



LINING SYSTEMS

High performance lining technology for aluminium foundries

VESUVIUS





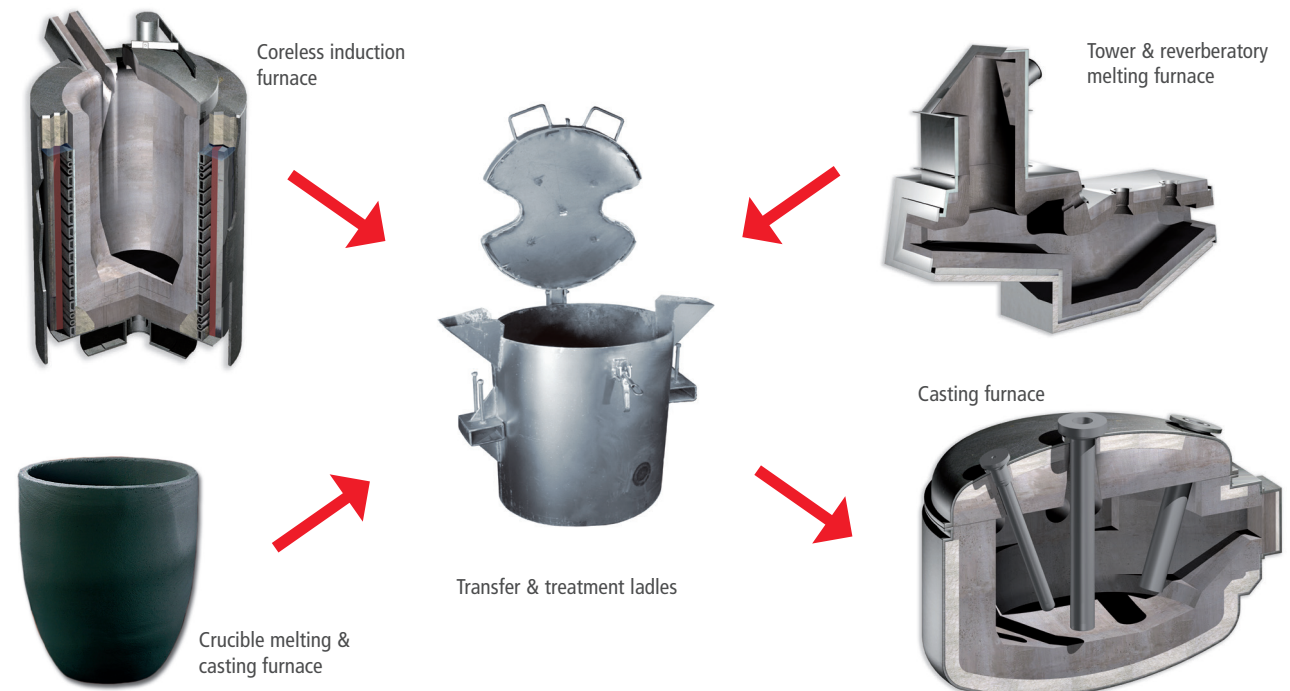
Aluminium foundry linings

The aluminium foundry melting plant was once dominated by crucibles, however, bulk melting by coreless induction and tower melting furnaces is increasingly important. Consequently monolithics now play a significant role in modern aluminium foundries. Foseco's ALUGARD* low-cement castables and TRIAD no-cement castable now contain a new aluminium resistant additive giving

even better corundum resistance across a wider temperature band whilst Foseco's dry-vibratable lining KELLUNDITE* is ideally suited to coreless induction melting.

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 aluminium foundry layout



Melting furnaces

in aluminium foundries

Tower melting furnaces

Tower melting furnaces are commonly used in aluminium foundries. They consist of a vertical melting shaft with a connecting holding bath. The solid ingot is charged into the top of the tower, with pre-heating in the stack followed by melting in the melt chamber hearth.

The melt then flows naturally into the holding chamber. Here the metal resides until it is tapped into a ladle, treated and then delivered to the casting furnaces. These furnaces are complex in their geometry and most customers look for a full supply and installation maintenance package.

Reverberatory melting furnaces

Unlike tower melters, reverberatory furnaces are usually single chambered furnaces. The solid ingot is charged into the furnace through the charge door opening, then melted within the furnace bath. The melt is then charged into the holding furnace.

