EREDI SCABINI

EREDI SCABINI NEWS

Since 1945, the refractory specialist at your disposal.

EREDI SCABINI LAUNCHES THE NEW BEcoat® LINE

Ladle treated with BEcoat® WB 200.

Eredi Scabini has recently expanded its product offering with BEcoat®, a new line of aqueous suspensions with high Boron Nitride content to be used in the transfer/casting of Aluminium, Zinc and Magnesium.

BEcoat® products are coatings applied on metal or ceramic materials that are in contact with molten metals to prevent corrosion and make the cleaning easier. In addition to the excellent lubricating and 'non-wetting' properties of Boron Nitride, special nano-additives provide high adhesion and good abrasion resistance.

Today the BEcoat® line counts 4 products with different characteristics to meet all requirements; in all cases, their application is extremely simple and may be performed either by brush, spray or immersion. Moreover, the red colour of some products alerts the operator when a reconditioning is required. Here are all the available references:

BEcoat® WB 100

Product with a very high concentration of Boron Nitride for application on ceramic preformed shapes after dilution.

BEcoat® WB 200

Product with a high concentration of Boron Nitride for application on ceramic preformed shapes after dilution. The initial application and subsequent reconditioning coatings are easily visible thanks to its red colour.

BEcoat® WB 300

Ready to use product specific for application on both ceramic and metal supports. It is particularly recommended for ingot moulds since it does not release gas. It can be applied in hot conditions up to 500°C.

BEcoat® WB 330

Ready to use product for application on ceramic support and metal supports with high surface adhesion of the latter. It is particularly recommended for ingot moulds and bale-out ladles in case the application can't be repeated frequently. It can be applied in hot conditions up to 500°C.

The main applications of **BEcoat® WB** are:

- Transfer launders
- Degassing units
- Hot top rings
- Casting cups
- Skimming tools
- Casting launders
- Casting tables
- Nozzles
- Ingot moulds
- Skimmers
- Filter box
- Transition plates
- Stoppers
- Casting wheels

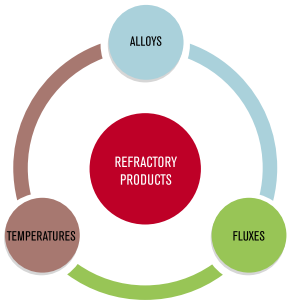
Just a few months after its launch, the product has already garnered great appreciation among customers and in some cases has quickly become part of the equipment necessary for routine maintenance. On the following pages is described one of the first most significant case histories. All preformed products provided by Eredi Scabini can be pre-coated with BEcoat®.

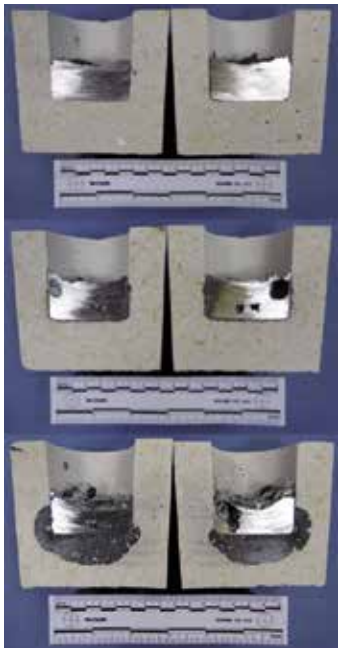
Photo 1 - Cleaning of casting table coated with BEcoat® WB100

Photo 2 - Cleaning of casting table coated with BEcoat® WB100

Looking for the most suitable, high-performance, specific product for aluminium? We have it!

We have often told that our company is the sole proprietor of hundreds of formulae for refractory materials, which have seen the light thanks to a vast amount of work by our R&D department, led personally by the company Chairman Daniele Scabini since the very creation of the company, often with input from partnerships with top research and university institutes.





But what we have not always said, or perhaps not stressed sufficiently, is that each of these products is the outcome of constant, painstaking work in support of our customers, intended to develop just the right solution to every specific need described to us. In more than 70 years in business, this has enabled Eredi Scabini to build up an immense store of knowledge that still lies at the core of its product portfolio.

But the world does not stand still, situations change and it is essential to keep up to date.

The changes in the aluminium industry during the last few years – such as the introduction of new alloys, new equipment and new working conditions – have recently led us to reassess the performance of our specific products for this sector in the light of these sometimes extreme conditions, with the aim of coming up with the very best compromise on the basis of the alloys, temperatures and fluxes parameters involved. This project has affected 33 different Eredi Scabini products, of 4 different types:

- **conventional castables**
- **low-moisture castables**
- **cement-free castables**
- **nanopastic materials.**

The aim of the first phase of the project was to check every product's performance in contact with each of the alloys considered (Lithium 2196, 46100+46000, 7075), at different temperatures (815 – 1,100 – 1,200 and 1,300°C).

Cross-checking of all the possible combinations involved the performance of 396 tests.

The results achieved enabled us in some cases to confirm and in others to review the products' strong points in relation to the various situations tested, increasing our awareness of our products' quality and even further raising our standards in offering more and more high-performance solutions, tailored to specific needs. It's tried and tested! Our next ambitious objective is to assess the impact of fluxes on the performances of the products selected in the first phase. We are currently at work on the creation of a database of specific information about fluxes, that will be then selected for the continuation of the tests.

New investments at Eredi Scabini: constantly expanding, now even more flexible.

Eredi Scabini has a history reaching back 72 years, during which it has created, consolidated and developed its business by keeping a very close eye on the market, identifying its evolutions and - where possible - keeping ahead of its trends. This has enabled the company to grow, evolve and - in spite of the many difficult moments on its key market and in the economy as a whole - to face its challenges and press forward without ever flinching. Its far-sighted adoption of preformed shapes, a major part of the business for about 35 years now, further reinforced Eredi Scabini's standing, especially on the export markets, enabling it to make a name for itself all over the world. Since then, the company has grown rapidly; to meet ever-increasing demand, it has gradually enlarged its workforce and expanded its production site. 2016 is yet another year which will be remembered for this reason.

