



# EREDI SCABINI NEWS

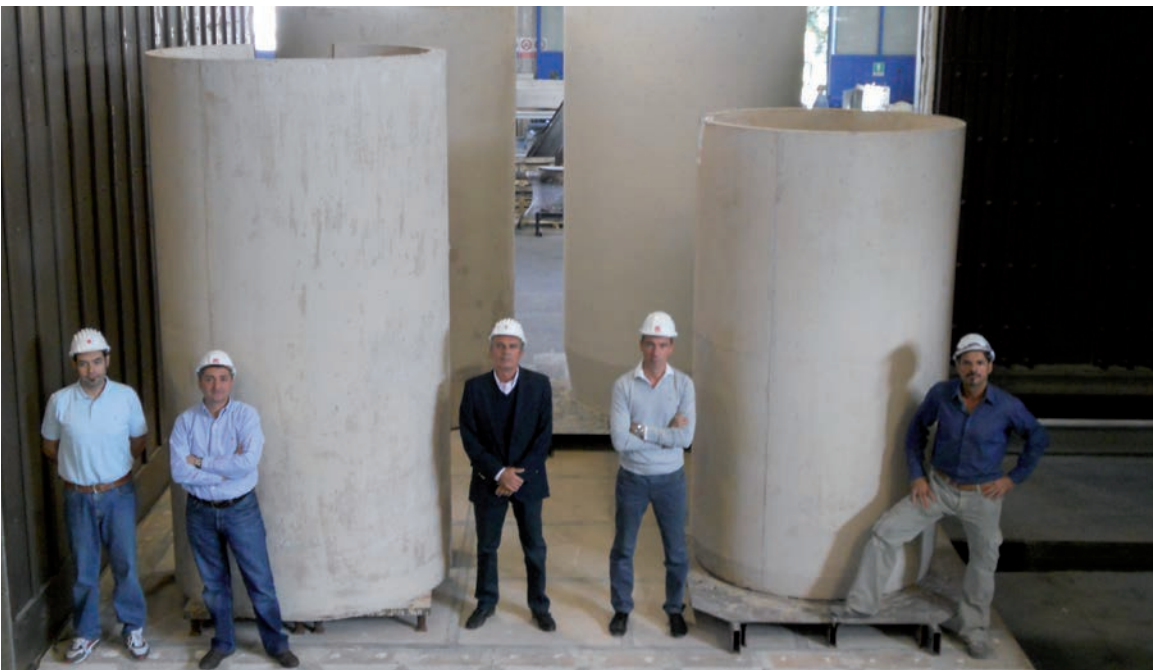
Since 1945, the refractory specialist at your disposal.

## Advanced refractory solutions from Eredi Scabini.

Eredi Scabini, was one of the first companies to introduce unshaped (monolithic) refractories as an alternative to conventional bricks. Today, the company specialises in the design and production of monolithics, preformed shapes and composites based on its own exclusive formulations. More than 30 percent of the material produced is transformed into preformed products for the lining of furnaces and containers for molten metal - in a broad range of shapes up to 15 tonnes each. Preformed shapes offer a number of advantages, and the growing demand for high-quality, ever larger shapes confirms that Eredi Scabini's approach is the right one. The aim is to replace bricks with larger-sized pieces to reduce the number of joints and construction time, thus increasing furnace life and productivity on the one hand, and reducing the resultant costs on the other.

