



ENERGY EFFICIENT CASTING

OUR SOLUTIONS FOR YOUR FOUNDRY

VESUVIUS

A VESUVIUS GROUP COMPANY

EVERY DAY WE HELP DRIVE E-MOBILITY.

By enabling our clients to build the e-car of the future – with the help of our products and experts.



Aluminium castings make e-vehicles lighter and thus reduce greenhouse gas emissions. Lightweight castings are particularly important for the production of electric cars and for meeting climate protection targets.

Foundries have relied on having a strong partner at their side for more than 100 years, with innovative solutions, efficient technologies and products of the highest quality. Together with the expertise of experienced foundry engineers - worldwide and also directly on your doorstep.

FOSECO. Your partner to build on.



VESUVIUS

Subscribe to our newsletter at www.foseco.co.uk now



CONTENT



4. INTRODUCTION

5. IRON & STEEL FOUNDRIES MELTING & HOLDING

REDUCTION OF CO₂ GENERATED BY DRYING AND PREHEATING BY MORE THAN 90%

OPTIMISED LADLE LINING AND FLOW CONTROL SYSTEM BY USE OF KALTEK* BOARDS AND VISO* STOPPERS

8. IRON & STEEL FOUNDRIES FEEDING, FILTRATION & COATINGS

REDUCTION IN FETTLING COSTS OF €0.30 PER CASTING WITH FEDEX VAK SLEEVES

REDUCTION OF THE REJECT RATE AND MANUFACTURING COSTS THROUGH THE USE OF FINER SEDEX* SUPER FLOW FILTERS

INNOVATIVE KALPUR* DIRECT POURING APPLICATION ON AN AUTOMATIC HIGH PRESSURE GREEN SAND MOULDING LINE

HOW SEMCO FD REDUCED ENERGY COSTS AND INCREASED PRODUCTIVITY THROUGH FASTER DRYING SPEED

HOW COATINGS WITH COLOUR CHANGE VISUALISATION REDUCE ENERGY COSTS AND OPTIMISE THE DRYING PROCESS

14. NON FERROUS FOUNDRY MELTING, HOLDING & MELT TREATMENT

LOWER ENERGY CONSUMPTION DUE TO THE BETTER ENERGY EFFICIENCY OF THE CRUCIBLE

SEVEN DAYS OF SINTERING OR TWO DAYS OF PREHEATING: YOU DECIDE

PROCESS STABILITY AND MINIMISATION OF REJECTS THROUGH THE USE OF MELT TREATMENT AGENTS AND EQUIPMENT

18. NON FERROUS FOUNDRY FEEDING SYSTEMS

FEDEX* NF1 - HIGH PERFORMANCE LEADS TO SIGNIFICANT ENERGY AND CO₂ SAVINGS

Escalating costs of electricity and gas require new solutions for foundries

It is more important than ever for foundries to control and minimise their energy consumption costs in order to remain competitive. The war in Ukraine has led to a drastic increase in energy costs. Compared to last year, electricity prices have almost tripled and gas prices have more than doubled, and the end of this price development has not yet been reached. Energy-intensive industries, such as the foundry industry, are particularly impacted by this cost explosion.

While the industry has long contributed to sustainability in some areas, notably through the recycling of iron, steel and aluminium scrap, there is still much room for improvement in other areas, such as increasing energy efficiency.

Therefore, technologies and solutions that reduce energy consumption are becoming increasingly important. The good news is that today there are many ways to achieve this through the use of modern foundry consumables.

On the following pages, we would like to show you how our solutions for iron, steel and aluminium foundries help to save energy and reduce CO₂ emissions in the various areas of the foundry.

Our experts at Foseco will be happy to help you identify your energy savings potential and implement solutions so that we can all get through these difficult times together. Contact us!

ENERGY SAVING PRODUCTS FOR IRON AND STEEL FOUNDRIES:

- FERROGEN* cleaning agent for melts, furnaces and ladles
- KALTEK ladle lining systems
- FEEDEX VAK feeder sleeves
- KALPUR direct pouring process
- SEDEX filters for iron
- STELEX filters for steel
- SEMCO* FD quick-drying coating
- SEMCO CC colour change coating

ENERGY SAVING PRODUCTS FOR NON-FERROUS FOUNDRIES:

- ENERTEK* crucibles
- COVERAL* melt treatment fluxes
- MTS 1500 melt treatment station
- SMARTT software for process optimisation
- FEEDEX NF1 exothermic feeder sleeves



Melting & Holding

Normally 60-70% of the energy costs in foundries are for melting, holding and pouring metal.

The melting furnace is probably the major consumer of energy, therefore it is essential to ensure that the furnace is maintained in good order to guarantee its efficient running. Build up of slag not only reduces furnace capacity, it also affects the electrical characteristics by reducing the level of power that can be applied, limiting the output capacity of the furnace and reducing foundry productivity. Regular use of slag fluidisers such as FERROGEN will keep the furnace lining clean, increase ladle life, improve energy efficiency and maintain foundry productivity.

There are many types and uses for ladles in the foundry. Depending on the type of foundry and the ladle process, the amount of time metal is held in the ladle can be less than a minute to some hours, with ladles varying in size from a few kilograms to many tonnes.

Whilst the metal is in the ladle it is desirable to minimise the rate of heat loss to the lowest level possible. To increase energy efficiency Foseco has developed a range of linings over the years including KALTEK precast and castable ladle lining systems.

