MINING INDUSTRY OCCUPATIONAL SAFETY & HEALTH

MINERALS COUNCIL SOUTH AFRICA

CONTINUOUS REAL TIME MONITORING (CRTM) OF DUST ENGINEERING CONTROLS

SERITI KHUTALA COLLIERY

CASE STUDY

FULL DESCRIPTION OF THE RISK ADDRESSED:

Khutala Colliery is one of Seriti Resources underground mining operations which is located about 7km south of Ogies town in the Mpumalanga province. The mine produces 4 Seam using bord and pillar mining method which it supplies to Eskom's Kendal Power Station.

The risk of occupational lung diseases [OLD] within the South African Coal Mining Sector remains a challenge. The sector continues to report a high number of employees who are exposed to respirable coal dust levels that are above the regulated occupational exposure limit [OEL] of 2.0mg/m^3 (now recently amended to 1.5mg/m^3).

According to the Mine Health and Safety report [MHSI 2022_2023], a total of 7% of employees in the coal mining industry are exposed to airborne pollutant levels that are above the standard occupational exposure limit. Data sourced from the current Minerals Council South Africa Occupational Health Milestone reporting portal [HealthSource] indicates that the respirable coal dust target of 1.5mg/m^3, which was agreed upon by Tripartite Stakeholders in 2014 was not achieved.

As the coal mining industry continues to intensify efforts focused on reducing employee coal dust exposure by targeting dust generation at source, continuous real time monitoring of dust levels to measure the performance of dust engineering controls has been identified as one of the leading practices to mitigate the risk of exposure.

Continuous real-time monitoring [CRTM] of airborne pollutants engineering controls is not a primary engineering control but rather a system that monitors and communicates the performance of dust engineering controls in real time. The system enables operations to proactively manage dust by taking immediate actions upon failure of dust engineering controls. Khutala Colliery adopted the CRTM Leading Practice to help them monitor the effectiveness of the following dust controls i.e., travelling roads dust suppression, belt transfer points water sprays, ventilation, and CM dust suppression systems [scrubber fans and water sprays].

OVERVIEW

A **Mining Company**: Seriti Resources

B **Commodity:** Coal

C **Health and Safety Case Study:** Application of the MOSH Continuous Real-Time Monitoring [CRTM] of Airborne Pollutants Engineering Controls

D **Operation/Mine:** Khutala Colliery

E **Number of employees affected:** About 1800

F **Stakeholders Consulted:** Mining, Engineering, VOHE, Training and SHE Committee

G **Occupations affected/benefited:** Belt Attendants, all Inbye employees i.e., Miner, Operators and Engineering personnel.

FINDINGS AND LESSONS LEARNED FROM THE IMPLEMENTATION OF CRTM LEADING PRACTICE

Khutala Colliery attempted to introduce continuous real-time monitoring at their operation prior to signing up for MOSH Adoption. However, their effort was unfortunately unsuccessful due to the lack of collaboration and employee involvement. The team then engaged with the MOSH Dust team and signed up for MOSH CRTM Leading Practice adoption in the latter part of year 2021.

Some of the key factors to successful adoption, effectiveness, and sustainability of the leading practice at the operation was the approach taken in the appointment of the Mine Adoption Team by the Mine Manager, MOSH leading practice adoption accountability at mine level, leadership buy-in, involvement of key stakeholders and continuous technology improvements.

The Mine Adoption Team was a multi-disciplinary team comprised of the relevant disciplines such as Mining, Engineering, Instrumentation, Training and the VOHE department. The Adoption Champion is a Section Engineer who is passionate about driving this project. Leadership ensured that MOSH adoption progress is tracked and reported at an operation level on a weekly basis, this was achieved by incorporating MOSH communication into the Health and Safety Committee meeting. Each Mine Adoption Team member had a task/s as outlined in the project plan and would give progress update at this forum.

The involvement of key stakeholders from the onset is critical and the team understood this well following previous failed attempts. All employees affected by CRTM Leading Practice were identified and these included Belt Attendants, Continuous Miner [CM] Operators, Shuttle Car Operators, and Inbye Engineering/Instrumentation personnel. The training of key personnel affected by the CRTM Leading Practice was designed, executed, and incorporated into the training lesson plans.

The Khutala Colliery team continues to work with the Original Equipment Manufacturer [OEM] of the CRTM dust monitors to develop monitors which are suitable for the operations' specifications, at the time of MOSH adoption close-out the team was using version three of the initial dust monitor. The introduction of the feeder breaker interlock was also not an overnight success; the team had to collect and analyse sufficient data before arriving at the set limits for cut off.

