

## FDU FOUNDRY DEGASSING UNIT

Equipment & consumables

VESUVIUS



# FDU Foundry Degassing Unit

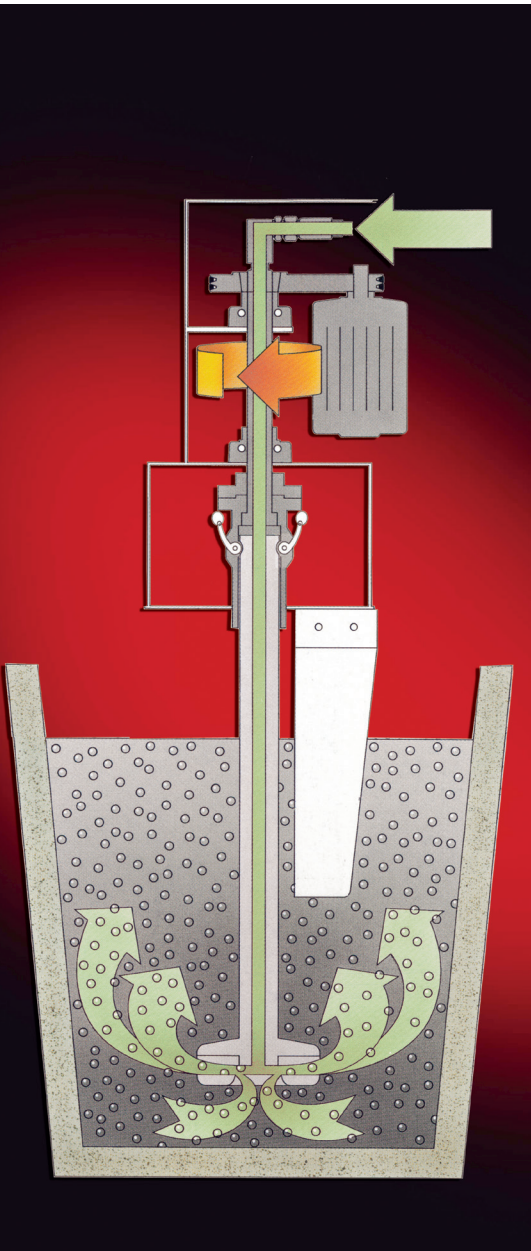
For the improvement of quality of non ferrous castings

FDU foundry degassing units are a melt treatment system for the degassing and cleaning of aluminium alloys in foundries.

All FDU units use the impeller principle with patented rotor designs which mixes fine inert gas (usually Nitrogen or Argon) with the melt. The gas bubbles are distributed widely through the melt whilst maintaining a smooth melt surface. This results in short treatment times, effective degassing and melt cleaning.

## The advantages

- + Reproducible results
- + Short treatment time
- + Reduced gas porosity and hard inclusions in castings
- + Reduced machining costs
- + Consistent mechanical and physical properties
- + Environmentally friendly





The FDU product range covers a number of machines for transport by crane or fork-lift truck, mobile and static units. The degassing equipment is used for transport ladles and free standing crucible furnaces. All machines are custom-made and adapted to foundry's requirements and needs. An advanced control system enables the operator to program various parameters; the degassing treatment runs automatically without any operator involvement once the process has been started. A team of Foseco specialists commissions the equipment, optimises the treatment parameters and trains the operators.



**FDU ROTOSTATIV**  
Compact assembly on the ground; a manual arm swivel (optional) provides easy access to furnace or transport ladle.



**FDU ROTOSCHWENK**  
For assembly on the ground and electrically arm movement for process automation and multi-position use.



**FDU MINIDEGASSER**  
Compact design for placing on top of a crucible or ladle by means of crane or fork-lift truck.



**FDU MARK 10**  
For treatment in transport ladles or furnaces, easily pushed manually into position.



**FDU ROTODRIVE**  
Battery operated trolley for moving into treatment position and for long-distance movement.

# Degassing consumables

For the improvement of quality of non ferrous castings

Graphite rotors are used in connection with the corresponding graphite shafts. Various rotor designs and diameters can be combined with shafts in different lengths and types. This procedure provides maximum flexibility to suit almost all crucible and transport ladle designs. Vacuum impregnation of the graphite consumables ensures a long life.