A new building next-door to the existing production site is now nearing completion, and a new high-temperature furnace for firing preformed shapes up to 15 tons is being installed alongside the one already in service for several years. All this will very soon be reflected in an impressive increase in production capacity and thus greater flexibility in responding to customers' requests. 2016 is now drawing to a successful end, and the company is ready and waiting to face new challenges and more and more important goals!

A new high-temperature furnace is about to be installed in Eredi Scabini plant.

Highlights

Cleaner, more durable launders with BEcoat®.

BEcoat® is a line of aqueous suspensions with high Boron Nitride content for use in the transfer/casting of Aluminium, Zinc and Magnesium. BEcoat® line products are coatings applied to metal or ceramic materials in contact with molten metals to prevent corrosion and facilitate cleaning. In addition to the excellent lubricating and 'non-wetting' properties of Boron Nitride, special nano-additives provide high adhesion and good abrasion resistance.

The customer is a leading international producer of rolled products, processing more than 150,000 tons of aluminium a year. It prioritises the constant search for potential improvements to the production process to maintain a high quality standard over time. In this case, the customer expressed the need to reduce routine maintenance by staff on its aluminium launders, to simplify cleaning operations and extend their durability over time. Eredi Scabini came forward with BEcoat® WB 300, a ready-to-use product from its line of aqueous suspensions with high Boron Nitride content and special refractory nano-additives. From the very first tests performed on the launders, the customer was immediately impressed by the uniformity and covering power of BEcoat® WB, the strong bonding achieved, the subsequent easy removal of aluminium burrs and run-off, and the simple application and general convenience of a product which is supplied ready for use with no need for dilution. In this plant today, BEcoat® WB 300 is considered essential, and its use is standard foundry practice.

REF. N.33

BEcoat® application by brush on aluminium launder.

Launder treated with BEcoat®, ready to be put into operation.

Launder treated with BEcoat®, in operation.

Flextrong® launder: a solution that empowers performance.

Flextrong® is a preformed ceramic matrix composite reinforced with heat resistant steel. The product has excellent resistance to thermal shock, impact, fracture and oxidation as well as to contact with molten metals. Flextrong® is designed for the installation via bolts and/or welding brackets provided.

The customer is a company which produces about 300,000 tonnes/year of rolled aluminium products with continuous casting machinery. The launders between the melting and holding furnaces have to cope with massive flows of molten aluminium. A new 135 ton top-charging static tank furnace was installed in 2008. The launder of this new furnace was lined with concrete, but its lifetime was very short due to the extreme stresses it had to withstand.
In fact, it became necessary to re-line the curved sections about every 2 or 3 months while the straight sections had to be re-lined every 5/6 months. This furnace operates non-stop, 24/7, producing about 520 tons of aluminium every day. 130 tons are tapped from the furnace every 5 hours, in an operation taking about one hour. Therefore, every 5 hours the launder has to withstand the passage of 130 tons of aluminium at 750°C for about one hour. Eredi Scabini supplied several Flextrong® launder sectors, which were installed by levelling the metal structure with a dense concrete casting to create the supporting surface and using Patch-Lite™ for insulation of the side walls.
This new preformed launder solution immediately provided greatly improved performance, with an average lining lifetime of 12 months compared to the 3/6 months of the previous solution. The customer has been using only this solution, on a regular basis, since 2008.

REF. N.31

Preassembly of Flextrong® shapes prior to shipment.

Flextrong® parts prior to shipment

Preparation of the substrate to take the preformed shapes.

Tapped aluminium in the Eredi Scabini launders.

Tapped aluminium in the Eredi Scabini launders.

Flextrong® & Flustone® make up a complete lining.

Flextrong® is a preformed ceramic matrix composite reinforced with heat resistant steel. The product has excellent resistance to thermal shock, impact, fracture and oxidation as well as to contact with molten metals. Flextrong® is designed for the installation via bolts and/or welding brackets provided. Flextrong® HT has been specifically developed for applications at high temperatures and in the presence of oxidizing atmospheres.

The customer is an European company which is a leading international producer of rolled products, processing more than 150,000 tons of aluminium a year and exporting to more than 85 countries. It prioritises the constant search for potential improvements to the production process to maintain a high quality standard over time. In this case, the customer was about to completely rebuild a 60 ton reverberatory furnace and stated the need to greatly extend the lifetime of the door frame compared to the conventional types with steel or iron impact plates, to eliminate the flares, the continuous maintenance costs and the rapid wear of the sill and chute due to the charges. The customer also required a high-quality refractory material with strong resistance to aluminium corrosion, highly reliable, stable and with minimal expansion and contraction in the event of furnace shutdown and re-start, not to mention quick to install. One key feature of the design developed by Eredi Scabini is the Flextrong® HT doorframe. The wear linings of the basin, walls, burner blocks and roof were constructed in a variety of products from the Flustone® line of microionic dense castables with high resistance to abrasion and/or saturation by metals and/or slags. More than three years after it was put into service, the plant is still fully operational with only a small amount of scheduled maintenance and just one replacement of the sill and jambs and not of the lintel, which is still intact. Completely satisfied with this solution to all its requirements, the customer is now working in partnership with Eredi Scabini on a continual basis, assigning more complete melting furnace rebuilding projects to our company.

REF. N.49

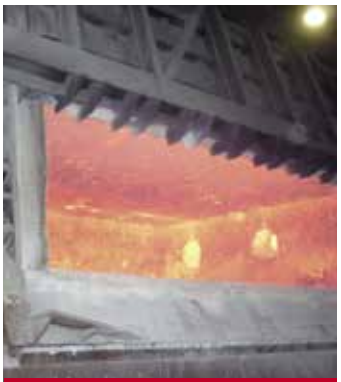
Furnace during maintenance. Note the serious wear of the metal door frame.

Construction of the Flextrong® HT doorframe. The sill is in Flextrong® HT AL.

Wear lining in Flustone®

Completed lining ready for controlled drying.

Drying with remote-controlled TURBOFLAME®.



Furnace in production 3 years after reconstruction.

Eredi Scabini: Number 1 for OEMs too!

The customer is an international corporation specialising in the design and production of industrial furnaces for ferrous and non-ferrous metals. Their range also includes aluminium melting, holding and heat treatment furnaces.