**The company is market leader in this segment and points to a customer reference list that includes well-known companies such as ALCOA, ALERIS, AURUBIS, COMPONENTA, CONSTELLIUM, DUBAL, FONDERIE TACCONI, FORGIATURA VIENNA, HAYES LEMMERZ, KME, MAHLE, NOVELIS, TENARIS, THYSSENKRUPP, TRIMET, WIELAND-WERKE, ZANARDI FONDERIE.**

Thanks to its technology, product range and know-how coupled with a reputation for listening and responding to customers' needs, Eredi Scabini can offer products and solutions tailored to any plant. This includes a complete 'turnkey' service, from the careful analysis of the specific requirements through to the design, production and installation of the refractories, which is backed up by a comprehensive after-sales service. Eredi Scabini's refractory solutions are developed entirely in-house. The design is executed with the aid of sophisticated 2D and 3D CAD and FEA systems. All the monolithics, including those used for the production of preformed shapes, are produced in the company's own plants and are based on exclusive formulations. The company owns the intellectual property rights to hundreds of products, and is constantly developing new formulations to fully meet every type of requirement. Installation and commissioning are carried out by specialist engineers with the aid of equipment designed by the company itself. Eredi Scabini offers innovative, high-performance solutions for many applications in a several industries. The solutions are 'kits' for the modular refractory lining of furnaces or specific plants. They are created and controlled in the company's plants and then transported to customers' sites and assembled. A kit comprises several products, both monolithics and preformed shapes. The quicker and easier is to assemble a kit, the greater is the benefit for the customer. To have a broader picture of Eredi Scabini's cutting-edge solutions, you can read some of our most significant case histories in the following pages.



Dense preformed shapes for applications requiring high analytical purity, excellent resistance to abrasion and outstanding non-wetting properties.



Advanced Block Technology: modular preformed and preformed solution for reverberatory furnace linings.

### 90% OF OUR BUSINESS IS IN MOLTEN METAL APPLICATIONS.



Our mission:  
“Everything that is worth doing at all, is worth doing well.” (P. Stanhope, 1694-1773)

## Eredi Scabini R&D Lab: an inexhaustible workshop for new ideas.

Our company has always implemented a policy strongly oriented towards quality and the continual innovation of its offering. In the Research and Development laboratory, the heart and soul of the company, engineers and researchers, with in-depth knowledge of ceramics, mineralogy and chemistry, work constantly in close contact with the very best international universities and external research laboratories to identify new products for specific requirements. The sophisticated equipment, the development of new installation techniques and access to a vast range of high quality raw materials guarantee Eredi Scabini unrivalled flexibility in the development of more and more complex materials, constantly at the state of the art. Responsive to the evolving market and with a clear orientation towards new technologies, during the last few years Eredi Scabini's research work has focused above all on the development of nanotechnology and the application of its basic principles in the refractory sector. This has been a project on a vast scale, in which the company has invested and is continuing to invest im-

**WE VIEW NANOTECHNOLOGY AS SIMPLY A MEANS TO THE DEVELOPMENT OF A NEW PRODUCT CONCEPT WITH FEATURES THAT WRITE NEW CHAPTERS IN THE HISTORY OF REFRACTORY MATERIALS.**

mense human and financial resources and which is already yielding amazing results. Today nanotechnology itself is no longer new, and plenty of companies have already used and sold it in their products. We are not content with this, we are doing much more. We view nanotechnology as simply a means to the development of a new product concept with features that write new chapters in the history of refractory materials. A product, or rather an extended family of products with such revolutionary characteristics that we feel it is reductive to describe them as just "nanostructured castables". Eredi Scabini owns hundreds of exclusive proprietary products. The nanoplastic products further extend its offering, giving its customers a vast range of options for dealing with every requirement in the best possible way, in terms of both performance and cost. We will be coming back to this topic with further information very soon...

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Eredi Scabini amongst the best suppliers of the Tenaris Group.  
A success story.



## Greatly multiplied performances thanks to Flextrong® skimming and stirring tool.

The customer is a company based in the Middle East. The foundry is divided into casting centres with one 65 tonne melting furnace and two holding furnaces. The tools, mounted on forklifts, are used for stirring the bath to remelt the alloys, stirring the bath to speed up the melting of internal returns, skimming slag from the surface of the bath and cleaning the lining. Every day, the tool is used 15 times for stirring and 15 times for skimming. Every stirring session lasts 6 minutes, which may be increased to 15 if it becomes necessary to re-alloy the bath a second time. The tools the company normally uses are made from carbon steel plate and last 1 or 2 days. In the past, the company has performed tests with

special steel tools, achieving a lifetime of up to 7 days, and other composite materials, which lasted for from 2 to 24 days. Not a day more. Eredi Scabini supplied 2 Flextrong® tools with the aim of achieving a working lifetime of 70 days' service. Well, the results exceeded all the customer's best expectations: the Flextrong® HT tool was taken out of service after about 100 days, and not because it had worn but due to corrosion of the flange used to mount it on the boom connected to the forklift.