When using KALTEK ladle lining systems, preheating is not required, virtually eliminating energy costs associated with gas-fired or electric preheating systems. The insulating properties of KALTEK allow for lower tapping and holding temperatures. KALTEK ISO linings are characterised by reduced drying and heating times.

All the KALTEK types can be considered "clean" ladle systems. The linings can be replaced very quickly, the time taken to knock out the used lining and replace it with a new one so that the ladle is ready for use is usually less than one hour. This rapid relining means that the ladles can be relined when they need to be, old and dirty linings do not have to remain in service until there is time to reline them. Indeed for optimum ladle cleanliness many steel foundries reline the ladles after one heat, giving cleaner castings. This can have a significant impact on the energy efficiency of the foundry. Cleaner castings mean less energy is used in rectification (gouging and welding of steel castings) and repeated heat treatment can be reduced.

With every melt transport, part of the heat is also lost at the surface of the melt. To reduce these losses, the use of an insulating ladle lid such as KALTEK L300 can be helpful.

BENEFITS OF KALTEK

- Application is simple with no specialist equipment required
- Water is not used in the application of the linings so there is no need for expensive drying operations
- All the linings are "Cold Start" so there is no need for expensive – and often uncontrolled – heating of the ladles before they are used, and the use of ladle preheaters can be eliminated.
- In steel foundries ladle preheating can account for almost 10% of the total energy required to produce the casting
- The linings are low density and provide higher insulation
- The rate of heat loss from the ladle is lower than conventional systems giving greater control over pouring temperatures. Lower tapping temperatures (typically 30°C for large steel ladles) from the furnace can be achieved reducing the energy consumption in induction furnaces and reducing temperature related defects



REDUCTION OF CO₂ GENERATED FROM DRYING AND PREHEATING BY MORE THAN 90%

PARAMETER:

Alloys:	Ferritic ductile iron 450/10
Ladle Size:	Tundish cover ladle process with a capacity of 2.3 tonnes
Ladle Temp.:	Treatment temp. 1480 °C, Furnace tapping temp. 1520 °C
Ladle Lifetime:	1150 t. treated. 500 cycles of FeSiMg treatment
Installation practice:	Total weight of KALTEK ISO 60BF = 850 kg
	Thickness: from 85 mm to max 120 mm, Installation time: 2 hours
	Reaction time: 1 hour, Pre heat: for 1 hour maximum

TREATMENT LADLE LINING FOR AUTOMOTIVE CASTINGS IN NODULAR IRON

FOUNDRY:

Founded in 2004, Fonderie Venissieux is located in Venissieux, France. The foundry specialises in the manufacture of large cast iron parts for heavy goods, military, railway, public transport and special vehicles industries.

FOSECO PRODUCTS

- KALTEK* ISO 60BF refractory
- LUBIX* 33 release agent

KEY BENEFITS

- CO₂ generated from drying and pre-heating reduced by more than 90%
- Energy savings (furnace tapping temp. -20°C)
- Reduced labour cost
- Reduced heat loss from the ladle



Ladle after firing



Steel former for the ladle



THE CHALLENGE

Fonderie Venissieux previously used 1275 kg granular silica/graphite ramming refractory per ladle that took 4 hours for installation, 9 hours for dry-out and 4 hours for pre heating which they wanted to reduce. With that lining 750 tonnes of iron could be treated. The foundries objective was to reduce labour time and costs, improve safety and work conditions and improve insulation and temperature control.



OUR SOLUTION

Foseco offered KALTEK ISO 60BF refractory as new lining solution. With this solution the ladle lining weight was only 850 kg at a thickness from 85 mm to max. 120 mm. Due to the good insulating properties of KALTEK ISO 60BF the furnace tapping temperature could be reduced by 20°C. Additionally LUBIX 33 was supplied as a release agent.



THE OUTCOME

By use of KALTEK ISO 60 BF the installation and ladle cost was reduced by 10%. Installation time could be halved, drying time was reduced by 8 hours and pre-heating time was reduced by 3 hours. The lining weight could be reduced by 35% and lining lifetime could be increased by 35%. With the new lining solution 1150 tons of metal could be treated = 500 cycles. Ladle 1 day in continuous operating followed by cleaning.



OPTIMISED POURING CONDITIONS AND WORKING ENVIRONMENT BY USE OF KALTEK* MULTILIFE BOARDS

PARAMETERS:

Alloys:	Stainless steel, low alloy steel & carbon steel
Pouring temperature:	Range from 1580°C to 1620 °C (depending on casting weight, alloys, pouring area ...)
Ladle size:	4T, 5T, 6T, 8T and 11T bottom pour ladle (with 2 stopper mechanism)
Ladle practice:	KALTEK board bottom pour ladle with assembly stopper (ROTOLOK* stopper head) and alumina well block & nozzle system.
Ladle turnaround:	KALTEK ladle preparation is less than 2 hours - Set construction - Set installation in the ladle - Set removal and cleaning

KALTEK BOARD MULTILIFE SYSTEM

FOUNDRY:

French Steel Foundry with up to 150 years of experience in Stainless, duplex, super duplex and steel casting for various industrial sectors such as oil & gas, power generation & nuclear, railway, mining & earth moving. Castings from 100kg (220 lbs) up to 10.000kg (22.000 lbs). Melt shop area is equipped with induction melting furnaces and AOD converters.