Over time, Eredi Scabini has built up a major partnership with this company, enabling the two firms to work in synergy to provide end customers with a complete, absolutely efficient service, as well as a top-quality product. In this case, Eredi Scabini saw to the lining of a 25 ton reverberatory furnace for melting aluminium, with regenerative burners. The design produced by EREDI SCABINI drew on its experience gained in linings for furnaces of this type during recent years, and involved the use of large preforms for the hearth and ramp and the use of CEMENT-FREE castables for all the other parts of the furnace. This solution was developed to deliver a easier, quicker installation and the best possible mechanical strength for both the hearth and the ramp, the areas that receive the most punishment from the charge and the electromagnetic stirrer. As scheduled, the complete lining installation procedure required just eighteen 10-hour shifts. The furnace is still in constant operation with no stoppages.

REF. N.37

Metal structure ready for work to start.

Metal structure ready for work to start.

Installation of the side walls underneath the bath.

Installation of the preformed hearth.

Preparing the crown anchor points.

Top-bottom side walls and burners. Crown formwork.

Completed refractory lining of furnace.

Furnace in production

IPS™ (Inductor Preformed System): more reliable and quicker to apply than other conventional systems.

The new IPS™ - Inductor Preformed System - is an innovative solution for the inductors of channel induction furnaces. The project comprises a preformed, pre-sintered wear lining to be sealed to the metal structure of the inductor by means of a monolithic safety lining. This concept allows the use of products with chemical and physical properties (e.g. abrasion and corrosion resistance) far superior than those of conventional refractories, and eliminates the most critical procedures related to the in situ installation of dry and wet monolithics: mixing, vibration and/or ramming, drying and sintering. What's more, with the IPS™ the use of disposable or reusable formworks for construction of the loop channel is no longer necessary. IPS™ is therefore more reliable and quicker to apply than other, conventional, systems.

The customer produces refined aluminium slabs for the internal production of flat products for the food packaging and automotive industries (500,000 tonnes/year). Two 45 ton channel induction furnaces with 4 inductor each are used to re-melt scraps to produce 5000 aluminium alloys slabs. Early in 2009, the customer explained the situation to Eredi Scabini, asking it to develop a new solution for lining the inductors, which had a very short lifetime with their dry ramming mix lining, leading to unscheduled production stoppages. After several months' development work on the new lining, Eredi Scabini suggested to the customer the use of a refractory lining made from a special castable with greater mechanical strength and chemical resistance than the previous dry ramming mix.

The first lining made from the new castable went into production in March 2010 and proved much more durable than the previous solution, enabling the project to go ahead until all the dry rammed inductors had been replaced, and to develop new castables to further increase inductor performance; furnace melting capacities have now been increased since the inductors are able to withstand higher powers.

Further to the good results achieved with the new Eredi Scabini castable solution, it was decided to work on a design for a pre-formed inductor lining. The design and development of this solution took several months and a considerable number of tests, but at the end of 2015 the first preformed inductor lining was ready to go into service.

This new solution offers a wide variety of both purely technical and logistic benefits: lining preparation times have been cut to one quarter of the previous time, reducing the need for specialist staff but still guaranteeing a constantly high lining quality, since it is preformed and fired in our plants.

REF. N.45

IPS™ working lining

IPS™ after several months of production.

Proud to build also customer loyalty!

Eredi Scabini is the only company which has introduced and continually implemented the CPS® (Crucible Pre-formed System), an innovative solution for coreless induction furnace linings. Every furnace is a one-off therefore each CPS® is customized to meet the specific condition.

The customer is a major international corporation with plants all over the world, specialising in the production of aluminium alloys for the aerospace and other industries. In the plant featured in this case history, the customer uses reverberatory melting furnaces to melt heavy scraps and coreless induction furnaces to melt chips and small scrap from its own machining shops.

Originally, the coreless induction furnace was lined with a dry ramming mix reinforced with steel fibres. This type of lining required a great deal of cleaning and maintenance. In fact, the furnace had to be cleaned by hand twice a day and shut down for cold maintenance once a week. "Elephant's foot" erosion and cracking appeared in the refractory lining of the bottom half of the crucible, and due above all to the erosion, the lifetime of a furnace lining was no more than 3 – 4 months.

The first project for lining the furnace using the Eredi Scabini CPS® system originated in 2015. The furnace was charged with even extremely fine scrap soaked with machining oils, but in spite of this the customer immediately found that it was very easy to clean and required absolutely no maintenance. The first CPS® lining lasted 10 months, an amazing 6-7 months longer than the previous type of lining; the second CPS® lining is still in service and the customer has already equipped itself with a third as a spare. So these are the main benefits of the CPS® system, which have converted the client to our solution once and for all: no maintenance, easy cleaning, energy saving and a 150% longer lifetime.

REF. N.43

First CPS®.

CPS® in service.

More durable impeller with Flextrong® HT AL

Flextrong® is a preformed ceramic matrix composite reinforced with heat resistant steel. The product has excellent resistance to thermal shock, impact, fracture and oxidation as well as to contact with molten metals. Flextrong® is designed for the installation via bolts and/or welding brackets provided. Flextrong® HT has been specifically developed for applications at high temperatures and in the presence of oxidizing atmospheres.

The customer is a leading international producer of forged wheels and alloy rims for the automotive industry. The recycling of aluminium chips from machining operations is fundamental to the production process and takes place in melting furnaces using impellers, which operate partially immersed in the bath and are constantly subjected to intensive thermal and mechanical stresses. The customer asked Eredi Scabini to come up with a preformed impeller which would provide a longer lifetime than the current type, which was lasting an average of about a month and a half. In response, Eredi Scabini S.r.l. designed an impeller in Flextrong® HT AL, a preformed ceramic matrix composite reinforced with heat resistant steel with excellent resistance to thermal shock, impact, fracture and oxidation as well as to contact with molten metals, generally used as a substitute for both refractory linings and metal castings. The target lifetime of the Eredi Scabini impellers was three months, meaning twice that of the competitors. Today, after more than 9 months of almost uninterrupted service, the Flextrong® HT AL impellers are still in operation, far exceeding even the most optimistic expectations. Without even waiting for the final result, the customer has placed another order with Eredi Scabini, with the aim of replacing all those installed in the various swarf stirring plants.