REF. N.10

Standard Solutions



Photo 1: New steel tool

Photo 2: Steel tool after 2 days

Photo 3: Tool in another composite material after 20 days

Eredi Scabini Solutions



Photo 3: Flextrong tool afterwards on support

Photo 4: Flextrong tool after 90 days

## Production stoppages are a thing of the past with ABT preforms.

The customer company is a member of a large international group which produces high-quality billets and profiles in various aluminium alloys. The company constantly tries to optimise its resources and is always on the look-out for new technologies to improve the existing condition of its equipment, increase yields and reduce overall costs. The plant has a production capacity of about 70,000 tonnes/year and features several reverberatory and induction furnaces from 7 to 45 tonnes in capacity. In response to an increase in worldwide demand for aluminium, it became necessary to improve the furnaces' performance, minimise scheduled stoppages and - above all - prevent unplanned downtimes due partially to failure of the refractory linings. The customer therefore turned to Eredi Scabini with the request to develop solutions to solve specific problems on the roof and sill of the plant's main melting furnace. The furnace has a capacity of 45 tonnes and produces Aluminium 2XXX - 4XXX - 5XXX - 6XXX - 7XXX alloys. It is charged with T-bars, billets and scrap items weighing up to 6 tonnes, which are placed on the sill and pushed into the furnace. Otherwise, for lighter scrap, a pusher loader is used. The furnace is completely cleaned once every 2-3 days or when the alloy changes. In the past, the lining of the sill and hearth was in low cement castable, while the walls and roof were lined with small preformed shapes. Frequent stoppages were required for maintenance of the sill and roof.

Eredi Scabini's project for a preformed lining for the roof was developed in 2012. An initial row of Ultrablock preformed shapes was installed in the zone linking the lintel and the flat part of the roof. In view of the excellent performance achieved compared to the previous solutions, the project was continued through to realisation of the entire roof. It is worth noting that the first blocks installed between the lintel and the flat part of the roof in 2012 were removed and then reinstalled during the total reconstruction of the roof, without any specific maintenance. Complete installation of the roof took about 2.5 working days, working a shift of 10/12 hours a day.



Roof in fibre blocks




Roof with one row of Ultrablock®



Ultrablock® after 12 months



Complete reconstruction of the roof, December 2013



Roof 18 months after installation of the first row of Ultrablock®

## Eredi Scabini Solution for Aluminium melting furnace lining.

The client is a marked leader in rolled aluminum products and beverage can recycler. In November 2011 a melting furnace was stopped for maintenance and Eredi Scabini supplied the refractory lining, the installation and the dry-out service. The furnace is a 23 ton/hour batch melter equipped with 4 regenerative burners. The lining was designed to increase the furnace capacity to 72 tons using big preformed shapes. Megablock®, large aggregate big-blocks, was installed in the furnace bottom. The combination of product with the grain size up to 150mm, and the unique ceramic matrix guarantees excellent impact and thermal shock resistance as well as unique non-wetting properties. **The prove is the result: after almost three years of service and around 300.000 tons, the bottom lining is still in excellent conditions without the need of maintenance.**

REF. N.4

Photo 1



Photo 4



Photo 2




Photo 5




Photo 3



Photo 6



### Job reportage:

- Foto 1: Furnace view in hot conditions before relining
- Foto 2: Complete hearth - Ramp&Sill demolitions
- Foto 3: Hearth block installations with Large aggregate preformed blocks made with Megablock® 245
- Foto 4: Hearth block sealing made with Flustone® 80 AL
- Foto 5: Eredi Scabini lining after dry-out
- Foto 6: Hearth block (Megablock® 245) after 18 months from start-up, with an average production of 175 ton per day

## CPS (Crucible Preformed System): an innovative solution for lining coreless induction furnaces with no rivals on the market.

