



FOR THE EFFICIENT MELTING OF IRON AND STEEL ALLOYS

## FURNACE LINING SYSTEMS

HIGH PERFORMANCE LINING TECHNOLOGY FOR FERROUS FOUNDRIES

Excellent refractoriness

Consistent performance

Clean furnace systems

Quick installation

Slag resistance

## Iron foundry linings

In most iron foundries, the primary melting process is by cupola or coreless induction furnace. Other methods can be used but these are rare.

From the primary melting unit, the metal is transferred by launder and or ladle to a holding furnace or a treatment ladle and then to a pouring unit.

A wide variety of melting, holding, treatment and transfer systems are in use.

All these systems require specialised refractory solutions to optimise lining life and metal cleanliness.

The products listed in this brochure represent the best-in-class products for typical foundry applications. Foseco offers an extensive portfolio of monolithic and precast refractory solutions to meet your specific needs. Please contact your local Foseco team for more information.



# Typical iron foundry layout



Coreless induction furnace



Holding channel furnaces



Cupola furnace



Transfer & treatment ladles



Pouring furnace



# Long campaign cupola melting

in iron foundries

## Long campaign cupola melting

Long campaign cupolas are the principal melting unit of most modern automobile and pipe foundries worldwide.

RAMWELL linings are an alumina based range of pitch-free, clay bonded, graphitised ramming material containing between 10% and 20% silicon carbide.

HYDRAMAX linings are a range of ultra-low cement bonded castables based on fused and calcined alumina, containing between 15 and 55% silicon carbide and graphite. HYDRAMAX refractories are available in a pitch or pitch-free versions.

ULTRAGUN SC linings are a range of high performance gunning materials containing silicon carbide.

SURGUN\* linings are an innovative range of low-cement castable applied by a specially adapted refractory gun.

The final choice of products is determined by whether the furnace is a "lined" or "liningless" cupola and by operating conditions in order to improve

- lining performance
- slag resistance
- speed of installation
- dry-out time
- resistance to sculling
- metal cleanliness
- lining security





### Lined long campaign cupolas

Fused alumina based RAMWELL 90 or RAMWELL PS001 and calcined alumina based RAMWELL 75 ramming materials are recommended for the well, syphon and taphole of the cupola. Alternatively a cast solution can be achieved with HYDRAMAX AT3A or HYDRAMAX VX 281M. Ultra low cement castable with SiC level from 18% to 31%.

Pre-cast HYDRAMAX AT3A or in-situ cast HYDRAMAX ST3 refractories are ideally suited to the slag hole.

ULTRAGUN SC 55 high silicon carbide gunning material is applied to the melt zone.

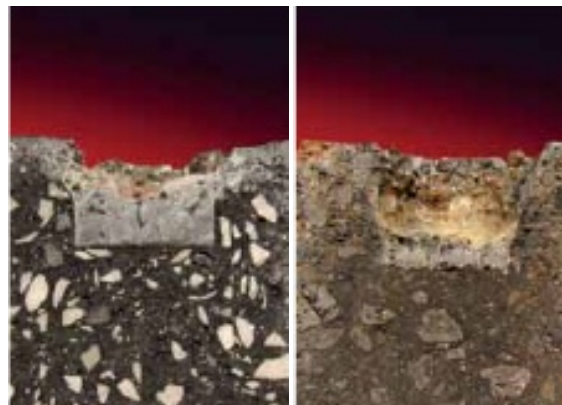
For the shaft, CRITERION\* 50ME castable is an established low-cement system, installed with formers. DURAGUN low cement gunning materials are recommended if formwork is not available.

For fast, durable, economic end of campaign repairs, SURGUN T8 low cement castables silicon carbide enriched can be applied successfully to the well, melting zone and shaft without the need for formwork.

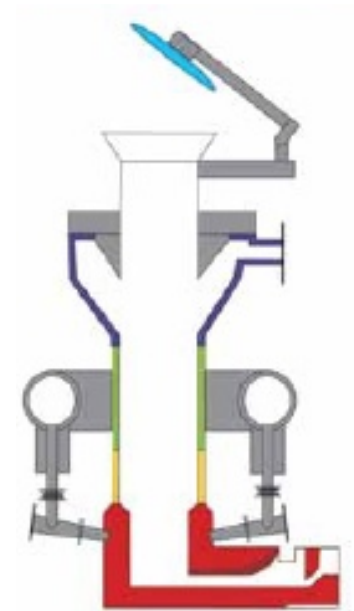
### Liningless long campaign cupolas

RAMWELL PS001 or RAMWELL 90 ramming materials are ideally suited to lining the well and syphon box. If a castable solution is preferred, then HYDRAMAX AT3A or HYDRAMAX VX281M ultra-low cement castables are recommended. Combinations such as a castable lining for the well together with rammables for the syphon box are also possible.