REF. N.36

Flextrong® HT AL impellers after 15 days in operation.

After three months of uninterrupted work.

Detail After 7 months' work.

Detail After 7 months' work.

Once you've tried preformed shapes you never step back!

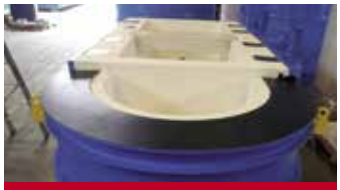
Eredi Scabini has always believed in the development of preformed shapes. This conviction has now been proved right, as the market is demanding high-quality, large-sized preformed shapes to reduce maintenance, increase performance and cut plant down-times. Its capability for producing preformed shapes up to 15 tons in weight places Eredi Scabini amongst the undisputed world leaders in this market sector. The production process takes place in a perfectly controlled environment, which reproduces the ideal conditions of a laboratory on an industrial scale. After casting, the pieces are cured, dried and fired in special furnaces, and undergo strict dimensional inspection before shipment to customers or - if requested - installation on their premises.

The customer is a successful multinational which produces aluminium, iron and steel castings for the automotive market. The company has a strong focus on technological innovation, and it therefore aims to continually upgrade its products, as well as the equipment used to produce them. It was for this reason that customer contacted Eredi Scabini in 2014 with the intention of trying CPS®, the exclusive preformed lining for coreless induction furnaces. The excellent performance achieved by CPS® (24 months in operation with no maintenance) and the lining's extremely easy cleaning encouraged the customer to continue to pursue the preformed option, also extending their use to the electrically heated bale-out holding furnaces. These furnaces comprise a basin containing a slag separator barrier and the charging and tapping wells, and the lid, where the electric heating elements are installed. After thorough development and design work, the first lining was produced in 2015. The basin wear lining was built as a monoblock, with 2lite® nanostructured foam as a safety lining. The lid was made with insulating monolithics.
The customer immediately noted how hard the metal was finding it to stick to the lining, and thus how much easier and less potentially damaging cleaning was, since it was no longer necessary to hammer the lining to break off the metal and slag, as had been the case in the past. A second complete lining of the casting machine holding furnace was produced immediately afterwards. At present the two furnaces, the first installed in October 2015 and the second in February 2016, are both in operation.
The customer is so satisfied that further development work is now under way on a new preformed lining made from Nanoplastic products.

REF. N.38

Preformed wear lining - Photo 1.

Preformed wear lining - Photo 2.



Working lining in Ultrablock® and 2lite® for insulation.

Furnace ready for production.

Furnace in operation.

Outstanding mechanical strength with Resistone®.

As well as formulating monolithics and preformed shapes, the company has a full range of products specifically developed for industrial floors exposed to heavy mechanical and chemical stresses in the presence of heat: the Resistone™ line. Resistone™ line castables are installed with procedures similar to those used for construction concretes, but they develop extremely high mechanical resistance within just a few hours and can be used at a temperature of 1.400°C even in contact with metal and slag splashes. Resistone's quick setting and ease of use also make it an excellent product for maintenance.

The customer is a multinational operating on three continents, with production sites in several different countries; these include a foundry which recycles aluminium from beverage and oil cans and other types of unclean scrap. The customer used to tip out the contents of the slag collection pans, and drop the pans themselves, onto an area paved with 60 mm smooth steel plates; considering the weight of the pan and slag, the paving was subjected to a total weight of 1.500 kg at a temperature of at least 1.000°C. With this solution, the plates had to be changed annually due to dangerous warpage. What's more, the uneven, misshapen surface, with sharp edges, also damaged the forklift truck wheels. Early in 2011 the entire area was rebuilt using Eredi Scabini Resistone™ HT MF, a castable specifically developed for high-temperature industrial pavings. Resistone™ HT MF delivers excellent mechanical strength - at both high and low temperatures The area reconstructed in Resistone™ HT MF has a total area of 20 m^2 and is 250 mm thick. The customer empties about 30 slag collection pans onto this paving every day, subjecting it to a heavy impact on each occasion. In spite of this, the Resistone™ HT MF paving has remained in good condition for over 5 years, recording a performance an amazing 5 times better than the previous solution.

REF. N.32

Previous situation.

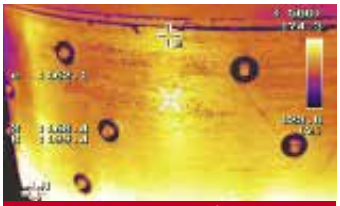
Previous situation.

Resistone™ HT MF installation.

Resistone ™ HT MF after 5 years.

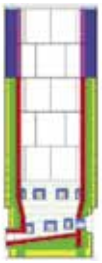

Initial stages of Flextrong® installation.


Flextrong® installation completed in half a day.


Infrared picture of mouth metal structure, 170°C with furnace in operation.


After 8 months in production, the Flextrong® HT is perfectly intact (please note the serious wear of the new bricks installed, just underneath).

Stronger and more reliable charging area with Flextrong® impact plates.



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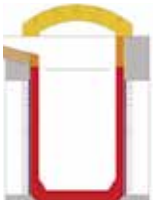
The customer is an international leader on the semi-finished copper product market. With a production capacity of over 400,000 tons/year on 2 production sites, and more than 60 years' experience, the company is a benchmark for all production and trading companies in the electrical engineering, electronic and system construction industries. The customer needed to solve a series of problems around the charging area of its shaft furnace, initially lined with copper impact plates. The problems included: sticking of copper cathodes to the impact plates causing the formation of bridges, a very high temperature on the charging mouth structure, requiring forced-air cooling, and unsatisfactory impact strength and lifetime.

In response, Eredi Scabini developed a new charging mouth lining using Flextrong® HT, a preformed ceramic matrix composite reinforced with heat resistant steel, generally used as a substitute for both refractory linings and metal castings. This lining was installed by simply bolting in place, in just half a day. Apart from the benefit of extremely fast installation, this solution solved all the other problems, with no more sticking of cathodes or bridge formation, a dramatic fall in the metal structure temperature from 400/ 600°C to about 170°C and thus no more need for forced-air ventilation, and excellent mechanical strength. The success of this Eredi Scabini solution encouraged the customer to assign more complex projects to us, cumulating with the complete reconstruction of the shaft furnace, to be undertaken entirely using the innovative ABT - Advanced Block Technology.