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, so each CPS is customised to meet the specific conditions involved. The first CPS was installed in 2001, and there are now dozens of furnaces in operation with this solution with capacities up to 15 tonnes. Wherever the CPS has been installed, it has increased the lifespan compared to conventional linings.

Here is one example. The customer company is a member of a major international group specialising in the production of high-quality billets and profiles in various aluminium alloys. The company is very open to new technologies, seeing them as a way of increasing production efficiency and optimising costs. The plant has a production capacity of about 70k tonnes/year and output comprises 2XXX - 4XXX - 5XXX - 6XXX - 7XXX AL alloys. As well as several reverberatory furnaces, the company has three coreless induction melting furnaces with capacities

of 7.5 - 10 and 13.5 tonnes. The original refractory lining consisted of dry ramming mix reinforced with metal fibres. The lifetime of the furnace linings varied from 2 to 5 months, with unplanned stoppages due to localised infiltrations and/or erosion in the lining. The Eredi Scabini project to reline the smallest furnace (7.5 tonnes) with the CPS system was launched in 2005 and the lining was installed in May 2006. The furnace operates 7/7/24, is charged 5 times a day and has an average output of 35 tonnes/day. Apart from its simple installation, the

CPS's easy cleaning and greater durability immediately became clear in contrast with the dry ramming mix lining still installed in the other furnaces (10 and 13.5 tonnes), where the same problems of variable lifespan and unplanned downtimes due to lining failures continued to occur. What's more, with the new CPS system the customer also noticed a considerable reduction in the overall furnace lining costs. At present, all three crucible induction furnaces are equipped with CPS, with average lifespan of 11 to 15 months.

REF. N.12

7.5 ton CPS



7.5 tonne CPS after two months in production.



7.5 tonne CPS after seven months in production.



Inspection of 13.5 tonne CPS after 6 months in production





New **2lite®** insulating foam.  
Effective, safe innovation.

2lite® is a product line that represents an absolute novelty on the market for insulation products. Developed to create the back-up of preformed linings in a simple, fast and safe way, 2lite® is an insulating nanostructured mixture that expands in situ generating a foam with very low thermal conductivity, high thermal shock resistance and good mechanical strength. 2lite® guarantees maximum safety thanks to the excellent non wetting properties and stability, enabling it to maintain excellent insulating properties and ensure a stable support for the working lining, even in case of contact with molten metal. Moreover, 2lite® is an ecological product and does not contain ceramic fibres.

The customer whose case history is described here belongs to an international group with 9 production sites in Europe, North America and Asia. It is the world's biggest producer of semi-finished products for the packaging industry (tubes and cans), with output of about 30,000 tonnes/year. The foundry has 2 continuous casting lines. The customer used to insulate and fix its preformed filter boxes and launders with insulating panels clad with adhesive aluminium sheeting and ceramic fibre cements. The customer has now been using our 2lite® insulating foam to insulate and fix its preformed filter boxes and launders since 2013, to its great satisfaction. Apart from the easy installation and effective insulation, the customer is also delighted with the reduction in crack formation in the preformed launders: exceptionally fluid, 2lite® fills in every gap and its volumetric stability guarantees the preformed launder excellent support.

REF. N.6



The product is poured into the gap between the preformed shape and the carpentry or the rest of the insulating lining. The filling is guaranteed by the product fluidity and its 'high' density during the installation. - Photo 1



Expansion of 2lite® - Photo 2

With **Flustone®**, lifetime of tilting rotary furnaces lining has increased by +35%.