ALUGARD

ALUGARD aluminium resistant castables are used to line these types of furnaces. There are a variety of grades, specifically developed for different applications and conditions found in aluminium handling and containment. ALUGARD materials are termed "non-wetting" due to their ability to "repel" molten aluminium, resulting in no reaction between the metal and the refractory.

This leaves a clean refractory furnace lining, optimising the client's furnace service life.

ALUGARD CE-S high alumina low-cement castable offer excellent aluminium resistance. This is the perfect general purpose product, with good strength and all round performance.

ALUGARD HS85 high alumina, super tough aluminium resistant castable has been specially developed to combat aggressive erosion and mechanical damage around charge areas.

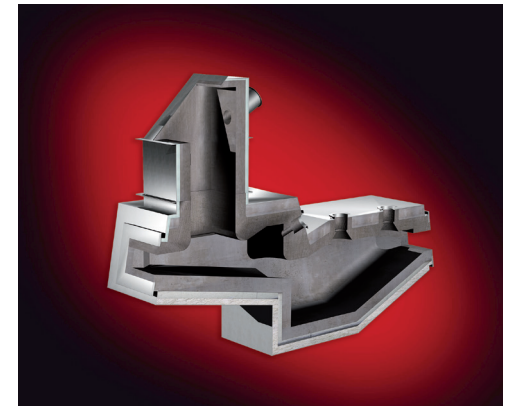
QUICK FIX ALUGARD EXP 2-part phosphate bonded system contains a non-wetting additive and is ideal for patch repairing furnaces. This material can also be used for thin veneer repairs due to the fact that it sticks very well to existing, used and new refractories.

TRIAD*

TRIAD AL high alumina cement-free castable offers exceptional resistance to aluminium wetting and penetration. It has all the characteristics of normal TRIAD castables:

- + Easy to mix
- + Easy to install
- + Reduced bake-out time.

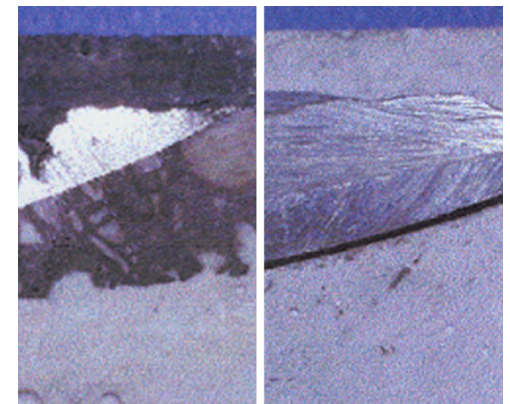
The product is suitable for all metal contact areas; including bath, lower sidewall, ramp and sill.



Tower melting furnace



Cup test of ALUGARD CE-S



Sample of ALUGARD CE with ARA (right) and without ARA (left)



Melting furnaces

in aluminium foundries

Coreless induction melting

Coreless induction furnaces are the ideal foundry tools for batch melting scrap.

Coreless induction furnace linings for aluminium melting are required to exhibit excellent non-wetting properties and operate successfully over a range of melting and casting temperatures for aluminium alloys.

KELLUNDITE 703 high alumina dry-vibration refractories are used for induction furnaces melting aluminium.

They include the addition of a special aluminium resistant agent to provide a clean furnace lining with minimum dross build-up and sticking, enabling easy and non-aggressive cleaning.

KELLUNDITE 703 linings are based upon andalusite, which is expansile through the aluminium alloy melting temperature ranges and therefore reduces the risk of metal penetration.

Ancillary products

KELLUNDITE 707 dry topping prevents crack propagation and ensures a seamless transition from the furnace body to capping area.

Coil Protection

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

Spout Materials

- + BLU-RAM* HS and BLU-RAM HSW granular phosphate bonded material with good installation properties
- + ALUGARD CE-S precast refractory

Lid Materials

- + CERCAST 1500AL castable with good volume stability and non wetting additives

Crucibles

The most widely used method of melting aluminium in foundries is with crucible furnaces. Fosco offer a wide range of crucibles for all types of furnaces.

