INTELLIGENT OPERATIONS
OPPORTUNITIES IN STEEL MANUFACTURING
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INTRODUCTION
STEEL INDUSTRY RIPE FOR TRANSFORMATION

Buoyed by higher prices and steady demand, the steel industry has shown its grit in the face of strong headwinds that it has experienced in the past five years. Where attention continues to focus on margin control, steel manufacturers are also looking to:

- diversify their production line;
- reduce their carbon dioxide emissions; and
- improve the quality of their products.

For example, World Steel estimates that there are more than 3,500 different grades of steel produced every year, with each grade consisting of different physical, chemical and environmental properties, as well as new recycled steel. While the makeup of the properties determines the grade of steel, the dynamic nature of the properties also impacts the yield, cycle time, energy consumption and CO₂ produced during production. Underpinning the notion that as steel manufacturing continues to innovate, the complexity within the plant exponentially increases.

**With this complexity, answering common questions increasingly comes under the spotlight, such as:**

- How can we reduce operating costs?
- How do we minimize waste?
- How do we increase yield?
- How do we improve quality?
- How do we optimize raw material consumption?
- How do we reduce downtime?

**Along with the more challenging questions:**

- How can we adjust our production mix based on demand and inventory?
- How do we better manage inventory of raw materials, Work in Progress and finished goods?

**3,500+ different grades of steel**

**New steel products contain 37% recycled steel**

**75% of today’s steel grades did not exist 20 years ago**

**Steel use is expected to increase 1.5x by 2050**

Source: World Steel
For decades, steel producers have increasingly connected their plants’ systems, machines and devices, creating millions of lines of data from hundreds of process variables. By 2020, it is anticipated that over 1.7 megabytes of new data will be generated every second, the equivalent of streaming eight Game of Thrones episodes simultaneously each hour. However, even with so much data being generated, it is estimated by Forrester that of all the data generated, as little as just 12 percent is used by industrial companies to aid decision making.

There are many reasons for this:

1. Many operations teams lack the data-driven insights to anticipate, address and control property changes in real time.

2. Siloed facilities may be more advanced in how they utilize data but the interfaces between them are still highly manual.

3. Operations teams have advanced Operational Technology (OT) but Information Technology (IT) is relatively new, with little integration.

These challenges stem from the fact that for many, the volume, velocity and variety of data generated simply overwhelms their analytics systems’ ability to go beyond data collection and deliver actionable insights.

“The volume, velocity and variety of data generated simply overwhelms a toolkit-based analytics systems’ ability to go beyond data collection and deliver actionable insights.”
Leading to three common outcomes:

• Operations teams shy away from data-driven optimization projects because they don’t know where to start and remain in the digital dark ages;

• Operations employ data science teams to manually analyze the data to derive any insights, which can span six to 24 months. After which, ROI on the project has greatly diminished and the results rarely implemented; or

• Operations teams leverage their data by utilizing analytics toolkits. However, toolkits only support decision making for the 'known' assumptions based on operator expertise but do not provide new insights that improve operations.

What is common across all of these approaches is the objective to improve the performance of their assets, processes and engineers but the lack of analytics power to achieve what Canvass Analytics coins: ‘Intelligent Operations’.

This is an industry wide challenge, best depicted by Figure 1, which shows the varying maturity of data capabilities across industrial companies.

FIGURE 1
How mature are the data analytics capabilities in your company?

Source: PWC
Intelligent Operations breaks down the silos between the data of a steel mill’s assets, processes and workforce to create a continuous closed loop that curates raw data, connects intelligence and creates impacts. In an Intelligent Operations environment, it acknowledges that assets, process and the workforce all contribute an important role to a steel mill’s success and therefore creating a ‘sum is greater than the parts’ mentality. It transforms operations from a situation of ‘best case’ performance based on experience and intuition to where they can anticipate and address contributing factors in order to capitalize the top and bottom line. The important glue that transforms this operations floor is an AI-powered predictive analytics platform that pinpoints the parameters and understands how they impact production.

AI is shepherding in a new era where industrial operations can move from situational/post-production awareness to comprehension and prediction. And most importantly – insights come in near real-time so that the appropriate action is taken before production is impacted and operators are empowered to continuously measure and improve their performance.

