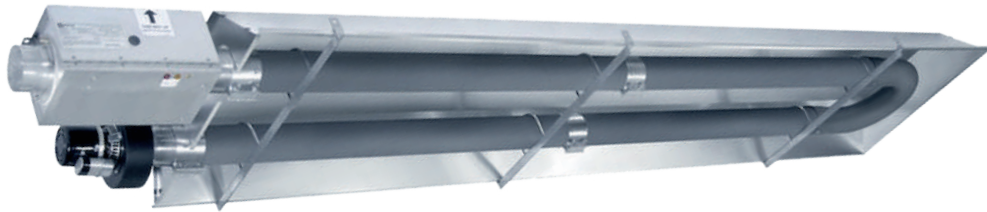




# HIGH PERFORMANCE TURBULATOR

## For gas-fired tube heaters



### The purpose of our innovation

Eurotubi, driven by a customer-oriented approach, has always made of continuous product innovation its cornerstone. With this in mind, we have internally developed our **High Performance Turbulator**, a new device aiming at offering to our customers a valuable solution to gas-fired tube heaters.

Eurotubi's Turbulator is actually designed to **increase radiant tube heaters efficiency and extend their life cycle**:

1. **Protecting** the first part of the radiant tube from **high temperatures**;
2. By **better distributing the flame**, and therefore the **heat generated**, which assumes a **helical movement** inside the tube.

### OUR INNOVATION IN A GLANCE



- Improved flame distribution with significant increase in **heat transfer coefficient** at lower temperatures;
- Increase the **energy efficiency** of the entire heating system;
- Longer product life cycle** thanks to higher **protection** of first part of the **radiant tube**;
- More **compact** and **lightweight** design;
- Easy** and **quick** to **disassemble**, enables radiant tubes **cleaning** to get the best performance;
- Easy to install** even in existing heating systems.





## The current situation's drawbacks

The first part of the tube, right after the burner – in general within 3 meters – is usually subject to very high temperatures, which can reach up to 800° C. These temperatures, combined with the continuous on/off cycles, generate significant thermal stress, which over time can lead to tube breakage at its joints.

To overcome this problem, some manufacturers opt for placing a 1 to 3 m stainless steel tube inside the radiant one, right after the burner, while others go for 3-meters helical turbulator, which is a twisted steel strip inserted inside the radiant tube and fixed with a small weld.

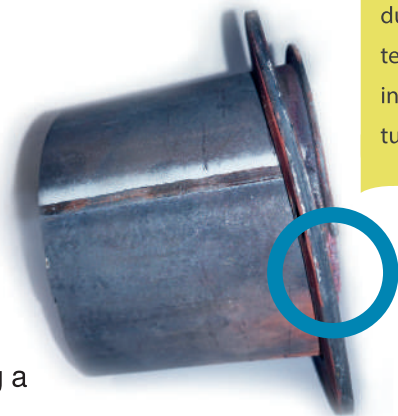
However, **both technical solutions currently in use present some drawbacks.**

On the one hand, using a **stainless steel tube** implies the need to refer to more than one supplier, thus **increasing spare parts and production costs**. In addition, as many people know, stainless steel tubes have **lower radiant efficiency** than aluminized tubes - up to **50% less**.

On the other, **common turbulators** are a good solution because they can boost radiant efficiency through better heat diffusion, but the way they are currently manufactured **still has some disadvantages:**

1. The most used locking method consist in manually welding the twisted metal strip inside the tube, thus complicating the production process;
2. Using a welded turbulator means to have a unique product made of a radiant tube with a twisted metal strip welded inside that can no longer be disassembled. This generates maintenance problems to the radiant tube because it hampers the proper internal cleaning and soot removing activities, which should be performed periodically to improve the efficiency of the heating system.

Damaged radiant tube due to high temperatures in gas-fired tube heaters.



Soot and waste that can be found inside the tube if proper cleaning operations are not performed.





