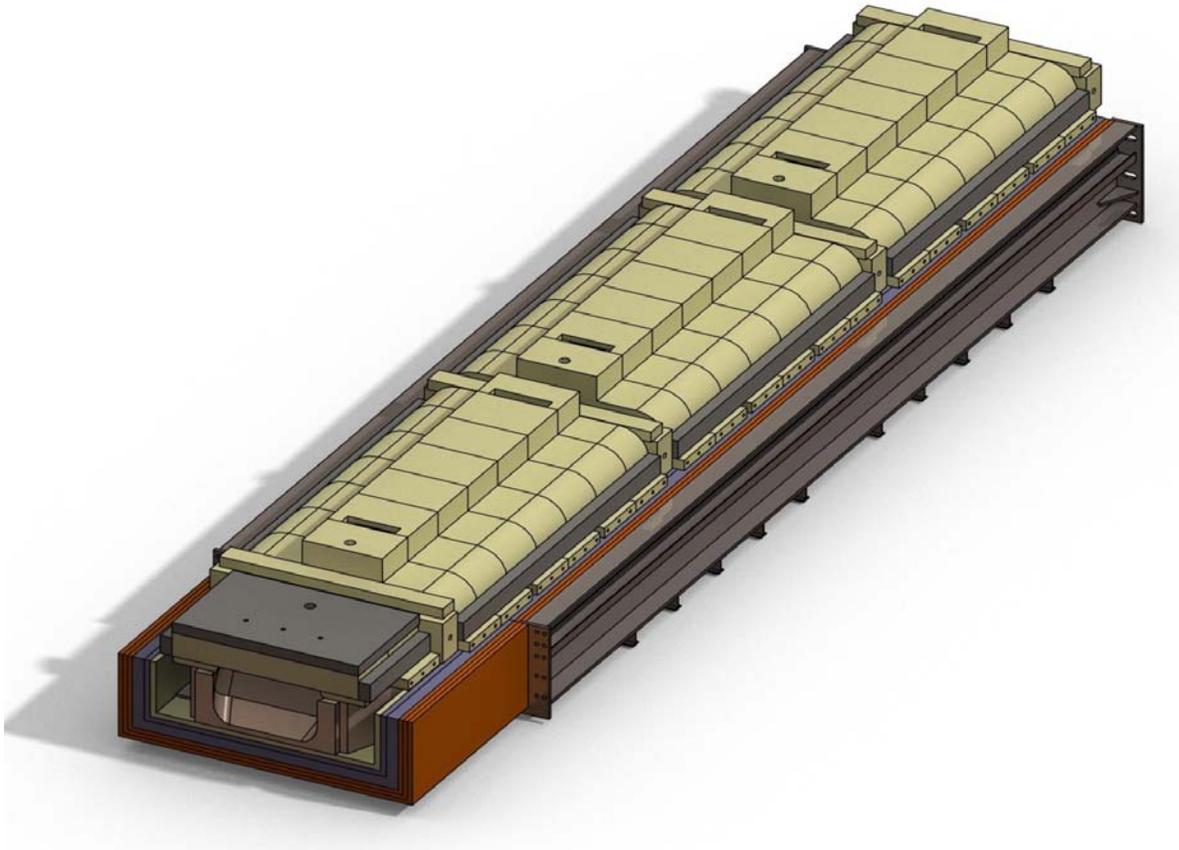


F.I.R.E. SHP FOREHEARTH

The SHP forehearth (Patent no. WO 2010/015964 A2) is able to guarantee a minimum of 98% (soda lime colored glass) of thermal homogeneity at the triple thermocouple near the spout.