FOSECO PRODUCTS

KALTEK 801 Multilife boards
RAMTITE 45 plastic mouldable
ROTOLOK stopper head

KEY BENEFITS

- Pouring temperature process control
- Minimal pre-heating (nozzle & stopper rod)
- Multiuse system for up to 5 fills
- Improved working environment



KALTEK board assembly



Ladle after one tapping when hot



THE CHALLENGE

As consistent temperature control and metal cleanliness are essential pouring parameters, especially in high quality alloys and complex castings these were the main customer requirements. Additionally the productivity of the ladle lining process should also be considered in order to reduce manpower and maximize the lining life time. Finally the foundry wanted to improve the working environment and reduce labour costs.



OUR SOLUTION

The KALTEK Multilife board solution combines insulating properties (compared to conventional lining systems such as high alumina castable or brick) with a clean lining system (for up to 5 fills) to avoid cross contamination and slag inclusions. KALTEK multilife is 10 times less conductive (0.31W/m.K) than conventional linings and reduce the temperature loss in the first tap (less heat absorption).



THE OUTCOME

The tapping temperature could be reduced by up to 20°C compared to conventional lining systems and the KALTEK board ladle system is much more efficient. The alumina based KALTEK system could be used for up to 5 times depending on the foundry requirements. Continuous use or cooling down and reuse of the ladle on the next shift or next day is now possible. Ladle preparation could be completed in less than 2 hours with a minimum of manpower and in more worker-friendly conditions (lower ambient temperature, no extra noise and labor intensive work such as hammering).



Feeding systems, filtration and gating

The amount of liquid metal required to produce a casting has a major impact on the energy required to make the casting. The effective use of feeding systems helps the foundry through better output energy savings. Pattern redesign with FEEDEX VAK sleeves, for example, helped improve metal yield at one manufacturer of liner castings for large compressors from 40% to 70%, resulting in a reduction in CO₂ emissions of 2.62kg per casting. This was achieved because FEEDEX sleeves are able to operate efficiently within a small surface area and under complex application conditions. This means they can be used even in moulds where limited space would usually preclude the placement of a feeding system that could improve metal yield.

In addition to improving yield, other processes were simplified and costs lowered by using FEEDEX VAK sleeves. The feeders are delivered ready to use and, due to the smaller neck of the feeder, the contact area with the casting is 45% smaller, significantly reducing the need for fettling. This latter benefit is significant, as post-casting processes are a key area for improvement when thinking about energy consumption. Reworking castings and remelting returns consumes energy: eliminating or reducing the need to do so is therefore a good way to improve energy efficiency. It also reduces costs and improves productivity.

The KALPUR direct pour system combines the benefits of feeding and filtration into a unit that functions as a pouring cup, filtration system and feeding system. Correct application of KALPUR will allow for the complete removal of a conventional running and gating system and in many

cases provides optimised directional solidification of the casting.

Avoiding rework not only optimises casting processes but also raises the quality of the molten metal. This can be achieved with filtration technologies, such as the SEDEX and STELEX ranges, which remove nonmetallic inclusions and ensure better flow control into the mould, producing a higher quality casting with enhanced mechanical properties as well as reducing the need for post-cast reworking.

Coatings for moulds and cores

In many foundries the use of solvent-based coatings for cores and moulds is still prevalent due to their fast drying nature or the ability to burn off the solvent rapidly. However from an environmental and local working environment perspective a transition to water-based products would bring significant benefits.

When transitioning from solvent to water-based products, maintaining productivity and the cost of drying equipment are two of the main concerns. The development of faster drying water-based coating technologies helps to alleviate these concerns; SEMCO FD coatings are formulated to offer excellent rheological properties and are ideally used for flow coating. The required coating layer thickness can be built up in one application without the formation of runs and drips, yet has significantly higher solids

content than is typical of flow coating products, meaning the water content is much lower and can be removed quicker. Meanwhile, SEMCO FD fast dry waterbased coatings reduce the consumption of energy for drying. At a foundry specialising in wind turbine castings, for example, the use of SEMCO FD shortened core/mould drying cycles by 50%, improving energy consumption by 50% with a consequent improvement in the CO₂ footprint.

Handling was also made easier and safer due to the application of a lighter filler combination and the removal of zircon from the foundry. Energy can also be saved by using a colour change coating such as SEMCO Sil CC. In the past, to be on the safe side, cores were often dried in the oven for too long, resulting in unnecessary energy consumption. In oven drying, a three-colour indicator now makes it possible to determine the optimum drying time and temperature. If the cores are in the oven too long or the temperature is too high, the core will take on a third colour and this can be used to determine the optimum oven dwell time.

Find out more about SEMCO FD fast drying coatings





REDUCTION IN FETTLING COSTS OF €0.30 PER CASTING WITH FEEDEX VAK SLEEVES

PARAMETER:

Alloy:	GJS 600-10
Casting weight:	6.9 kg
Pouring temperature:	1,430 °C
Poured weight:	255 kg
Pouring time:	approx. 19 seconds
Moulding process:	Horizontal, Green sand moulding line

LINER

FOUNDRY:

Procast Guss Nortorf (formerly CLAAS GUSS GmbH) can look back on a long tradition as a jobbing foundry. With a production capacity of 6,000 t of casted products, the foundry produces unit weights of 0.5 - 350 kg in machine mould casting. The range of cast iron materials offered by us varies from grey cast iron and spheroidal cast iron to SiMo and ADI to highly alloyed austenitic or wear-resistant materials.