## Graphite shafts

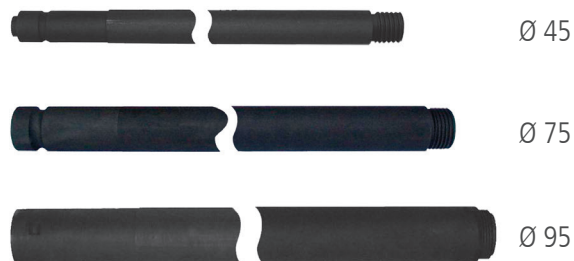
Graphite shafts are available with two different connections to the degassing unit: Quick-lock or clamp coupling for BKF type shafts and screw coupling for DSK type shafts.

- + Graphite shafts
  - Ø 45 mm, 700 mm long
  - Ø 75 mm, up to 1200 mm long
  - Ø 95 mm, up to 2300 mm long

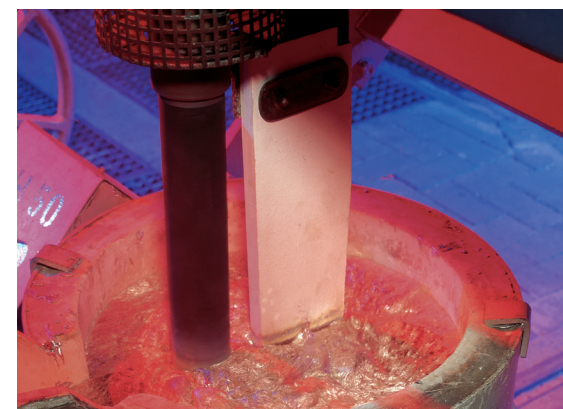
## INSURAL\* baffle plates

A baffle plate is placed near to the graphite shaft and guarantees a smooth melt surface during treatment. It is available in different shapes and lengths.

FDU BKF types of shaft



FDU graphite shaft and INSURAL baffle plate



The rotor design is the key for optimal cleaning and degassing the melt; rotors must fulfill the following functions:

- + small size of purge gas bubbles
- + homogeneous bubble distribution across the whole volume
- + good melt movement and mixing
- + low melt surface movement

Foseco intensively investigate existing rotor designs combined with theoretical studies, simulations, extensive modelling and practical tests to further improve the degassing performance.

#### FDU XSR graphite rotor

The XSR rotor type can be combined with all graphite shafts. Different diameters from 140 to 250 mm fit nearly all geometries and sizes of treatment vessels. Turbo cuts in the upper section of the rotor further reduce the size of the inert gas bubbles thus maximising the surface area of the bubbles for a given volume of treatment gas.

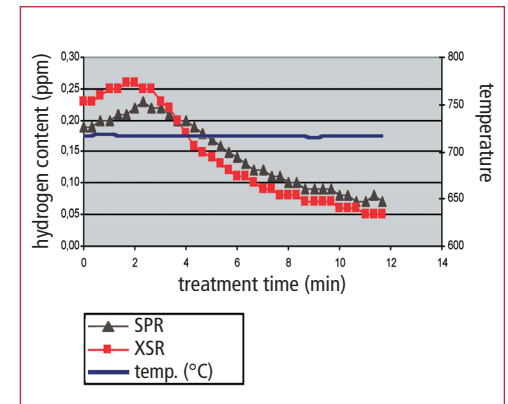
The degassing effect has been plotted online with a hydrogen analyser. The diagram illustrates a typical curve for hydrogen concentrations in aluminium. The rate of degassing under consistent test conditions in achieving a target level of 0.08 ppm of hydrogen in the molten material was 0.03 ppm H<sub>2</sub>/min with the XSR rotor. The degassing rate for the SPR rotor was 0.02 ppm H<sub>2</sub>/min, 50% less.