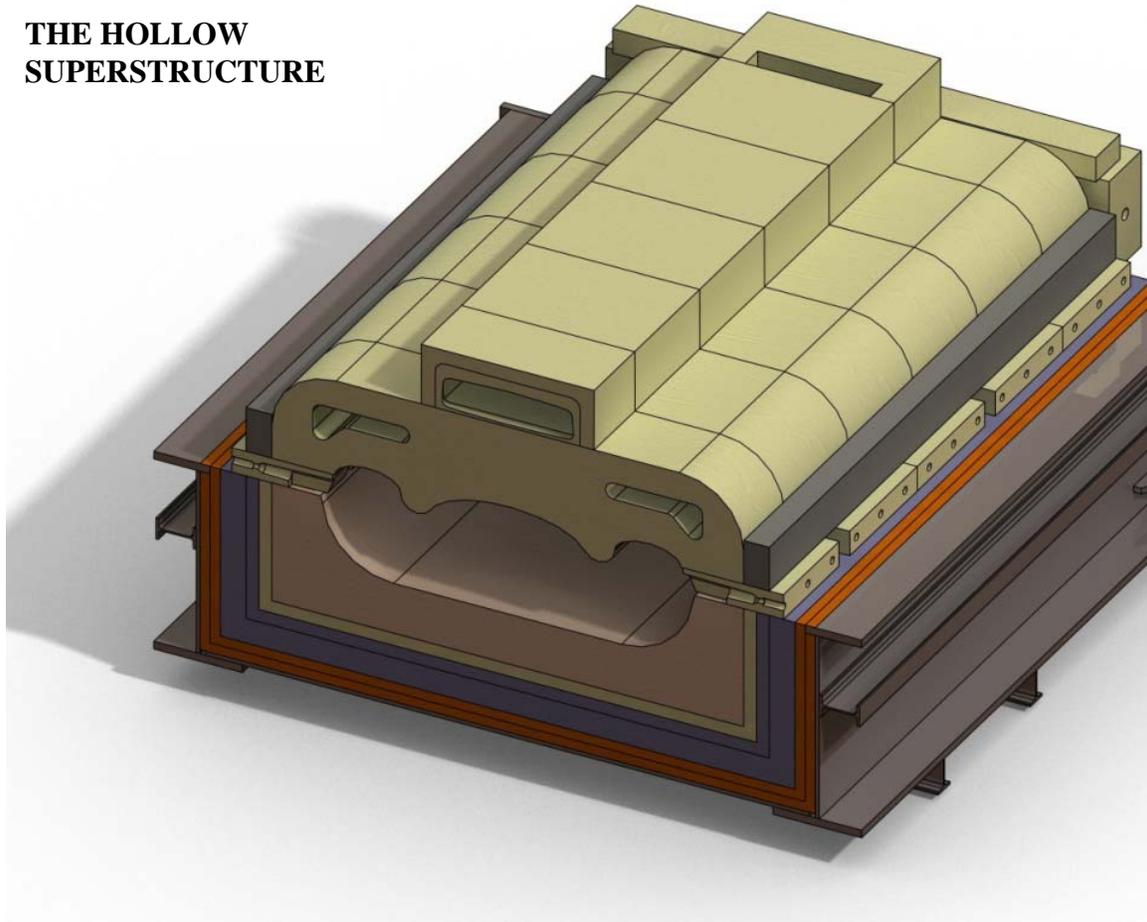


Innovation:

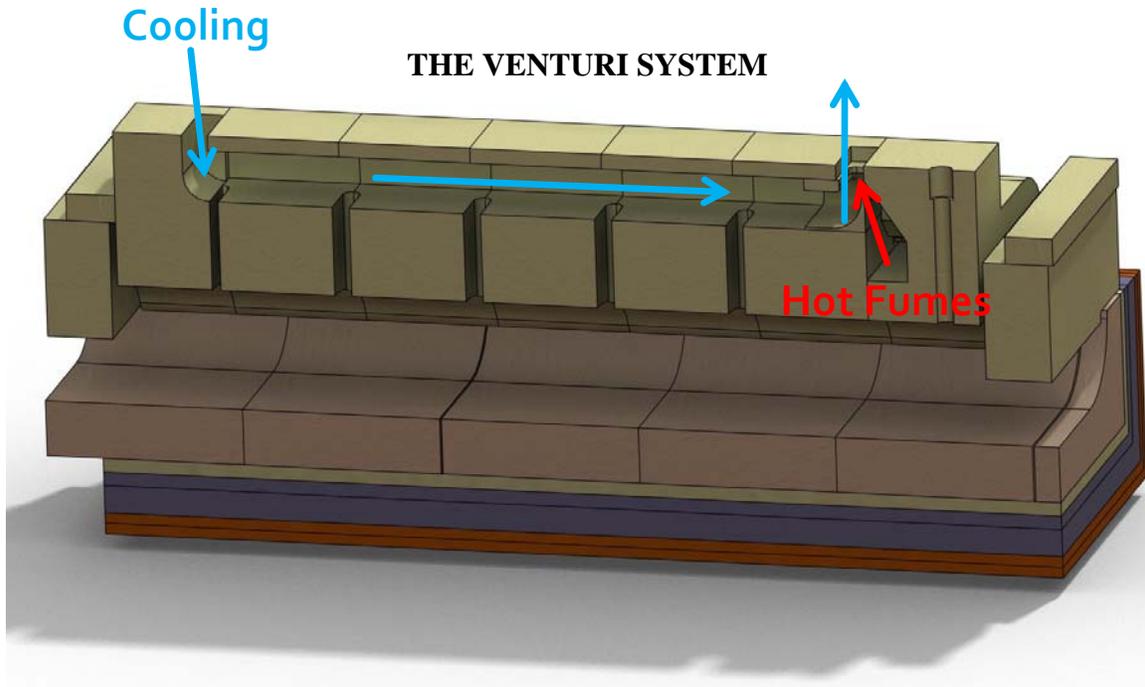
This result is achieved by introducing a combination of innovative designs in the superstructure which consists of the following three main features:

1. Alternative superstructure shape, which enables the separation of the flue gas zones (at the side) from the cooling zone (in the centre)
2. Hollow superstructure with integrated flue gas ducts
3. Venturi system which extract the flue gas in proportion to the central cooling air pressure

THE HOLLOW SUPERSTRUCTURE



The innovation is based on a new physical cooling process. Flue gas flows inside the superstructure, keeping the side of the forehearth hot. The cooling air extracts the flue gas with a special venturi device. When more cooling is required the flue gas is extracted more rapidly in order to exchange less energy with the refractory. This process is self regulating.



Benefits:

Thermal performance

SHP forehearth have proved the following performance in practice:

- 98% thermal homogeneity on Colored Glass (compared to the average 94% with the best western European furnaces)
- 99% thermal homogeneity on White Glass (compared to the average 97% with the best western European furnaces)

Forehearth length reduction

Due to the physical process described above, the SHP forehearth needs less insulation to obtain the same homogeneity. SHPs are therefore very efficient and can be installed on furnaces where more through-put is needed but the gob points should not be moved because of the cold-end layout.

As an example, a K36" SHP Forehearth can be shorter of 6' (1820 mm) compared with a standard forehearth at the following running conditions: Soda-lime colored glass, Pull 100 t.p.d., Inlet Temperature 1200°C, Gob Temperature 1100°C.

Consumption Reduction

Due to the innovative superstructure, SHP forehearths can achieve efficient cooling without compromising thermal homogeneity, therefore reducing fuel consumption.