The impact of Intelligent Operations can be far-reaching, such as:

**Solution Areas**
- Asset optimization
- Predictive maintenance
- Energy usage optimization

**Benefits**
- Increased reliability
- Extended RUL
- Reduced energy costs

**Intelligent Assets**

**Intelligent Processes**
- Anomaly detection
- Process optimization
- Quality/yield optimization

**Intelligent Workforce**
- Executive dashboards
- Operations integration
- Data-driven decision making

**Benefits**
- Improved risk mitigation
- Higher yield for similar conditions
- Improved quality and fewer defects
- Institutionalized knowledge
- Workforce transformation
- Empowered digital workforce
A leading North American steel manufacturer wanted to increase revenues by improving quality and quantity of its steel products produced within their plants. In particular, they wanted to interrogate how they can increase yield, reduce costs and production delays and improve reliability.

Utilizing Canvass’ Outcome-focused Framework, the steel manufacturer initially identified several use cases that spanned their infrastructure, steel making, hot strip mill and cold mill. They ended up focusing on applying Canvass AI to increase production yield and quality for a blast furnace.

**Increasing production yield and quality for a blast furnace**

**Objective**

The customer is looking to consistently optimize the production line by improving the quality and quantity of yield. These are dynamic and complex processes that generate hundreds of data points and the variability is high which leads to challenges in managing consistent quality of production.

By implementing Canvass AI Platform, the manufacturer wanted to:

- Identify the influential parameters that maximize production yield on days with no delays and result in a desired quality.
- Forecast production quality and yield at different time intervals in advance and use these insights to adjust real-time control parameters to maximize production quality and yield.

**Solution**

The Canvass AI Platform defined the relationship between the variables that significantly affect output. The AI models are helping to determine which control variables have a positive or negative impact on production quality by predicting real-time output values at the specified time intervals.

Further, the Canvass AI Platform gives the Control Room Operator the ability to see the predictions via the real-time dashboard to accurately adjust control variables and improve future production quality.
Results

Using the Canvass AI Platform, the customer can now predict future production and control production quality. Further to this, the Control Room Operator can now virtually adjust control variables and see potential changes in real-time on the production process.

As a result of applying AI across various operations in steel manufacturing, the customer has gained a competitive edge in process improvement and production quality that brings about a consistent quality of product and reduces the amount of scrap thus reducing the costs and producing high grade product.

Additional examples of AI use cases in Steel Manufacturing:

- Boiler optimization
- Yield optimization
- Casting optimization
- Asset optimization and predictive maintenance
- Arc furnace (EAF) optimization
- Steam optimization
- Blast furnace optimization
Conclusion

The steel industry is under immense pressure to reinvent itself. However, an important piece of the reinvention puzzle – data – remains underutilized at the steel mill. The first step towards intelligent operations requires real-time analytics power that transforms operational data into actionable intelligence. AI-powered predictive analytics must be at the center of every steel manufacturer’s strategy to take control of their operations and make data-driven decisions that improves their performance, reduces costs and unlocks new revenue streams.

This paper covers just the tip of the iceberg when it comes to the huge potential for steel manufacturers to apply AI into their operations and begin the journey towards intelligent industrial operations. It’s important to note that AI is not an endpoint, but a journey.

And like any journey, you will not see any results unless you commit to starting.
Canvass Analytics is a provider of intelligent industrial operations. The Canvass AI Platform empowers the world’s largest industrial companies with actionable intelligence to improve the performance of their assets, optimize processes and institutionalize the expertise of their workforce.

Developed specifically for the industrial sector’s most complex processes, Canvass’ AI-powered industrial advanced analytics platform empowers industrial operations teams with:

**Clarity** to anticipate and address contributing factors that impact production in order to capitalize the top and bottom line;

**Control** by removing blind spots to improve process reliability, optimize asset performance and maximize yield; and

**Confidence** by making operations more repeatable, scalable and predictable, instilling trust in decision making and inspiring confidence in the workforce.

The Canvass AI Platform distills the millions of data points being generated by industrial processes and machines, sensors and operations systems in order to create key predictive insights. Once collected, the Canvass AI Platform identifies patterns and correlations hidden deep within industrial data to create new insights. These self-learning models adapt to new conditions and data points in real-time ensuring that decisions by operations teams are made with the most accurate data possible.

Across the globe, Fortune 500 industrial companies in the manufacturing and oil and gas industries are implementing Canvass AI to improve key business metrics, such as energy costs, production yield and greenhouse gas emissions, 12x faster than other platforms in the market without the need for deep technical skills or expensive and lengthy consulting projects.

For more information about Canvass AI and to get started on implementing AI into your steel operations, please contact:

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References: 1. Artificial Intelligence in Manufacturing Market, MarketStudyReport.com, 2019
Cover photo: worldsteel/Robert Kolykhalov, Footer photo: worldsteel/Gregor Schlager