REF. N.42

CPS® (Crucible preformed system): still the best solution on the market for coreless induction furnace linings.



Eredi Scabini is the only company which has introduced and continually implemented the CPS® (Crucible Preformed System), an innovative solution for coreless induction furnace linings. Every furnace is a one-off therefore each CPS® is customized to meet the specific condition.

The customer is a long-established European company that leads the world in the manufacture of heat exchangers in copper and copper alloys. The plant is equipped with a coreless induction furnace with capacity 7,4 tons, used to remelt returns of various weights and sizes to produce billets.

The original refractory lining consisted of dry ramming mix. The lining's lifetime was highly variable but never satisfactory.The critical point in the lining was around the lower edge of the structural rings. In fact, most stoppages and lining replacements were due to the formation of through cracks in this point.

Tired of the continual failures of the dry ramming mix lining, in 2014 the customer decided to try Eredi Scabini's CPS® solution. First and foremost, use of the CPS® would avoid the use of the expensive copper formwork otherwise necessary for construction of the ramming mix lining. It was also expected to solve the greater problem of the continuous failures, since the lining consists of a monolithic preformed crucible. After meticulous design work, the first CPS® lining was supplied in August 2014.

The first immediately obvious major difference between the previous solution and the CPS® lining was that the latter was much easier to clean. What's more, this solution eliminated the metal infiltration around the spout, which in the conventional design was complex in geometry, requiring it to be installed using several materials; with the CPS®, on the other hand, it is integral with the rest of the crucible.

Another problem solved with the CPS® was the overflow of metal during tapping; the crucible was designed and built with an integral barrier in the upper part to prevent any overflows. The furnace with the new CPS® lining was to operate continually for 12 months, with stoppages only for routine cleaning and to check the general condition of the refractory lining. The first CPS® lining was followed by another, again with very satisfactory performance, and then another, which is still in operation. The customer is completely satisfied with the Eredi Scabini preformed solution, to the point where it is also considering the use of our preforms for lining more of its furnaces.

REF. N.44

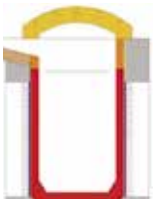

Cracks in the conventional lining.


CPS ready to process its first charge.


1st CPS after 33 weeks in service.


1st CPS after 55 weeks in service.

Dristone® the dry ramming mix that really makes the difference!



Eredi Scabini has offered and subsequently conducted the in-house development of top quality monolithic refractories since its foundation. The range now comprises hundreds of different formulae, which can be used for the realisation of refractory and insulating linings by a wide variety of methods. DRISTONE® is a line of dense dry ramming mixes made with neutral or basic raw materials for installation by dry vibratory compaction. These products can be used as either safety or wear linings and with either disposable or reusable formworks.

The customer is a cast iron foundry with output of about 21.000 tons/year of grey (30%) and ductile (70%) cast iron. A few years ago, it also began to produce steel for the automotive industry. The cast iron foundry contains 28 ton coreless induction furnaces and 4 ton pressurised coreless induction furnaces; the steel foundry is also equipped with coreless induction furnaces from 1 to 7 tons. The first linings the customer used for its steel furnaces encountered duration and infiltration problems, and furnace lifetimes varied from 1 to 3 weeks at the most (photos 1-2). Eredi Scabini offered a "turnkey" solution including both supply and installation of the complete furnace lining. The lining ran from the coil grouting to the working lining, for which the choice was dry-rammed DRISTONE® , compacted with our innovative VIBROSYSTEM 4000 vibrator. This solution doubled the crucible lifetimes while maintaining a high safety level, demonstrated by the fact that the rammed DRISTONE® was found to be partially sintered on demolition. (Photos 3 – 4 – 5 - 6). At present, all coreless induction furnaces in this foundry are constructed using the Eredi Scabini solution.

REF. N.41


Photo 1 - Competitor solution.


Photo 2 - Competitor solution with deep sintering.


Photo 3 - Eredi Scabini Solution for coil grouting.


Photo 4 - Eredi Scabini Solution for slip plane.


Photo 5 - Eredi Scabini Solution for Vibration.


Photo 6 - Eredi Scabini Solution after 5 weeks.

Incontrovertible savings!

Flustone® is a line of microionic dense castables with excellent flow ability allowing application by self-distribution. They are used mainly for working linings requiring high resistance to abrasion and/or saturation by metals and/or slags. They are self-bonding, allowing linings to be repaired by applying the same product to the worn surface without changing the whole lining.

The customer is a major foundry producing about 35.000 tons of cast iron a year (70% ductile and 30% grey) mainly for the construction machinery industry, with a small proportion for the automotive industry. The foundry contains 55, 28 and 14 ton coreless induction furnaces serving 2 casting lines. One line is served by tilting ladles of varying capacity, already lined with Eredi Scabini castables. The excellent results achieved with our products encouraged the customer to request a feasibility study on the lining of the 5 ton pressure ladles installed on the other line.

Prior to the Eredi Scabini solution, these ladles were lined with bricks and concrete, with an average lining lifetime of no more than about 5.000/7.000 tons (photo 1). With the new solution, Eredi Scabini set ambitious targets for improvement in both durability and energy saving, achievable using products with high-tech capabilities in terms of wear and insulation. The results were astonishing! In fact, as of today the lining lifetime has increased from 5/7.000 to over 16.000 tons and the ladle is still in operation; since it went into service it has only required 4 repairs, which moreover used very little material. From the energy point of view, compared to the previous solution (photo 2), the Eredi Scabini solution has reduced the temperature of the metal structure by about 120°C (photo 3). This result has cut ladle preheating times and ferroalloy consumption and allows metal to be tapped from the melting furnaces at about 10°C less than in the past.

From the economic point of view, the annual saving calculated by the customer is:
- about 10,000€ of electricity
- about 36,000€ of FeSiMg ferroalloy
- about 8.000€ of natural gas

Il this has led the customer to decide to use the solution for both the ladles in the plant (Photo 5).

