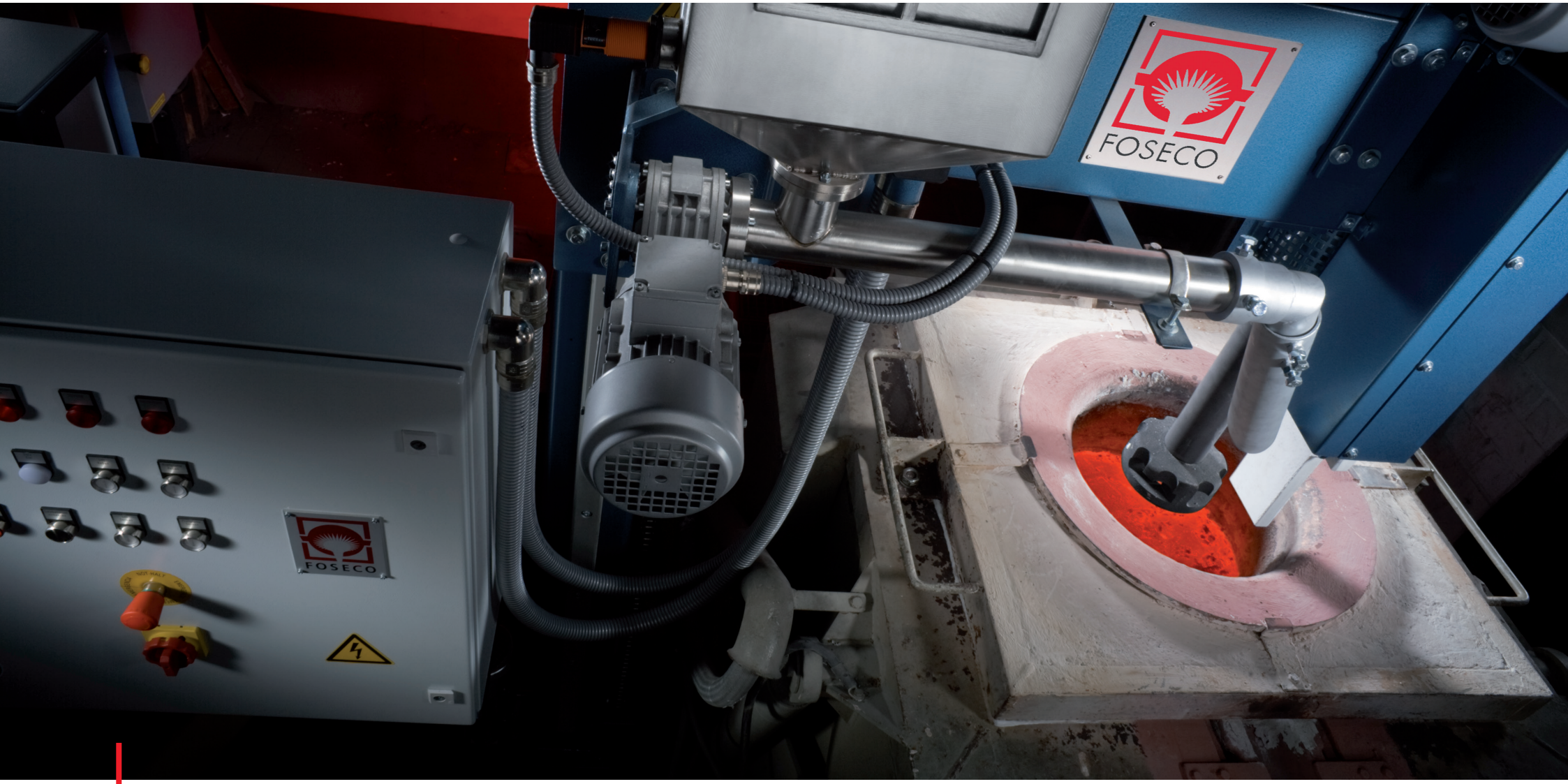


MTS 1500

Automated melt treatment station

VESUVIUS

FOSECO

“MTS 1500 technology is an automated process and the platform of a fully controlled degassing and melt treatment.”

A new perspective on performance

What is the MTS 1500?

The MTS 1500 is an automated melt treatment station that:

- Provides a platform to perform all necessary melt treatments in a single operation
- Improves efficiency of the various treatments
- Reduces operator involvement
- Reduces emissions

The MTS 1500 is based upon FDU rotary degassing technology, with the additional capability of adding a range of melt treatment products.

