+ Real-time Digital Twins

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Hatch Blast Furnace Digital Twin: Real-time casting guidance model for stable and efficient blast furnace operations

Region: North America
Sector: Metals
Industry: Iron and Steel

The challenge

Blast furnaces are critical assets in integrated iron and steel plants, but their inner states remain difficult to fully comprehend. This lack of visibility and understanding makes it challenging for operators and engineers to interpret the furnace's operating conditions, leading to production, quality, and cost issues, as well as safety and environmental concerns.

Casting is a crucial function for blast furnace's stability and control. Poor casting can lead to slow burden movement, inconsistent quality, and fuel inefficiency. Accumulated liquids can cause back pressure on tuyere raceways, distort gas flow, and pose significant operational risks. Traditional casting methods based on operators' experience are ineffective for monitoring hearth liquid levels in real-time.

The solution

Hatch's Blast Furnace digital twin uses a modified Bernoulli's equation and a mass balance model to provide real-time guidance for casting operations, considering taphole geometry, blast pressure, liquid head, and friction factor assumptions. The digital twin has three main functions: operation monitoring to provide real-time insights on hot metal and slag height in the furnace; scenario analysis to model future scenarios in response to furnace conditions or plan the day's casts; and AI-based model tuning to learn and adjust model parameters based on observed furnace behavior.

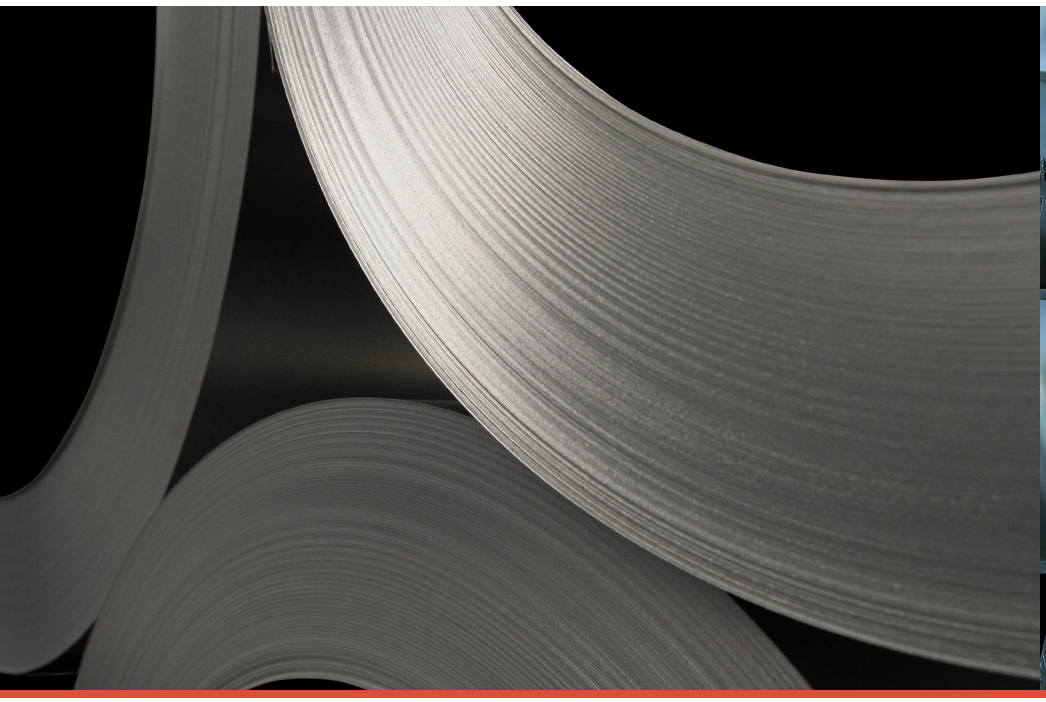
The Hatch Blast Furnace Digital Twin offers several benefits to iron and steel plants. By providing real-time insights and AI-based model tuning, the casting guidance model significantly improves blast furnace operations, reducing the variation in bosh pressure differential, cast duration, casting gap time, and other factors by 10-20%. The model also improves furnace stability, leading to better hot metal quality and reduced unplanned shutdowns and operational risks due to high accumulation of furnace hearth liquid.

Specifications

Product: Hatch Blast Furnace Digital Twin
Applies to: Iron and Steel
Delivery mode: SaaS
Benefits

- Reduced variation in bosh pressure differential, cast duration, casting gap time, etc. by 10-20%
- Improved furnace stable operation and hot metal quality
- Reduced unplanned shutdown and operational risks due to high accumulation of furnace hearth liquid.

