

SMARTT

An innovative process control for rotary degassing of aluminium alloys



Overview



Mass flow controllers



Operator screen

SMARTT

An innovative process control

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.

The SMARTT software is installed on a Windows PC and data exchange is carried out on a comfortable touch screen panel. The SMARTT PC is LAN connected to the Siemens PLC that controls the degassing unit.

SMARTT continuously measures humidity and air temperature while data for the Foseco rotor designs are stored in a database. The hydrogen content at the end of the treatment is always the target for the optimisation. Additionally, ingot quality, melt temperature or casting requirements influence the performance of a treatment process.

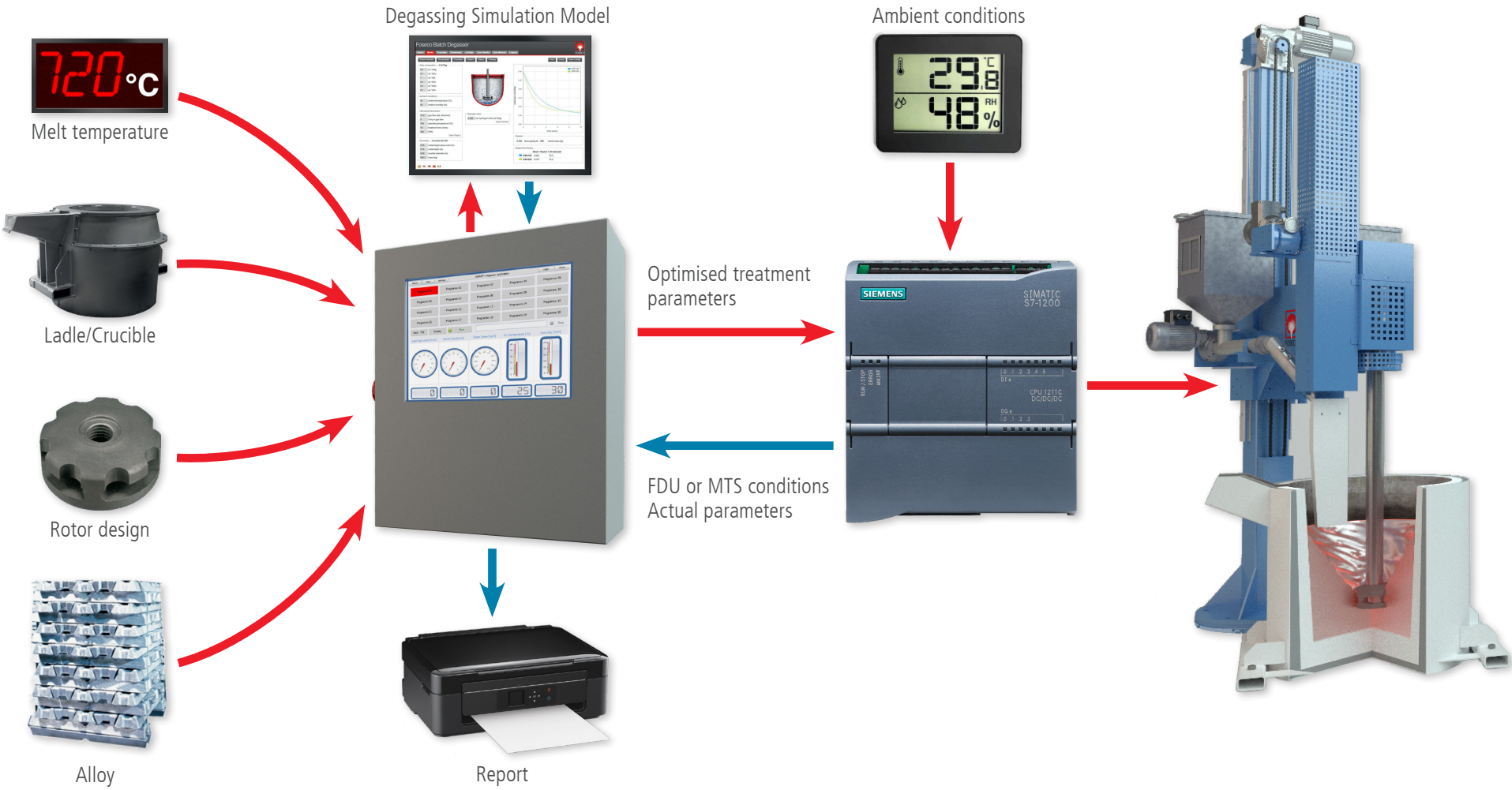
SMARTT determines rotor speed, inert gas flow rate and treatment time and transfers this data to the degassing unit before treatment begins.