REF. N.35

Photo 1 - Traditional solution after 2000 tons.

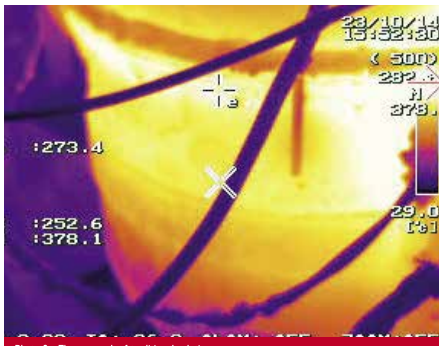


Photo 2 - Thermograph of traditional solution.

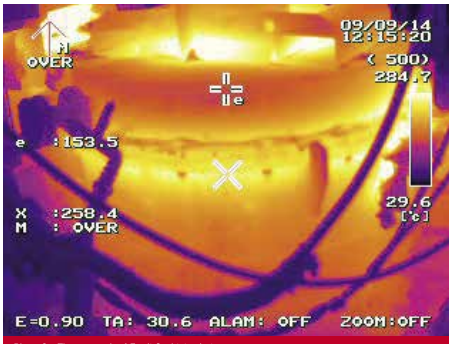
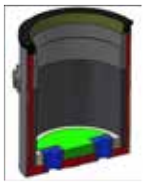


Photo 3 - Thermograph of Eredi Scabini solution.

Photo 4 - Second ladle lined with Eredi Scabini solution.

Dristone®: The best monolithic safety lining solution.



Dristone® is a line of dense dry ramming mixes made with neutral or basic raw materials for installation by dry vibratory compaction. The products in this line can be used as either safety or working linings and with either melt-in or removable forms.
For the steel industry, Dristone® is specifically designed to be installed behind the brick working lining, creating a joint-free, monolithic back up. At the operating temperature, the product develops a high strength and low- porosity hot face but maintains a loose back-up to stop metal infiltrations.

The customer is a major European steel group which produces about 3.000.000 tons/year of coils. The steelworks has one 130 ton and one 260 ton electric arc furnace with the relevant ladles. The customer has already been using Dristone® for the safety lining of the 130 ton ladle as an alternative to the conventional alumina bricks for a considerable period of time. In view of the constant very satisfactory results achieved, the customer recently decided to use the same solution for the 260 ton ladle. While the 130 ton ladle is cylindrical in shape, the 260 ton ladle is conical. The use of our dry ramming product meant that the safety lining was able to hug the metal structure precisely, providing the perfect supporting surface for the brick working lining, with none of the steps typically found with brick safety linings. Moreover, the use of our Dristone® dry ramming mix for the safety lining was combined with the use of ISOLINE® Micropor as insulating lining on the metal structure. The combination of insulating and safety linings applied as described above provided the customer with energy savings and a joint-free solution, which was therefore able to withstand any metal infiltrations.

REF. N.50

Photo 1 - Microporous insulating lining in Isoline® Micropor.

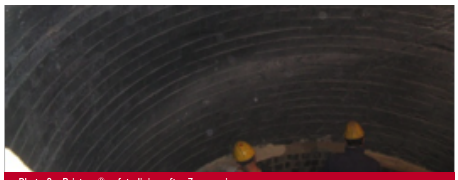
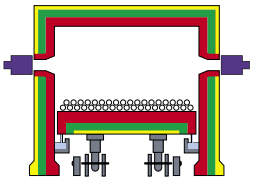


Photo 2 - Dristone® safety lining after 7 campaigns.

Photo 2 - Dristone® safety lining after 7 campaigns.

Hearth free from wear and with stable joints thanks to Flustone®.



Flustone® is a line of microionic dense castables with excellent flow ability allowing application by self-distribution. They are used mainly for working linings requiring high resistance to abrasion and/or saturation by metals and/or slags. They are self-bonding, allowing linings to be repaired by applying the same product to the worn surface without changing the whole lining.

The customer is a forge producing sized parts for the petrochemical and energy market. The forge contains several reheating furnaces with capacities of 150-400 tons, including a rotary hearth furnace, and heat treatment furnaces from 60 to 200 tons. Both types of furnaces were experiencing continuous problems with the hearths and outer rims. In the rotary hearth furnace, the customer was forced to perform repairs on the hearth during every annual shutdown. This operation extended the plant shutdown times, apart from the fact that the repairs lasted a few months. The furnace was completely rebuilt after just 3 years in operation. It was possible to reconstruct the hearth with a new Eredi Scabini solution, with the outer rim in Flustone® V, an extremely stable castable with high mechanical strength, and the hearth in another product from the same line, the metal-reinforced Flustone® MF, also with outstanding mechanical strength and thermal shock resistance.
(Photo 1 – Photo 2). This solution solved the wear problem. After about 12 months in operation, the furnace is still in excellent condition without any repairs having been performed (Photo 3 - Photo 4). This result has persuaded the customer to use Eredi Scabini's Flustone® castables for the complete and partial repair of other furnaces in the plant.

REF. N.40

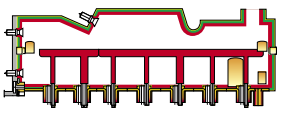
Photo 1 - Eredi Scabini Solution Outer Rim.

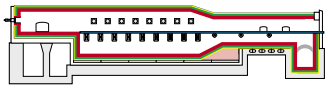
Photo 2 - Eredi Scabini Solution Central Hearth.

Photo 3 - Outer Rim after 12 months in service.

Photo 4 - Central Hearth after 12 months in service.

Flustone® extends the lifetime of reheating furnaces.





Flustone® is a line of microionic dense castables with excellent flow ability allowing application by self-distribution. They are used mainly for working linings requiring high resistance to abrasion and/or saturation by metals and/or slags. They are self-bonding, allowing linings to be repaired by applying the same product to the worn surface without changing the whole lining.