FOSECO PRODUCTS

- FEEDEX* HD1 VAK 159/61M sleeve
- SEDEX* 100x150x22/10 ppi filter

KEY BENEFITS

- Reduction of fettling area by 45 %
- Fettling cost reduction of €0.30 per casting
- Simplified handling of sleeves



Energy saving: 5.34 kWh per casting
CO₂ emission reduction*: 2.62 kg per casting



Pattern plate with FEEDEX HD1 VAK 159/61M sleeves



Casting in detail



THE CHALLENGE

Due to the cylindrical shape of the casting, it was essential to use sleeves which can serve the small footprint area. Furthermore, Procast's previous riser application was complex, as the riser had to first assembled from two individual parts to form the sleeve unit.



OUR SOLUTION

FEEDEX VAK risers are used when minimal contact areas are required. The application of the VAK technology is very simple. The sleeve is located on the pattern using rigid locating pins and rammed up during moulding. The remaining riser stub can be easily removed from the casting by knock-off.



THE OUTCOME

With the use of FEEDEX VAK, the customer's processes could be considerably simplified, as the feeders were delivered ready to use. Due to the small feeder neck, the contact area was reduced by 45 %. This resulted in a fettling cost reduction of €0.30 per casting.



REDUCTION OF THE REJECT RATE AND MANUFACTURING COSTS THROUGH THE USE OF FINER SEDEX* SUPER FLOW FILTERS

PARAMETERS:

Alloy:	GJS 600, Rm ≥ 590 N/mm ² , Rp0,2 ≥ 370 N/mm ² , A ≥ 10%
Casting weight:	4.9 kg
Pouring temperature:	1430 °C
Filter print:	SEDEX FP4
Poured weight:	43 kg
Pouring time:	8 s
Magnesium treatment:	Inmould process
Moulding process:	Horizontal parted moulding line - green sand

STEERING KNUCKLE

FOUNDRY:

TEKSID IRON POLAND is based at Skoczów belonging to the Teksid Group. The plant was built in 1974. The annual production capacity is 70,000 t. The plant develops, industrialises, and produces various types of iron castings for the automotive sector. The products range from safety components such as suspension arms and steering knuckles, as well as manifolds, differential cases, crankshafts and cam shafts.

FOSECO PRODUCTS

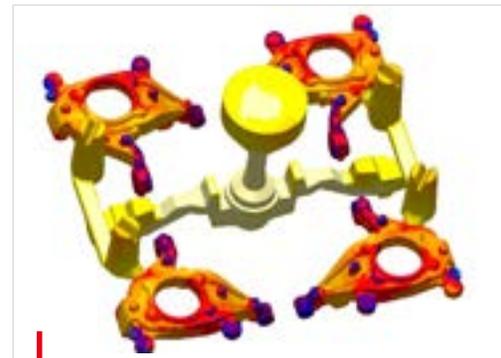
- Initially SEDEX 50x50x22/10 ppi
- Finally SEDEX SUPER FLOW 50x50x15/20 ppi

KEY BENEFITS

- Improved filtration efficiency due to the use of finer filters
- Improvement of casting quality in terms of surface quality and machining
- Reduction of the reject rate
- Reduction of manufacturing costs



Filter print



Spray of castings



THE CHALLENGE

Optimisation of the reject rate by using finer filters with the aim of reducing manufacturing costs. In this application, the magnesium treatment process used is of great importance since the inmould process can be problematic due to possible filter blockages.



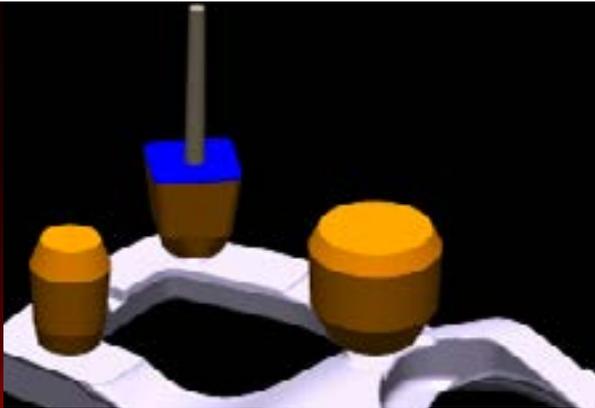
OUR SOLUTION

The use of finer SEDEX SUPER FLOW filters provides the opportunity to achieve an improved filtration efficiency.



THE OUTCOME

Despite the critical application conditions, on changing to SEDEX SUPER FLOW filters, the pouring time was maintained providing reliable manufacturing conditions. The reject rate was reduced by approximately 40 %.



INNOVATIVE KALPUR DIRECT POURING APPLICATION ON AN AUTOMATIC HIGH PRESSURE GREEN SAND MOULDING LINE

PARAMETERS:

Alloy:	GJS 500 -7
Casting Weight:	260 kg
Pouring temperature:	1390 °C
Pouring weight:	283 kg
Pouring time:	25 s
Moulding process:	Automatic high pressure green sand moulding line

SUPPORT LEFT

FOUNDRY:

GF Casting Solutions Leipzig GmbH looks back on a long and successful tradition in terms of producing state of the art castings. This foundry is producing finished castings in the range from 100 kg up to 1000 kg. First experiences with the KALPUR direct pour systems were very positive. The application of this novel KALPUR technology will now be extended to other suitable castings.

