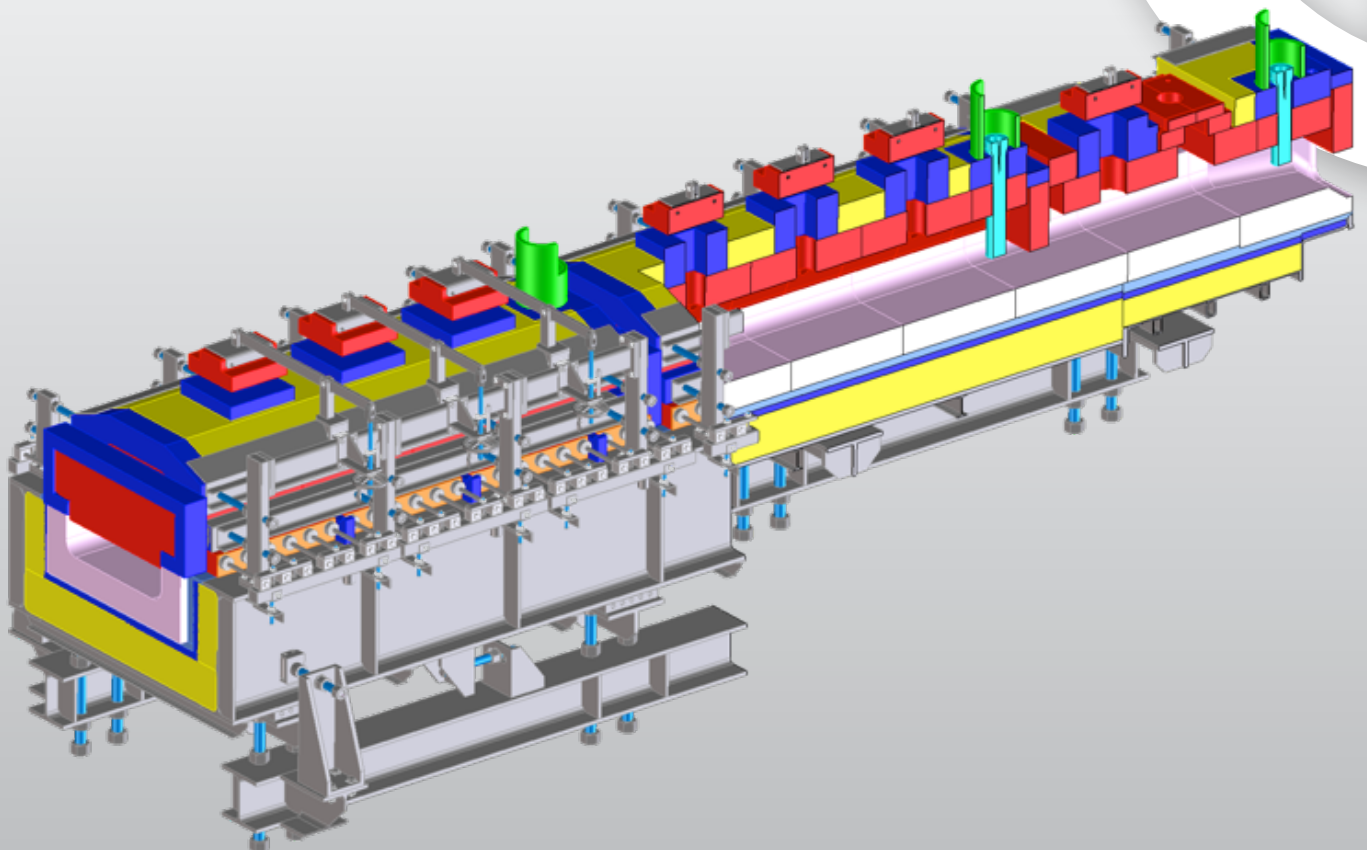




SOLUTIONS FOR THE GLASS INDUSTRY

DISTRIBUTOR & FOREHEARTH





GENERAL DESCRIPTION

Glass Service design and supply distributors and forehearth, each to the customers requirements to give the best possible performance and taking into consideration the space available for the installation.

