming out of the slat nozzles.

Slat type nozzle where the hot gases are blown from the plenum to the dough pieces being baked.



Convection oven with stainless steel covers.



# Hybrid oven

An **hybrid** oven is divided into sections with different types of heating systems; depending on the type of product and its baking requirement, Imaforni specialists can suggest the most suitable oven configuration to suit the customer's product.

Cracker and hard sweet biscuits are usually baked in a hybrid oven with a direct gas fired section, followed by the direct convection system. A cyclotherm section followed by indirect convection is usually used when rotary moulded and wire-cut products are to be baked.

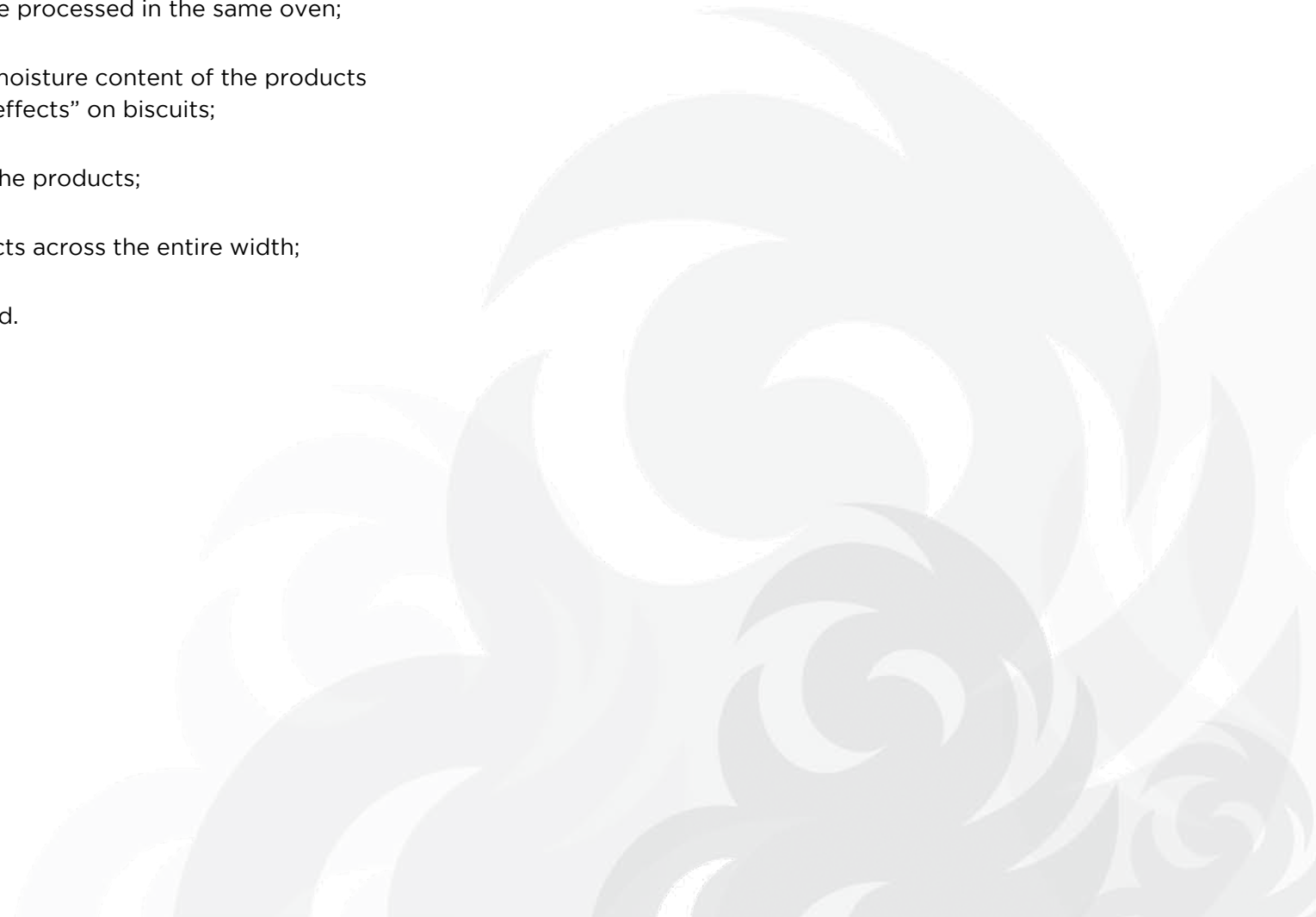
Hybrid oven: **direct gas fired and direct convection** configuration.  
Please note the enclosures installed on the return of the baking conveyor which can be supplied on request.



