Q-REG+

Advanced electrode control system

BENEFITS

Reduced electrode consumption: - 6%
Reduced flicker: -10%
Increased arc efficiency: + 20%
Increased average power: +3%
Reduced energy consumption: - 5kWh/t l.s.

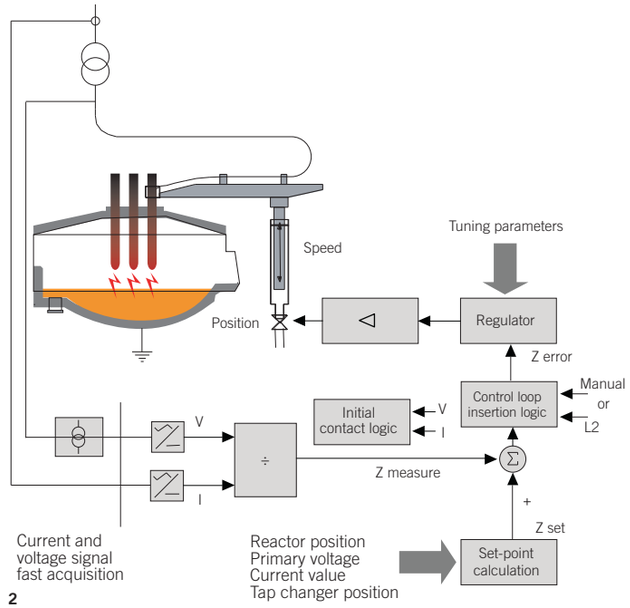
PROCESS

Q-REG+ is a highly sophisticated electrode control systems for AC - DC EAFs and LFs. The system uses high performance algorithms together with intelligent measurement technology. The control strategy is based on fast data acquisition and processing to manage both electrical and chemical power input of the EAF process.

Dynamic electric energy regulation
Controlling the position of each electrode column, the system dynamically adjusts the electrical set-points to adapt to furnace and network current conditions and to achieve the highest possible active power input.

Dynamic foamy slag control
During the refining phase, arc coverage by the foamy slag is the key parameter for monitoring the foaming process. Q-REG+ continuously monitors the slag conditions, evaluating the Arc Coverage Index (ACI), a proprietary function based on arcs' V and I real-time analysis.
When the ACI exceeds a proper threshold, optimal foamy slag conditions are detected and the system automatically reduces the static C injection flow set-point. If the arc becomes uncovered, the carbon flow is increased accordingly. Toward the end of the process, dynamic regulation is applied to lime-dolo injection, to recover proper slag basicity while optimizing slagging agents consumption.

Tuning and monitoring functions
Full-fledged customization tools allow interactive set-point input and visualization. Advanced diagnostic functions enhance process and machine monitoring.
The circular diagram display features an interactive visualization of the furnace work area and work settings, to quickly check and modify the electrical working points.
The hydraulic circuit linearization function allows automatic measurement of the positioning system response nonlinearity, to get a valve linear response for a defined range of lifting and lowering.
The dynamic regulation overview shows the current process status and electrical-chemical working points, while statistical analysis of process data is performed by Q-REG Scope.
The electrode irradiance supervisor (Q-RAY) evaluates the total radiant heat flux on the furnace panels to modify the electrical set-points, thus balancing the thermal loads on the water-cooled panels.



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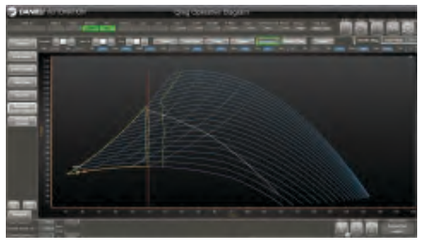

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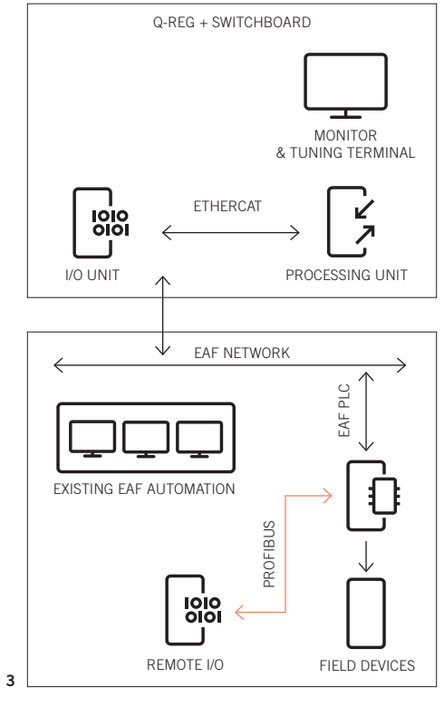
EQUIPMENT

To streamline and simplify the electrode regulator architecture, a complete system porting to a single platform was performed. From a hardware point of view, the DAPAC platform is based on high-performance commercial processing units that ensure plenty of performance (quad-core I7 based) and the ruggedness needed for plant operation (fanless, -25 to 70 °C, 10% to 95% humidity operative range).
The overall dimensions also are relatively limited, as no additional PLC components are required. Thanks to the system added simplicity, interaction with several different PLC architectures is immediately available. The high computational power of the platform allows a high communication speed and a logging period down to 100 microseconds. Also, advanced data processing procedures, such as FFT analysis, can be integrated in the controller itself and vast future developments in this field are supported.

PERFORMANCE ACHIEVEMENTS

More than 220 installations worldwide.

1 QREG+ operative diagram HMI.
2 Current control block diagram: once arc conditions are evaluated, electrode regulation can be performed using a reference value of I, V or Z.
3 Typical HW-configuration of Q-REG and Q-REG+ system.



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