

ATAS METSTAR

TAKE CONTROL OF YOUR
METALLURGICAL PROCESS

A NOVACAST SYSTEMS PRODUCT



ATAS METSTAR

ATAS MetStar is an easy to use, adaptive metallurgical process control system for analyzing, stabilizing and optimizing the metallurgical production process. The result is a stable process, reduced variations in mechanical and physical properties, decreased scrap rate, less energy consumption and a greener planet.

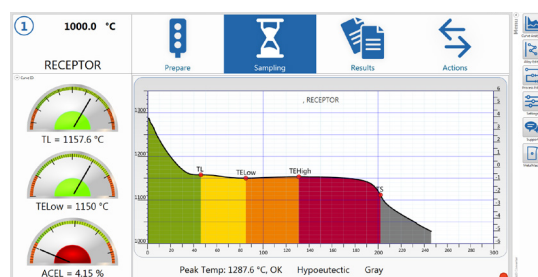
ATAS (Adaptive Thermal Analysis System) MetStar system has been developed from a metallurgical point of view, based on years of foundry experience both from NovaCast's own personnel as well as customers' day-to-day challenges. The system is used to create routines and rules for developing a structured production method.



System design

The system has an open design and can be adapted to foundries using cupola or induction furnaces for melting, with or without holding or pouring furnaces. The system calculates additions for magnesium treatment with sandwich/Tundish or wire feeder technology.

CURVE ANALYZER FOR SINGLE CURVES



The analyze phase consists of analyzing a number of physical samples of a specific alloy or melt quality to find the best practice. The stabilizing phase consists of extracting data from the analysis and defining the unique fingerprint for the desired quality. The optimizing phase is the final stage, where fine tuning and improvement takes place. This leads to a process with less variations and stable quality. The result is reduced scrap rate, less energy consumption and a greener planet.

ATAS MetStar predicts the possible risk for defects in the castings such as;

- micro shrinkage porosity
- macro shrinkage porosity
- chill tendency (cementite)
- inverse chill tendency
- oxygen content
- mechanical properties

ATAS MetStar can be used in small to large foundries with different production layouts. The system is developed to control the production of the following alloys; grey iron, compacted graphite iron, ductile iron, white iron, SiMo iron and Ni-resist iron.

In order to use more realistic material data for microstructure and shrinkage prediction, ATAS MetStar communicates with NovaCast Systems' casting simulation system, NovaFlow&Solid.

Modularisation - production and engineering unit

The system is divided into production units and engineering units to facilitate planning of the complete process control system, ready for installation in a foundry. The production unit is a complete system for sampling and providing information to the operators. The engineering unit is handled by the production management.

Metallurgical Process Control based on Thermal Analysis – a metallurgical spectrometer

Thermal analysis is based on recording the cooling curve (temperature vs. time), and solidification of a standardized volume of metal. During the solidification process austenite and graphite is

precipitated and energy is released which causes temporary arrests on the temperature/time curve. ATAS MetStar detects temporary arrests with cooling rate, from which we receive the melt quality. ATAS MetStar acts as the metallurgical spectrometer in the foundry.

Database for alloys and process information

The database in ATAS MetStar is compatible with other systems from NovaCast. It shares information with MetalMaster and ATAS One. The database is easy to use and easy to customize according to the foundries' specific processes. The metallurgist/production manager sets up the parameters for the different alloys (base and final iron) and processes with regard to process lay-out, chemical composition, production window limits and actions such as;

- ACEL control (Grey solidification)
- CEL control (White solidification)
- Dynamical inoculation for grey and ductile iron
- Ductile iron optimizer
- Mechanical properties hardness and UTS (pearlite module)

Reaching eutectic morphology in Ductile Iron with different Thermal modulus

With today's high demand for defect-free castings, many users rely on ATAS MetStar. The main challenge has been reaching the correct ACEL target in sand cups to secure proper eutectic morphology across different casting sizes. Now available in ATAS MetStar, this feature helps customers reduce macro defects and improve ductile iron production. Benefit: better eutectic control means fewer defects.

ACEL CORRECTION

ACEL Correction				
	Target	Actual	After	Adjustment
ACEL	4,22 ^{+0,03} _{-0,03}	4,04	4,22	SteelScrap <input type="text"/> Kg
C	3,70 ^{+0,05} _{-0,05}	3,50	3,67	FeSi <input type="text"/> 1,05 Kg
Si	1,51 ^{+0,09} _{-0,09}	1,40	1,42	Carburizer <input type="text"/> 6,50 Kg
P	0,04 ^{+0,01} _{-0,01}	0,02	0,03	FeP <input type="text"/> 0,39 Kg

GGI 64

Furnace weight 3000 kg C 3,50 % Si 1,40 % P 0,02 %

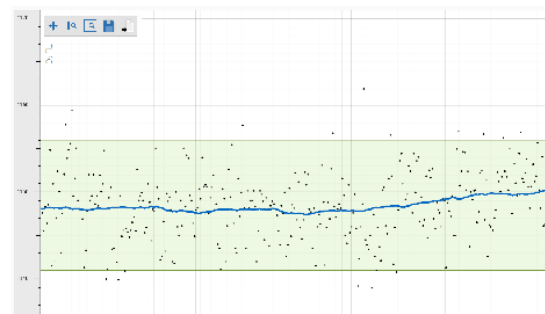
Usability and interactivity

ATAS MetStar is easy to use due to the clean and intuitive interface with distinct symbols. It is also easy to interact with since it follows a structured process approach. It demands few actions and input from the operator and thereby limits the influence of the "human factor" on results and performance.

