

IBM Global Business Services



Center for Business
Optimization

Excellence in steel manufacturing

IBM Production Design & Operations Scheduling
Solution for Steel



Steel company executives know better than to sit back and wait for the market to determine their fate. Intensifying global consolidation and steeply rising raw material and freight costs keep many of them on edge and evaluating their options. The Chinese steel market has also added to their concerns. While China continues to be a voracious consumer of steel products, steel producers in the country are joining together and quickly becoming fierce competitors to Western and other Asian steel manufacturers.

To cope with this ever-changing landscape, steelmakers are making structural changes to reduce costs and seeking customer loyalty through higher service levels. As part of these efforts, many are looking for ways to drive new levels of efficiency and flexibility within their core processes.

The complexity of production planning and scheduling in the metals industry is greater than in most other industries. More often than not, off-the-shelf solutions designed to help companies perform these functions provide only limited customization and optimization capabilities. As a result, they fall short in fully addressing the production problems steelmakers face.

Now, there's an answer. Over the past decade, IBM has been working with leading steel manufacturers worldwide to develop a solution that applies advanced optimization techniques to achieve major improvements in production design and operations scheduling.

Working with IBM, major steel manufacturers have used the Production Design & Operations Scheduling Solution for Steel to improve production throughput 2–5 percent; reduce inventories 5–40 percent; lower operating costs 2–20 percent; and increase sales revenue 2–15 percent.

The optimal solution

The IBM Production Design & Operations Scheduling Solution for Steel is designed to help steel companies fulfill customer orders in the most efficient and profitable way. The solution fills a critical gap between the company's enterprise resource planning (ERP) system and the plant's real-time production control system by optimizing the daily production process, typically over a seven-day horizon.

The solution considers the order specifications, which may include metallurgical, physical, dimensional and customer business needs, together with available inventories, production constraints and shop floor status, to design the steel slabs or plates and generate detailed production schedules for the entire plant. Six optimization modules compose the solution.

- **Inventory Application.** The inventory application module matches the order book to available inventories across the entire mill in the best possible way, taking into account all applicable order specifications, material attributes and production process constraints. The module considers work-in-process and surplus inventory, which can accumulate from customer cancellations or when manufacturing and quality constraints are not satisfied during the production process. A key feature of the module is its ability to perform multiple order assignments to one or more items of both finished and unfinished inventory. Multiple order assignments allow smaller orders to be applied together to the same item of inventory thereby reducing waste and more efficiently satisfying these orders.

- **Slab Design.** The slab design module helps cut production costs by reducing the number of slabs that need to be produced to fill a given quantity of orders and by reducing the surplus material production that often occurs during steel production. Slab design establishes the width, weight, grade and quality of the slab. The design also has a direct impact on the operations of the casters, especially when caster capacity is a bottleneck. A key feature of the module is its ability to perform multiple order assignments to the same slab.
- **Plate Design.** The plate design module designs composite or mother plates from smaller thick plates, forming a guillotine-feasible design that helps maximize yield and average slab weight and minimizes the number of plates required to fulfill customer orders. The resulting plates are used in applications such as ship building and construction.
- **Melting Shop Scheduling.** The melting shop scheduling module generates optimized production schedules for the melting shop facilities — from the blast furnaces to the continuous casting operations. The module considers applicable production and metallurgical constraints and seeks to guarantee the arrival of hot metal in a sequence that enables the continuous operations of the casters in the most productive way. Optimized melting shop scheduling can increase throughput, reduce inventory and operating costs and provide steel companies with greater flexibility to cope with urgent orders and unexpected disruptions in production.
- **Hot Mill Scheduling.** The hot mill scheduling module generates optimized production schedules for the hot mill facilities, which convert slabs through heating and rolling processes into strip coils of various thicknesses and widths. Coils are typically used in the manufacture of automobiles, home appliances, refrigeration and electrical equipment. The module coordinates the activities of the slab yard, reheating furnaces and hot strip mills, and takes into account direct hot charging, hot charging, warm charging and cold charging operations.
- **Finishing Line Scheduling.** The finishing line scheduling module generates optimized production schedules for the finishing lines, which consist of numerous operations that are selectively applied to meet customers' final specifications for dimension, surface finish, mechanical properties and coating. These operations may include pickling, cold rolling, annealing, tempering and galvanizing. The module seeks to maximize the utilization of resources by ensuring the right levels of inventory are maintained in front of each of the finishing stages, thereby improving overall production throughput and due-date performance.



Each implementation of the solution typically begins with an intensive study by IBM to understand the client's challenges and existing processes. This four-to-six week consulting engagement allows both parties to determine the required process changes, assess value opportunities and generate a business case and implementation approach to maximize return on investment.



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Turning analytics into action

The Production Design & Operations Scheduling Solution is supported by the IBM Center for Business Optimization, which brings together IBM's industry and process expertise, hardware and business performance software, and the company's deep computing and advanced analytics and optimization capabilities to tackle our clients' most difficult business challenges. The center offers solutions in the areas of complex supply chains, marketing investment mix, dynamic pricing and risk management.

Summary of solution benefits by module

	Productivity	Revenue & Market Share	Operating Costs	Inventories
Inventory Application	Better utilization of capacity	Fewer lost sales due to better inventory search	Less handling by considering route compatibility	Less unused weight and waste
Slab Design	Higher average slab weight	Greater flexibility to handle smaller orders	Higher manpower productivity	Reduced slab inventory due to better designs
Plate Design	Fewer plates to fulfill orders	Improved ability to fulfill high-priority orders	Less cutting waste and surplus	Reduced plate inventory due to better designs
Melting Shop Scheduling	Higher caster uptime and hot charging	Faster responsiveness to customer inquiries	Less waste due to grade transitions	Less surplus due to better cast/charge design
Hot Mill Scheduling	Higher hot charging ratio	Higher quality due to less radical gauge and grade changes	Reduced hauling costs from slab yard to hot mill	Reduced WIP due to tighter synchronization
Finishing Line Scheduling	Better production flow due to tighter synchronization	Improved on-time delivery	Greater flexibility to handle unexpected situations	Reduced WIP due to tighter synchronization

For more information

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To learn more about the IBM Production Design & Operations Scheduling Solution for Steel and the IBM Center for Business Optimization, visit:

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