Technical Article-12

Digital Interventions for Safe Mining Operations

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Abstract:
In pursuit of driving the vision of Better Every day, JSW thrives to continuously innovate to cope with the fast-pacing world and transform its business operation safer through digital interventions. To drive Digital Transformation, JSW has laid down a roadmap to leverage digital across the mining value chain to achieve its business objectives, improve operational efficiency, safe mining operations, reducing operational related injuries & fatalities, curtailing man machine interactions.

1. INTRODUCTION

The Mines & Metal industry is developing at very fast pace, the demand of the raw materials & end products is like never before. To suffice the need of increasing market demand at competitive price, the industry needs to innovate and transform its production & business strategy to improve operational efficiency at reduced cost. To drive the revolution and to be future ready, the organizations need to leverage the potential of Digital across the mining value chain to enable achievement of Business objective at improve efficiency and reduced cost and ultimately to remain competitive in the market.

1.1 JSW IN BRIEF

JSW's journey began in 1982 with the first steel plant at Vasind, near Mumbai. Since then, JSW has been expanding to become India's leading integrated steel company with a capacity of 28 MTPA and a target of achieving 37.5 MTPA by FY25. To accommodate the business, JSW is operating 14 Manufacturing facilities and 13 Iron ore mines in India.

JSW Steel Ltd. started its Mining operation in Odisha in July 2020 by acquiring 4 Iron Ore mines (i.e., Jajang, Gonua, Nuagaon, and Narayanposhi) with a combined EC capacity of 25.6 MTPA, and it gradually increased to 27.99 MTPA. JSW Steel Odisha mines division aims to expand the EC capacity to
35.79 MTPA by 2030.

Along with Mines, JSW's ongoing projects in Odisha include 30 MTPA Central Processing Unit (CPU – Screening & Crushing) and 30 MTPA Beneficiation plant to enrich the iron ores excavated from mines. To reduce the on-road burden and to optimize the logistic activity, JSW is setting up a 30 MTPA mineral grinding unit and a 300 Km Slurry Pipeline of 30 MTPA from Nuagaon to Paradeep, Jagatsinghput, Odisha. With 300 Km length and 850 mm diameter, it will be India's longest and the world's largest slurry pipeline. JSW has also proposed setting up a 12.5 MTPA Integrated Steel Plant at Paradeep to enhance the steel production capacity further.

1. JSW DIGITALIZATION JOURNEY

Every challenge is an opportunity to innovate and make the process more efficient and effective. Considering the Digital trends and their implications on the mining business, JSW intends to leverage digital across the mining value chain to achieve its business objectives, improve operational efficiency, reduce costs, and streamline operations.

JSW Steel has laid a road map for digital interventions as of the journey to “Digital Transformation” to create intelligent mines using IOT, RPA, AI, ML, etc. As of now, the Digital Logistic Management System, Track & Trace, fleet and fuel management, security & surveillance, and safety & compliance management system are underway. The aim is to utilize the innovations in digital to make operations more flexible, transparent, agile, and responsive to the ever-changing market dynamics.

JSW regularly carries out continuous improvement programs and does operational studies to identify the bottlenecks in existing processes. Then a comprehensive study is conducted to understand the functional requirements to mitigate the challenges. The aim is to intervene digitalization into the process, such as automating it and making it more efficient & cost-effective. Digital interventions enable data collection to do real-time monitoring & use it analytically and statistically to improvise the process further, thus improvising the operation recursively and continuously in the long run.

JSW, in collaboration with Govt. of Odisha, has done the POC and implemented a digitalized stack verification process, allowing 20K t stacks to be verified in one go while ensuring the authenticity and transparency of the process.

In collaboration with the Ministry of Railways, JSW integrates its Digital Logistic Management System (DLMS) with the Freight Operation Information System (FOIS) for real-time monitoring of dispatching rakes and to ensure digital accounting of every transaction.

Various automated reports are being generated, such as hourly dispatch reports, permit reports, transporter reports, siding reports, quantity & quality reports, etc.

