

August 2008

ERG-series stirrer systems (M-EMS, S-EMS, F-EMS) for billet & bloom caster

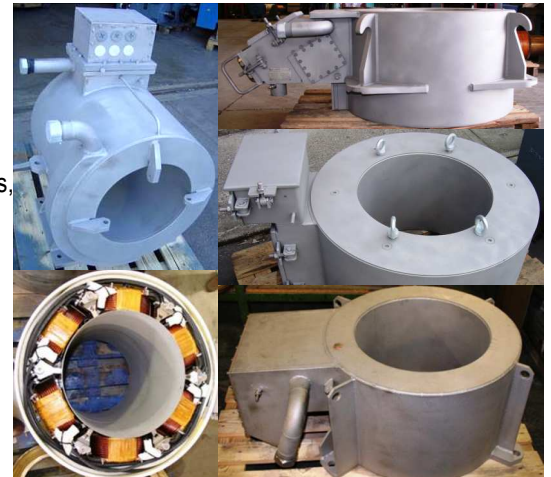
Electromagnetic stirring (EMS) improves quality and productivity in continuous casting. The rotating field induces magnetodynamic forces in the liquid steel producing rotational flow, thereby providing better heat transfer and gas release, improved equiaxed zone, and minimizing carbon segregation, inclusions, porosity, surface & internal cracks.

Ergolines offers Mould-, Strand- & Final-EMS coils, with wet- or dry-insulation technology; internal and external M-EMS design.

Systems can also include: special cables, junction boxes, complete VVVF Inverter stations, transformers, cooling water systems, Gauss-meters, spare parts

A typical project package includes:

- Analysis of metallurgical process requirements
- Computer coil calculation & design on COMSOL Multiphysics® platform
- Optimization of operating parameters (current, voltage, frequency, position)
- Magnetic, electric, hydraulic and mechanical design + production engineering
- Manufacturing and testing
- Start-up and commissioning
- After-sales service



Repair, reconditioning and total renovation of EMSs

EMS coil windings are subject to wear during operation. Wear causes a progressive degradation of the insulation properties of the coils, causing loss of ground insulation. In addition, accidental events (like insufficient water cooling, steel overflows, etc.) can damage the materials, causing significant reduction of the EMS performance.

Ergolines offers a qualified and efficient Service of reconditioning or complete renovation of EMSs of any brand:

- Proprietary VPI re-impregnation treatment
- Reconstruction of windings
- Complete EMS renovation
- Final electric and hydraulic testing, with complete technical reporting
- M-EMSs, S-EMSs, F-EMS, Slab-EMS, Linear EMS and Ladle-EMS
- 2- and 3-phase design;
- Dry- and wet-insulation design;

The Ergolines renovation technologies give the reconditioned stirrers insulation and life-time properties significantly higher than the original new equipment.



ILD - Electromagnetic Mould level Sensors and Control Systems

The use of electromagnetic sensors for mould level measurement in continuous casting of steel is a worldwide common practice. Level stability, smooth regulation and fast response time are all features that improve process control and steel surface quality.

The Ergolines ILD 80-07 sensor is a new-generation inductive transducer designed for accurate and reliable mould level control in open-stream billet casters.

Sensor installation, directly on the stainless-steel water-jacket, is trouble-free and highly-protected, and it offers the best operating practice among all systems.

The system for one strand includes: sensor, heat-resistant cable, junction box, signal processing & control unit. Level regulation is on withdrawal speed.

Typically, the ILD sensor is permanently installed in each mould, in a slot obtained in the water jacket (detail installation engineering is provided).

In combination with a Co60 radioactive level sensor, acting as main level control device, it becomes a mould powder thickness sensor for realizing automatic powder feeding control on billet and bloom casters.

Special versions of ILD for bloom and slab casters are also available.



MFM - Portable EMS Gauss-meter probes

In continuous casting, the process-analysis & service instrumentation is as important as the production equipment, because it allows to constantly monitor its efficiency.

Ergolines offers a new-generation portable Gauss-meter instrument for measurement and complete analysis of the rotating field produced by EMS stirrers.

Based on a Hall-effect 3D sensor, it measures field densities up to 2000 Gauss and frequencies from 0.6 to 60 Hz. Measurements are shown on a hand-held ergonomic pocket-terminal with LCD screen, in numerical and graphic forms, so that field geometry and symmetry can also be accurately analysed. It also reveals the presence of harmonics. All data collected by the pocket terminal can also be downloaded to a PC.