The addition of these treatment products uses a unique method, whereby the fluxes are fed from a dispensing unit into a vortex deliberately created by the spinning rotor. This vortex is carefully controlled to ensure a very efficient mixing of the treatment products.

Process parameters

The standard treatment cycle using the MTS 1500 consists of a series of stages that can be summarised as follows:

1. **Consumables introduction**
   Shaft, rotor and baffle plate are first lowered into the melt.

2. **Vortex formation**
   The baffle plate is deactivated and rotor speed is increased to a point at which a vortex is created around the shaft.

3. **Addition of treatment agents**
   The required amount of flux is then dispensed directly into the vortex and drawn down into the melt.

4. **Vortex termination and degassing**
   After the flux addition the baffle plate is activated again to terminate the vortex and initiate the degassing phase.

Consumable products

There are two types of products that are key to the performance of the MTS 1500

XSR and FDR rotors

New designs of rotors that

+ create the optimum vortex for the addition of the treatment products
+ are highly efficient in removing dissolved hydrogen

Granular fluxes

A range of new treatment agents has been specifically formulated for use with the MTS 1500 that

+ covers the principal foundry operations of cleaning and drossing with COVERAL*, modification with SIMODAL and grain refinement with NUCLEANT*
+ keeps smoke and fume to a minimum

Flux	Application	Purpose
COVERAL ECO 2531 COVERAL ECO 2532 COVERAL ECO 1510	Cleaning and drossing	Reduces corundum build up. Removes oxides and other non-metallic inclusions. Produces a light dry dross.
COVERAL FREE 1560	Sodium free cleaning and drossing	Reduces corundum build up. Removes oxides and other non-metallic inclusions. Produces a light dry dross. Especially suitable for AlMg alloys.
COVERAL PURE 1565	Sodium and calcium free cleaning and drossing	Reduces corundum build up. Removes oxides and other non-metallic inclusions. Produces a light dry dross. Especially suitable for AlMg and piston alloys.
SIMODAL 1572 SIMODAL 1576	Sodium modifying	Modifying metallurgical structure to reduce shrinkage defects and increase mechanical properties.
NUCLEANT 1582	Grain refining	Grain refinement to improve mechanical properties.
DYCASTAL* 1540	Hydrogen addition	Introducing controlled hydrogen level.
EPURAL* 1591	Element removal	Removes Na, Ca, Sr, Li.

For detailed information refer to the datasheets and SDS which are available on request.

Benefits of the MTS 1500

The MTS 1500 offers the foundry several benefits that can be divided into four main categories

Metallurgical benefits

The highly efficient manner in which the melt treatment products are introduced gives a number of metallurgical benefits in the finished casting:

+ Consistent mechanical and physical properties
+ Homogeneous microstructure and composition
+ Very good levels of metal cleanliness
+ Controlled gas porosity

Environmental benefits

The MTS 1500 assists the foundry in achieving a better environmental performance by

+ using less consumables (flux, inert gas)
+ reducing the amount of dross produced
+ reducing emissions
+ reducing treatment time and melt superheat with associated energy savings

Health and Safety benefits

The MTS 1500 contributes to the foundry Health & Saftey improvements:
A healthier environment through reduced particulate and gaseous emissions compared to conventional treatments because

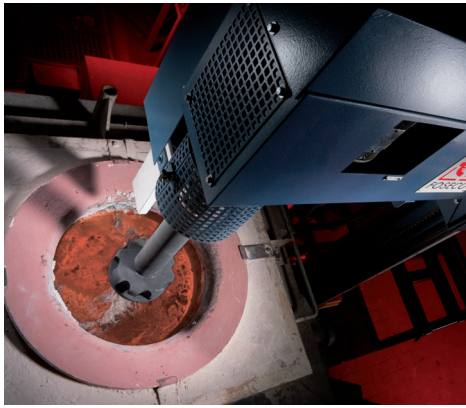
+ the MTS 1500 uses less flux
+ the action of the vortex draws the flux down into the melt where it is quickly mixed into the metal
+ the flux used for the melt treatment is fully consumed and does not continue to react post treatment
+ a safer environment through reduced operator involvement in the melt treatment process

Economic benefits

Of major importance to aluminium foundries is reducing process costs. From this perspective the MTS 1500 brings value to the foundry by