Hatch MeltShop 4.0: Unlocked value through optimization for a leading stainless steel manufacturer



Region: North America
Sector: Metals
Industry: Iron and steel

The challenge

Stainless steelmakers strive for a higher use rate of recycled materials to produce low-cost and greener steel with reduced carbon emissions. As a global leader in this industry, our client needed to respond quickly to ever-changing market conditions for raw material availability and demand and make informed, timely decisions.

Sourcing the best and most cost-effective raw material is crucial for the client because the raw material costis more than 80% of the production cost. It is a daunting task to source raw material based on three parameters: pricing, chemical composition, and availability .The client wanted to improve cost efficiency and gain further insight into product's carbon footprint, and the impact of carbon prices on their procurement and production strategies. We helped them develop intelligent analytics that led to a holistic, practical solution.

The solution

Our client implemented Hatch Meltshop 4.0 as a holistic value chain optimization solution. This helped them determine the optimal raw material purchasing costs, the raw material charging and operating conditions of each processing step and the final product portfolio.

The client was able to conduct what-if analyses and compare different optimization strategies, leading to a cost savings of USD$3-10/ton of steel, depending on various market conditions. With Meltshop 4.0, they gained a better understanding of the impact of raw material procurement and production strategies concerning their carbon footprint and could make informed trade-off decisions between production cost and carbon emissions.

Specifications

Product: MeltShop 4.0
Applies to: Steel/Stainless steel manufacturing
Delivery mode: SaaS
Benefits

- Reduce $3-10/ton of steel because of optimum raw material procurement and operation conditions
- Manage handling hundreds ofraw materials and tens of productgrade groups
- Get the optimal solution in a matter of minutes.

Hatch Downstream Planner and Scheduler : Improving efficiency, reducing lead times for a leading steel company in North America

Region: North America
Sector: Metals
Industry: Steel
Solution Area: Analytics and Decision Solutions

The challenge

Our client, a leading steel manufacturer in Canada was grappling with challenges due to an increased demand for customized steel products. As a result, production coordination became more complex.

Inefficiency in production plan created a ripple effect that could be seen in delays, splits to client order fulfillment, frequent transitions, and excess inventories. The combination of these problems created an impact of about 10-15% on throughput efficiency.

Line schedulers worked in silos and did not have complete visibility of upstream or downstream processing lines, which made their production planning hard. In addition to that, meeting production demand and the line's scheduling rules without an integrated, holistic view of production made the whole exercise a tight rope walk.

The solution

Hatch Downstream Planner and Scheduler helped our client calculate planning targets for production and inventory effectively. This generated an optimal coil scheduling and sequencing strategy while considering specific processing rules for production lines and coil characteristics.

Hatch Downstream planner and scheduler used advanced algorithms to equip line schedulers with an easy-to-use tool for day-to-day activities to reduce the width, grade, and gauge transitions. We reduced the impacts of unforeseen events and generated robust plans that incorporate planned maintenance and quick-to-adapt unforeseen downtime.

Contact us to find out more about the Planner and how our flexible solution concepts and technology can extend to other industries.

Specifications

Product: Downstream Planner and Scheduler
Applies to : Steel manufacturing
Delivery mode : SaaS

Benefits

- Reduced grade and gauge transition by 12%
- Reduced order splitting
- Quick response to unforeseen downtime and resilient operations

Hatch Smelter Optimization: Maximize production throughput with a holistic advanced planning and scheduling solution.

Region: Europe
Sector: Metals
Industry: Nickle
Solution Area: Analytics and decisions

The challenge

Our client operates one of the only smelters in Europe with a capacity to produce 310 kilotonnes of nickel yearly. With the surge in demand, our client set an ambitious goal of increasing throughput by 10%, The client also wanted to analyze whether the existing process was adequate to meet those expectations.

Nickel smelting typically involves interconnected continuous smelting furnaces and converters in batch operations. To get optimized nickel recovery and consistent quality, the smelter needs to synchronize the furnace feed rate and tapping schedule with downstream batch processes.

Inefficient planning and scheduling processes, and the use of shared resources for production and maintenance activities, overwhelmed the client's operations, which further impacted throughput and nickel quality.

The solution

The Smelter Optimizer enabled our client to generate shift by shift production schedules down to the minute, therefore providing seamless, agile interaction into operations.

To further drive efficiency and reduce schedule break-ins, the Smelter Optimizer also has two practical features — the production scheduler adjuster, which enabled our client to coordinate both planned and, more importantly, unplanned maintenance events, and the Resource Manager, which enabled our client to use the right skill set at the right time.

The result was an increase in throughput by approximately 11-15% annually.

This solution can also be used to provide evidence-based decision support for CAPEX project planning and scenario analysis.

