System 500 Forehearth

Designed to achieve the best glass thermal homogeneity and energy efficiency over the widest operating range.

Key Feature 1

Hot face longitudinal forced air cooling.

Fan driven cooling air is passed underneath the central zone of the System 500 contoured roof blocks.

This cools the underside of the roof block, enabling heat to be removed from the glass surface by radiation to the cooler refractory surface.

Why do we do it like this?

The use of fan driven cooling air enables gradual and controlled cooling of the glass flow. It also maintains a positive internal pressure inside the forehearth, preventing the uncontrolled ingress of cold air through the forehearth brickwork and peepholes.

Key Feature 2

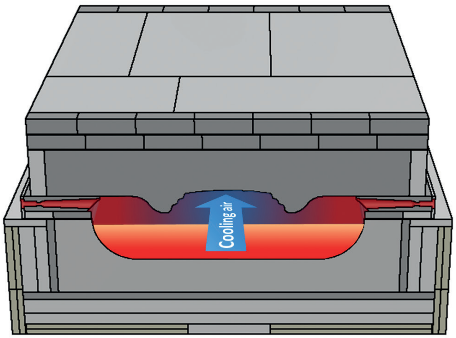
Separate combustion and cooling exhaust flues.

Cooling air is passed longitudinally down the forehearth under the profiled centre section of the roof block and is exhausted from a central flue at the end of each zone.

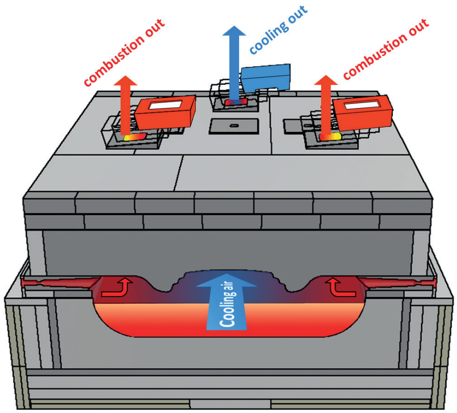
The combustion takes place at the sides of the forehearth and is exhausted from side flues in the middle of each zone.

Why do we do it like this?

Without intervention the flow of glass down a forehearth will always be hotter in the centre and colder at the sides. This can be partially counteracted by the application of insulation to the forehearth sides. The provision of separate flues for the exhaust of the cooling air and combustion gases ensures that the cooling and combustion are kept separate, enabling the cooling to be concentrated on the central flow of glass and the heating to be concentrated at the sides.



Longitidinal cooling of System 500 forehearth.



Heating and cooling flues of System 500 forehearth.

Key Feature 3

Automatically controlled combustion and cooling exhaust dampers.

Automatic control of the damper movements is a fundamental design element of the System 500 forehearth.

A motor is provided for each zone that drives the dampers across the forehearth, opening the flue holes as required. In the same movement a butterfly valve in the cooling air supply is opened via an additional linkage, allowing the flow of cooling air to commence. At maximum cooling, as illustrated by the diagram bottom left, combustion is exhausted from the side flues, cooling air is exhausted from the centre flue, and a positive pressure is maintained inside the forehearth.

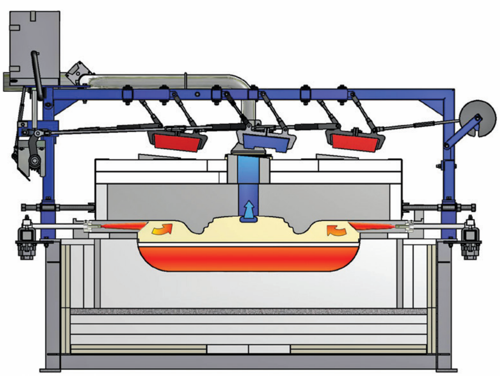
A truly unique feature, as illustrated by the diagram bottom right, is that when no cooling is required the dampers and the cooling air butterfly valve return to their closed positions, leaving the products of combustion to escape through the centre flue via a small cut-out incorporated into the underside of the cooling damper. This enables heating of the entire glass flow width.

Why do we do it like this?

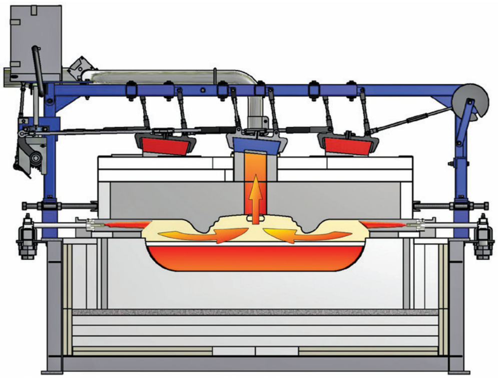
The incorporation of automatic damper movements is a feature that adds a degree of cost. However the ability to control the heating and cooling functions between the side and the centre, and the fact that the forehearth is always able to operate with a positive internal pressure, provides the following important benefits:

- the ability to achieve optimum glass thermal homogeneity at the spout entrance.
- the ability to achieve fast temperature adjustments at job changes.
- fuel savings of between 20%-50% resulting from the continuously positive internal forehearth pressure.