1.1 DIGITALIZATION PROJECTS

In the first phase of the Digitalization wave, JSW has identified and is working on the following Projects–

- Digital Logistic Management System (DLMS)
- Track & Trace
- Fuel Management System
- Fleet Management & Vehicle Health Monitoring System
- Smart Safety, Security & Surveillance system
- Drone Management System

2.1.1 DIGITAL LOGISTIC MANAGEMENT SYSTEM (DLMS)

To optimize end-to-end logistic operation, JSW has implemented DLMS to integrate pit-to-port-to-plant logistic operations. In the backend, the DLMS is integrated with i3MS, FOIS & SAP to make the process automated, validated, and more efficient. Various critical touchpoints such as weighbridges and Mines entry/exit gates are automated using IOT devices to reduce the in-mine TAT of dispatch trucks. A transporter management module is commissioned to generate digital DO in validation with i3ms, thus ensuring authorized mines entry through RFID validation. DLMS is integrated with FOIS to optimize rail dispatch by real-time monitoring of dispatching rakes and digital accounting of every transaction.

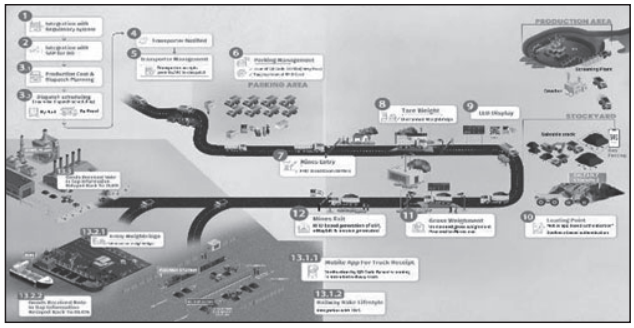

Figure 2: End to End Digitalized logistic process flow

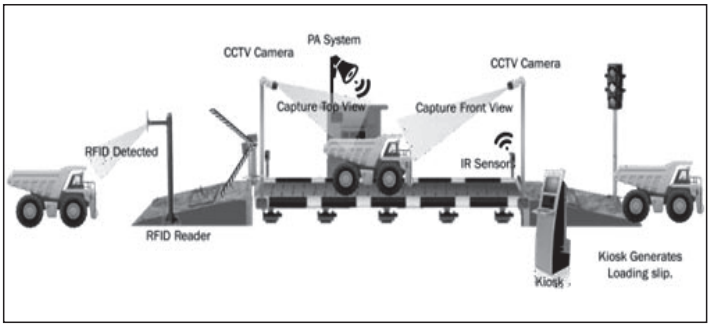

Figure 3: Automated Weighbridge component

A web-based dashboard is developed to visualize the e2e logistic operation in real time. The KPI dashboard enables users to monitor relevant KPIs in real-time and improvise the operations if needed.

This project has helped JSW to reduce the in-mine TAT of dispatch trucks by more than 50% and make logistic process free from human errors.

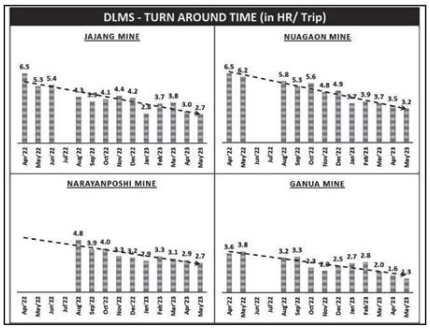

Figure 4: In-mine TAT reduction trend

2.1.1 TRACK & TRACE

This enables tracking the real-time material movement through dispatch trucks and ensures on-time delivery & reduced pilferage. For live location tracking, each truck is fitted with GPS devices and is tagged to a particular geo-fenced route depending upon its source and destination. Once the truck gets diverted from its designated geo-fenced route, a real-time alert is generated on the live dashboards. Depending upon the events, the system can generate route deviation alerts, over-speeding alerts, over-halting alerts, delayed alerts, etc. The project's highlight is to get notified of an unwanted event to ensure on-time delivery and control pilferage while enroute.

The KPI dashboards generate automated reports such as permit-wise dispatch reports, alerts reports, transporter & driver performance reports, etc.

Figure 5: Track & Trace dashboard for real-time dispatch truck monitoring