Hybrid oven: **cyclotherm and indirect convection** configuration.



The advantages of using the hybrid oven as opposed to the traditional single heat transfer system, could be summarised as follow:

- **flexibility** of the baking process – different products requiring different baking profiles can easily and successfully be processed in the same oven;
  - much better fine-tuned control of the final moisture content of the products with consequent **reduced risk** of “checking effects” on biscuits;
  - improved crispness and general texture of the products;
  - more uniform colour of all the baked products across the entire width;
  - in most cases, higher output can be obtained.
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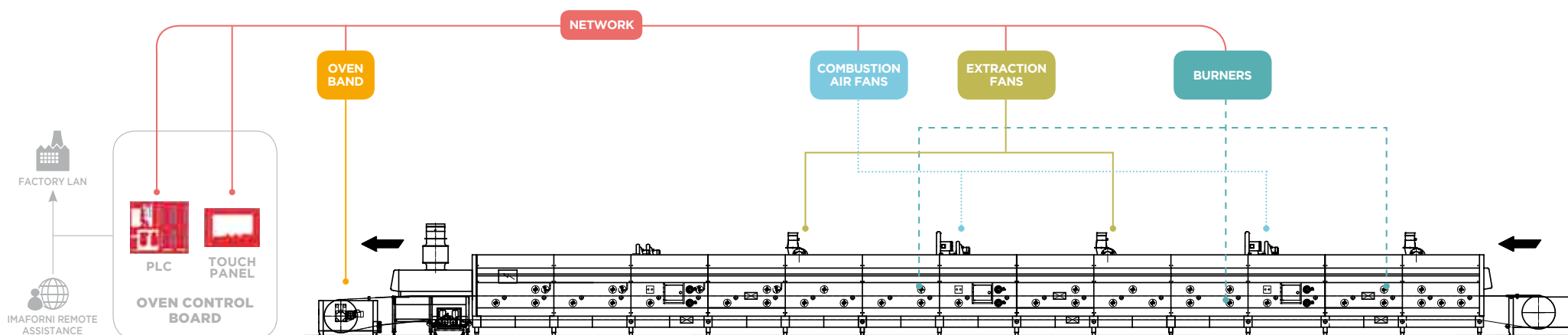
# Control system

The control system has the important task of supervising the baking process. It usually comprises a **PLC** and one **thermoregulator** for each zone in the oven. The thermoregulator modulates the heating power of each burner in the zone in order to maintain the set temperature constant.

The PLC supervises the safety, start-up and shutdown procedures. It also supervises the operation of the conveyor and all the alarms, and stores all the settings made by the operator (Recipe Storage Function). In the case of a direct gas fired oven, based on the recalled recipe, it automatically switches on the selected burners. The PLC communicates with all the components of the oven through **a dedicated network**. By means of a touch-screen panel, the operator can quickly call up the pages that report the different working parameters of the oven and change them when needed. The main control panel and all the electrical cables comply with the regulations in force. Remotely in-line assistance can be provided by skill Imaforni's engineer in case of trouble shooting or software change are needed. The oven setting parameters and alarms data can be made available to an external existing supervision system to the factory. The optimized oven design in conjunction with an automatic controlled extraction damper from the baking chamber ensure high rate of energy saving and lower emissions to the atmosphere.