Glass Service has developed a new concept for distributors and forehearth with direct or indirect cooling technology.

High thermal insulation combined with high performance central cooling increases the glass thermal homogeneity and reduces energy consumption.

The combination of **Glass Service** distributor and forehearth design including the **Glass Service** high performance combustion system reduces the time to change temperature settings for faster job changes.

The distributors available with widths from 400 to 1500 mm and with glass depths from 300 to 600mm depending on the glass colour, types, etc.

Profiled longitudinal glass depths are used

to ensure the correct velocity and residence time.

The forehearth widths are available from 14" to 54", glass depth from 6" to 9", depending on the glass colour, type, etc.

The distributors and forehearth size are designed to optimize the glass velocity and residence time for the optimum energy performance and thermal homogeneity.

To ensure good thermal homogeneity, all of the combustion systems are designed to allow independent control of left side and right side firing.

Temperature measurement and control can be by either optical pyrometers or platinum thermocouples.



Glass Service has developed a new concept of forehearth for glass container production.

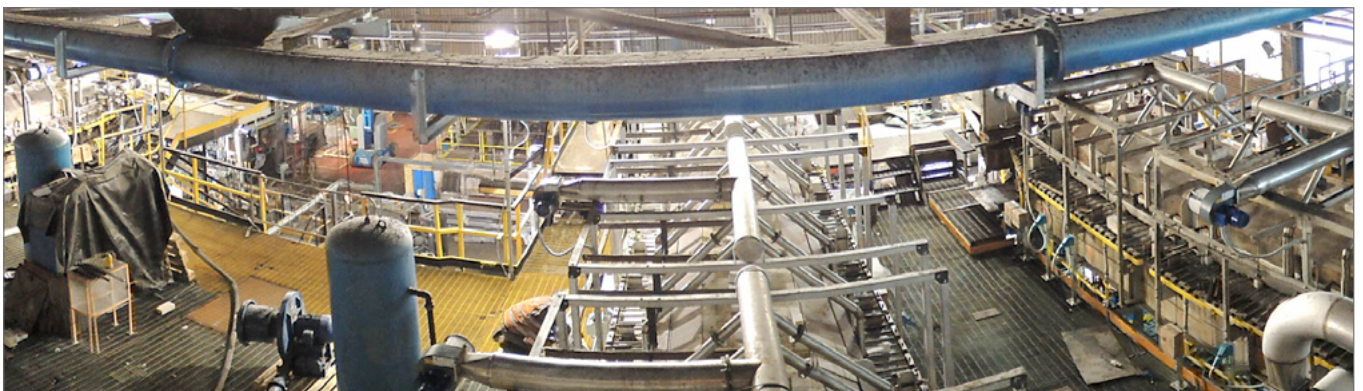
The direct cooling distributor and forehearth type FH-DC combines a high thermal insulation on the sides with a highly efficient central cooling system.

Thanks to this innovation the result is high thermal homogeneity combined with low energy consumption.

A simple refractory construction reduces the number and cost of the refractory parts over the roof blocks. This solution also reduces the installation cost as well as reducing the mechanical bending of the superstructure due the lower weight of the superstructure refractories.

The type FH-DC has the following advantages:

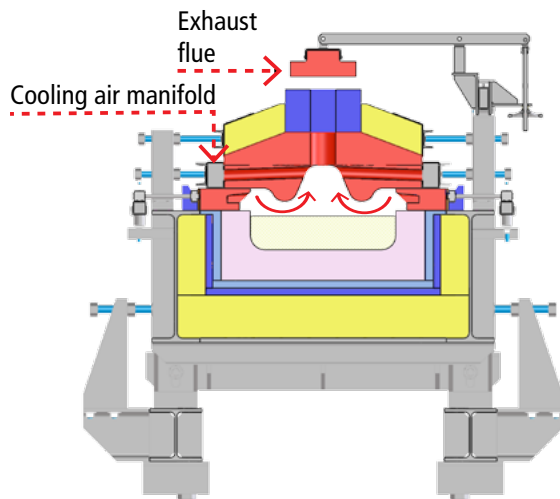
- High performance central cooling
- High side thermal insulation
- Low energy consumption
- Simple refractory blocks design and easy installation (reducing installation and refractory cost)
- High resistance to bending
- Constant cooling air distribution along the full zone length
- No over-cooling in the air cooling input area
- Due to the high performance of the centre cooling system the total length can be reduced, thus saving the space for the installation which is especially useful when space is limited



