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Digital Regulator-Based Control Strategies for Electric Arc Furnace

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At the ArcelorMittal Hamburg facility, steel production has long relied on electric arc furnaces (EAF), a process widely recognized for its resource efficiency and decarbonization potential. To further enhance operational performance, General Electric implemented a DirectFeed system, replacing the conventional static VAR compensator (SVC). This advanced high-voltage power conversion technology introduces a paradigm shift in furnace control by enabling continuous and decoupled regulation of voltage and current, thereby allowing dynamic adaptation to varying operating conditions and precise management of the thermal equilibrium within the EAF.
Beyond its documented benefits for grid stability, the system's novel control mechanisms deliver operational advantages. Ultra-fast response times facilitate dedicated arc length and power control, which can be leveraged to optimize energy efficiency, minimize refractory wear, and reduce the formation of leakages. Furthermore, the ability to tailor electrical parameters to distinct melting phases mitigates arc instability and improves process responsiveness, establishing a robust foundation for advanced, data-driven furnace operation.

Speaker Country

Germany

Speaker Company/University

ArcelorMittal Hamburg GmbH

Primary author: Dr WURLITZER, Michel (ArcelorMittal Hamburg GmbH)

Co-author: Dr SAFI, Mohammad (ArcelorMittal Hamburg GmbH)

Presenter: Dr WURLITZER, Michel (ArcelorMittal Hamburg GmbH)

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