The HMI of the oven displays, on a bar graph format, the set and the real temperatures on a multi-zone oven.



# Components and accessories

They are called “accessories”, but in actual fact these components are **essential** for problem-free production. These devices can be fitted to the oven and are helpful in solving many different production or technological problems.



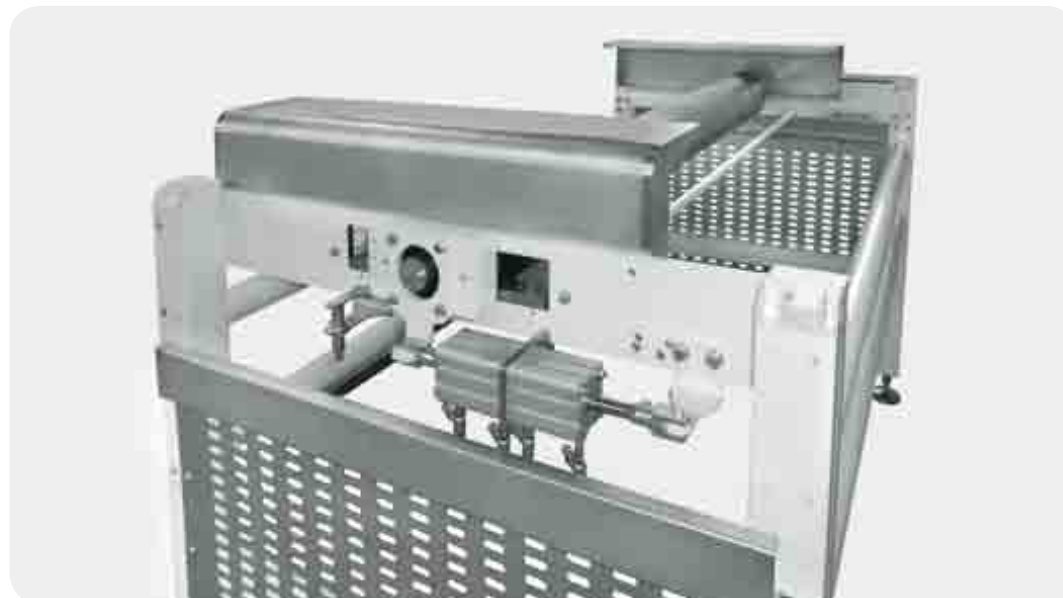
Three roll outfeed system suitable for wiremesh conveyor complete with pneumatic tensioning system.



Band water cooling system to be installed on the outfeed of the oven. Used to facilitate detachment of the products from the oven steel band in limited spaces.



Automatic pneumatic tracking system of the oven conveyor.



Scraping blades for cleaning the steel band conveyor.



Band greaser for solid steel band.



Infeed drum: on request the drum can be jacketed for the circulation of chilled water to help cooling the steel band.



Motorized brush system for cleaning the wiremesh.



Water jet oven wiremesh conveyor cleaning system.



Detail of the water jet system.



Spring loaded guides for the oven conveyor. They are installed in the baking chamber and in the return section of the conveyor.