FOSECO PRODUCTS

- KALPUR* Filter sleeve
- FEEDEX* HD1 TAE 1126/MD/0162MH/L10 Sleeve
- SEDEX* Filter
- FEEDEX HD1 VS 191/37MH Sleeve
- FEEDEX HD1 VS 415/37MH Sleeve
- FEEDEX HD1 VS 1650A/0162MH Sleeve

KEY BENEFITS

- Good surface finish
- Improved yield
- Reduction in fettling costs
- Square shape of the riser stub facilitates handling of the casting spray, reducing accidental damage
- Solved problem of limited space for gating system



Fraction Liquid Solidification



Tandem roller – articulated



THE CHALLENGE

As the finished casting is painted and highly visible, there is a strict requirement in terms of casting surface finish. With limited space on the pattern for a traditional filtered gating system, a KALPUR unit is perfectly suited. However, until now, there has not been a suitable product available for use in ram up applications on high pressure green sand moulding lines.



OUR SOLUTION

This new KALPUR Direct pouring system design is made of several elements. The components include a high strength FEEDEX sleeve unit to withstand the high moulding pressures during ram up and a SEDEX foam filter to ensure a perfect filtration of the melt. This KALPUR unit further includes patented Kompressor core which makes possible the removal of the riser stub by knock off and the easy cleaning of the casting.



THE OUTCOME

The application of the KALPUR Direct pouring unit provided many advantages; filtration of the melt, smooth, uniform filling of the casting and a directional solidification from the exothermic feeder. Fettling of the ingates was completely eliminated. The Kompressor cores facilitated the easy removal of the risers stubs. Damage to the casting during handling operations was significantly reduced. As a consequence, there was an overall improvement in yield and a significantly reduced scrap rate.



HOW SEMCO FD REDUCED ENERGY COSTS AND INCREASED PRODUCTIVITY THROUGH FASTER DRYING SPEED

PARAMETER:

Alloy:	SG Iron
Casting Weight:	3,000 - 12,000 kg
Pouring Weight:	Up to 22,000 kg
Pouring Temp:	1250 - 1450 °C
Core & Mould Making:	Furan

WIND TURBINE CASTINGS

FOUNDRY:

Global Castings Foundry – specialised in wind turbine castings

FOSECO PRODUCTS

- SEMCO* FD
- SEMCO ZIR 7320 V
- ESHANOL* VM 1723
- CATASET VM 100
- CATASET VM 200
- SEMCO Coating 9223
- SEDEX* filters
- FEEDEX* sleeves

KEY BENEFITS

- Faster drying speed
- Reduced energy costs
- Easier coating handling



Core after coating application



Finished core – 50% faster supplied to moulding line



THE CHALLENGE

The customer wanted to improve core shop output, accelerate coating drying rate and reduce energy consumption. It was important to them to have as good as or better casting surfaces and reduce their overall casting manufacturing cost.



OUR SOLUTION

SEMCO FD is a range of water-based coatings designed for flow coating applications that will dry quicker than traditional water-based products. The range includes products with a variety of refractory fillers making them suitable for different metal types and casting conditions.



THE OUTCOME

Through the use of the SEMCO FD, the customer found 50% faster core / mould drying cycles. They significantly reduced CO₂ output due to 50% less energy consumption. The coating application was improved due to lighter filler combination applied and zircon was removed from the foundry.



HOW COATINGS WITH COLOUR CHANGE VISUALISATION REDUCE ENERGY COSTS AND OPTIMISE THE DRYING PROCESS

PARAMETERS:

Alloy:	EN-GJL-HB 215
Casting weight:	78 kg
Core package weight:	44 kg
Casting temperature:	1.400 - 1.420 °C
Core & mould production:	Coldbox

EN-GJL GEARBOX CASTING

CUSTOMER/FOUNDRY:

Eisengiesserei Baumgarte GmbH, Germany - With a wide range of references in various industries from general mechanical engineering, plant construction and railway engineering to vehicle construction, pump technology and special drive technology.

FOSECO PRODUCTS

SEMCO* SIL CC Coatings

A colour change indicator can be integrated in almost every Foseco water coating. Excluded are pure graphite or coke dust coatings.

The colour change works on the following systems:

- Furane resin
- Phenolic resin
- Coldbox
- Croning
- Lost Foam

KEY BENEFITS

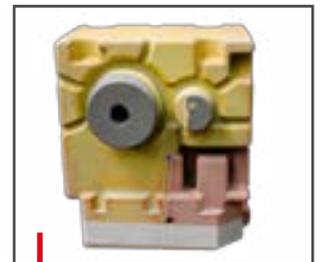
- Visualisation of the drying time by a different colour
- for oven drying, determination of the optimal drying time and temperature
- thereby optimising/minimising energy costs and environmental impact
- Reversible colour change at high humidities



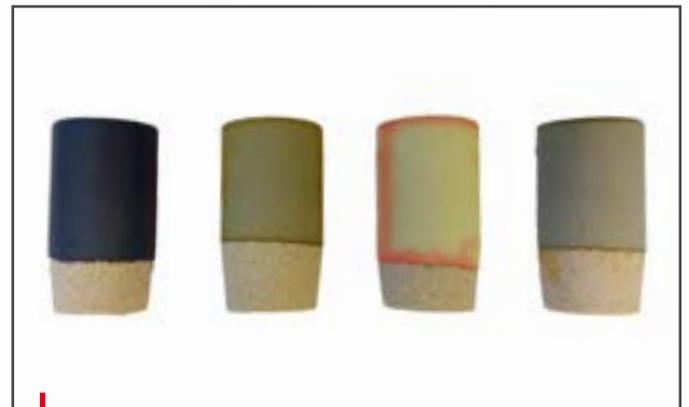
Savings of 20% energy costs per year.



