



Need for IT/OT
integration in mining
to power innovation

mining



Organizations continue to invest in core technologies to mitigate the challenges they face. These challenges include depleting grades of ore bodies impacting multifactor productivity, remoteness of new deposits with the lack of infrastructure and skills at the site, deeper underground mining that increases safety risks, etc. An ecosystem of suppliers and research institutions have been working at mitigating many of these challenges by applying innovation and technologies such as sensors, autonomous operations, drones and UAVs, mining simulators, etc.

Most of these technology innovations affect field level controls. There needs to be corresponding innovation in Production Process Operating Controls, Operation Management Level Controls and Planning, Recording and Analysis Level Control to reap the full benefits of the new technologies being leveraged. This is where IT/OT integration can play a key role.

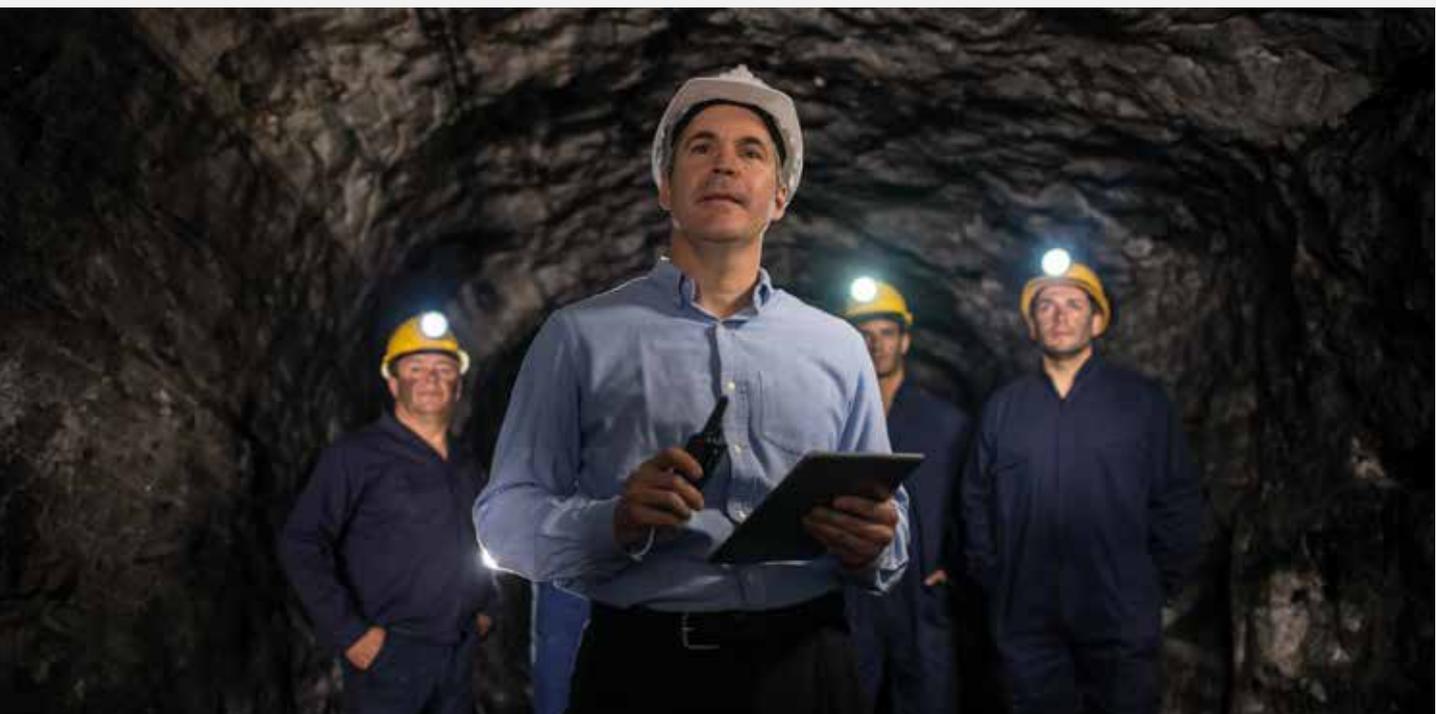
This paper explores how IT/OT integration can help reap the full benefits of a close feedback loop (the analysis level control) through innovations, improve productivity and reduce costs.