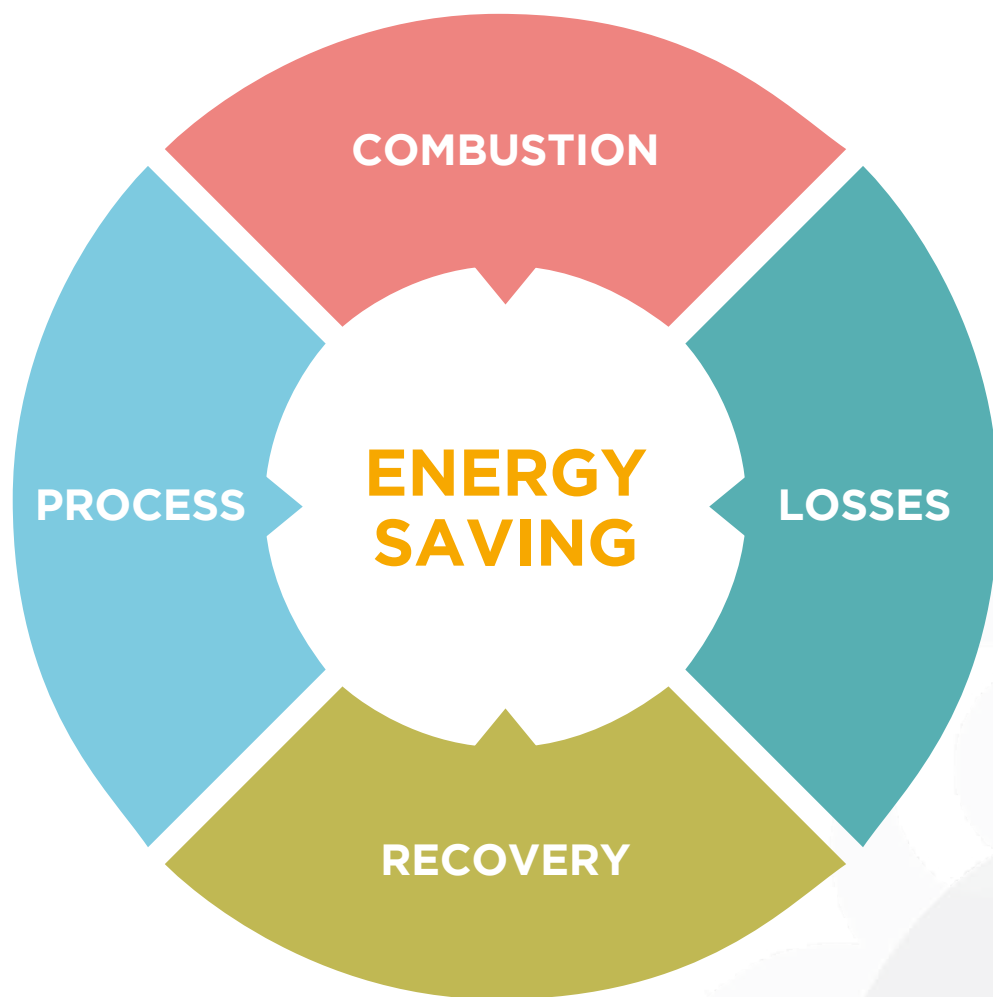


Manholes on the non-control side allow easy and quick access to the baking chamber for cleaning or maintenance purposes.

# Energy saving

4 ways to improve energy efficiency.

**Care to environment** has always been part of our business-doing. Imaforni's innovation leans towards the identifications and adoption of **technical solutions** which provide consistent and firm fuel savings accompanied by lowest possible emissions to the atmosphere.



## New Generation Oven equipped with Energy Recovery Systems.

System to provide recovered energy from the oven to the general services of the factory.