Fresh coated core



"Dried" core with colour change visualisation



Easy visualisation: (from left to right) core before drying, oven-dried, overdried, air-dried



THE CHALLENGE

The customer wanted to visualise the sufficient drying of cores by means of different colours of the applied coating. This was to prevent insufficiently dried cores from being used in production and rework or rejects from occurring. Furthermore, the drying time and temperature should be optimised.



OUR SOLUTION

Selection of the most suitable coating family for the application. This coating is supplemented with a suitable colour indicator, which can also be removed again if required. A colour indicator can also be added to Foseco water-based coatings already in use in order to visualise and thus optimise drying processes.



THE OUTCOME

By using the SEMCO* SIL 4451 CC with colour indicator, the customer achieved an optimisation of the drying process. The result: reduction of energy costs & drying times and increase of productivity. Visualisation prevents insufficiently dried cores from being used. These improvements resulted in savings of 20% energy costs per year.



BENEFITS OF INSURAL

- 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

Melting & Holding

Melting accounts for 30% of energy consumption in the foundry. Improving the efficiency of this process is therefore a key concern.

Crucibles designed for high conductivity speed up the melting process. In one application at an aluminium diecasting foundry, in which the melting of aluminium ingots took place in a 700 kg crucible with a gas-fired tilting furnace, the use of an ENERTEK melting crucible resulted in a 22.5% reduction in energy use with correspondingly lower CO₂ emissions and energy costs.

In the aluminium sector, experience has shown that a dry lining of dosing furnaces is more effective than lining with monolithic lining systems which contain approx. 5 % water, saving up to 18% energy. Such a dry lining can be installed within one working week. The energy-intensive drying and sintering of the newly installed lining is reduced to a minimum. The use of highly insulating materials in furnaces and ladles ensures that the energy required for melting or keeping warm is reduced to a minimum - and thus also CO₂ emissions.

INSURAL furnace linings also minimise the formation and growth of corundum, saving time and money on maintenance and reducing health and safety risks.

Melt treatment

Melt treatment is an important part of the casting process that often has a significant impact on casting quality, scrap rate and thus process and energy costs.

Technologies that safeguard final product quality, such as COVERAL environmentally friendly fluxes that clean the melt of oxides and other non-metallic inclusions, also have a role to play in improving the overall energy efficiency of an operation in that they help to minimise the production of poor-quality castings that must be scrapped and recycled. In doing so, they minimise the amount of energy wasted by this rejected production.

For example, SMARTT is a process control software that drives the Fosco MTS 1500 degassing and melt treatment unit. The software analyses all critical process parameters in real time, including rotor design and size, melt quality, ladle design, alloy type and temperature, and ambient conditions, to design the optimum degassing and treatment cycle. Different control schemes ensure either that inert gas is not wasted or that the lifetime of graphite consumables is extended.

By using SMARTT for degassing, constant hydrogen values are achieved even under varying initial conditions. The targets can be achieved in a cost-effective way; no additional compensation for deviations is required. This saves time, energy and inert gas and minimises wear on the graphite shaft and rotor.

Find out more about INSURAL dosing furnace linings



Foundry:

Volkswagen AG
Braunschweig, Germany

Objectives:

- Reduction of energy consumption
- Reduction of CO₂ - emission

Alloy:

Aluminium alloy

Crucible size:

ENERTEK BP 1000

Crucible capacity:

1000 kg Aluminium

Application:

Holding of liquid aluminium in electric resistance furnace

Benefits:

- Very high thermal conductivity
- Very high strength
- Very high oxidation resistance

Problems:

- Increasing energy costs
- Reduce CO₂ - emission

Improvements:

- Due to the higher energy efficiency of the ENERTEK crucible, an energy saving of 13,4% was achieved
- The corresponding reduction of CO₂ - emission is achieved
- CO₂ - emission could be calculated

FOSECO PRODUCTS

- + ENERTEK* holding crucible

KEY BENEFITS

- + Reduction of energy costs approx. 1,200 € per year and furnace
- + Reduction of the CO₂ - emission

CO₂ ENVIRONMENTAL BENEFITS

Lower energy consumption due to the better energy efficiency of the crucible

- + A reduction of 12.056 kWh energy per year
- + 7.993 kg lower CO₂ - emission per year and furnace



Crucible in use



ENERTEK BP 1000

Foundry:

Aluminium Foundry
Diecasting

Objectives:

- Reduction of energy consumption
- Reduction of CO₂ - emission

Alloy:

Aluminium alloy

Crucible size:

BUK700 with spout

Crucible capacity:

700 kg Aluminium

Application:

Melting of Aluminium ingots in gas-fired tilting furnace

Benefits:

- Very high thermal conductivity
- Very high strength
- Very high oxidation resistance

Problems:

- Increasing energy costs
- Reduce CO₂ - emission

Improvements:

- Due to the higher energy efficiency of the ENERTEK crucible, an energy saving of 22,5% was achieved
- The corresponding reduction of CO₂ - emission is achieved
- CO₂ - emission could be calculated with 0.544 kg CO₂ per kWh)

FOSECO PRODUCTS

- + ENERTEK* melting crucible

KEY BENEFITS

- + Reduction of energy costs appr. 1,440 € per crucible (calculated per 200 Charges and 0,40 € per m³ Gas)
- + Reduction of the CO₂ - emission corresponding to energy-saving of 22,5%

CO₂ ENVIRONMENTAL BENEFITS

Lower energy consumption due to the better energy efficiency of the crucible

- + A reduction of 10.800 m³ gas per year and furnace (average calculated 600 charges per year)
- + 61,69 tons lower CO₂ - emission per year and furnace (average calculated 600 charges per year)



Crucible in use



BUK700



SEVEN DAYS OF SINTERING OR TWO DAYS OF PREHEATING: YOU DECIDE

PARAMETER:

Temperature: 700°C
Casting Process: High pressure die casting

TD 500 DOSING FURNACE LINING

FOUNDRY:

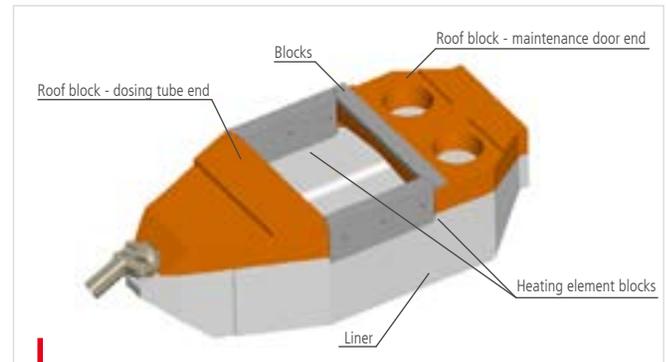
Founded in 2009 as Foundry 4 Thermdos GmbH and now headquartered in Hochheim am Main, Germany, the company specializes in the development and manufacture of furnaces for holding and dosing non-ferrous metals (especially aluminium).

FOSECO PRODUCTS

- INSURAL* 140 shaped refractories
- INSURAL 170 shaped refractories
- INSURAL 290 shaped refractories
- INSURAL insulating backing materials

KEY BENEFITS

- Quick installation
- No sintering necessary
- Minimised corundum growth
- Energy savings



Overview of INSURAL precast shapes



Installation of an insulation mat



THE CHALLENGE

Traditional linings for dosing furnaces require a time extensive drying and sintering process. When in service, the traditional linings tend to build up corundum quickly. Cleaning of the furnace is time-consuming and energy consumption is high.



OUR SOLUTION

By the use of INSURAL shaped refractories, the required time for the installation process can be reduced significantly. Due to the dry installation, the time and energy consuming sintering process becomes obsolete.



THE OUTCOME

Due to the minimised installation time, the furnace can taken back into service quickly. The extremely low corundum growth leads to an easy furnace cleaning. The highly insulating backing materials generate a huge energy saving.



PROCESS STABILITY AND MINIMISATION OF REJECTS THROUGH THE USE OF MELT TREATMENT AGENTS AND EQUIPMENT

PARAMETERS:

Alloy:	AlSi7Mg0,3
Core production:	Cold-Box sand core
Casting weight:	7,5 kg
Casting weight:	10,5 kg
Casting temperature:	740 °C
Casting time:	12 seconds
Moulding process:	gravity die casting

E-MOTOR HOUSING VW ID.3 / ID.4 / ID.5

FOUNDRY:

The Volkswagen plant in Hannover is the headquarters of Volkswagen Commercial Vehicles, a division of Volkswagen AG. The foundry mainly produces cylinder heads, intake manifolds and now also electric motor housings for the ID.3, ID.4 and ID.5.

FOSECO PRODUCTS

- FDU MTS 1500 degassing unit incl. rotors and shafts
- SMARTT Process control
- NUCLEANT* 1582 Grain refiner

MAIN BENEFITS

- Fully automatic process (oxide removal, grain refinement, upgassing)
- High process reliability
- Shorter treatment times; thus lower electricity and gas consumption
- Reduction of the reject rate by >10%



E-motor housing



SMARTT process control for rotor degassing of molten aluminium



THE CHALLENGE

In order to achieve VW's high quality requirements and ambitious sustainability goals, high purity of the melt with high process reliability is required. Compliance with density tolerances as well as an improvement in environmental impact and labour saving were the additional VW requirements for FOSECO.



OUR SOLUTION

SMARTT is a specially developed software for process control of aluminium degassing. It records and analyses all the initial variables and calculates the optimum parameters for each subsequent degassing and upgassing process. The aim of this optimisation is to achieve a consistent melt quality after each treatment, regardless of the initial conditions. SMARTT calculates rotor speed and inert gas quantity and sends this data to the unit's control system at the start of treatment. Different optimisation modes (high-speed, low gas quantity, low wear, standard) offer the operator further options and work facilitation to achieve the required melt quality.



THE IMPROVEMENT

The combination of SMARTT and NUCLEANT 1582, VW achieved continuous automation of the melt treatment process with constant conditions, adherence to density tolerances and thus a reduction in the workload of the employees. This combination allows to have a big reduction of scrap rate > 10% which link directly to saving money, electricity costs and CO₂ emissions.