Introduction

The mining industry has had a fair share of innovations across field level and operations management controls in the last couple of decades. We've seen the emergence of autonomous haulage systems, airborne surveys, larger sized trucks (400 tons), online analyzers and collision detection systems during the boom in mining after World War II.

But innovation has begun to slow down in the industry. A study conducted by BAE research for Rio Tinto shows that there has been a consistent decline of multifactor productivity. Deeper deposits have been the largest contributing factor. Stripping ratios (moving a higher volume of waste tons due to deeper open pits) and the rising level of impurities (lower grades) have led to greater milling/processing costs.

There is an urgent need for innovating in operations management and analysis controls. Data from field level controls – which by themselves are incremental innovations – can lead to steep change for a mining organization when they are integrated with IT.



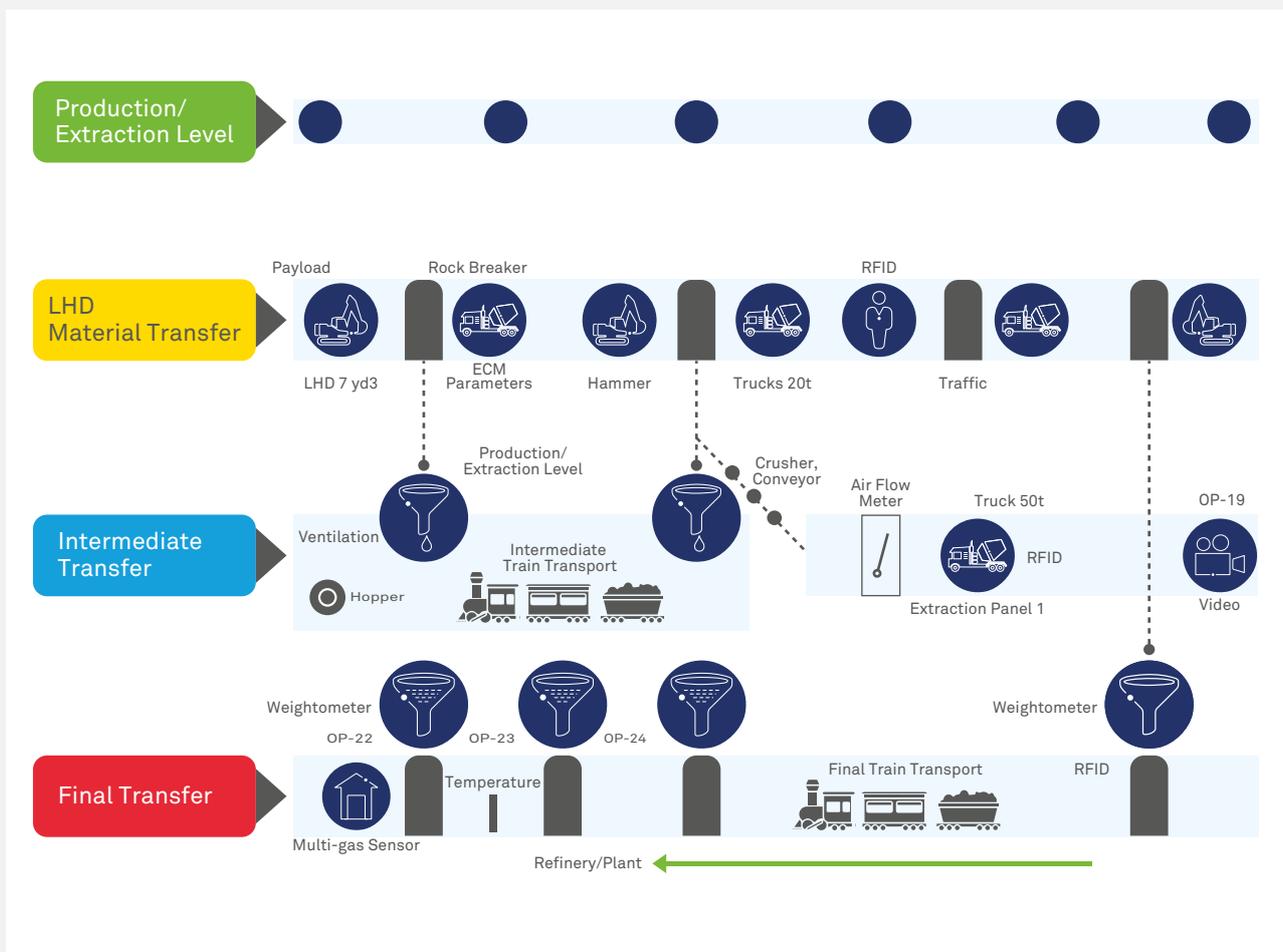


While data from field level controls in itself has incremental utility, with IT integration can lead to exponential change for a mining organization.

Field level control innovations