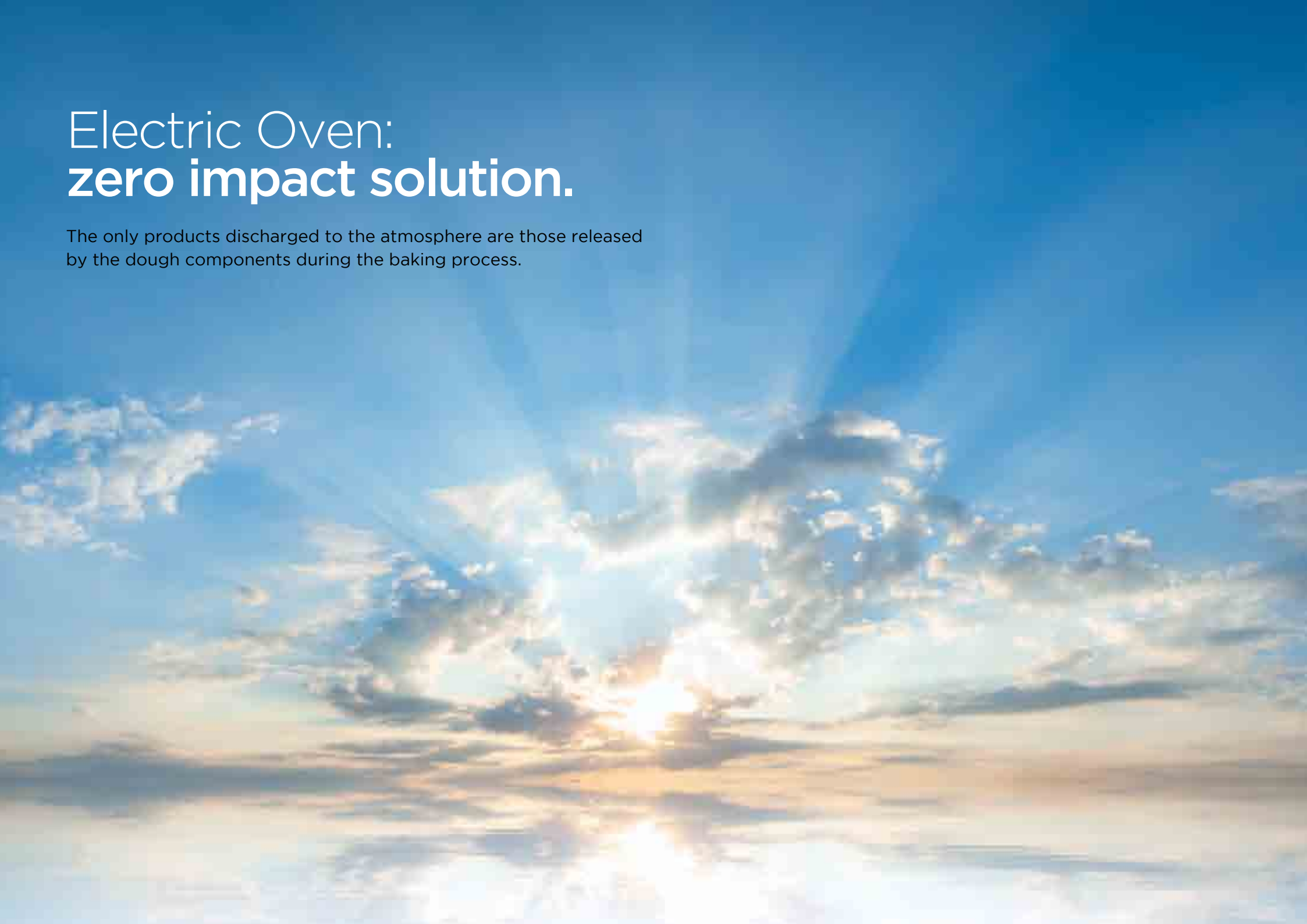
Main exhaust collection duct is connected to the oven heat recovery system.