Walking-beam and pusher-type furnaces are widely used for reheating billets and slabs for rolling, and the most common problems occur in their hearths, which are exposed to both thermal shock and corrosion and thus require frequent maintenance. The presence of scale, which penetrates into the porous surface of the refractory lining or cracks caused by thermal or mechanical shock, is a familiar problem, and it led Eredi Scabini to develop a refractory material specifically for this application. After a thorough assessment of operating conditions, it came up with a number of products with excellent mechanical properties and low linear expansion, to withstand mechanical abuses and thermal shocks. The new products then underwent severe high-temperature corrosion tests (photo 1) in the presence of scale (photo 2) in order to select the material with the best performance. The outcome of the study conducted by our R&D department was Flustone® V 891, the supreme product for this application.

Photo 1 - Corrosion test.

Corrosion test.

Corrosion test.

Photo 2 - Mill scale.

Flustone® V 891 has been installed on the hearths of pusher-type and walking-beam furnaces as documented in the case histories below.

Case history # 1

The customer is a historic steel industry player which has been in operation for more than 100 years, and is European leader in the production of rolled steels. The group comprises four steel mills and ten rolling mills, spread across nine production sites. The customer uses both walking-beam and pusher-type furnaces. Final products are destined for the construction, shipbuilding and automotive sectors.

In walking-beam furnaces, beams and ridges made from low cement concrete experienced problems with failures around joints, while the beams wore very quickly, preventing balanced positioning of the billets (Photos 3 - 4). Since there was no alternative available, the customer adopted the practice of repairing the blocks during each annual scheduled shutdown, although aware that the lining was deteriorating in much less than 12 months.Eredi Scabini supplied the customer with a complete solution involving the use of specific insulating materials to reduce heat losses to preserve the metal load-bearing structure, together with the use of Flustone® V 891 as the wear lining material.

After 12 months in service, the lining was still in excellent condition and there were no problems of wear, cracks and/or failures on the hearth or ridges (Photos 5 - 6). The lining produced by Eredi Scabini is therefore still doing an excellent job for the second consecutive year.

In pusher-type furnaces, Flustone® V 891 replaced 3 different low-cement castables being used for the hearth lining. Here again, there was no option to annual maintenance (photo 7) and after application of the Eredi Scabini solution (photo 8), the lining was still in excellent condition after 12 months in service, with no problems of wear, cracks and/or failures (Photo 9).

Photo 3 - Traditional Solution, joints between blocks after 12 months.

Photo 4 - Traditional Solution, cracks in blocks after 12 months.

Photo 5 - Eredi Scabini Solution, joints in blocks after 12 months.

Photo 6 - Eredi Scabini Solution, blocks after 12 months.

Photo 7 - Traditional Solution: blocks of left-hand zone after 12 months.

Photo 8 - Eredi Scabini Solution: Repair of left-hand blocks.

Photo 9 - Eredi Scabini Solution: hearth blocks after 12 months.

Case history # 2

The customer is an electric steel mill which produces about 900,000 tons a year of steel pipes, which is processed in-house to serve the petrochemical, energy and automotive market. The plant contains a number of reheating and heat treatment furnaces, including a walking-beam furnace, where the customer complained of a large number of problems on the refractory lining of the beams. The lining was prepared by casting small segments with ceramic fibre joints between them to compensate for the high level of thermal expansion of the low cement castable used. The expansion created cracks and mechanical failures in the joints (Photo 10 - 11), apart from serious wear of the surface which led to the absence of uniform support for the steel pipes, generating high output rejection levels.

The customer was repairing the blocks during each annual scheduled shutdown, although the wear was occurring a long time before this. The solution supplied by Eredi Scabini involved the use of Flustone® V 891, which thanks to its stability allowed the creation of thinner sectors with fewer joints. After 12 months in service, the walking-beams were still in excellent condition, with no problems of wear, cracks and/or failures of the joints (Photos 12 - 13). After two years in service, the lining is still in excellent condition, so it is about to be used for the third consecutive year. What's more, the customer has noticed a sharp reduction in reject rates during use of the furnace.

REF. N.39-47-48

Photo 10 - Traditional Solution, joints between blocks after 12 months.

Photo 11 - Traditional Solution, cracks in blocks after 12 months.

Photo 12 - Eredi Scabini Solution, joints in blocks after 12 months.

Photo 13 - Eredi Scabini Solution, blocks after 12 months.

PAPERS

INSULATING REFRACTORIES

Insulating refractories are an extremely complex subject. When used to insulate dense refractory structures, they can totally change the engineering concept of the structure, and so the structure as a whole must be taken into consideration as well as the specific insulating material itself. This is even more the case when the refractories are in contact with molten metals, because the use of insulating materials can modify the metal's solidification planes.
We will discuss insulating refractories from two different points of view: those of their insulating and refractory properties.

INSULATING PROPERTIES

In general terms, there are 4 main categories of insulating refractories:

- Insulating shapes (bricks, calcium silicates, etc.)
- Insulating monolithic (castables, ramming mixes, etc.)
- Insulating fibres (glass and ceramic)
- Microporous materials

The key feature which distinguishes insulating refractories from other types is their low thermal conductivity, which varies from product to product depending on the temperature to which they are exposed. (Figure 1)

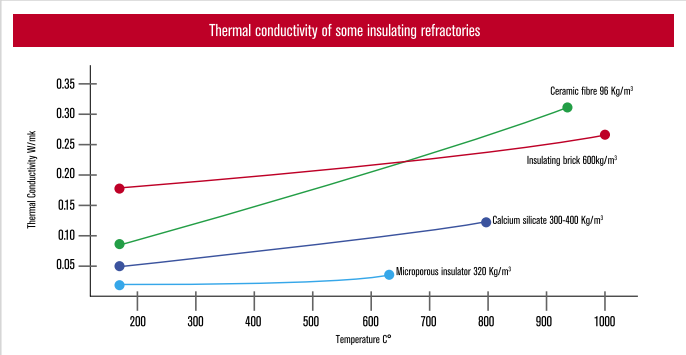


Figure 1: Thermal conductivity of some insulating refractories.