DIRECT COOLING

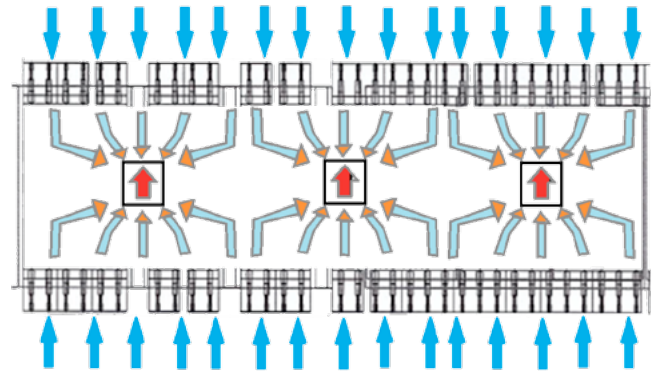
Due to the direct cooling and the special design of the superstructure, the cooling system has the following advantages:

- Cooling effect is developed in a "separated" central channel with minimum «interference» with the heating area
- The flow of the cold cooling air is across the glass flow and distributed on the full zone length, without any over-cooling of the air input zone

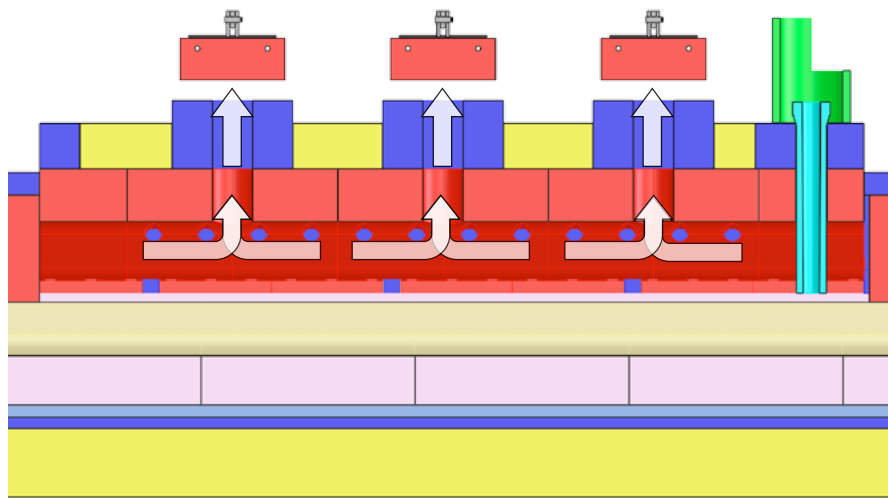


- Each cooling zone is "separated" by manifolds and each pair of manifolds (left and right) has its own chimney
- The cooling effect of each zone can be automatically controlled by manual fine tuning of each manifold

By using the "cooling manifolds" concept, using several chimneys, the cooling air is introduced directly into the central cooling zone without impacting on the combustion zones on each side



This concept avoids the uncontrolled flow of air along the forehearth and gives the operator more confidence about the effects of the local cooling effects, without disturbing the heating effect of the burners.