Casting furnaces

in aluminium foundries

There are three main types of casting furnaces found in aluminium foundries, each using different furnace technology:

- + low pressure furnaces
- + dosing furnaces
- + bale-out furnaces

Low pressure furnaces

Refractory lined low pressure furnaces have traditionally cast linings. These furnaces are usually small and the cast furnace bath is done in a single pour. This is so that there are no construction joints below metal level that could allow aluminium penetration during the pressurised casting operation. The bath linings can be cast in one of the following materials:

- + TRIAD 70AL castable
- + ALUGARD CE-S castable
- + ALUGARD A95 castable

Many furnaces use crucibles to hold aluminium. The main advantage is that the crucible can be easily changed and casting can commence immediately, without the need for prolonged drying of the furnace linings and reducing the risk of hydrogen pick-up. Crucibles also ensure that the aluminium is uniformly heated through the crucible wall by electric resistance heating. Foseco offer a wide range of crucibles for all types of furnaces.

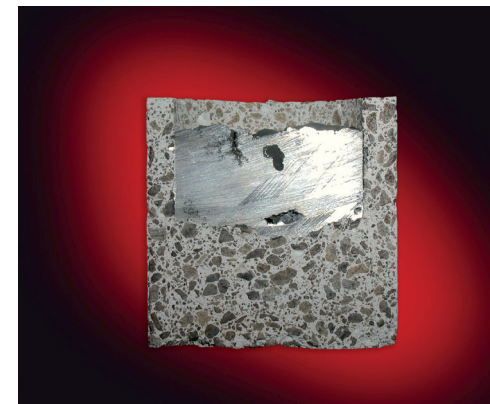
Dosing furnaces

Refractory lined dosing furnaces have traditionally low moisture rammed linings. However these furnaces are usually small and can be cast in a single pour. This is so that there are no construction joints below metal level that could allow aluminium penetration during the pressurised casting operation.

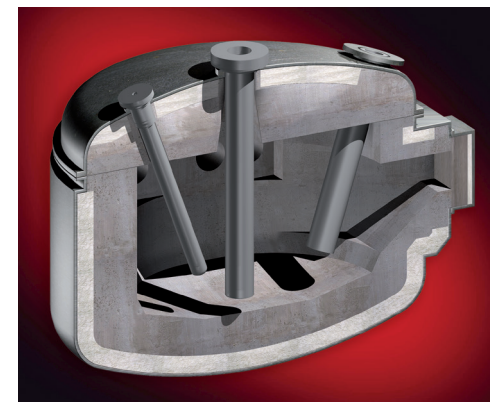
The bath linings can be cast in TRIAD 45AL castable, TRIAD 70AL castable and precast INSURAL* refractory.

Bale-out furnaces

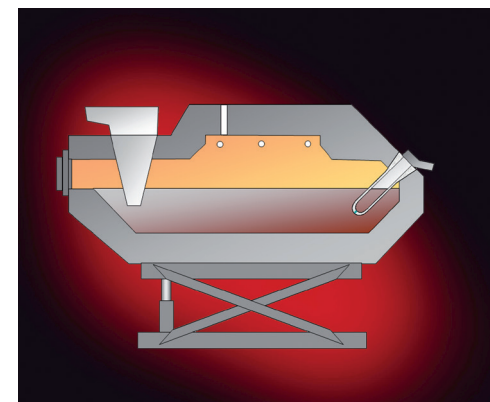
Most bale-out furnaces are crucible furnaces and are either electric resistance, gas or oil fired. Lifetimes can be many months, depending upon the application and metal treatment conditions. Foseco offer a wide range of crucibles for all types of furnaces.



TRIAD 70 AL cup test



Low pressure furnace with accessories



Dosing furnace with accessories

INSURAL* Furnace Lining System

Insulating shaped refractories for aluminium applications

The target: Fast turnaround

The solution: Dry installation of INSURAL precast, insulating shapes.

