



**Centro Sviluppo
Materiali S.p.A.**

COMBUSTION TECHNOLOGIES



CSM's COMBUSTION STATION

The CSM's Combustion Station, located in Dalmine (BG), is one of the main Combustion Science Centre in Europe starting from fundamental investigation of innovative combustion processes to their application in different industrial sectors. Strong synergy between semi-industrial and industrial scale testing of burners, mathematical modelling and field technical service allows us to continue to maintaining a position of excellence in combustion R&D and at the same time to support application for all industries using large gas flames.



CSM is one of the promoting partners of the International Flame Research Foundation (IFRF) and has built a strong network with national and international organisations and universities,

promoting the technological transfer of innovative combustion processes.

Thanks to long tradition and modern equipments the CSM's Combustion Station is presently able to perform complete and accurate characterisation of industrial burners firing natural gas and to support the design and engineering of new equipments.

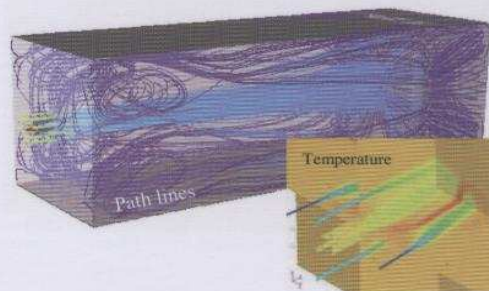
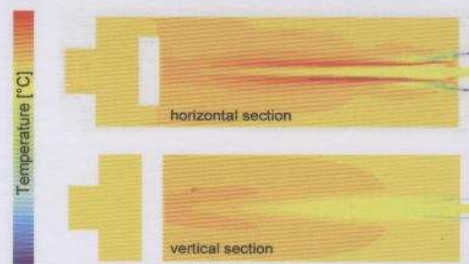
Equipments

Traditionally, the central theme of the Station work has been based on **industrial and semi-industrial scale research facilities** in which aspects of industrial heating processes are simulated:

- Furnace #1: detailed studies on gas flame.
The furnace is of flexible design and can modify its length from 3m to 7.5m. The cross section is 2m x 2m and typical thermal input is 0.5-2.5MW.
- Furnace #2: characterisation of small burner (up to 250kW), investigation of interaction between direct flame atmosphere and product, test of ceramic honeycomb recuperator. Internal dimensions are 1.2m x 1m x 2m
- Furnace #3: radiant burner tests (up to 100kW)
- Furnace #4: simulation of direct reduction process (pellets)

More recently capability in the area of **Computational Fluid Dynamics (CFD)** has been developed. The emphasis is placed on model verification using data generated in the CSM experimental facilities. The CFD is applied:

- to R&D on new burners by testing conceptual design before they get to a prototype stage;
- to assist in the designing of experimental programs and interpretation of measured data;
- to provide a reliable method of scaling existing design to larger or smaller applications



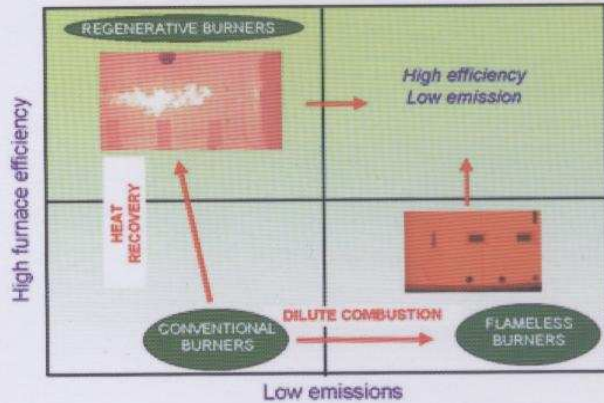
Mathematical Modeling

Burner development

The main effort of CSM's R&D in the field of reheating furnaces has been devoted to the environmental impact and consequently to the control of pollutant emission through the development of:

- lateral and roof burners for steel reheating furnaces;
- high impulse burners for steel reheating furnaces;
- radiant tube for controlled atmosphere furnaces
- lateral burner heat treatment furnaces

In the latest years the focus has been on design and testing of the new generation of Low NOx gas burners based on flameless combustion and of regenerative burner equipped with ceramic honeycomb regenerators.



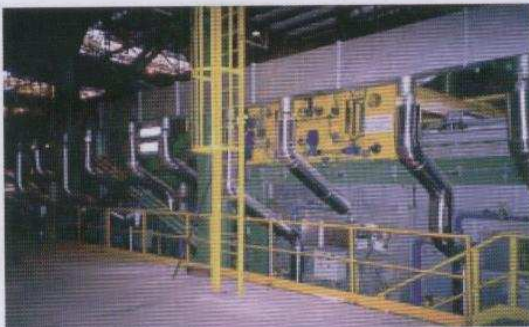
Road map for the development of NG burner with minimum environmental impact

Innovative Processes

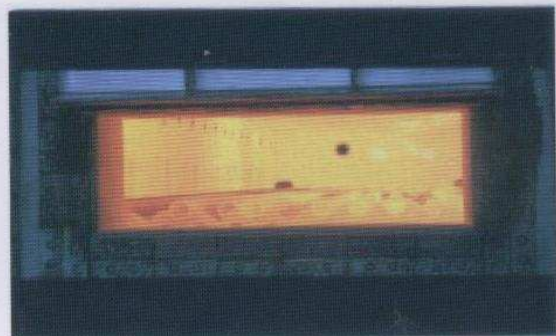
Collaboration between the Combustion Station, the CSM's Engineering Department and qualified industrial partners consents to design and realise demonstration and industrial furnaces. Excellence in the high temperature systems and process automation together with design, erection and commissioning strong know-how allowed to satisfy the most qualified requests both in terms of environmental impact and energy saving, in agreement with the directive of Kyoto protocol about the CO₂ reduction.



Stain less Steel Strip Reheating Furnace



Direct Annealing Furnace



Pipes reheating furnace

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