Process tracker - real time process information

The Process tracker is an instant information system that visualizes how crucial metallurgical parameters vary over time. With this information, the operators can actively take required actions, and break the trend towards declining quality of the base and final iron. The process tracker is capable of evaluating an extensive amount of data from different alloys (for example 60.000 samples) and present it instantly.

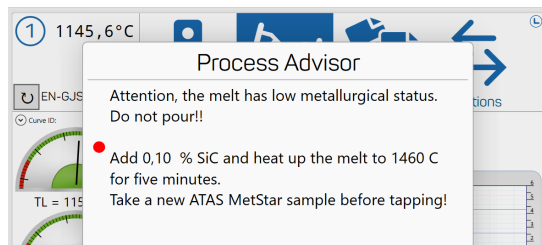
PROCESS TRACKER



Process Advisor

The Process Advisor is an expert system that advises the operators about sampling and process quality. It informs the operators about possible defects and gives basic explanations why these defects may be formed in the castings. It has pre-defined rules for bad sample detection and alerts the operators through a warning window when a faulty sampling is made. Alerts will for example indicate if the pouring temperature in the sampling cup is too high or too low, if the thermocouple is broken and if the cup is not correctly filled or if the sampling time is too short. The expert system is possible to customize with user defined equations and rules based on the foundry's own specific production process.

PROCESS ADVISOR



Curve Analyzer

With curve analyzer it is possible to compare, assess and make significant conclusions about the nature of solidification. In order to assess correct limits for a specific quality, a statistical approach should be used. Using the functions in the Curve Analyzer allows to distinguish samples before and after correction of the base melt. By looking at the final good and bad quality castings, a foundry can analyze these sample curves and learn the limits of the unique fingerprint for the optimal process window. The filtered data is used to create customized information, such as comparison between an unlimited numbers of cooling curves, detailed information concerning metallurgical parameters, generating pictures and export data to other formats (.xls or .csv). The learning function is intuitive and intelligent. The system will automatically filter bad samples and therefore bad curves will not be used in the evaluation process.

Communication with external devices

To make full use of generated data, ATAS MetStar analyzes data from different external systems; spectrometer, tensile/hardness testing equipment, wire feeder, charging machines, inoculation machines (e.g. Pourtech), industrial scales, lamps/sound signals, PLC (Programmable Logic Controller) interface, ERP Systems like SAP and DISA Foundry Cockpit.

MasterMind (Correlation Finder)

MasterMind is an advanced tool integrated within the ATAS MetStar system, designed to identify correlations among thermal parameters, spectrometer readings, user inputs (such as perlit content, HB, defects, etc.), and other variables. Upon establishing a significant correlation, the system automatically generates and saves an equation, enabling ATAS MetStar to serve as a

proactive predictor tailored for specific foundry requirements. This leads to more accurate defect prediction and timely prevention.

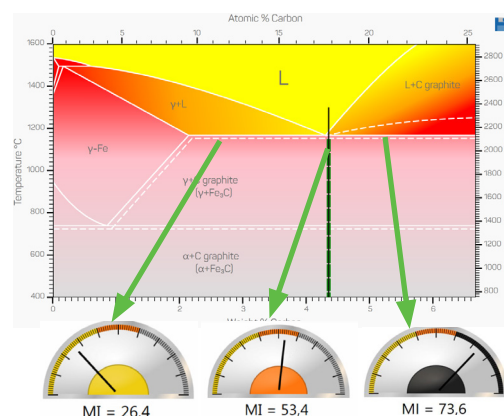
Reporting system

With the enhanced customized reporting system, the operator, the metallurgist and management team can make daily/weekly/monthly, internal and/or external reports in a few seconds. The reports can easily be pre-defined in settings, saved and exported in PDF-format. The operator works with the database in Process Tracker, activates the desired group of samples and receives a readable, accurate and ready to present report for internal as well as for external use for management or customers. This allows the foundry to make everyday life of reporting duties much easier for all levels in the foundry. The design of the reports is made by the user. The user could choose different types of parameters to be evaluated, units on x and y axis (sample, date, or parameter versus parameter). There are two types of diagrams; scatterplot or Bell diagram.

Morphological Index (MI)

It is essential for operators to understand the relationship between carbon equivalent and morphology. The MI provides clear and informative guidance regarding hypo, eutectic, or hyper-eutectic morphological regions. This understanding helps determine proximity to eutectic or hyper-eutectic morphology, which is vital for timely prevention of macro defects in castings. The Morphological Index (MI) ranges from 0 to 100, with the default eutectic range set at 40-60, though this can be adjusted by the user.

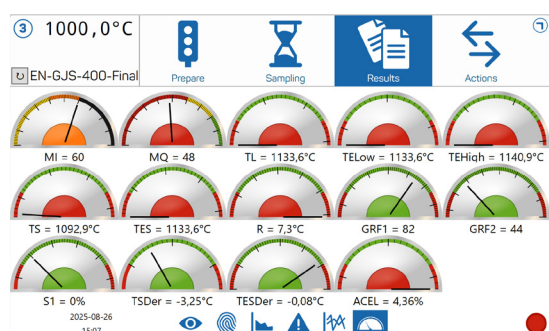
MORPHOLOGICAL INDEX ON FE-C DIAGRAM



Gauges results

ATAS MetStar now combines all gauge-based results—temperatures, time intervals, and calculations—into a single tab for easier review. This unified layout highlights out-of-limit parameters in red, allowing operators to spot issues quickly and act promptly. The update makes data interpretation faster and improves user experience. Benefit: Centralized results visualization saves time and simplifies analysis.

GAUGES IN CHANNEL (OPERATOR'S VIEW)



Support

Need support? Click on the “support” button in the main menu and you will be remotely connected to a NovaCast team member.