Digitizing mining through short interval control

An introduction to the challenges

With a great deal of focus on productivity, many miners have started to look at adopting short interval control philosophies into their mining operations. Short interval control implies a review of inter-shift performance; this by itself is not a new term to miners, but only recently digital technologies are enabling miners to have a relook, to define it holistically considering the large volumes of data that is available for driving insight. A simplistic approach would find a detailed scheduling with a visual work management feedback approach as the opportunity, but there is much more to it than just a focus on aspects of reviewing the production process and real-time process visibility.

Short interval control can be defined as a structured process for identifying and acting on opportunities to improve the effectiveness moreover, the efficiency of production[1]. It is a factory-floor process for driving production improvements during the shift. Each shift is split into short intervals of time (four hours initially), within which plant-floor employees use data to identify and implement improvement actions.[2]

Mining industry has had a laser sharp focus on improving utilization. With emergence of autonomous haulage systems, autonomous drills, driverless trains, online analyzers, field mobile devices for data acquisition there is a lot more data available within the shift today.

There also exists many sites with a minimal level of automation; hence there are questions that need to be answered to define Short Interval Control in today's context. Some of the issues we hear are:

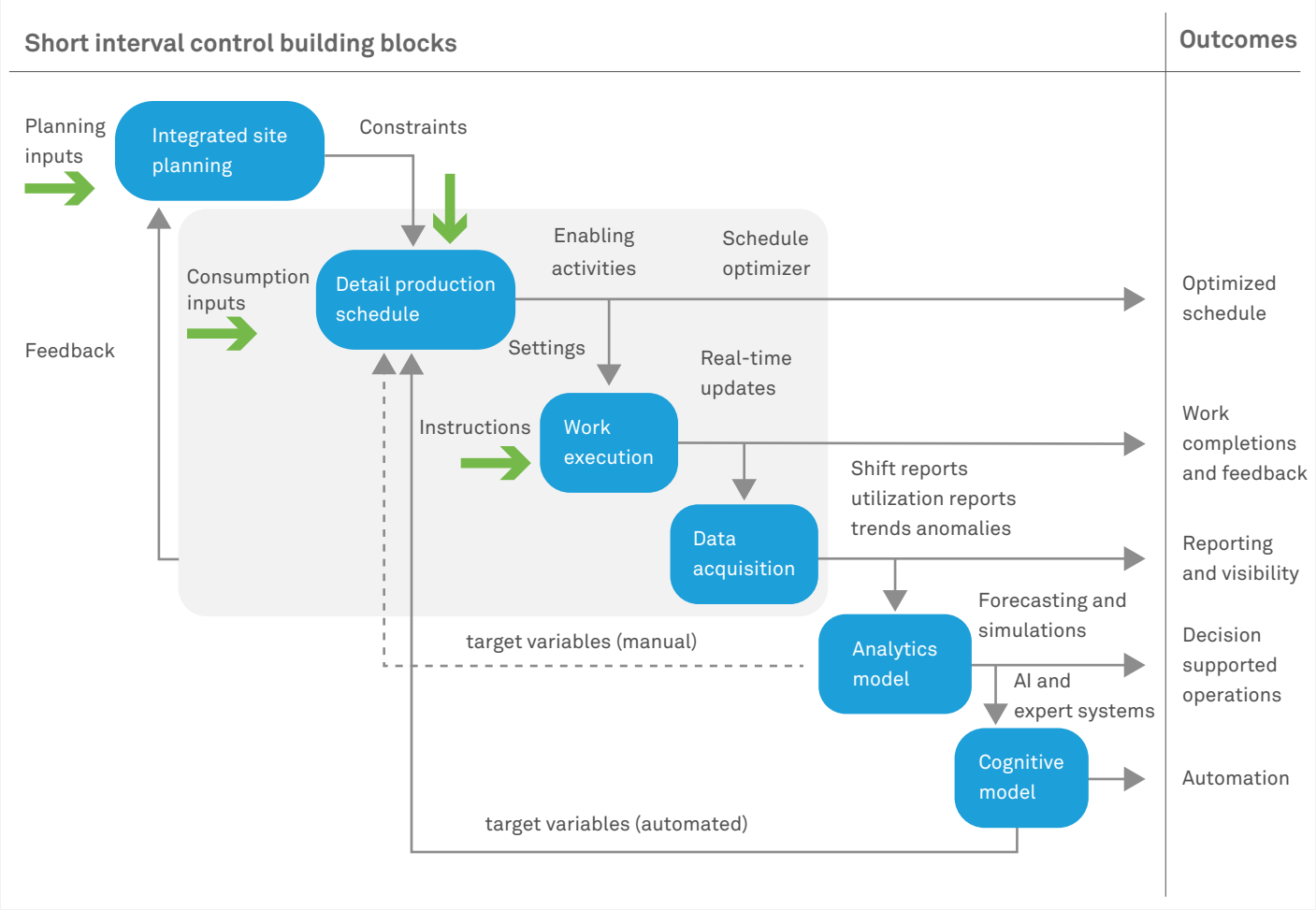
- In the past, we would have to wait until the end of the shift to generate a production report, but we now have much information available in real-time on the shift. How can I use this data smartly and intelligently?
- The level of automation may vary across the different operations. Is there an approach that can take recognition of this operating context?
- Is this a one-off project with purely a systems approach? To what extent is a culture change needed in work practices?
- We already have real-time fleet visibility and detailed scheduling as well as a control room environment. Haven't we already established a level of short interval control?