Specifications

Product: Smelter Optimizer
Applies to: Nickel, Copper, Platinum metals group
Delivery mode: SaaS
Benefits

- Holistic planning and scheduling which delivered
- 5% increase in the feed rate
- 9% yield improvement
- 11% improvement in production batch size

Hatch Autoclave Digital Twin: Improved efficiency and production through real-time insights and enhanced monitoring

Region: Asia Pacific
Sector: Metals
Industry: Gold or Nickel

The challenge

Mining companies face numerous challenges in their day-to-day operations, including the management of large and complex process equipment. As one of the largest gold producers in the world, our client's top priority has been to optimize the productivity of their pressure oxidation autoclaves.

These autoclaves are large vessels used to unlock gold from sulfide refractory ores and are critical components of the gold production process. However, autoclaves operate under aggressive conditions, limiting instrumentation options and equipment availability. With limited real time data, operators aren't equipped to make insightful and proactive operating decisions, and and non-response or ill-response to unmeasured variability often leads to sub-optimal production performance. By using the digital twin to provide real-time information on autoclave performance, operators can make process-optimizing decisions. These decisions cumulatively improve gold production and revenue by tens of millions of dollars annually.

The solution

To address these challenges, Hatch has designed and developed an autoclave digital twin to operationalize Hatch's process know-how in real-time based on its extensive engineering expertise.

The autoclave digital twin provides the operation team with new, real-time insights on key performance indicators that are not directly measurable, such as sulfide mineral oxidation rates in each compartment. It is a highly visual and secure online system that enhances monitoring information with automated notifications and recommendations for early responses to emerging operating issues.

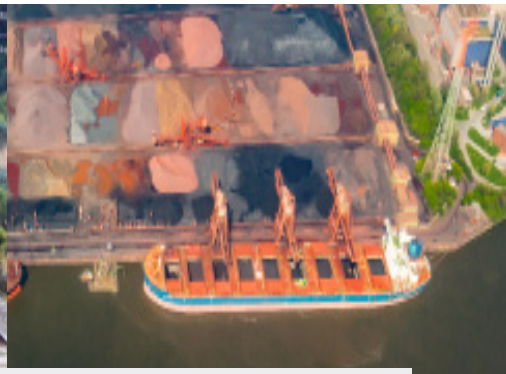
Operators can simulate setpoint changes and optimize their responses to maximize asset productivity. The commercial adoption of the digital twin was justified by increasing gold throughput via gains in operating efficiency—more than 5% improvements in injected high-purity oxygen utilization were observed when the autoclave digital twin was in active use, equivalent to a multi-million dollar boost in production.

Specifications

Product: Autoclave Digital Twin
Applies to: Gold mining and other base metals industry
Delivery mode: SaaS
Benefits

- Improve 5% oxygen utilization, equivalent to a multi-million dollar boost in production
- Provide enhanced online monitoring to track process efficiency and optimize productivity.
- Optimize operators' decisions through simulated scenario analysis.

Unlock the full potential of your assets with the Hatch Mine-to-Market Value Chain Optimization solution.



Region: South Africa
Sector: Mining, bulk materials
Industry: Iron ore
Solution Area: Analytics and decisions

The challenge

As one of the leading global manufacturers of high-grade iron ore, our client's operations span the entire mining value chain: exploration, planning, mining, processing, blending, shipping, and marketing.

Organizations of such a scale often deal with challenges that include siloed planning, limited coordination between cross-functional teams, unavailability of a single source of truth, and an absence of real-time data.

This creates conflicting priorities along the value chain and leads to a spike in operating costs and a lack of readily available data, forcing users to manually extract information from the source and process it for days to determine a course of action.

The solution

Hatch partnered with the client to integrate its Mine-To-Market Value Chain Optimization solution to recalibrate their operating planning model to determine the best product portfolio and minimize operational costs through logistical and quality improvements along the chain.

The solution increased the client's product margin by giving users the flexibility of quick replanning, scenario analysis, and comparison of different optimization strategies. The integration tools allowed planners to get the right data from the right source, generate an optimized plan in minutes, and alert various stakeholders of potential risks along the value chain. In addition, training and support was provided to the cross-functional team to ensure that the defined value was sustained.

The overall benefit derived from blend optimization and improved plan-to-forecast accuracy was identified as USD$49 million, annually.

Specifications

Product: Mine-to-Market Optimization
Applies to: Mining operations

Sustained Benefits:
Overall increase in margins by USD$49 million/annually, driven by:

- Unlocking the blending opportunities along the chain
- Reducing the material handling cost
- Reducing transportation cost

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About Hatch

Whatever our clients envision, our engineers can design and build. With over six decades of business and technical experience in the mining, energy, and infrastructure sectors, we know your business and understand that your challenges are changing rapidly.

We respond quickly with solutions that are smarter, more efficient, and innovative. We draw upon our 10,000 staff with experience in over 150 countries to challenge the status quo and create positive change for our clients, our employees, and the communities we serve.

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