The benefits:

- + No sintering required
- + Significant energy savings
- + Extremely low corundum growth
- + Improved melt quality
- + Reduced hydrogen level after commissioning
- + Reduction of energy peaks
- + Can be installed on or off-site
- + Minimised downtime
- + Immediate achievement of a constant density
- + Easy to clean

Preheating

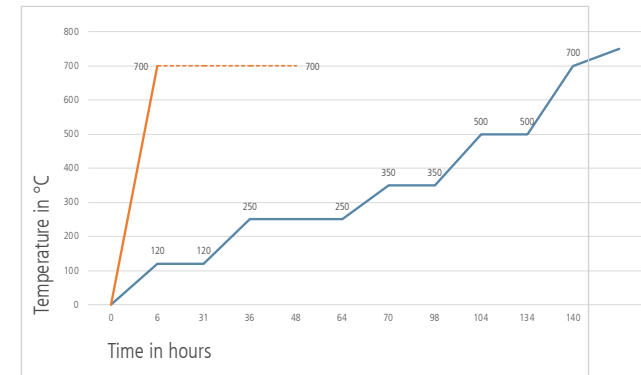
The table shows a typical preheating curve for a traditional 650 kg capacity furnace lining against an INSURAL lining. Unlike traditional refractory linings which have to be brought up to temperature gradually for up to 7 days, an INSURAL lining can be heated to working temperature straight away. We recommend 48 hours holding time.

Density index

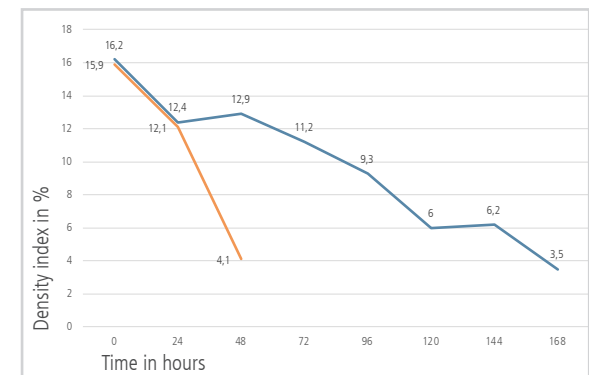
With an INSURAL installation, the desired density index of the melt can be achieved much sooner. The advantage is a faster integration of the furnace into the production process. Also, high quality castings can be produced much sooner than with conventional linings. Restrictions on production capacity are avoided or at least significantly reduced.

Energy consumption

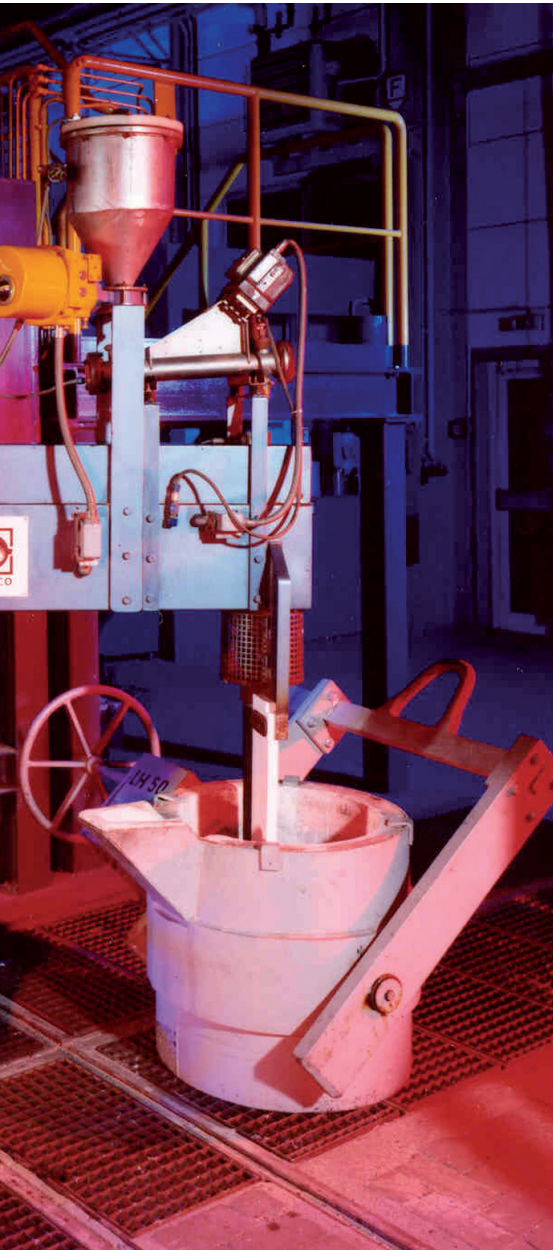
The insulating properties of INSURAL are very high and in addition, a highly insulating backing material is used. The thermal output stays at a low level for 98% of the service time. This preserve the lining, the environment and saves costs. Compared to monolithic lining systems, up to 17% energy savings can be achieved.