Microporous materials are the most effective insulators, but their operating temperature does not normally exceed about 1000°C and they are used only for particular applications, or when traditional products are unable to reduce temperatures as required.
Moreover, this solution is expensive and the materials are not resistant to water or steam unless manufactured by specific methods.
All the same, I believe that the continuous increase in energy costs will cause the use of these materials to become more and more widespread.
Microporous insulators consist mainly of microsilica with an extremely small pore diameter (in many cases it is smaller in size than an air molecule, meaning that we are close to nanometric values).

HISTORY OF INSULATION

We all know that calm air is an excellent insulator.
In the 13th century Marco Polo reported an insulation material being used in Siberia; this is now thought to have been asbestos.
We know that people have always used animal pelts to protect themselves from the cold and prevent the loss of heat from their bodies.
They did not know why this was the case, but it worked.
The answer is very simple: it worked by means of the calm air trapped in the hair of the pelts, which became an insulating agent.
Transferred into high-temperature industrial plants, this concept has encouraged people to find solutions and products to insulate furnaces or other equipment by cladding them with dense refractory materials, initially natural refractory clays.
What are the main reasons why more and more sophisticated insulating refractories are required?

- To reduce energy usage
- To reduce the thickness of furnaces' linings and thus their structures
- To achieve more control of temperatures or the process
- To reduce the loss of heat to the exterior to provide a better, safer workplace

One important principle of thermodynamics (thermodynamic flux) is that heat tends to move from a high-temperature zone to a zone where the temperature is lower (Figure 2) before returning to the hot zone.

Heat transfer occurs in 3 different ways:

- Conduction
- Convection
- Radiation

These systems are clearly explained in the literature, and without getting too involved in mathematical formulae (nowadays handled by computers), it is important to look more closely at the concept of "Thermal flux", because it is directly related to heat transfer. (Figure 3-4)

$$Q = \frac{K.A.(\Delta 2 - \Delta 1)}{L}$$

Figure 3: Thermal flux formula

Where Q = Thermal flux
K = Thermal conductivity of the insulating refractory material
A = Cross sectional area
($\Delta 2 - \Delta 1$) = Temperature difference (hot side - cold side)
L = Length of thermal flux

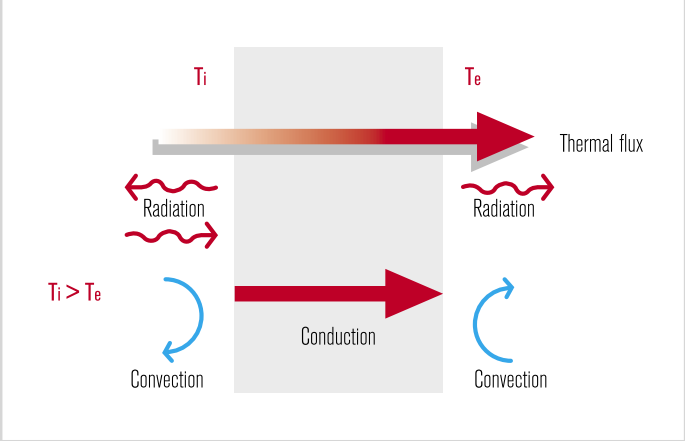


Figure 4: Heat transfer through a wall by conduction, convection and radiation.

In terms of conduction there is little that can be done to influence heat transfer for any given length and cross-section of a solid refractory substance. Since it involves a convective motion associated with heat exchange, heat transfer by convection can be partially controlled, as can radiation, in which heat is conveyed in the form of electromagnetic waves. How? By means of the length of the thermal flux passing through the solid.

For example, if a refractory material contains large pores, convection will occur inside them as well as radiation on one side and the other. If we were able to make the thermal flux travel further between the pores, this would enable us to reduce heat transfer inside the solid. How can this be done?

The answer is: by controlling the pore diameter of the apparent porosity of the insulating refractory.
An ideal insulating refractory should have a highly porous structure consisting of pores of the smallest possible size and with the most uniform possible shape, with the spaces between pores as narrow as possible and consisting of materials with the lowest possible thermal conductivity. Easier said than done, but it works!

In fact, to simplify, Figure 4a shows the path of the thermal flux ("L" Figure 3) in an insulating refractory with large pores, while Figure 4b shows its path within a microporous material. In the latter case, the thermal flux, conveyed by conduction, has to travel a longer distance to pass through the solid, which will therefore be a better insulator.

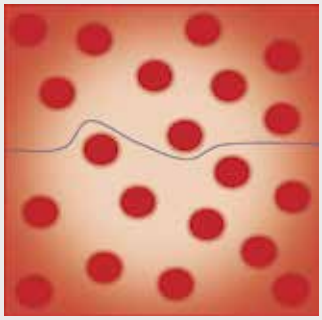


Figure 4a

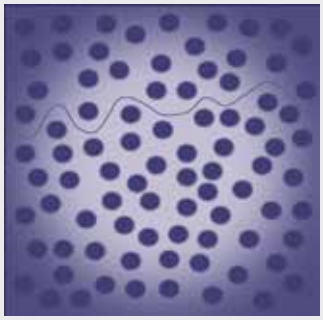


Figure 4b

It should also be noted that this does not modify the apparent porosity, and thus the apparent density of the material and therefore its other physical characteristics - such as its mechanical properties - remain unchanged.

This also means that apparently "heavy" insulating materials can have thermal conductivity values similar to or even better than those of even much lighter insulators.

REFRACTORY PROPERTIES

It is an accepted fact that the refractory properties of a solid depend directly on its analytical conformation, meaning which metal oxides it contains and in what percentages.

It is equally certain that the lighter a solid the less refractory it is, meaning that it will be less able to withstand continuous operation at high temperatures without deformation than a similar, denser material. This is not because it does not contain the same metal oxides but because it contains more air within its volume, and is therefore less physically stable at high temperatures.

Hence, of two light insulating refractories with the same % apparent porosity, that is containing the same amount of air, the microporous material will be more refractory than the macroporous one: in the microporous material, the air will definitely be better, more evenly distributed through the mass, meaning that its reactions within the tiny cells will be less concentrated and destructive, with the practical result of greater volumetric stability.

Since it is standard practice to assign an insulating refractory a maximum working temperature on the basis of its permanent linear shrinkage at that temperature, it is obvious that for any given density, a product with micropores will have better resistance to heat.

Written by Daniele Scabini