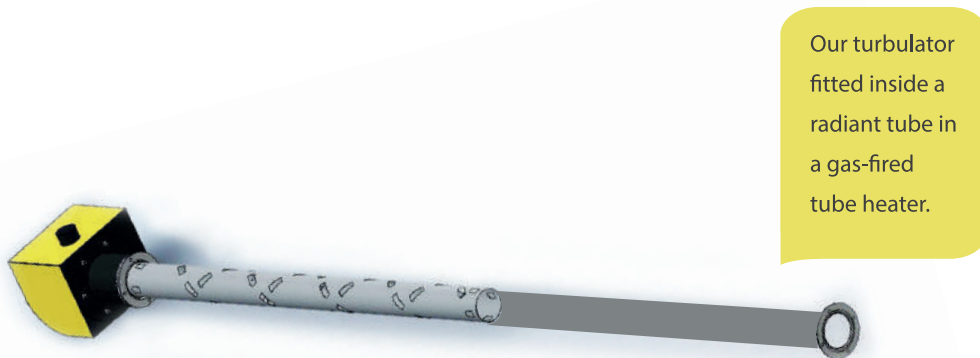
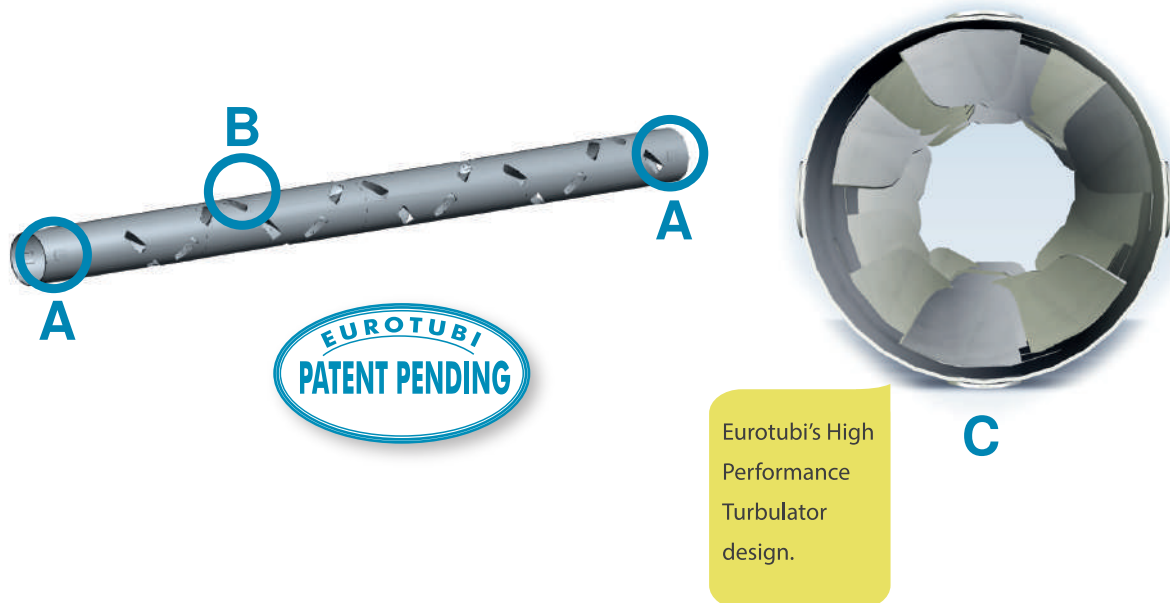
## Our innovation

Eurotubi has developed a **stainless steel High Performance Turbulator with 1mm wall thickness and up to 2 m length.**

Our Turbulator is manufactured using a 3D laser system according to a specific design;

At both ends (A), we find fins sticking out from the outer diameter of the turbulator, which are used to lock it inside the radiant tube, following the direction of insertion. Lengthwise, notches are made at regular intervals, which are then bent inwards (B).

At the end of the production process, looking inside the turbulator, all the plates will form a kind of helix (C), causing the heat to take on a helical movement.