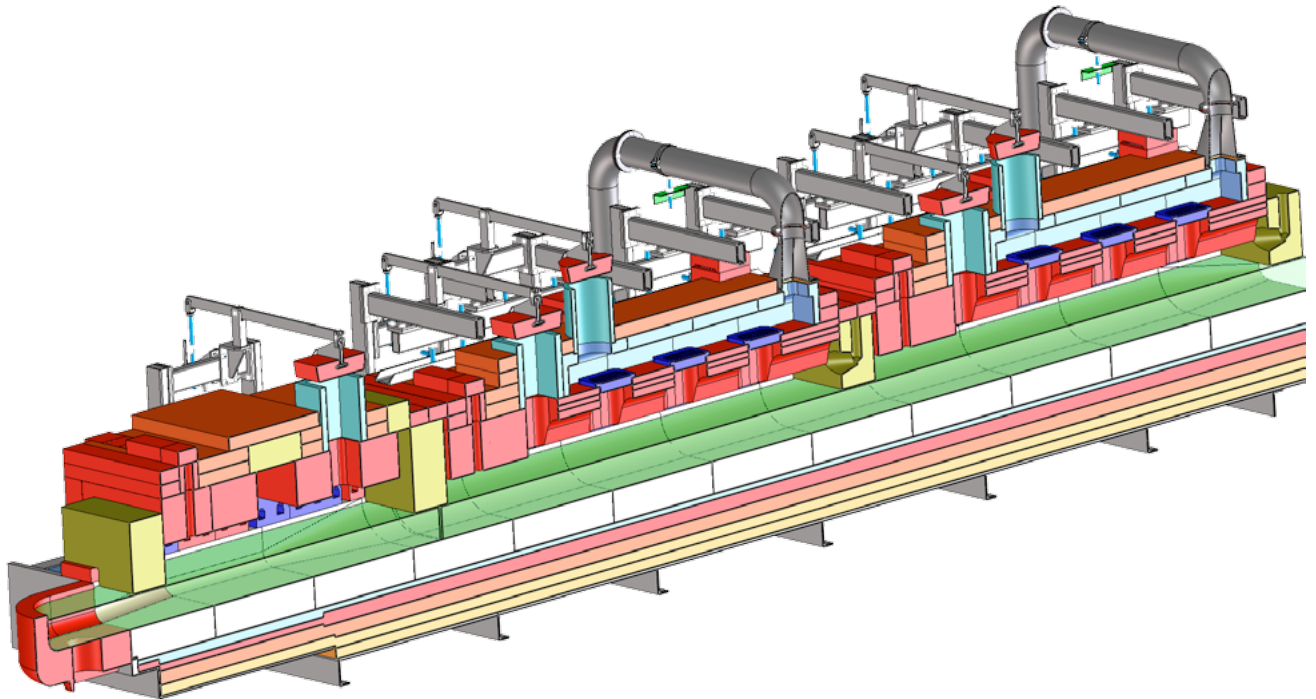


In forehearth with high pull variations and/or gob temperature differences, especially at opposite conditions (high firing at low pull or high cooling at high pull) the use of separated left and right combustion control is an important tool to help achieve the best homogeneity of the glass flowing to the spout.

The DC (direct cooling) forehearth model gives very high flexibility and cooling effects in a very short length. It can be an ideal solution for forehearth designs when the space available is limited.

For high pull rates and limited space the bottom cooling can be also added.

- Low energy consumption
- Simple refractory blocks design and easy installation
- High resistance to mechanical bending
- Constant cooling air distribution over the full zone length
- No over cooling in the air cooling input area
- Due to high performance centre cooling the total length can be reduced, saving the installation space



Glass Service has developed the model FH-DC-IC with a combination of radiant central cooling and direct central cooling.

The indirect cooling system has been developed to separate the waste gases from the cooling air. This solution is recommended for low pulling distributors and forehearth and for special glasses.

The cooling is via radiation plates installed on the centreline of the forehearth, these plates have a sinusoidal, rough surface to improve heat transfer.

For job changes or during periods of high pull, direct cooling can be applied to each zone.

The operator can combine the radiant and the direct cooling effect to obtain the best performance and optimum thermal homogeneity.

For high pull installations, bottom cooling can also be installed.