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 an aluminium refiner with production capacity of about 100,000 tonnes a year. Apart from the various melting and holding furnaces, the foundry contains 2 tilting rotary furnaces with capacities of 14 and 20 tonnes. The tilting furnace produces aluminium by melting Al slag and salt (10%) and is charged every 6 hours, with continuous operation for 6 days a week. This causes problems of thermal shock, abrasion and chemical attack. In the past, tilting rotary furnace linings used to be made from Low Cement Castable, which tended to wear very quickly, lasting only 8/12 months in tilting furnace 1 (14 tonnes) and just 6/8 months in tilting furnace 2 (20 tonnes) (Photo 1). Most of the problems occurred on the charging/pouring door, in the first part of the basin and on the end wall.

**Our solution:** the tilting rotary furnaces were lined with Flustone castable. The first lining was installed on tilting furnace 1 and lasted 28 months, while the second, installed on tilting furnace 2, is currently still in service after 25 months (Photo 3). A number of infrared pictures were taken during production and showed very low heat losses (Photo 4). All this foundry's tilting rotary furnaces now have complete Flustone linings.

REF. N.13



Preassembly of the lining

**ABT increase output and reduce problems.**

Eredi Scabini has always believed in the development of preformed shapes and its capability for producing them up to 15 tonnes in weight places the company amongst the undisputed world leaders in this market sector. Eredi Scabini's ABT- Advanced Block Technology- solutions are customised preformed furnace lining kits. The kit developed for this customer comprised several products, including Ultrablock®, dense preformed shapes with excellent "non-wetting"



Installed lining

**Resistone™** - The ideal product for high-strength industrial floorings.

As well as formulating refractory castables and preformed shapes, the company has a full range of products specifically developed for industrial pavings 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 secondary aluminium plant refiner (coils) with production capacity of about 65,000 tonnes a year. The foundry belongs to a multinational with production plants all over the world. The foundry has 5 production lines, each with a melting furnace, and

2 holding furnaces. The areas around the slagging doors of all the furnaces used to be paved with metal plates, on which the slag collection pans were placed (Photo 1). Due to the heat and metal splashes, the metal plates tended to warp, forcing the customer to replace them as



Photo 1 - Paving with metal plates

Better performances with **Ultrablock®** preformed shape for casting launder system.

The customer is a leading Middle Eastern company which produces rolled aluminium products with continuous casting process, with production capacity of about 250,000 tonnes/year in two plants. The holding furnaces are connected to the continuous casting machine by the launders, which convey the molten metal from the furnaces to the degassing unit, the filter box and finally the casting machine itself. In the past, the launders used to be lined with preforms and insulated by means of two sets of insulating panels; the preform was fitted inside them and secured by flanges at the top. The customer started to use Eredi Scabini preforms for its launders in 2011. The launders were constructed using Ultrablock®, which has excellent non-wetting properties and equally outstanding resistance to thermal shock, impact, and in particular the abrasive effects of the liquid metal. Moreover, its low apparent porosity makes the launders easier to clean. Thanks to these characteristics, the launder recorded better-than-standard performance (of 1.5/2 years). In response to these highly satisfactory results, the customer has chosen also to use Ultrablock® preformed linings for the degassing unit and filter box.

REF. N.7

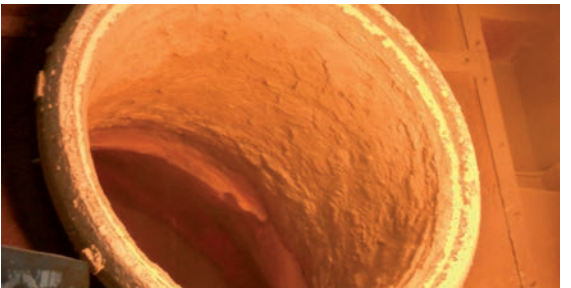
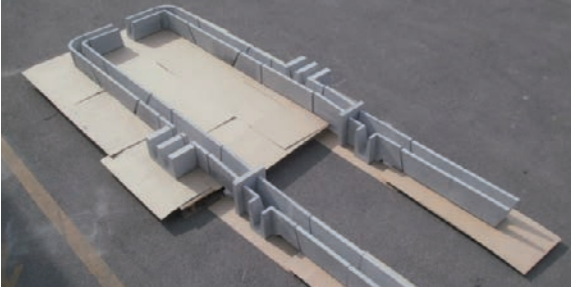