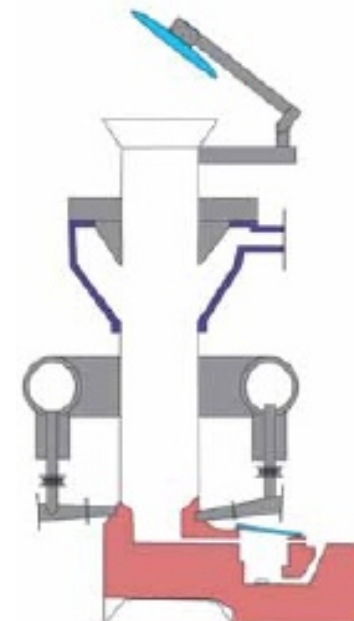
HYDRAMAX AT3A (left) and RAMWELL 90 (right) cup test



Lined cupola



Liningless cupolas





# Coreless induction melting

in iron foundries

Coreless induction furnaces are ideally suited to the batch melting of scrap. Most iron melting coreless induction furnaces have acid (silica) linings, however for specific arduous applications Foseco's SILCOR\* fused silica enriched acid linings are ideal along with andalusite based KELLUNDITE\* linings for certain niche applications.

## SG iron melting

SILCOR linings are high purity, graded quartzite (silica) based dry-vibration refractories enriched with 30% fused silica. Used for lining high powered, medium frequency induction furnaces melting low silicon SG based iron, SILCOR improves:

- lining life
- productivity
- metal cleanliness
- lining security

SILCOR is exclusively supplied by Foseco and can be used as a complete lining.

SILCOR 308

0.8% B<sub>2</sub>O<sub>3</sub>: Max Temperature 1600°C

SILCOR 305

0.5% B<sub>2</sub>O<sub>3</sub>: Max Temperature 1650°C

SILCOR refractories can be used as complete linings, or zoned linings. Zoned linings are formed with SILCOR materials being used in the erosion problem areas. Zoned linings are only practical on large furnaces.

### Iron melting

KELLUNDITE 700 refractories are an alumina based, mullite forming, dry-lining alternative to quartz-based silica linings for grey and ductile iron. With the health and safety issues associated with the installation and removal of silica-based refractories, KELLUNDITE 700 materials provide a cost-effective, alternative lining solution.

KELLUNDITE 707 alumina dry-vibratable material ensures a seamless transition of the refractory without joints.

### Ancillary products

Capping & spout materials

KELLUNDITE 85 topping is a high alumina dry-vibratable material containing magnesia that ensures a seamless transition of the refractory without joints.

BLU-RAM and DURACRETE ready-to-use, chemically bonded plastic materials vary in alumina content from 45-85%.

Benefits include:

- ease of installation
- very low moisture content
- excellent adhesion to existing linings
- high resistance to infiltration

Patch repair & maintenance

DURACRETE 85PC high alumina based plasters have a very fine grain size and are ideal for cracks and patch repairs of the lining.

Coil protection

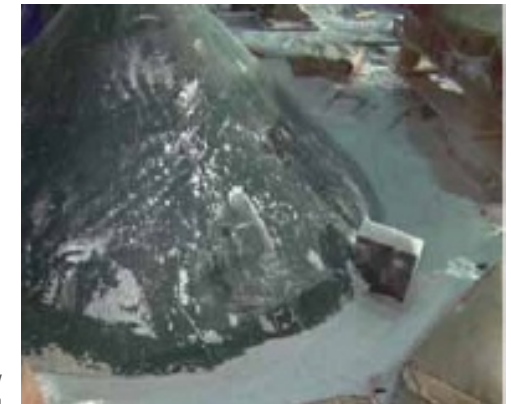
COILCOTE high alumina grouts provide a strong, protective, semi-permanent refractory screed to the power coil.

Lid materials

- CERCAST 1500
- TRIAD 60



BLU-RAM HS plastic refractory used as spout material



Chinese hat for dry vibration installation



Former vibration tooling



# Channel holding and pouring furnaces

in iron foundries

## HOLDING FURNACES

### Channel holding furnaces

Channel Furnaces are used in iron foundries to hold large quantities of iron melt between the melting station and the casting station.

There are 3 types of channel furnace to consider:

- Vertical channel furnaces
- Drum channel furnaces
- U-shaped channel furnaces

### Vertical and U-shaped Channel Furnaces

This type of channel furnaces can be lined with high alumina, dry-vibratable lining or ultra-low cement castable.

The high alumina dry-vibratable KELLUNDITE 95 is particularly beneficial when used in conjunction with melt-out formers in order to reduce the total "turnround" time of the installation. CRITERION 50ME is used as a capping material for securing the top of the dry lined furnace body.