For detailed information refer to Foundry Practice 241 (2004).

#### MTS FDR high-performance rotor

The MTS FDR high efficiency rotor is a further development of the SPR and XSR types range. An innovative design is the key for its advanced functionality for good degassing performance and optimal melt homogenisation during MTS 1500 application. Furthermore it is suitable for degassing of ladles or crucibles with difficult geometries. Degassing runs at reduced speed in order to extend the service life of the graphite shaft as abrasion is reduced.

Curve for hydrogen content in aluminium



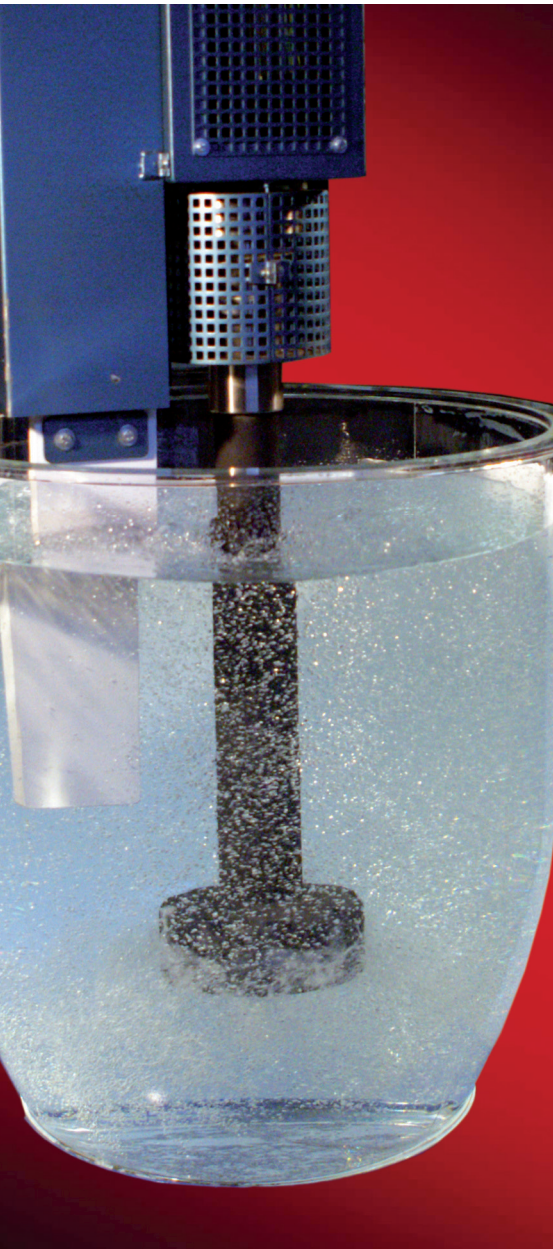
FDU XSR rotor



MTS FDR rotor







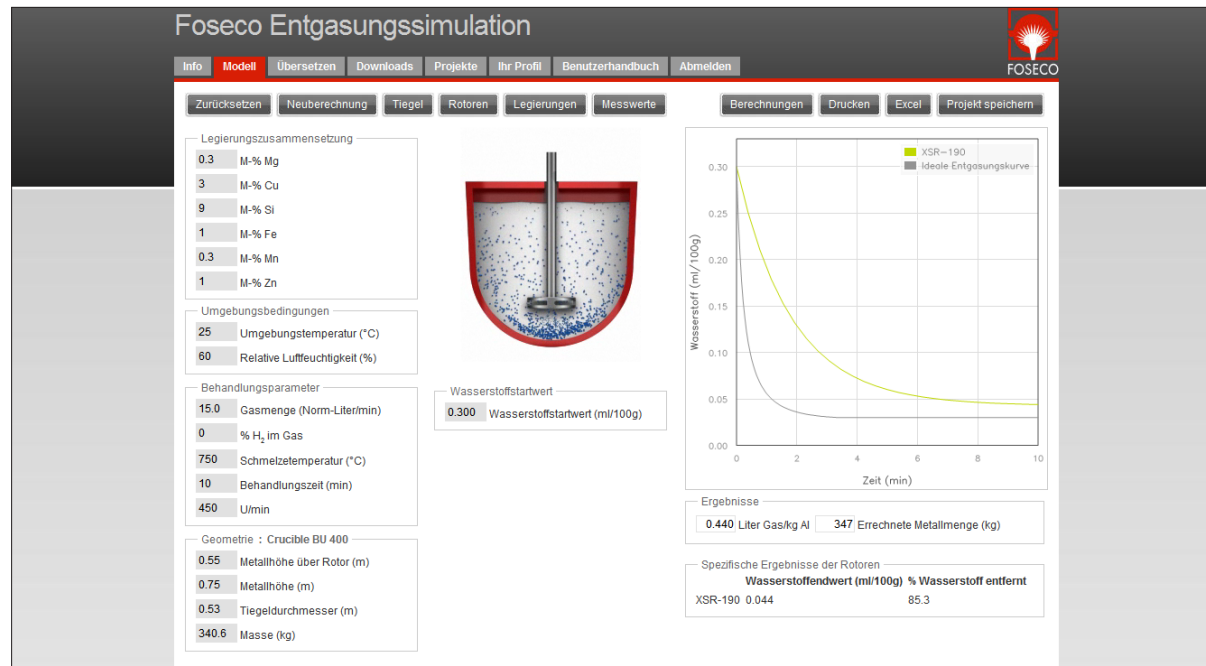
# Degassing simulation

Software to analyse batch degassing processes

Rotary degassing of liquid aluminium alloys is a widely used commercial process to control levels of hydrogen, alkali metals and inclusions in the melt, prior to casting. A comprehensive theoretical understanding of the kinetics of aluminium degassing has been established in the past twenty years.

A selection of different Foseco degassing rotors has been characterised in a comprehensive experimental program. Tests have been carried out in both water model and during foundry trials. The study results in an Internet based simulation software for degassing processes in foundries.

Screen shot



The software enables the operator to characterise the degassing process with an extended parameter list for data input:

- + Pre-set crucible and ladle sizes
- + Pre-set alloy compositions
- + Different ambient conditions
- + Starting level of hydrogen
- + Operating conditions like melt temperature, gas flow rate, rotor speed and diameter
- + Treatment time
- + Degassing and upgassing

Based on input data the software calculates a degassing curve – hydrogen content vs. time. It is possible to draw degassing curves of different rotor design and rotor diameters in one diagram. The software compares the hydrogen removal efficiency and total consumption of inert gas for each rotor.

A full report about the batch degassing software is available in Foundry Practice Issue 256 (2011).

For more information and a demonstration please contact the local Foseco representative.

### Diagram 1

The curves in diagram 1 compare the degassing efficiency of different rotor designs.

### Diagram 2

The curves in diagram 2 compare the degassing efficiency of different FDU XSR rotor diameters.

### Diagram 3

Diagram 3 shows an upgassing process using an inert gas-hydrogen-mix.