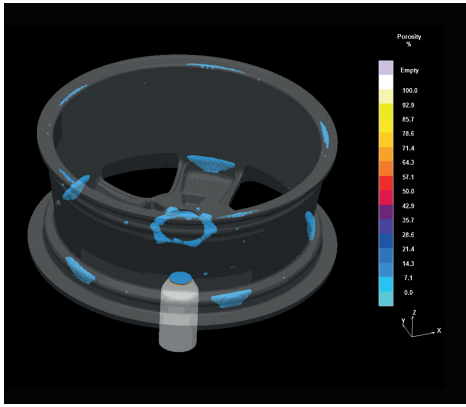
+ reducing treatment costs
  - reduced inert gas consumption
  - reduced flux consumption
  - reducing aluminium loss in the dross
  - reduced labour costs

+ improving performance
  - fast melt turn around
  - reproducible melt quality
  - increased reliability and decreased maintenance



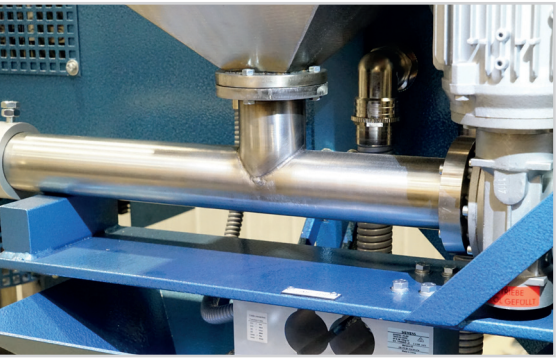
An environmentally friendly process

Screw feeder system for precise and reproducible dosing

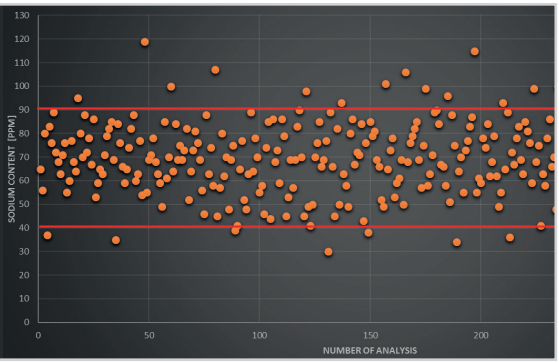


High melt fluidity and low porosity after NUCLEANT 1582 grain refinement

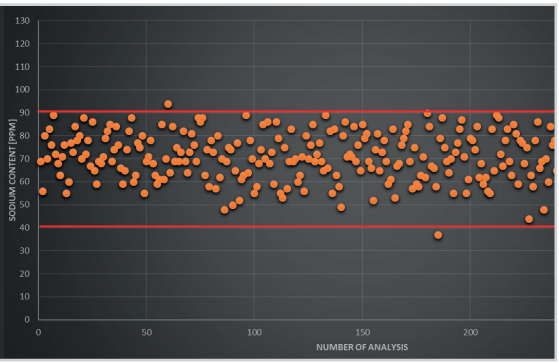
Case study A



Load cell for precise dosing



Mean variation: time controlled granulate dosing



Mean variation: time controlled granulate dosing

The foundry

German sand foundry

Foundry practice

- Small and medium batch series using an automatic sand moulding line
- Inductive melting of various alloys
- FDU rotary degassing in a transfer ladle, SIMODAL 1572 for sodium modification and NUCLEANT 1582 for grain refinement (depending on alloy and casting type)
- Specification for sodium in melt: 40 – 90 ppm (spectrometer)
- 9 percent (23 out of 260 batches) are out of sodium specification

Foundry requirements

Foundry wants to improve sodium yield in a stable process to avoid after treatment:

- Reduced number of batches out of specification
- Weight controlled addition of sodium modifier
- Production process without stoppage
- Stable melt treatment
- Increased productivity

Trial procedure:

In the common process, the granulate addition is time controlled. The screw feeder runs to end of pre-set dosing time. The added amount of flux is highly depending on granulate density, filling degree of screw chambers, and vibrations of equipment. In the MTS 1500 process the sodium yield is proportional to added weight of granulate. Variations in flux addition consequently lead to differences in sodium yield.
Now a load cell measures the starting weight of granulate and runs dosing step to the target weight using the differential measurement method.