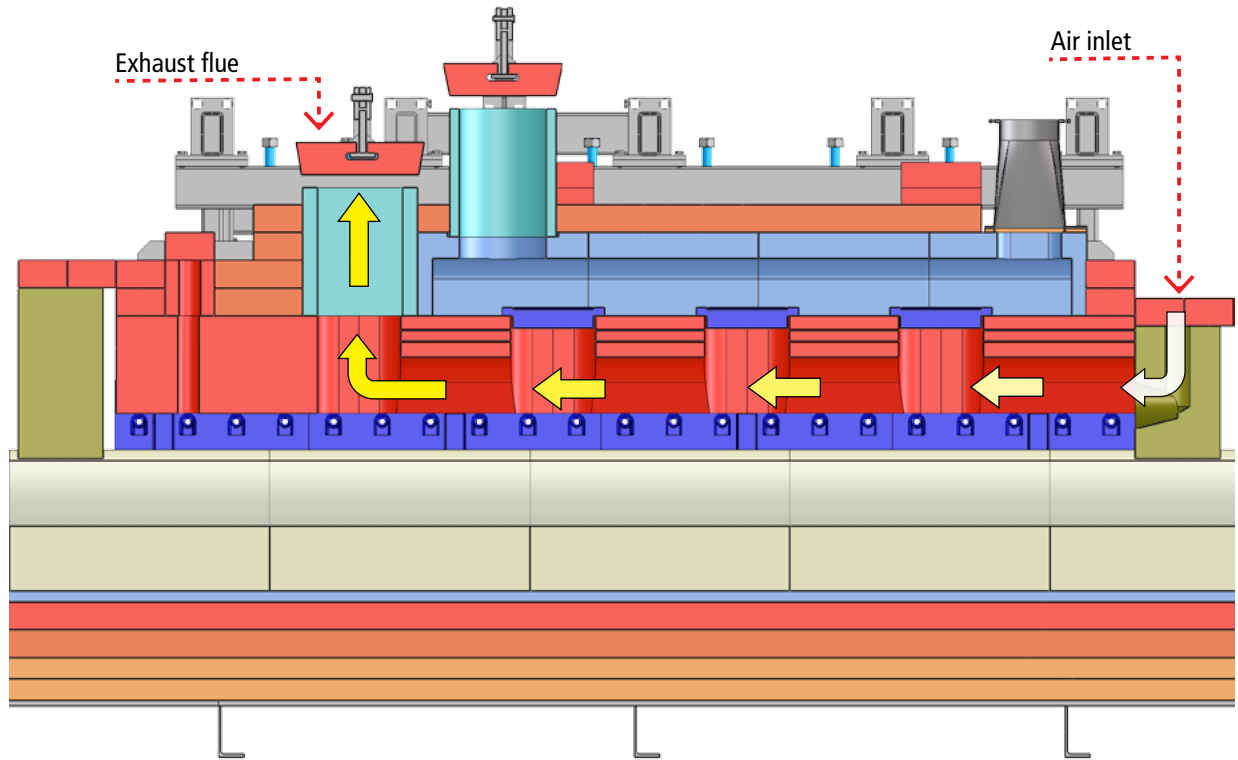
The refractory design guarantees high mechanical resistance to bending.

The type DC-IC has the following advantages:

- Combination of indirect radiant cooling and direct central cooling
- Smooth central radiant cooling
- High levels of side thermal insulation
- Low energy consumption
- High resistance to mechanical bending
- Direct cooling or radiation cooling effect
- Side lateral chimney