Feeding systems

Technologies that optimise pouring, reduce casting defects and the need to clean castings, and reduce nonproductive or wasted metal are important here. For example, by allowing smaller riser sizes than conventional sand risers and reducing cleaning requirements, the use of exothermic FEEDEX NF1 riser sleeves increases casting yield.

The new FEEDEX NF 1 exothermic risers for aluminium and copper give the foundryman new possibilities for cost optimisation. For example, the number of risers can often be reduced or the size reduced. This allows the cost per cast component to be reduced. Smaller risers or fewer risers directly means less material cast per part. With the combination of FEEDEX NF 1 and breaker cores, further cost savings can be achieved in the fettling shop. Feeders can simply be cut off. In a case study, the use of the new exothermic risers saved 9 kg of aluminium per component.

- BENEFITS OF FEEDEX NF1**
- High exothermicity with improved feeding performance
 - Very high strength
 - Minimised fettling costs when used in combination with breaker cores
 - Easy and quick knock-off of the sleeve and riser stub
 - Reduced process variation
 - Lower emissions



FEEDEX NF1 - HIGH PERFORMANCE LEADS TO SIGNIFICANT ENERGY AND CO₂ SAVINGS

PARAMETER:

Alloy: AlZn10Si8Mg
 Casting Weight: 72 kg
 Casting Temp.: 750 °C
 Poured Weight: 82 kg
 Pour Time: 35 seconds
 Moulding Process: Sand casting

MACHINE SLIDER

FOUNDRY:

Marsberger Metallguss oHG (MMG)

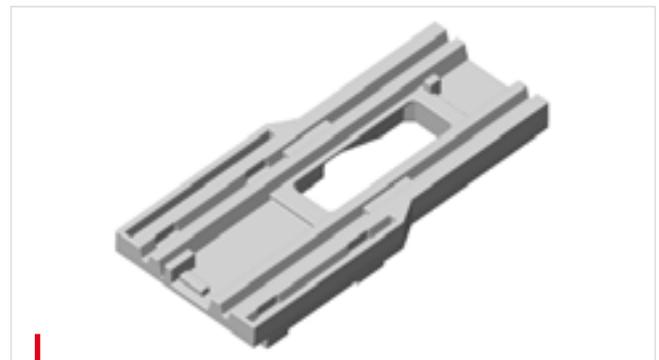
Founded in 1996, MMG is a medium sized foundry with highest technology standard, producing sophisticated products both in sand and die casting process.

FOSECO PRODUCTS

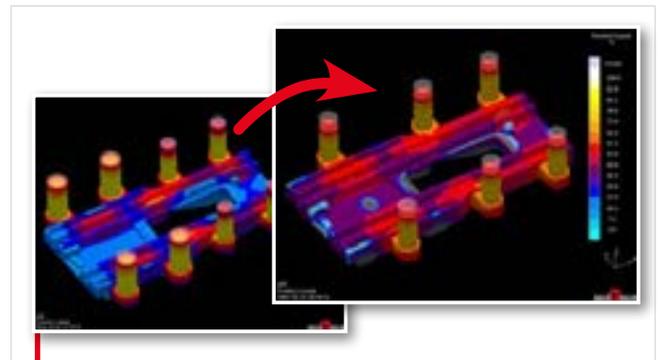
(originally) KALMIN 50 A4 (4x) and A3 (4x)
 (originally) FEEDOL 20
 SIVEX FC 100x100 22/10
 FEEDEX NF1 N3 (6x)

KEY BENEFITS

Improved yield
 reduced fettling costs
 reduced re-melting costs



3D view of the finished casting



Optimised Process: 8 insulating sleeves -> 6 exothermic sleeves



THE CHALLENGE

The defect-free casting of the machine slide requires a great deal of effort in the feeding area. 8 insulating feeders and the additional use of exothermic powder are necessary in order to avoid shrinkage.



OUR SOLUTION

The use of FEEDEX NF1 sleeves with increased feeding performance makes the use of exothermic powder obsolete. In addition, also the number of sleeves and their volume was reduced.



THE OUTCOME

Due to the use of FEEDEX NF1 sleeves, the number of sleeves and their volume was significantly reduced. A saving of 9 kg of Aluminium was achieved. This leads to lower fettling effort and less recycling material. The energy- and therefore CO₂ savings due to less remelting material is remarkable.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system of any nature or transmitted in any form or by any means, including photocopying and recording, without the written permission of the copyright holder.

All statements, information and data contained herein are published as a guide and although believed to be accurate and reliable (having regard to the manufacturer's practical experience) neither the manufacturer, licensor, seller nor publisher represents or warrants, expressly or impliedly:

- (1) their accuracy/reliability
- (2) that the use of the product(s) will not infringe third party rights
- (3) that no further safety measures are required to meet local legislation

The seller is not authorised to make representations nor contract on behalf of the manufacturer/licensor. All sales by the manufacturer/seller are based on their respective conditions of sale available on request.

*FOSECO, the logo, SEDEX, KALTEK, SEMCO, COVERAL, FEEDEX, ENERTEK, KALPUR, STELEX, VISO and INSURAL are Trade Marks of the Vesuvius Group, registered in certain countries, used under licence. ©Foseco International Ltd. 2022

COMMENT

Editorial policy is to highlight the latest Foseco products and technical developments. However, because of their newness, some developments may not be immediately available in your area. Your local Foseco company or agent will be pleased to advise.