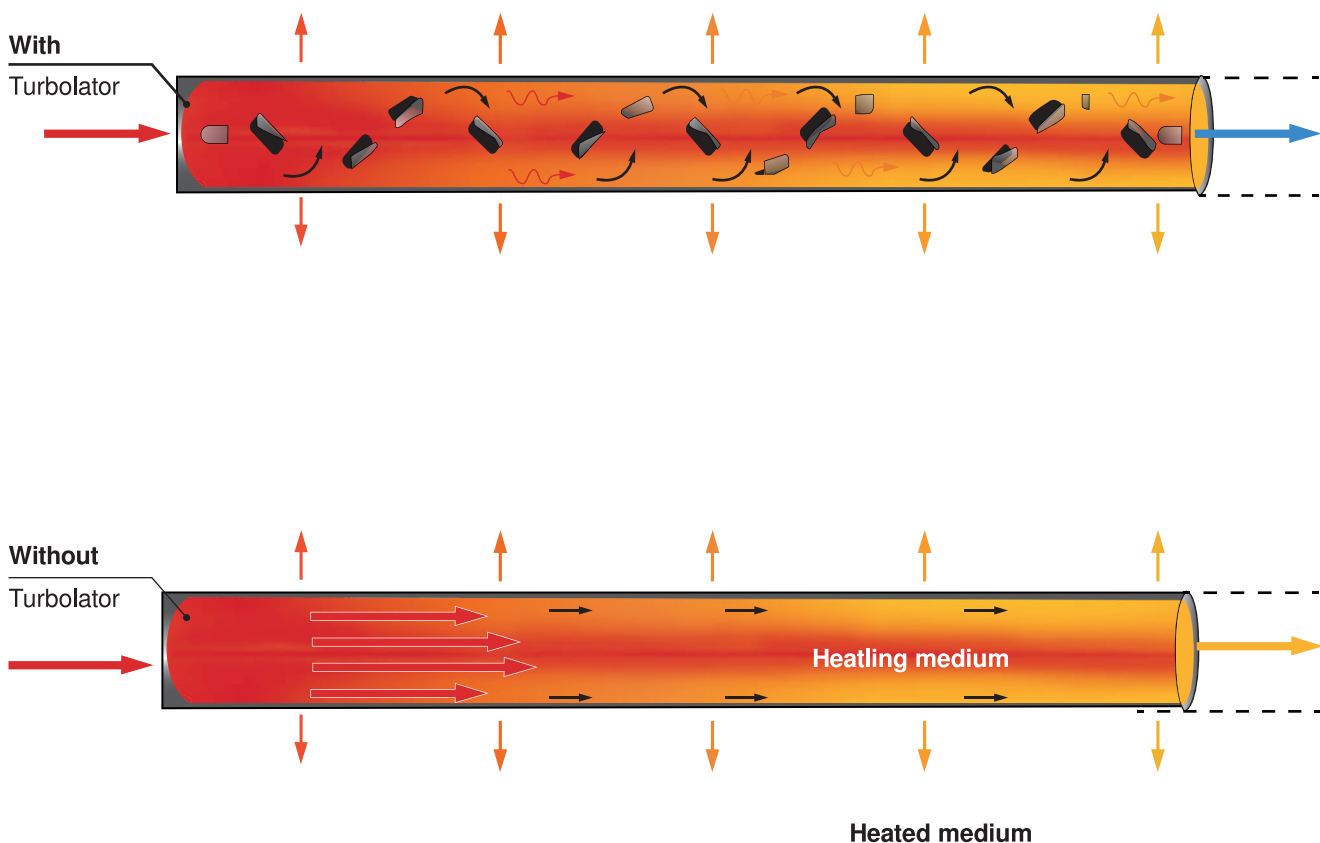


## What is the working principle of a turbulator?

In gas-fired radiant tube heaters, the heat exchange occurs at the wall of the radiant tube. Often, however, stagnation of the gas flow generates a thermal barrier near the tube wall that severely limits heat exchange between the tube itself and the area to be heated.