DIRECT COOLING



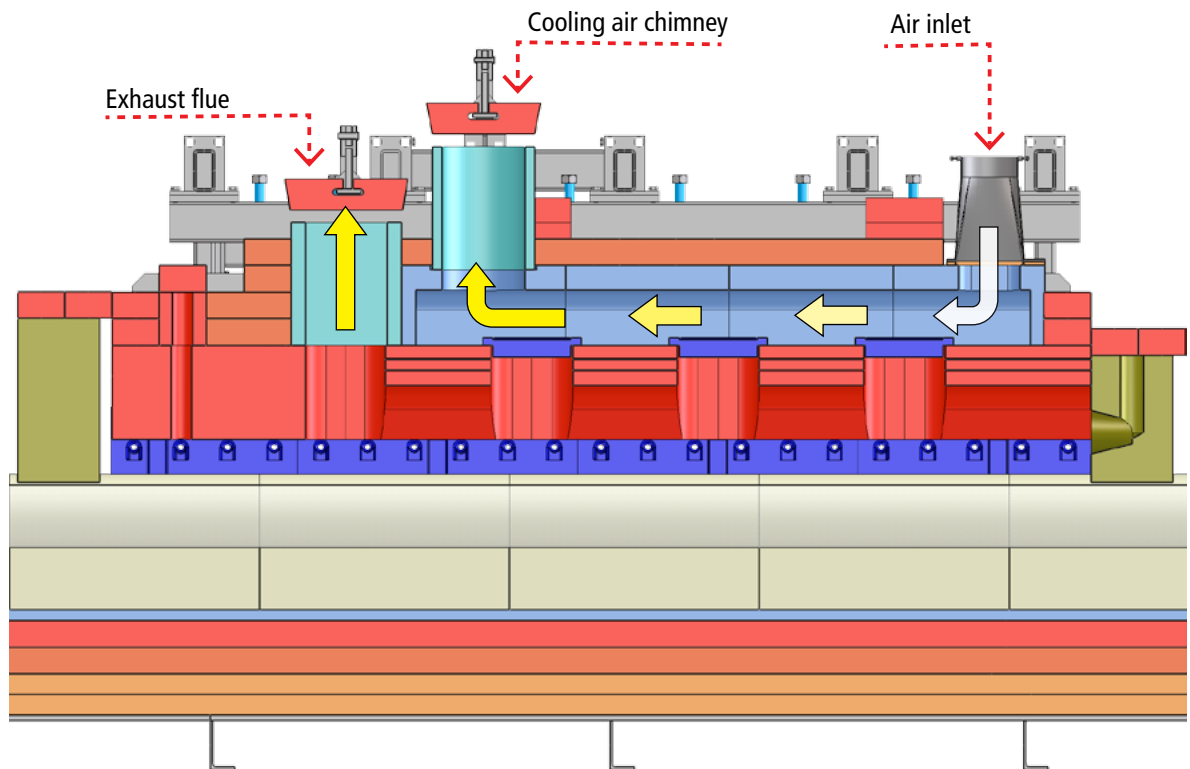
A direct flow of cold air along the forehearth centreline cools the glass along the central area of the forehearth, to improve thermal homogeneity.

The cooling air fan is inverter control.

The cooling air is combined with the waste gases.

The cooling air can be used for fast cooling during job changes or in the case of an extreme increase in temperature of the glass coming from the distributor.

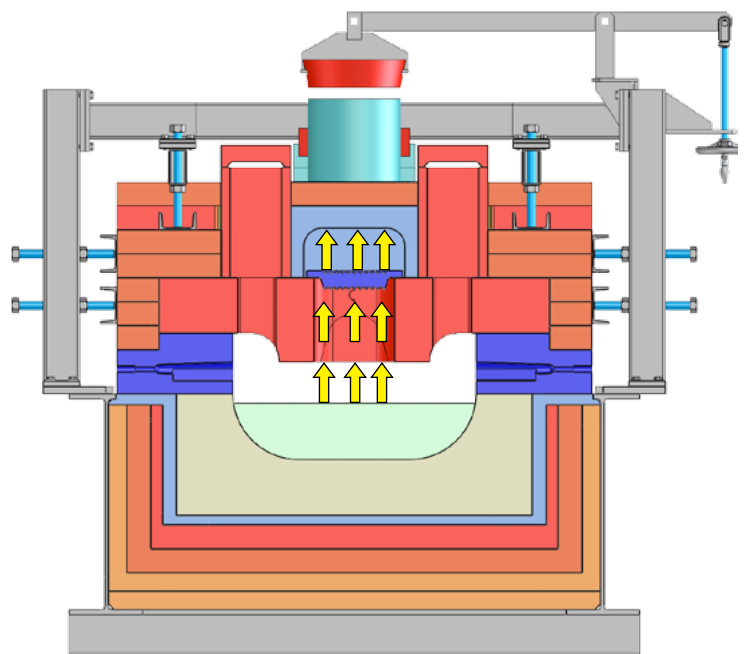
INDIRECT COOLING



Indirect cooling is based on radiation-plate effect. The cooling by radiation-plate ensures a smooth cooling effect in the central forehearth section.