— Traditional Lining
— INSURAL



— Traditional Lining
— INSURAL



Ladles and launders

in aluminium foundries

Ladles in aluminium foundries are used to transfer the metal from the melting unit to the casting unit, therefore minimum temperature loss is very important.

The following products can be used:

TRIAD 45AL low density no-cement castable has exceptional resistance to aluminium wetting and penetration and is very user-friendly. It is easy to mix, easy to install, easy to dry and easy to break out. Suitable for all transfer ladles and launders, it has the added advantage of a 12 month shelf life.

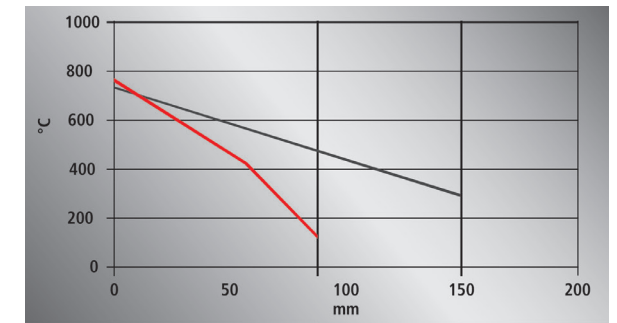
INSURAL ATL ladle linings are precast and supplied fully fired. The non-wetting properties ensure that aluminium skull formation is reduced and simple to remove, preventing cross contamination between metal transfers. Oxide build-up is avoided, reducing the risk of hard inclusions in the melt.

Furthermore, traditional linings frequently require the melt to be superheated to offset temperature loss, promoting oxide formation and higher dissolved hydrogen levels.

The use of CERAMOL* 258G or TERRACOTE 7667 refractory coatings can further improve the ladle lining cleanliness.

Refractory concrete Wall thickness: 150 mm Heat Loss: 9069 W/m ² Boundary temperature: 308 °C	INSURAL REFRACTORY Wall thickness: 90 mm Heat Loss: 2583 W/m ² Boundary temperature: 152 °C
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Layer No.	Thickness mm	Material	Thermal conductivity W/mk	Boundary temperature °C
1	150	Refractory concrete	3,140	741
2	0		1,000	308
1	60	INSURAL 140	0,460	747
2	30	INSURAL 10	0,300	410
3	0		1,000	152



Repair and maintenance

for furnaces and ladles in aluminium foundries

Foseco offers a wide range of repair mixes and mortars.

QUICK FIX* ALUGARD EXP

QUICK FIX ALUGARD EXP is a phosphate bonded castable with 85% alumina providing:

- + excellent non-wetting characteristics
- + good mechanical resistance
- + rapid installation and dry-out
- + excellent sticking properties to old refractory
- + long shelf life (12 months)

X-9 PLASTER

X-9 PLASTER is a thermally stable, putty consistency refractory, suited for all ferrous and non ferrous applications providing:

- + Excellent refractoriness
- + Durable performance
- + Non-wetting characteristics
- + Resistance to slag and molten metal
- + Easy and clean application

X-9 PLASTER is designed for hand patching and repairing applications.

INSURAL 700 and INSURAL 800

INSURAL insulating pastes are hardened by heat and are used especially for aluminium and zinc. They are self-adhesive, ready-to-use and free of classified synthetic fibres.

INSURAL 700 and 800 pastes are used for the assembly of INSURAL shapes, joining of INSURAL insulating bricks, repair of fissures and lining of ladles.

KALSEAL* 1

KALSEAL 1 sealing compounds are used for INSURAL lining assemblies, but can also be used as a general purpose mortar for repairs of brickwork refractories, etc. The mortar will dry and harden by air-setting in 30-40 minutes depending on ambient temperatures.

BLU-RAM HS

BLU-RAM HS phosphate bonded mouldable refractories are based on mullite and can be used as a repair material.



QUICK FIX ALUGARD EXP
repair



X-9 PLASTER and
BLU-RAM HS repair
material



INSURAL ATL
precast ladle linings

Design and engineering service

Foseco offers a full refractory lining design and engineering service, including:

- + Technical specifications
- + Thermal calculations
- + Installation instruction
- + Product datasheets
- + Material safety datasheets
- + Dry-out and commissioning schedules