Photo 1 - Conventional solution after 4 months' service



Photo 2 - Eredi Scabini solution



Photo 3 - Eredi Scabini solution after 20 months

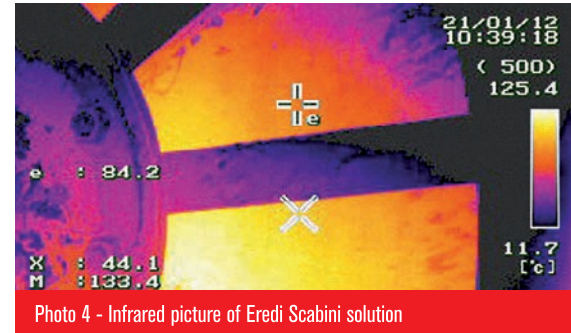


Photo 4 - Infrared picture of Eredi Scabini solution

properties. The low porosity, controlled pore size and unique bonding system deliver a winning combination against abrasion and chemical attack.

The customer produces refined aluminium slabs for the internal production of flat products for the food packaging and automotive industries (500,000 tonnes/year). This line for the production of series 5000 Al alloys comprises 2 channel melting furnaces of 45 t each and 1 holding furnace. 4 inductors are installed on each melting furnace. The project for rebuilding the furnaces with big-blocks arose and was developed in a number of phases in response to the customer's need to use a refractory lining technology capable of achieving the following aims: reduction of furnace downtimes, increase of the two furnaces' capacity, reduction in repair and maintenance costs, reduction of the number of maintenance stoppages, extension of the time interval between two complete reconstructions of the refractory lining, increase in output due to reduction of the number and duration of stoppages plus the increase in the inductor melting capacity. In the original solution, the basin was lined with bricks, the throat with ramming mix and the top cap with low cement castable. Maintenance work was performed frequently and major repairs were needed whe-

never an inductor was replaced. The first phase of the project began in March 2010. It involved the reconstruction of the throats of one furnace with Eredi Scabini Flustone® castable. In view of the good results achieved, in 2011 the throat of the second furnace and the top cap of both furnaces were rebuilt using the same castable. The rest of the lining was unchanged. Compared to the original solution, even this partial introduction of Eredi Scabini products generated considerable improvements: the throats and top cap required very little maintenance - the lifetime of the throats was doubled (from 18 to 36 months). The definitive project includes the use of Ultrablock big-blocks for the working lining, combined with a monolithic back-up lining in Flustone® and Cast-Lite™. The reconstruction of the two furnaces was completed in 40% less time than with the previous solution, drastically reducing the plant downtime. Staff immediately reported that the furnaces were needing less cleaning, since aluminium and slag do not stick to the lining easily. The furnaces' capacity was increased, but even though these modifications reduced the total thickness of the lining, there are no significant increases in the temperature on the steel shell. Simultaneously with the design of the basin, Eredi Scabini also developed a solution for the lining of the inductors which increased their lifetime by 300% compared to the previous lining.