Let us look at the range of innovations in an

automated underground mine as depicted by the diagram below.



The diagram shows a number of sensors that can be put to play, which continuously will sense equipment operating conditions, trip cycle events and mine environments using a Wireless Mesh Network. These sensors and systems can manage a wide array of mining requirements:

- Payload sensors embedded in LHDs (Load Haul Devices) stream data for material tons being loaded
- Remote rock-breakers operated from a command center lead to higher levels of safety
- Environmental sensors continuously monitor air quality levels
- RFID technology captures supply chain events, such as time for unloading
- Ventilation on demand regulates air supply and provides data from the bearings on temperature, etc.
- Engine parameters from vehicles provide insight into the condition of the mobile fleet
- Crushers and conveyor systems are connected

with SCADA and offer the ability to monitor equipment and process health

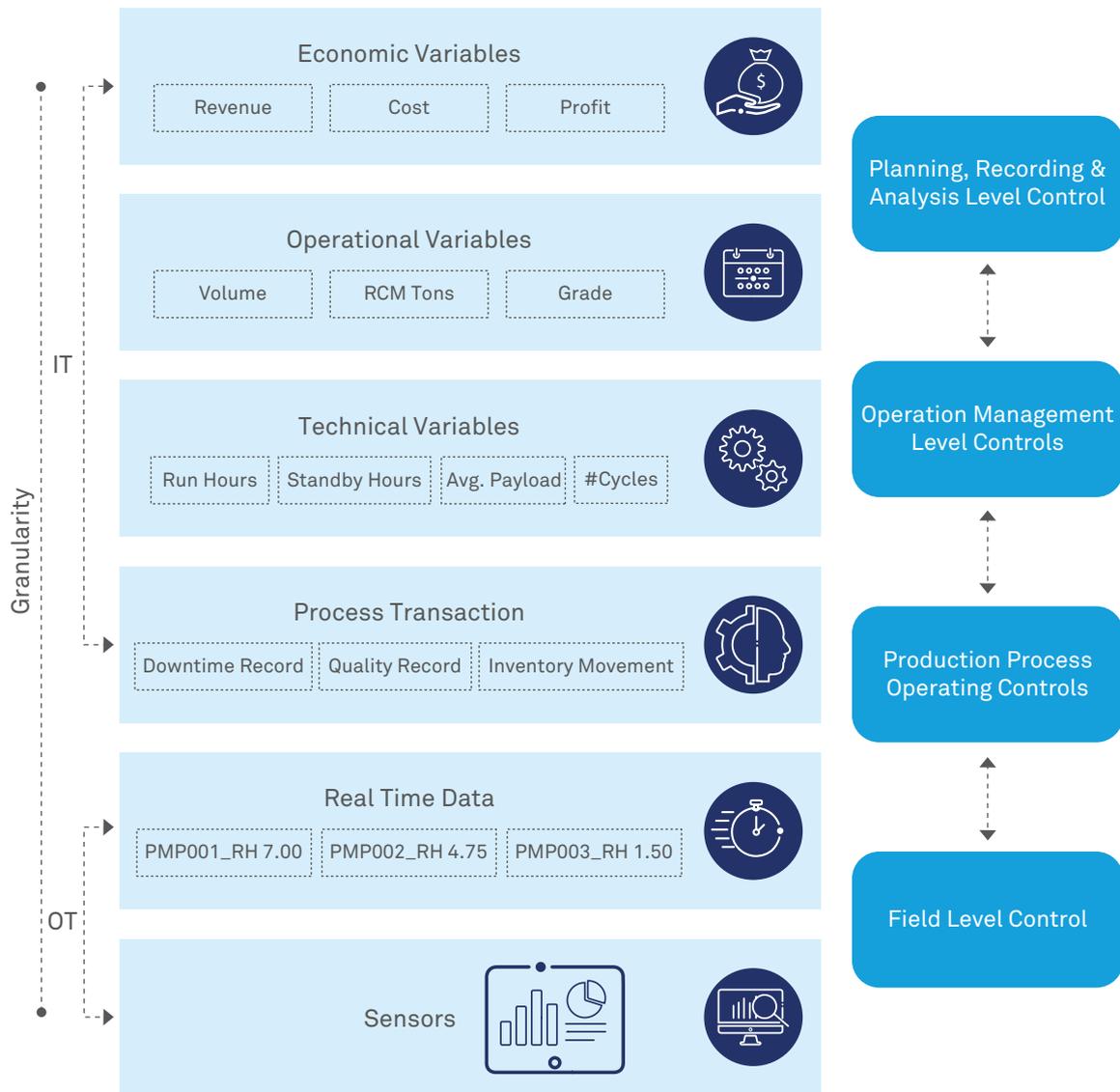
- Sensors used at a particular ore pass alerts the control room of blockage to shift production for using a different ore pass
- Rail SCADA provides fault diagnostic events and cycle times for rail movement of ore