The development of ultra-low cement castable with water contents of less than 4% has significantly reduced the dry-out times associated with cast linings as well as improving lining life.

Foseco's class leading DELTACAST 88 and CRITERION 85XL both meet the high quality criteria required for large channel furnace linings.

Vertical channel furnace linings can be easily and securely repaired with Foseco's innovative low cement gunmix SURGUN thereby extending refractory life and reducing lining cost.

### Drum channel furnaces

Drum shaped channel furnaces are normally brick lined due to their geometry.

Zoned linings can be used for large furnaces in order to get best performance with the most economical construction.



## POURING FURNACES

### Pressure pour furnaces

Pressure pour furnaces are used for holding iron at temperature whilst casting into moulds on an automated casting line. Pressure pour furnaces can either be heated with an inductor as is the case with a channel furnace, or operated without an inductor to reduce energy costs. In the case of the latter, an application specific lining design is required in order to minimise heat loss and maintain metal temperature.

Selfflowing cast DURAFLO 85, high alumina castable is a universal lining for both body and spouts with the added advantage of being selfflowing for ease of installation.

For the cover CERCAST 1500 mid alumina conventional castable with high volume stability and ease of installation or LITEWATE insulation castables for back layer insulation are recommended.

### Inductor boxes

Inductors for both channel furnaces and pressure pour furnaces are invariably lined with dry-vibratable materials.

MAGNAVIBE 850 spinel-forming, magnesia based, dry-vibratable refractories are suitable for high powered inductors.

KELLUNDITE 857 spinel-forming, alumina based, dry-vibratable refractories should be used for smaller inductors or as a universal inductor lining.



Channel inductor box lined with KELLUNDITE 857



Holding furnace



Pressure pouring furnace

## Steel foundry linings

Most steel foundries melt scrap in coreless induction furnaces. In larger steel foundries, electric arc furnaces may also be used.

From the prime melting unit, the metal is transferred by ladle direct to the mould. In most cases the melt is not held or treated in a separate unit between the melting station and the casting ladle.

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# Coreless induction melting

in steel foundries

Coreless induction furnaces are charged with steel scrap and melt very quickly. Traditionally, these units have been lined with magnesia based, dry-vibratable linings, but over more recent years, spinel forming alumina dry-vibratable linings have been adopted as standard practice.

KELLUNDITE 857 and KELLUNDITE 85RAS high purity alumina spinel forming, dry-vibration refractory materials are designed for lining coreless induction furnaces melting steel and high temperature alloys.

KELLUNDITE 695-PLUS neutral magnesia spinel forming dry-vibration refractories are designed for use in coreless induction furnaces melting low temperature alloys.

KELLUNDITE 85RAS linings are a spinel forming 85%  $Al_2O_3$ -13% MgO material based on fused alumina with a 1720°C limit service temperature.

KELLUNDITE 857 linings are a spinel forming 85%  $Al_2O_3$ -14% MgO material based on high purity white fused alumina with a 1750°C limit service temperature.

KELLUNDITE 695-PLUS linings are spinel forming 72%  $Al_2O_3$ -24% MgO material based on brown fused alumina with a 1750 °C limit service temperature.

## Ancillary products

### Capping Materials

KELLUNDITE 85 topping is a high alumina dry-vibratable material containing magnesia. KELLUNDITE 85 topping ensures a seamless transition of the refractory without joints.

BLU-RAM HS ready-to-use, chemically bonded plastic materials. Benefits include:

- excellent adhesion to existing linings
- high resistance to infiltration

### Spout Materials

- BLU-RAM HS
- CRITERION S85E

### Patch repair & maintenance

X9 PLASTER high alumina based plasters have a very fine grain size and are ideal for cracks and patch repairs of the lining.

### Coil protection

COILCOTE high alumina grout provides a strong protective, semi-permanent refractory screed to the power coil.

### Lid Materials

- CERCAST 1500



BLU-RAM HS is supplied ready to use



Spout lined with BLU-RAM HS



Sintered lining with KELLUNDITE material

# Application expertise

## Our service

Today's demands for high quality, defect-free castings must be balanced by the need for speed, performance and cost-savings in the casting process. Only when a lining system is optimally designed can it have the potential to fulfill all of these requirements.

Foseco has a broad range of technical and application expertise covering the whole casting process. By working closely with the foundry, our sales and technical teams can help develop comprehensive furnace management and metal transfer solutions that meet your needs.

## Quality

Accredited quality assurance systems ensure optimal testing of finished product, and provides a framework for continual improvement and further process optimisation.



BLU-RAM HS  
production line



Customer focused  
research &  
development

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COMMITTED TO FOUNDRIES

VESUVIUS