The central forehearth glass is cooled by the radiation effect due to the radiating plate.

The special sinusoidal profile of radiating plates ensure a high heat transfer.





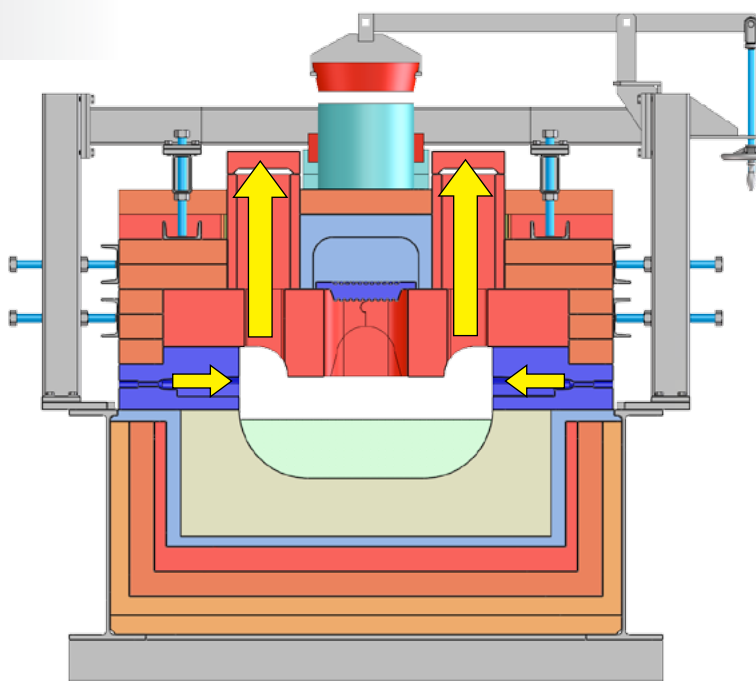
- Combination of radiant indirect cooling and direct central cooling
- Smooth central radiant cooling
- High side thermal insulation
- Low energy consumption
- High resistance to mechanical bending
- Direct cooling or radiation cooling effect
- Combination of radiant cooling and direct cooling
- Side lateral chimney

SIDE LATERAL CHIMNEY

The side chimney is used to exhaust the products of combustion to increase the central radiation cooling effect.

The rapid exhaust reduces the energy transfer to the forehearth center.

A combination of independent systems for the right and left firing systems increases the distributor and forehearth efficiency.



TECHNICAL FEATURES

Model		FH DC	FH DC - IC
Type		Direct cooling	Multi cooling
Size		K16 to K 54	K 26 to K 54
Depth	mm	178 to 250	
Direct cooling		✓	✓
Indirect cooling		-	✓
Side lateral cooling		-	✓
Bottom cooling		-	✓
Temperature control		Right & left independent	
Cooling air fan motor power	kW	3 Ph 400 VAC 50 Hz - 0,55 kW	



CUSTOMERS WORLD WIDE

SFH-17-01-E



turn key project

batch plants

furnaces:

recuperative

regenerative

gas fired

oil fired

oxy-fuel fired

mixed fuel

electric

forehearth:

colouring forehearth

combustion systems

day tanks

mini melters

boosters

bubblers

metallic recuperators

batch chargers

stirring machines

glass level controls

frit dosing and transport

control cabinets

SCADA and DCS

cooling systems

robotics

gathering - 4 or 5 axis

services:

installation and supervision

commissioning

training

preheating

technology transfer

assistance

laboratory and analysis

refractory consulting

project financing



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