All the above are relevant questions to consider within the operating context hence a framework to encompass these becomes a necessity.

[1] leanproduction.com
[2] perfectproduction.com

Short interval control building blocks

Hence let us look at what components a short interval control may include as depicted in the diagram below



Integrated site planning

First and foremost is an integrated plan approach. This function is needed to amalgamate multiple plans from construction, maintenance, short-term mine plans, mine development plans to visualize a single plan of the work for the site.

Detailed production scheduling

Once the plan has been optimized the Integrated planning system hands-off the plan for detailed scheduling. The detailed scheduling component looks at resource (equipment), workforce level granularity, optimizes resource conflicts, material availability, schedules enabling and preceding activities and dispatches instructions in the form of digitized messages to execution systems or work instructions to mobile tablets.

Work execution & data acquisition

The work execution function and data acquisition components include sub-components of real-time visibility (which has been achieved in many mining sites) but essentially drives the equipment and the people to execute the detailed schedule. The data is acquired via automation where it exists or smart tablets which allows operators to enter work completions and reflect status with intelligent graphics overlays on the detailed schedule and work plan providing the ability to visualize schedule adherence.

Analytics model

The above step does provide a level of visibility and clear view regarding reporting metrics and visualizing status, but the analytics model can translate that into a predictive and prescriptive view. For example, a sensitivity analysis of activities and delays in real time that provides the levers that the operation can optimize. You may not be able to send a partially loaded truck back to the bench, but you can appreciate whether fill factors are affecting the variance to plan in a predictive view.

Cognitive model

Artificial intelligence has a future role to play and should form part of the roadmap for every short interval control approach. Instead of human decision making using the analytics model the cognitive model learns the decisions from the analytics model does and thus creates an expert system. For example, the cognitive model could 'soft sense' the quality data based on planned grades and online analyzers and size data from imagery and fine tune the processing circuit to optimize recovery instead of an operator making that decision based on heuristical knowledge.

In summary

Short Interval control directly impacts the critical value levers that can drive the profitability of a mine and lower the cost curve. Its success depends on a robust framework built upon design thinking and an agile digital delivery approach.

About the author

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Heads the Mining Practice in Wipro and leads a team of domain and technology professionals working in the areas of Mining Process Optimization. Over a period of 19 years, Sudip has had extensive experience in applying IT for mining and mineral processing industries across roles of go-to-market, conceptualization, solution design, delivery and project management of complex programs.

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