By **increasing the turbulence intensity**, turbulators reduce the development of this thermal barrier and **boost the heat exchange between the heating medium – gas – and the tube wall**.

Hereby, the **heat transfer coefficient** of the entire radiant tube heater **increases** substantially.



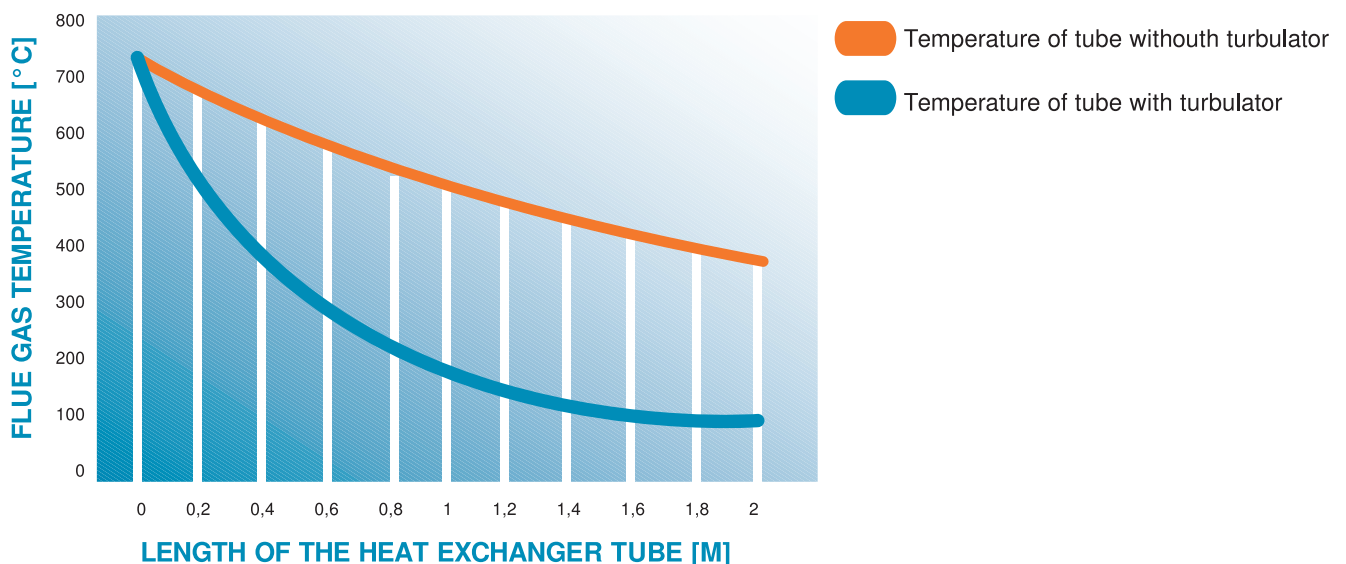


## How can our new High Performance Turbulator benefit your business?

As you can see by looking the graph below, using our Turbulator in gas-fired radiant tube heaters improves significantly the heat exchange rate, and thus the energy efficiency of the entire system.

Some analysis performed on combustion gas flowing through a 2-meter radiant tube shows that with our turbulator the **heat transfer coefficient** becomes **almost three times higher** than with a smooth tube.

Basically, our Turbulator can **reduce the temperature inside the radiant tube of about 50%** compared to a smooth pipe without a turbulator.



### WHY IS IT IMPORTANT TO IMPROVE THE ENERGY EFFICIENCY OF YOUR SYSTEM?



- Financial savings:** More efficient radiant tubes enable fuel savings, thus reducing operating costs. In general, the payback time of our turbulators can be measured in some months.
- Reduced carbon footprint:** High energy-efficiency tube heaters contribute to reducing CO2 emissions in fact, by consuming less energy, fuel emissions will be lowered.
- Compliance with environmental regulations:** Energy-efficient systems will find it easier to comply with the tightening environmental regulations. Therefore, improving producers' market share and productivity.