Four different treatment schemes (high-speed, low gas consumption, low rotor speed or standard degassing) offer opportunities for the foundry manager to optimise his process in various ways.

SMARTT Properties

- + 20 programs on the operator screen
- + For MTS 1500 units with 1 or 2 dosing systems
- + Degassing to a hydrogen target
- + Upgassing with N_2 - H_2 mixed gas
- + Data logging of all treatment parameters

SMARTT Scheme



Results from simulations and trials

Degassing treatment

Optimisation: Standard

BU 600 with AlSi8Cu3 at 750 °C, XSR 190 rotor

Treatment target: 0,06 ml H₂/100 g Al

Minimum treatment time: 240 s

Maximum treatment time: 500 s

SMARTT parameter for different ambient conditions:

| | | | |
|-----------------|---------------------|-----|-----|
| 20 °C / 25 % rH | Rotor Speed (RPM) | 423 | 423 |
| | Gas Flow (std. l/m) | 19 | 19 |
| | Process Time (s) | 240 | 240 |
| 30 °C / 45 % rH | Rotor Speed (RPM) | 431 | 431 |
| | Gas Flow (std. l/m) | 23 | 23 |
| | Process Time (s) | 240 | 240 |
| 40 °C / 65 % rH | Rotor Speed (RPM) | 454 | 454 |
| | Gas Flow (std. l/m) | 29 | 29 |
| | Process Time (s) | 240 | 240 |

SMARTT calculates treatment parameters for different ambient conditions to reach 0,06 ml hydrogen per 100 g aluminium after each treatment. With increasing air temperature and relative humidity, the rotor speed and inert gas flow rate increase to compensate the higher moisture content in the atmosphere. If the flow rate and rotor speed are at its specific limit, the software starts prolonging the treatment time to reach the target.

Foundry trials have shown that the target was always reached regardless of different ambient conditions.

Uppassing treatment

Some applications in foundries require a defined hydrogen content such as in the casting of wheels. It is common practice to run very short treatment times to avoid too much hydrogen removal; often oxide removal is not sufficient. The use of a N₂-H₂ mixed gas improves oxide removal due to longer treatment times but the variations in hydrogen at the end of treatment are still high.

SMARTT now runs an inert gas treatment followed by a 2-stage uppassing. The 1st stage runs with N₂-H₂ mixed gas only; during stage 2 a mix between N₂-H₂ and inert gas gives a defined hydrogen content in treatment gas and ends in an equilibrium between treatment gas, aluminium melt and atmosphere.

Optimisation: Standard

INSURAL* ATL 1000 with AlSi7Mg at 750 °C,

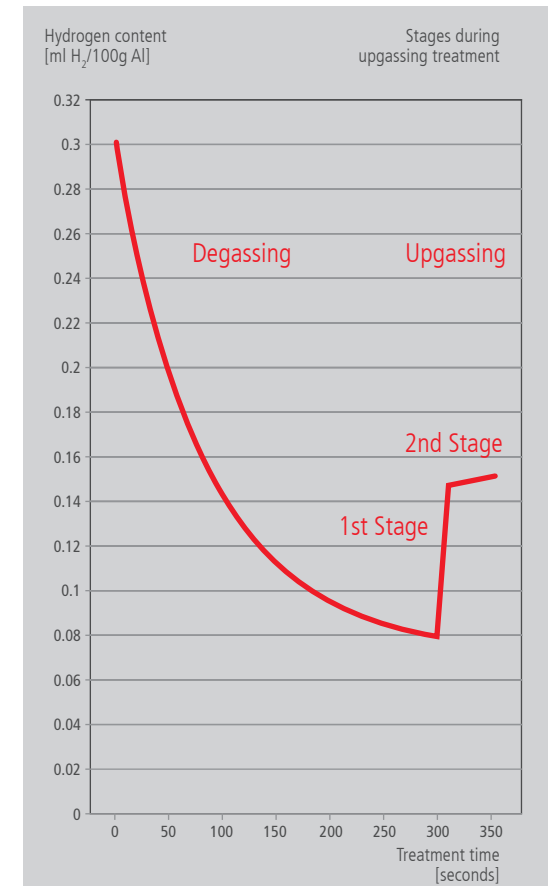
FDR 220 rotor

Treatment target after degassing: 0,08 ml H₂/100 g Al

Final treatment target: 0,15 ml H₂/100 g Al

Minimum treatment time: 360 s

Maximum treatment time: 600 s



Complete treatment cycle including uppassing

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