Lightweight, though sturdy, it's easy-to-operate and provides remarkable benefits for everyday check-ups, EMS maintenance and diagnostics, and it is also a powerful tool for the metallurgist in process analysis: stirrer position and alignment, field distribution, EMS current and frequency, static torque, etc. are all operating conditions that can be optimized with ease, accuracy and repeatability.



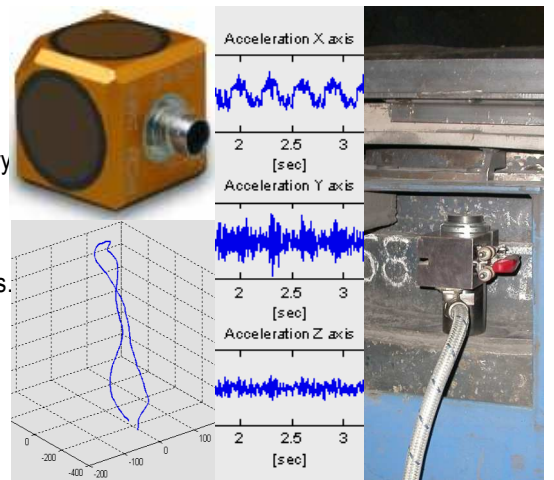
OPI - Mould Oscillation Monitoring System

To achieve optimum casting conditions and high billet surface quality, it is necessary to guarantee that the oscillator behaves correctly, as established by design.

The Ergolines OPI Mould Oscillation Monitoring System is designed for this purpose.

Based on Tri-axial (3D) high-precision accelerometers, the system measures the trajectory of the oscillator on the 3 axis: amplitude, acceleration, direction and frequency are all measured and analysed. In addition, the Fourier analysis of the signals provides real-time information on the presence of harmonics, which are typically caused by worn-out mechanisms, frictions, vibrations, strand misalignments, improper mould taper or bearings. Adding special software components, OPI becomes a powerful monitoring and troubleshooting system of the oscillator-mould-strand system, giving valuable information on its correct operation and early predicting maintenance needs. In conjunction with the casting speed data, it also calculates the strip-time parameters.

When combined, it also increases the level of reliability and accuracy of the MTM / BPS Breakout Prevention system. The OPI system is also available in a portable version.



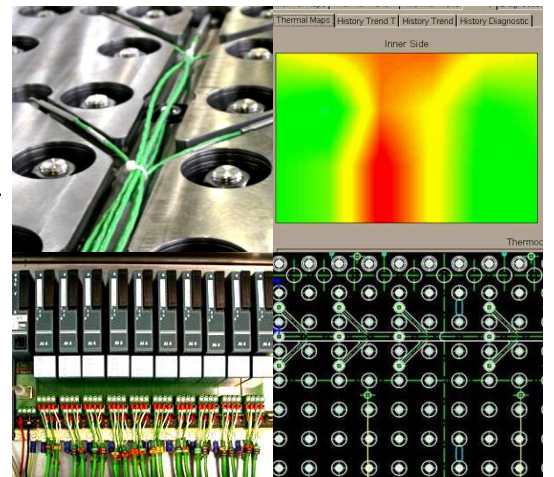
MTM / BPS - Mould Thermal Monitoring & Breakout Prevention Systems

The mould is the most important section of a caster, where liquid steel forms a solid shell. An incorrect growth of the shell can cause a sticker, which leads to a breakout of the strand. This results in downtime of the caster and extensive repair work.

The MTM/BPS system performs real-time monitoring and analysis of the temperature maps of all four mould walls by means of a matrix of high-precision k-type thermocouples. Intended for plate moulds (slab- & bloom-casters), its main purposes are:

- detection of mould thermal conditions indicating a sticker, so as to prevent break-outs. Specific and fine-tuned mathematical algorithms have been developed to reliably detect stickers and reject false alarms
- constant monitoring of casting process quality
- overall improvement of casting practice efficiency, e.g. testing new powders, tuning process parameters for new steelgrades, new types of entry nozzles, etc.

All above features offer remarkable benefits in metallurgical process analysis and are the heart for the realization of a fast, accurate and reliable Breakout Prevention system.



VSD - Vibrational Slag carry-over Detection systems

Unpredictable slag carry-over from ladle to tundish represents a serious problem, which can lead to either steel impurity or poor ladle yield. Ergolines VSD gives the right balance.

VSD, vibrational slag carry-over detection sensor. The system early detects slag carry-over from ladle to tundish, thus allowing the operator, or an automatic control system, to shut-off the ladle, preserving steel purity in the tundish.

The threshold of intervention is user-programmable so as to allow a choice between steel purity and yield of the ladle.

VSD is based on vibration measurement techniques by means of tri-axial high-precision accelerometers and sophisticated digital signal processing.

