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Optimized Scheduling for Electric Steelmaking: Integrating EAF, Secondary Metallurgy, Casting and Rolling for Throughput and Energy Efficiency

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In the electric steelmaking industry, short-term production planning often remains siloed, with process areas like the Electric Arc Furnace (EAF) melt shop, secondary metallurgy, and casting machine scheduled in isolation. This operational separation creates significant internal friction, manifesting as waiting times, inconsistent thermal profiles, and excessive energy consumption whenever inter-process synchronization falters.
We present a modern approach utilizing digital scheduling systems to unify these interdependent operations. We introduce a single, integrated process model built around a Mixed-Integer Linear Programming (MILP) core, which is further refined by a robust set of rule-based logic derived from expert operator knowledge and real-time plant data. This system generates a coordinated, executable production plan that ensures all steps from scrap charging to final casting are perfectly aligned.
An additional key capability is dynamic, reactive rescheduling. When unforeseen operational events occur, such as EAF delays, ladle transit variations, or caster disruptions, the system immediately performs a localized re-optimization. Unlike legacy systems that require a full plan rebuild, this approach adjusts only the necessary sequence sections, maintaining overall schedule stability and minimizing disruption to downstream processes.
Results from recent implementations across leading European and American flat-product electric mills illustrate substantial performance gains. These quantifiable improvements translate directly into maximized throughput, reduced operational costs, and higher on-time delivery reliability.
Ultimately, this integrated digital scheduling framework serves as a core pillar for operational excellence in modern electric steelmaking. By linking complex planning logic with plant KPIs and process automation, it empowers planners to evaluate performance scenarios in real-time, driving continuous improvement and accelerating the industry's digital transformation journey.

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