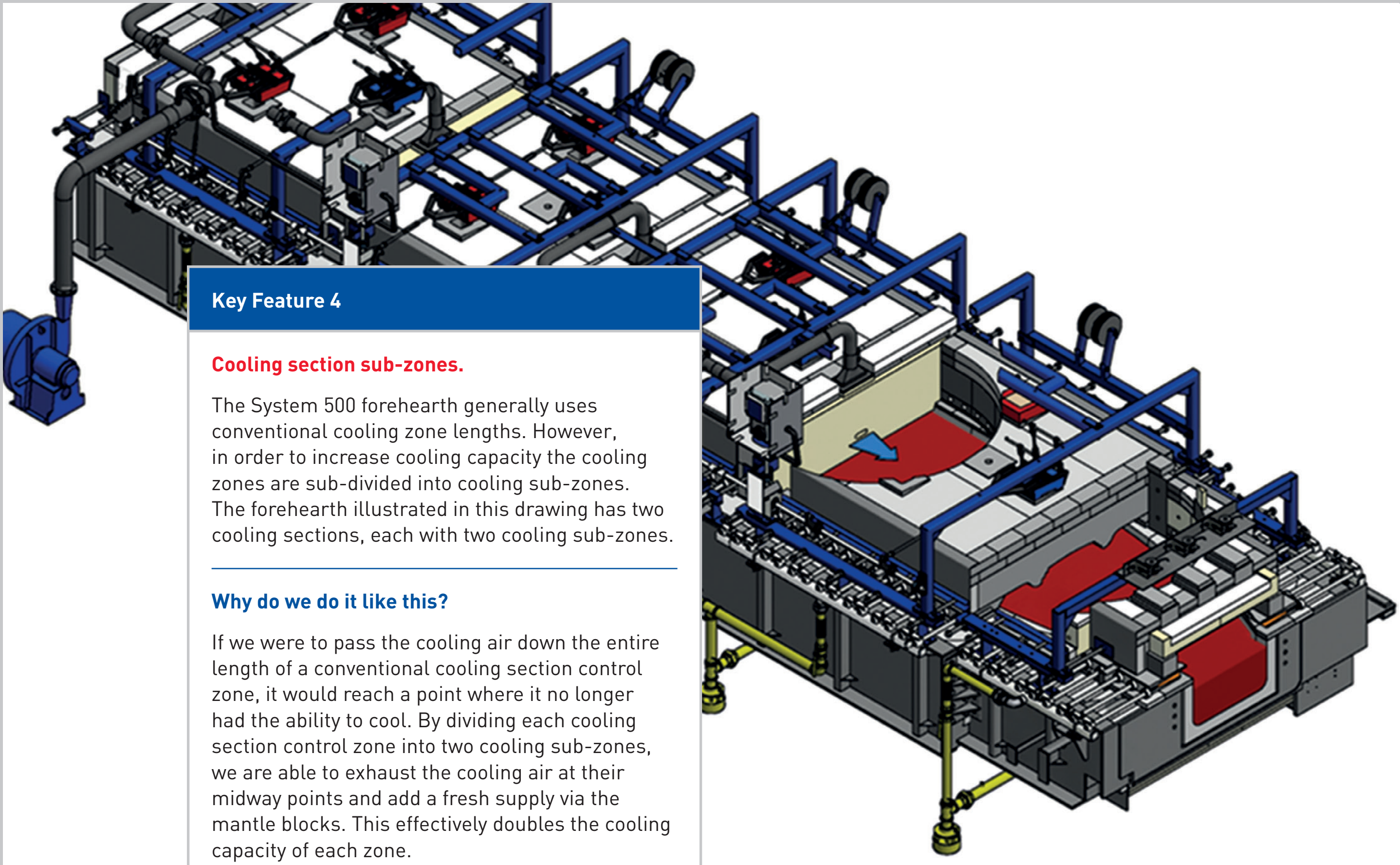
The payback time for this extra equipment, based on fuel savings alone, is usually less than six months.



Maximum cooling mode of System 500 forehearth.



Maximum heating mode of System 500 forehearth.



Key Feature 4

Cooling section sub-zones.

The System 500 forehearth generally uses conventional cooling zone lengths. However, in order to increase cooling capacity the cooling zones are sub-divided into cooling sub-zones. The forehearth illustrated in this drawing has two cooling sections, each with two cooling sub-zones.

Why do we do it like this?

If we were to pass the cooling air down the entire length of a conventional cooling section control zone, it would reach a point where it no longer had the ability to cool. By dividing each cooling section control zone into two cooling sub-zones, we are able to exhaust the cooling air at their midway points and add a fresh supply via the mantle blocks. This effectively doubles the cooling capacity of each zone.