REF. N.14

soon as safety problems were created, since the area was constantly crossed by staff driving forklift trucks. The problem was solved by replacing the metal plates with a Resistone™ paving. This solution, introduced on the first production line in 2010, solved the



Photo 2 - Installation of paving, 2010



Photo 3 - Paving after 2 years



# Sigmaplast™: the importance of its matrix.

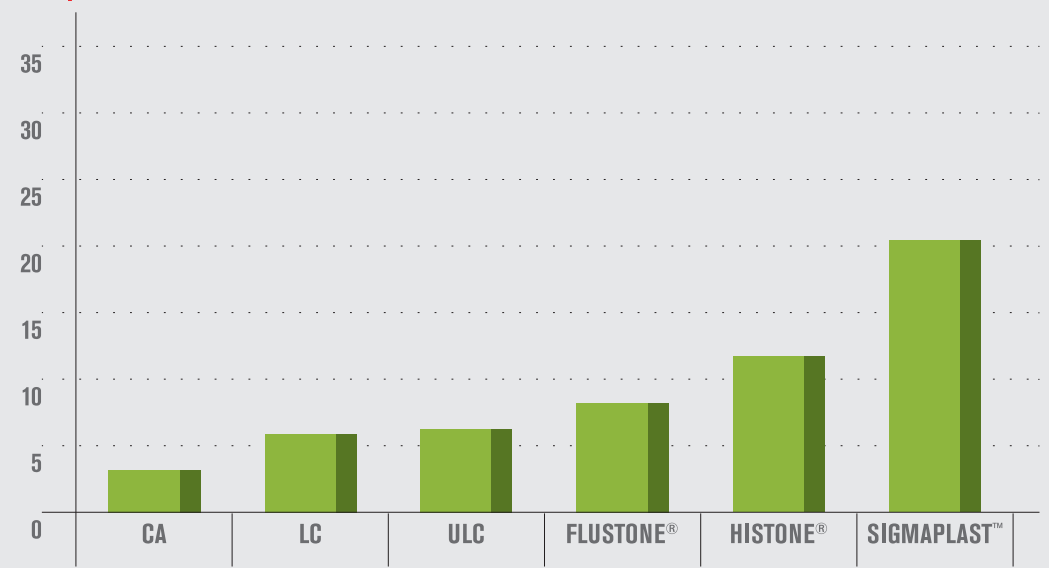
As we all know, the main problem to be solved when formulating a castable is the creation of a matrix, meaning the components with particle size < 0.5 mm, which is able to resist thermal corrosion and extreme mechanical wear and tear. It is the matrix that bonds the other aggregates together to form the end product. If the matrix gives way, the end product will not deliver the performance required, even if it contains the very best aggregates. If the matrix is sufficiently strong, it will bond to the surfaces of the other aggregates but will never penetrate their cores and transfer its own positive characteristics to them. At least, until now.

With the advent of the new Eredi Scabini family of nanoplastic products, especially “Sigmaplast™ AL” for the aluminium industry, the nano additives and binders are so tiny that it is hard to imagine them except with the aid of practical examples: if they were spread across a surface in a compact layer, 1 gram of them would cover an area

of up to 800m<sup>2</sup> (the size of 2 standard football pitches); so minute that, with the right carrier substances, they are able to penetrate into the porosity or micro-cavities of aggregates, generating nano umbilical pathways and nano porosity that will change some of their chemical and physical characteristics depending on the type of nano-structured matrix designed and thus also the characteristics of the final product. In the case of Sigmaplast™ AL products, a family of monolithics including vibratable, self-distributing, rammable, sprayable or trowellable products, the chemically neutral nano matrix is based on a mullite bond that generates superb resistance to aluminium alloy corrosion even without the use of conventional “non wetting” additives, up to temperatures over 1.200°C, very often reached above the metal level. Sigmaplast™ AL products do not contain hydraulic, phosphoric or sili-

cate-based binders, which research has shown to promote uncontrolled corundum growth as well as generating poor physical characteristics at the particular working temperatures of the metal and slag contact areas.”

## Comparative HMOR at 815°C for 80 to 100 % Al2O3 and 96% SiC Castables



## The company that gives you a hand!

Eredi Scabini is a company with an integrated production process: R&D, ENGINEERING, PRODUCTION (monolithics, pre-formed shapes, composites) and TECHNICAL SERVICE are all integrated with the aid of a consolidated organisational model developed to control the quality of the entire production chain.