Achievements

- Stable and trouble-free process
- Weight difference of less than 5 % based on a 500 g SIMODAL 1572 target
- Less than 1 percent (2 out of 260 batches) out of sodium specification

Summary

- Precise dosing
- Reliable process
- Increased productivity due to trouble-free treatment
- Improved quality management due to process recording

Case study B

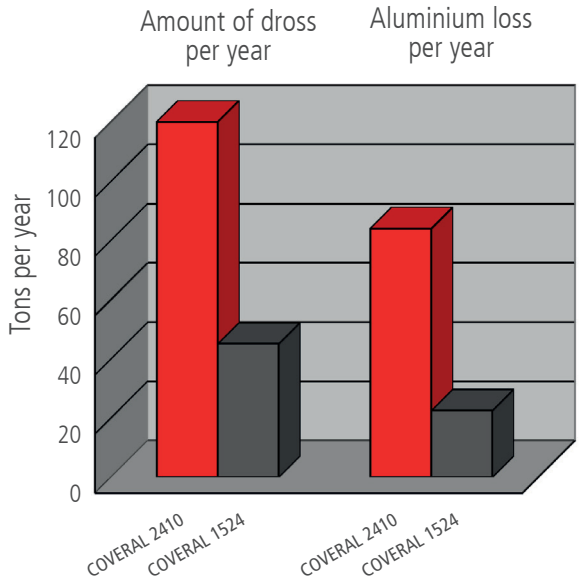
The foundry
Foundry B produces a range of castings in both high pressure and low pressure.

Foundry practice
Foundry B melts centrally and then transfers metal to the casting furnaces using a transfer ladle. Melt treatment was carried out in the transfer ladle using a rotary degassing unit with a manual addition of flux.

Foundry requirements
The foundry wanted to expand its activity by a factor of four and needed a second machine to increase melt treatment capacity.
The metal content in dross is high, to reduce the melt loss and save energy, an MTS machine is required.

Achievements
The high efficiency of the MTS 1500 has given significant cost savings in terms of reduced treatment costs and a reduction in metal loss in the dross.
More consistent process due to fully automised device and about 60 tons less aluminium loss per year.

Foundry B	FDU with manual granulate addition	MTS 1500
Production capacity	20,000 tons per year	
Number of ladles to degas	65 - 70 ladles with 800 kg AlSi7Mg per day	
Treatment temperature	730 - 760 °C	
Granulate and addition rate	COVERAL 2410 (0,05 %)	COVERAL 1524 (0,03 %)
Amount of granulate per treatment	400 g +/- 20 g	240 g +/- 10 g
Annual granulate consumption	6,000 kg	3,600 kg



Case study C

The foundry

A European wheel foundry produces aluminium wheels in low-pressure die casting.

Foundry practice

Foundry C uses AlSi7Mg alloy, molten in a tower smelter and treated in an INSURAL* transfer ladle. The original practice was a manual addition of TiBor rods followed by a FDU rotary degassing treatment.

Foundry requirements

The foundry wants to do all necessary treatment steps in a single operation to reduce operator involvement in TiBor rods addition. Moreover they recognised the high metal content in dross and asked for a reduction in aluminium loss.

Achievements

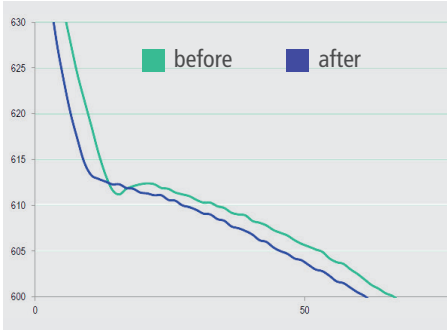
The titanium-boron based NUCLEANT 1582 grain refiner has been introduced and is applied through a MTS 1500 device. An amount of 250 g NUCLEANT 1582 grain refiner is added into a carefully controlled vortex during each MTS treatment.

It results in an excellent grain refining effect at lower addition rates compared to TiBor rods; the grain refining level is more constant now due to the automated process.

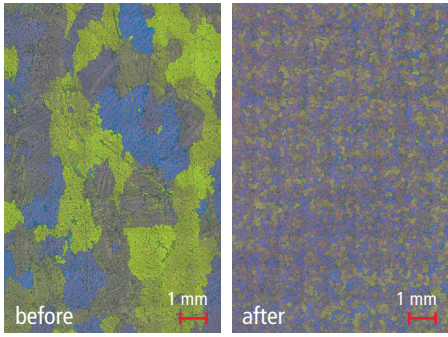
The resulting dross is low in metal and the foundry reports reduced effort in cleaning the LPDC furnaces.

Treatment parameters	
Ladle	INSURAL ATL 600 with 500 kg of AlSi7Mg
Temperature	730 - 760 °C
Addition rate	250 g NUCLEANT 1582 (0.05 % of the melt weight)
Treatment time	6 minutes
Inert gas flow	20 l/min N_2
Rotor speed	450 rpm for MTS FDR 190.70

Very dry dross obtained without any additional drossing flux



Thermal analysis curve



Micro structure before and after grain refining

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