Diagram 1

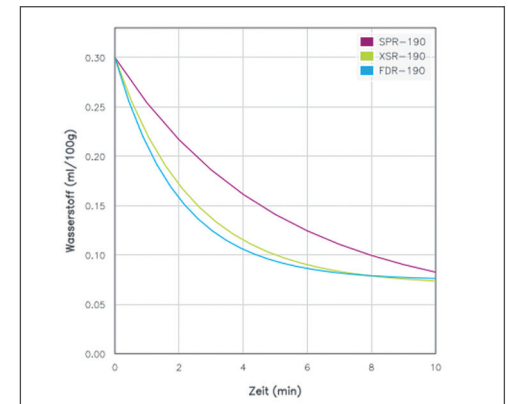


Diagram 2

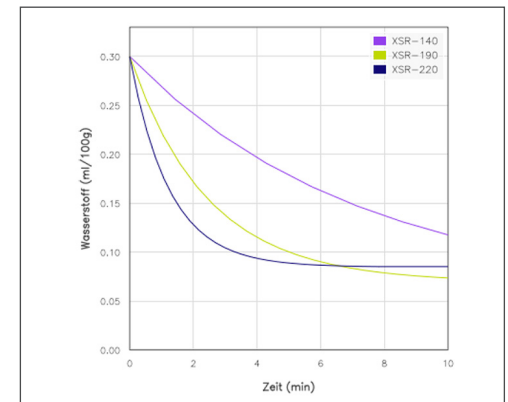
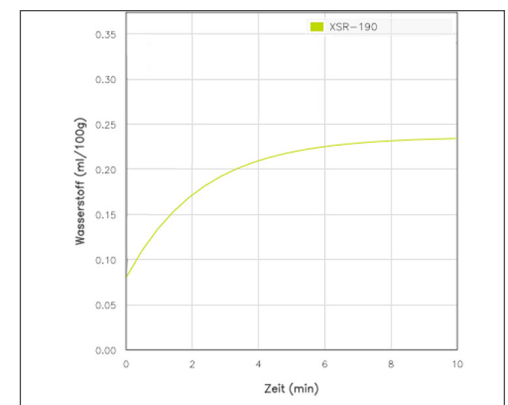


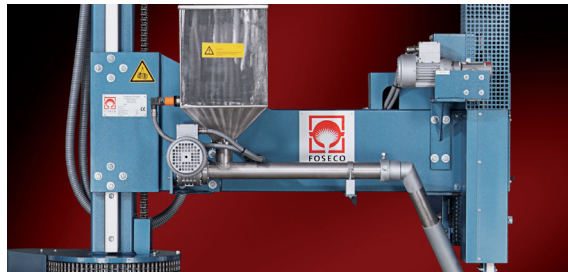
Diagram 3



# FDU

## Service and further options

MTS 1500 automated metal treatment process is available for nearly all types of FDU. A temperature measurement system is an option to enable foundries to monitor and control the degassing process. A PLC interface can be provided to collect and transfer treatment data.



MTS 1500 automated Metal Treatment Station

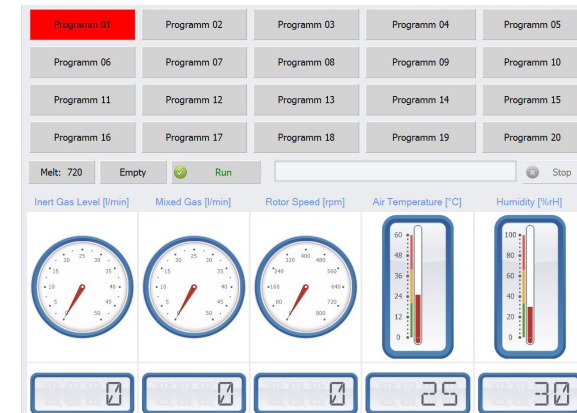


Training and service

The use of Mass Flow Controllers provides a temperature and pressure independent control of the inert gas flow during the rotary degassing process. A separate setting of flow rates for each program provides high flexibility, the actual flow rate is displayed on a touch screen. The  $N_2-H_2$  mixed gas addition for upgassing melt is also available with mass flow controllers.

SMARTT is a process control tool for the rotary degassing process of aluminium alloys. It analyses all external variables and calculates the treatment parameters for degassing and upgassing processes just before each treatment. The target for the optimisation is a consistent melt quality after each treatment.

Foseco is continually developing new and improved products and services to boost melt treatment efficiency and effectiveness. Our service team would be pleased to answer any further questions you may have.



SMARTT software



$N_2-H_2$  mixed gas control



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