IT/OT integration perspective

These innovations offer incremental improvements to a mining organization. They also create a wealth of data. But they don't necessarily translate into big ticket cost reductions by themselves. But, when the data is used at a Planning, Analysis and Control level to increase operations visibility, profitability improves by several magnitudes.

As depicted below, sensors provide the raw data that is historized into a data archive and translated into process transactions. As an example, a trip cycle from an ore drawpoint to a crusher generates an inventory record of mine production at the extraction level.





Integration benefits

At a shift control level, this implies the ability to record downtime events and trigger condition monitoring alerts. Aggregated records provide the drivers that influence mining output. These can include the ore volumes moved and tons mined. When combined with economic parameters such as commodity price, the system provides critical revenue side information to gauge profitability.

Likewise, the cost side of the equation is derived

from several variables such as the number of cycles for mobile fleets, effective operating time, fuel consumption and costs from Enterprise Resource Planning that captures fuel consumption, labor hours, etc.

The business gains come from the ability to rapidly assimilate data from OT into models that drive optimization for short term production planning, aid sensitivity analysis of parameters that influence economic output, causal analysis of variables that influence productionⁱ or dynamic capacity balancingⁱⁱ.

Such modelling technologies provide exponential benefits with the growth in data inputs. With effective IT/OT integration, access to data fuels innovation within the organization. For example, in a recent engagement, a production focused model with data integration from OT delivered an improvement of 1 rail rake per day. In real terms, this translated into a 10% improvement in output.

Conclusion

The innovation journey for a mining organization is incomplete without a robust IT/OT integration

program. Current technology makes it possible to integrate IT and OT and consolidate data in a single instance, enabling organizations to explore the data for improvement, efficiency and innovation.

Achieving a significantly high return is not difficult. This is more so because mining organizations are already making large investments in smart infrastructure. On the IT side, the investments now required are minimal, making this the ideal time to roll out IT/OT integration initiatives.

ⁱ For example, the degree of influence of fill factor of a particular model of trucks in a shift

ⁱⁱ For example, to understand the bottleneck between fleet, ore passes and rail

About the author

Sudip Chaudhuri

Head of Mining Practice for Energy, Natural Resources and Utilities Business Unit, Wipro.

With over 17 years of varied information technology experience in mining and mineral processing, Sudip has worked with numerous clients in the mining and minerals industry on transformational and advisory assignments and designing end to end programs . With deep

domain experience across the mining supply chain and execution he has been able to effectively apply new technologies to bring about improvement in productivity and safety in the mining context. He can be reached at sudip.chaudhuri@wipro.com



Wipro Limited

Doddakannelli, Sarjapur Road,
Bangalore-560 035,
India

Tel: +91 (80) 2844 0011

Fax: +91 (80) 2844 0256

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please write to us at
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