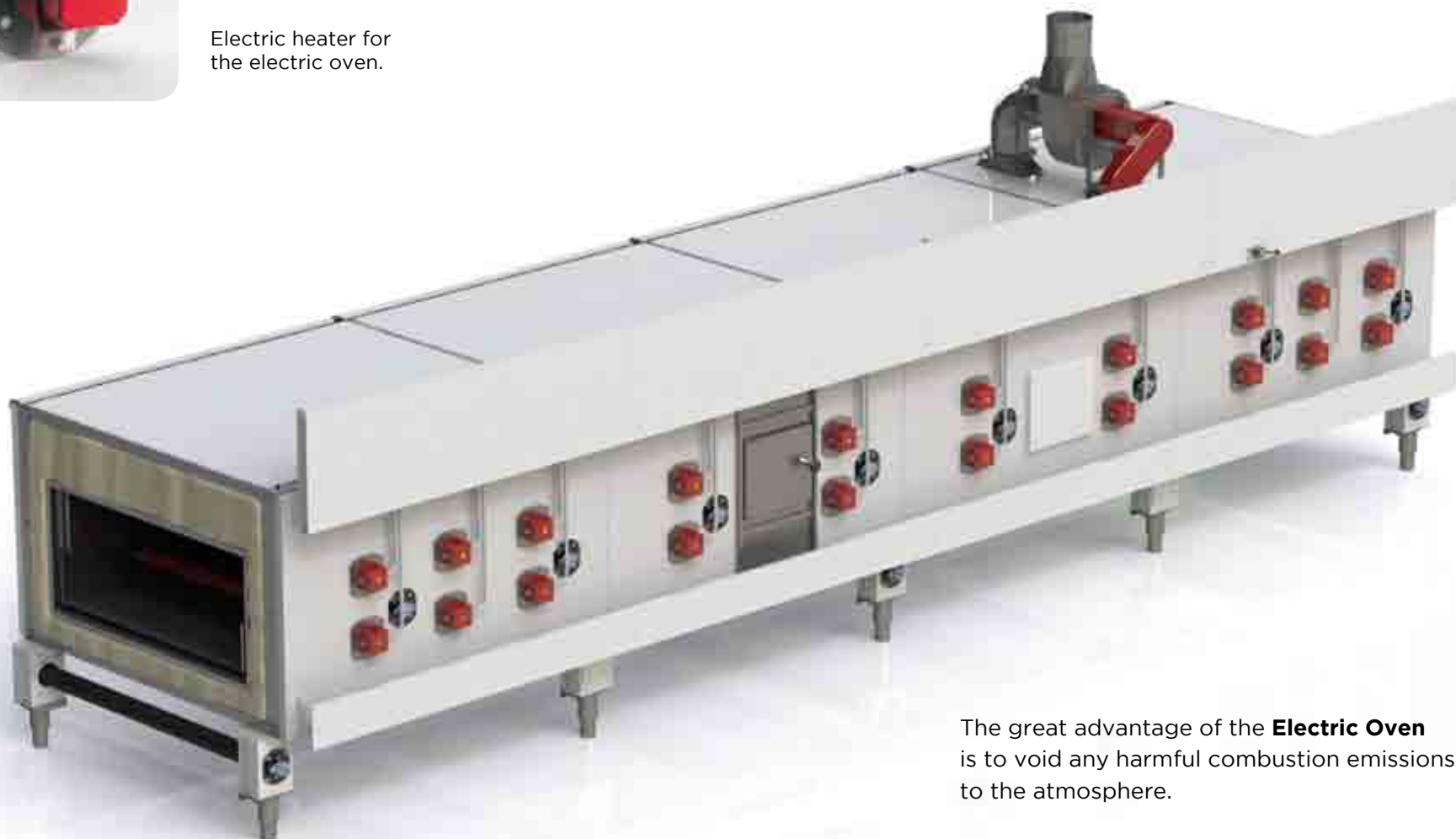
# Electric Oven: **zero impact solution.**

The only products discharged to the atmosphere are those released by the dough components during the baking process.





Electric heater for  
the electric oven.



The great advantage of the **Electric Oven** is to void any harmful combustion emissions to the atmosphere.

# Special ovens

By **special** ovens we mean all those in which traditional heating systems are applied to the baking of special products. A typical example is the baking of pizza products, which requires a high-temperature baking oven, stone-based conveyor and fast baking time.



Pizza oven equipped with stone conveyor.



Muffin production.



Italian traditional Panettone cake.





General selection of different products  
on tray, processed on wide oven.







Pilot oven with mixed indirect and convection electric heating systems, 400 mm wide.

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