

DIGITAL TRANSFORMATION IN MINERAL PROCESSING

The mining industry is undergoing a transformation. Margins are being squeezed as mines advance deeper, face more challenging geologies, and adapt to societal pressures. In order to remain competitive, innovative miners are leveraging digital technologies to improve recoveries, increase throughput, and reduce energy consumption.

Approximately 75% of the world's mine site operations are under some form of process control. A survey by the Carbon Trust has shown, moreover, that 60% of control loops perform poorly.

Digital technologies, such as advanced analytics, provide a powerful set of tools to improve and optimize process control within beneficiation plants. According to the global management consultancy McKinsey, advanced analytics have the potential to "raise mineral recovery by 1 to 3 percent and increase throughput by 4 to 8 percent, while reducing energy consumption".



Part of this opportunity stems from the fact that many plant operators lack an optimized control methodology to help them select appropriate process setpoints. These operators rely solely on their years of experience, and on their gut-feel, to make control decisions. Their decisions are based on a loose approximation of the intricacies of the process. The result is suboptimal performance, and increased day-to-day variance in the plant's metrics.

While theoretically possible, the exercise of optimising a beneficiation process based on an accurate and complex mathematical model is expensive and time-consuming - if not impracticable. It requires a team of domain specialists to painstakingly model the intricate relationships between process parameters and output metrics. Many of the second- and third-order interdependencies involved, would, in all likelihood, not be documented in the scientific literature.

The field of advanced analytics has opened up effective alternative methods of process optimization that unlock the potential of historical process data. These include expert systems, which yield insights from snapshots of historical data, as well as the more recent and sophisticated Expert Execution Systems (EES), which inductively discover the complex relationships between process parameters and plant metrics in order to generate prescriptive remedial actions.

The older expert system is a form of advanced analytics that, for years, has assisted plant operators by inferring improved control decisions from historical plant data. While Expert Systems have yielded significant efficiencies over the years, in industries that range from manufacturing to mining, they also have important limitations.

In particular, expert systems sought to provide operators with inputs that had been predetermined from a set of observable prior conditions. These were inherently analytically modelled from a set of first-order equations reflecting the state of knowledge about the system at the time. Even when these systems were augmented with some learnt decision logic, they remained inflexible around the domain of the observed science. Some expert systems took incredibly long to compile, as the underlying models were excessively complex. Accurate, dynamic, analytical expressions were absent for many of the processes. Meanwhile, engineers needed time to interpret the expert system's results, adding to their inability to keep up with changing plant dynamics.

EXPERT EXECUTION SYSTEMS

The Expert Execution System (EES) overcomes the limitations of classical expert systems in two important ways. First, an EES harnesses advanced machine learning algorithms to extract a deeper and more holistic model of the industrial process in a short space of time. Second, the EES leverages this model through an intelligent interface that delivers prescriptive remedial actions to the plant operator, thereby optimising the process ahead of real-time.

AWARD-WINNING TECHNOLOGY

DataProphet PRESCRIBE is an award-winning Expert Execution System (EES) that enables beneficiation plants to improve plant metrics through advanced, real-time prescriptions.



2020 AI 100
Most Innovative
Startups

THE
WORLD
ECONOMIC FORUM

2019 Technology
Pioneer

The Alconics

2019 Winner of
Best Innovation in
Deep Learning

Mercedes-Benz

Winner of SA
Innovation
Challenge

AFRICARENA

Winner of AfricArena
Vinci Energies
Challenge

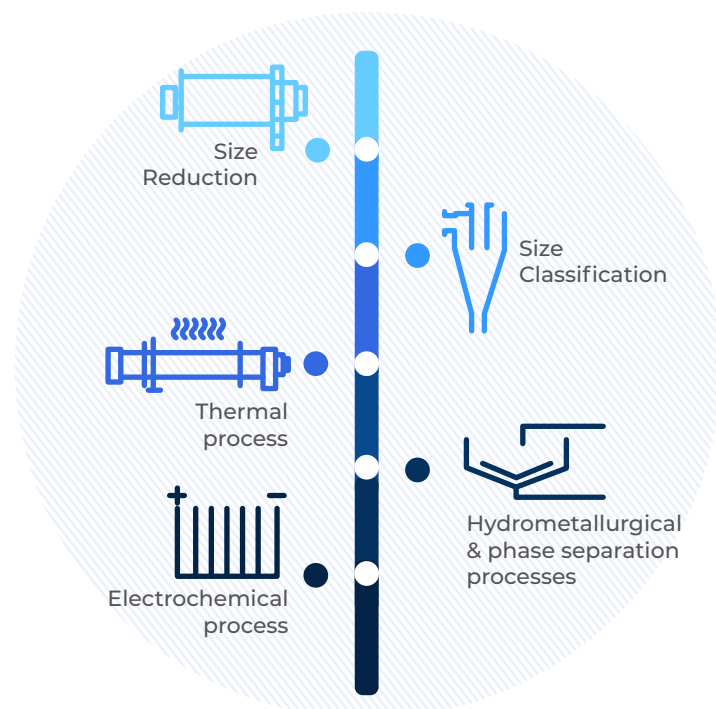
DATAPROPHET PRESCRIBE CASE STUDY

The mineral processing plant experienced uncontrolled variability in its product quality metrics and was looking to stabilize production within a more optimal state. The circuit included mechanical, thermal, hydrometallurgical and electrochemical processes.

DataProphet worked with metallurgists, engineers, operators and IT/OT stakeholders to identify relevant data to train our DataProphet PRESCRIBE machine learning model with. More than 1,000 parameters were considered. Through deep learning, DataProphet PRESCRIBE provided the optimum values for the operating parameters. A dashboard showed customized views for operators, engineers and management across the plant.

Operators are provided with continuous prescriptions to shift their process towards an optimized operating paradigm in order to achieve their production goals.

The customer embraced DataProphet PRESCRIBE as a strategic initiative to govern and motivate further 4.0 projects.



DATAPROPHET OVERVIEW

Founded in 2014, DataProphet pioneered the use of deep learning techniques to reduce defects in the foundry industry. DataProphet has built upon this early success and today is a global leader in optimizing complex processing plants. As recognized by the World Economic Forum, DataProphet helps customers around the world to reduce defects, increase recoveries and improve throughput.

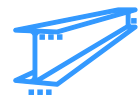
INDUSTRIES



Foundries



Automotive

Mineral
Processing

Long Steel



General Manufacturing

“What makes digital technology so exciting is that, unlike conventional mining technology, it enables mining companies to look beyond their own industries for solutions that have already been successfully incorporated in the business and industrial sectors”

— Alex Fenn, Head of Technology and Innovation, Sibanye-Stillwater

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