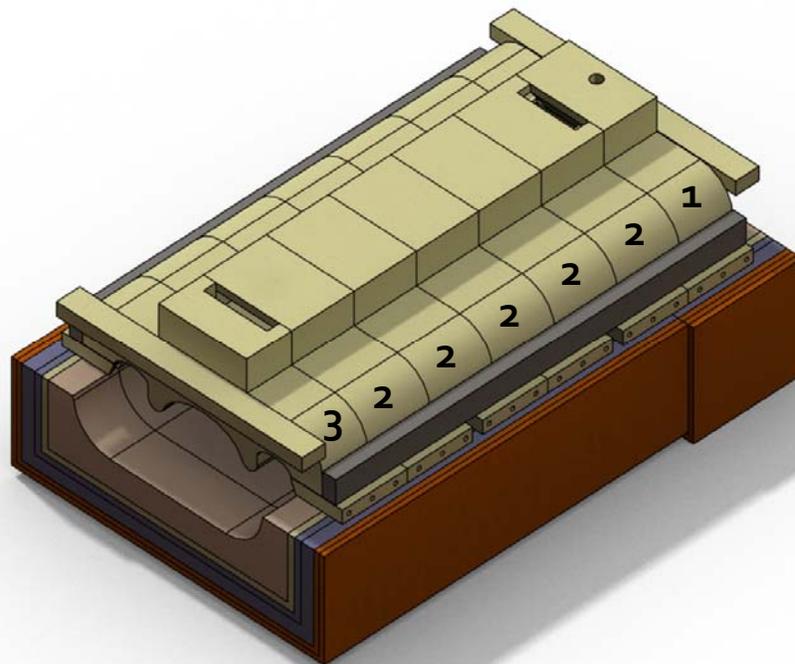
As an example, a 24' K36" SHP Forehearth can save 9% of methane when compared with a standard forehearth at the following running condition: Soda-lime colored glass, Pull 100 t.p.d., Inlet Temperature 1200°C, Gob Temperature 1100°C.

Reduction of building time and costs

SHP Forehearths can save up to 7 days of building work and therefore production when compared with other standard forehearths.

SHP Forehearths are easy to install and require less people to build.

They are composed of only 3 different superstructure shapes which can be quickly and easily assembled. The installation is simple without the need for many complementary parts currently used on standard HP forehearths (C shapes, L shapes, Triangles, Rectangles, shaped superstructure blocs, etc)

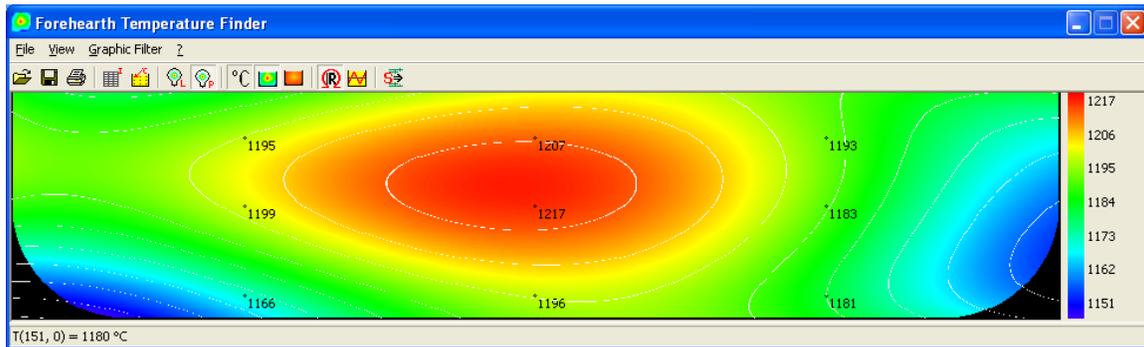


Easy maintenance

Due to the 3 blocks assembly system, the client receives spare parts after installation. In the unlikely event of superstructure failure, the blocks can easily be replaced (the time required is similar to when the spout is changed).

On line easy monitoring (optional)

An unique software has been developed to allow the operator to see the performance. At each moment the operator is able to visualize a thermal map at the triple thermocouple as well as to monitor the temperature distribution at each point of the section.



SHP key characteristics:

- Top thermal performance (minimum of 98% of thermal homogeneity guaranteed)
- Shorter layout without compromising through-put (reduction of 6' of total forehearth length compared with a K36", 100 t.p.d. standard forehearth)
- Less fuel consumption (reduction of 9% of methane consumption compared with a K 36", 100 t.p.d. standard forehearth)
- Easy to assemble
- Easy to repair
- Easy to be controlled with increased efficiency and a self regulating cooling process
- Easy to monitor due to our unique visual software