A genuine team is created for every new project, allowing the various departments to cooperate and share their expertise to produce the best possible result, in the sole interest of the customer. To guarantee the best possible quality, R&D and ENGINEERING study both products and solutions; all monolithics, including those used for the production of pre-formed shapes, are produced in our own plants, to exclusive formulae created by Eredi Scabini, using raw materials of the choicest quality. The sales and technical service departments take care of instal-

lation, using the input - when requested - of skilled staff who receive specialist training within the company, or coordinating and supervising the personnel made available by the customer. Some of the equipment used for the production and installation of products has been specially designed by the company itself.

A single contact, countless benefits for the customer: Expertise-Innovation-Quality-Fast delivery-Excellent service which, backed up by impressive flexibility and absolute confidentiality, make Eredi Scabini the ideal partner, able to provide a turnkey service of genuine value.

THE QUALITY OF ALL SERVICES AND PRODUCTS MANUFACTURED BY EREDI SCABINI IS CERTIFIED



Eredi Scabini took part in the last edition of Exiros Suppliers Award (2013), a prize awarded in recognition of the quality and excellence of products and services provided by Tenaris, Ternium and Techint Engineering & Construction suppliers.

## Eredi Scabini amongst the best suppliers of the Tenaris Group.



Exiros, service company that centralises procurement and purchase operations of the group, operates in 14 countries for a total of \$ 7.5 billion.

Eredi Scabini was listed amongst the best suppliers of the Tenaris group, those which distinguish themselves for the quality

of their work. The criteria for identifying the best suppliers are based on key performance indicators of Exiros and Tenaris Dalmine, including: safety, timeliness of delivery, quality, level of service, nonconformities and distinctive capabilities of the supplier in general.

## Eredi Scabini sees to everything!

It is well known for its impressive capability for offering its customers products with high technology and service contents. Eredi Scabini, one of the first to introduce monolithic refractories as an alternative to the conventional types, now specialises in the production of monolithics, preformed shapes composites and industrial floor products.

But above all, it is famed for its ability to offer products and solutions custom-developed for every specific requirement, guaranteeing a complete “turnkey” service in all cases.

For these reasons, over the years Eredi Scabini has become a leading player on the molten metal industry.



## A SUCCESS STORY

Eredi Scabini was established in 1945, thanks to the initiative and enthusiasm of its founder Osvaldo Scabini who established a firm position on the Italian heat engineering market from the very outset with high technological content refractory products. Mr. Scabini's son Daniele joined the Company in 1965 and this addition reconfirmed the company's mission for quality and innovation. The list of records grew longer and more significant.

For example: Eredi Scabini was the first company to introduce monolithic refractories in Italy as an alternative to the standard bricks combining these with the direct production of pre-cast materials and the lining service for complete furnaces, using the customer's shell or structural metalwork produced directly. Reassured by its direct experience, in 1993 Eredi Scabini addressed the market in its new capacity as a producer of monolithic refractories. The new acknowledgements were not long in arriving and the company was forced to reorganise the productive structure after only a few years: firstly, the company's plant was extended, a new plant was purchased later to cater for the continued market demands. The Scabini family, now in its third generation with Mr. Scabini's sons Corrado and Massimiliano, still controls and manages the company in accordance with the same principles which determined its success.

Today Eredi Scabini is an integrated Company that produces quality monolithics, preformed shapes and composites with control of the entire production process, from design to after-sales. The company operates from a site of more than 20,000 m<sup>2</sup> in the Milan hinterland and has a specialised staff of more than 60, enabling it to operate easily on both the domestic and the international markets.

Eredi Scabini's history is paved with innovative products which have contributed to the evolution of refractory materials

Year	Type	Brand
1970	Conventional castables	Thermojet
1980	Low cement castables	Al Vibe
1985	Ultra-low cement castables	Al Vibe S
2000	Self-distributing castables	Flustone
2005	Large Aggregate Castables	Dystone
2010	No cement castables	Histone
2014	Nanoplastic products	Alfaplast-Zetapast-Sigmaplast