REAL TIME MONITORING APPLICATION AND DATA REPORTING

The approach taken by the Khutala Colliery team was to install dust monitors at the intake and return of each underground production section to continuously monitor the levels of dust in the intake ventilating air to the section and the levels of dust generated by activities inside the production section, measured at the return of the section. The team is therefore able to measure the performance of dust controls at the intake of individual sections i.e., effectiveness of intake travelling way water suppression, Conveyor Belt Automated Transfer Point Dust Suppression System [CBAT] and dust controls inside the section i.e., Water Sprays, Scrubber Fan, Ventilation, condition of Picks & Sleeves etc. Refer to Figure 1 and 2 below.

Data from the CRTM dust monitors is linked to the supervisory control and data acquisition [SCADA] system and communicated to the Control Room and the various key stakeholders responsible for dust management [i.e., VOHE, Engineering and Mining personnel]. The CRTM dust monitors are also equipped with a visual display, audio and visual alarm which are aligned with the operation's set limits for dust. This warns employees of a hazardous environment and enables them to respond to dust control failures swiftly.

Integration of the CRTM system to activate additional dust engineering controls allows for further mitigation of the dust risk in that no production can continue if dust levels are above the set limit. Khutala Colliery has interlocked their continuous real time monitoring system [CRTM] with the feeder breaker/section conveyor belt to stop production when dust concentrations are above 1.0mg/m$^{3.}$

PRIMARY FUNCTION: UNHEALTHY STATIC DUST WE STOP PRODUCTION

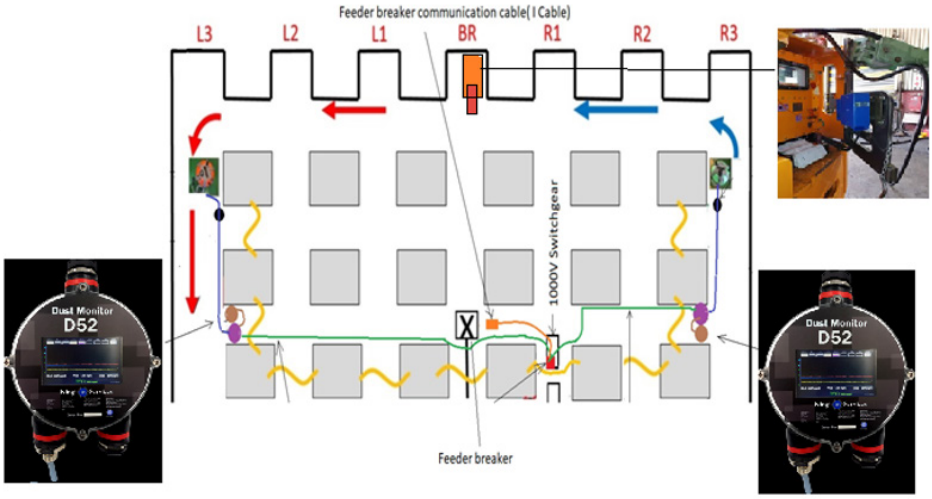

Figure 2: Seriti Khuthala Colliery Section Layout indicating the position of CRTM Dust Sensors in the Section. *Source: Seriti Khutala Colliery*

Figure 1: Seriti Khutala Colliery Section Overview indicating the location of dust sensors installed at KSA Shaft as part of the CRTM System. *Source: Seriti Khutala Colliery*

OBSERVED LEADING PRACTICE ADOPTION BENEFITS

Data from the CRTM dust monitors is integrated with the Continuous Miner [CM] operating status data to generate a shift report which details the dust levels/trends for each shift in line with the operating status of the CM as indicated in Figure 3. All key personnel in VOHE, Engineering and Mining department have access to the CRTM Integrated Shift report, and this has allowed the team to conduct proper investigations of dust over exposures, identifying the correct root causes of dust thus enabling the team to implement controls to prevent re-occurrences.

The total number of employees who are overexposed to dust has also decreased significantly following adoption of CRTM Leading Practice. Khutala Colliery reported a total of 54 respirable coal dust overexposures to the milestone target of 1.5mg/m^3 in 2023 against a baseline of 94 cases which was reported in 2022. This accounts to 43% reduction.

PERSONAL COAL DUST OVEREXPOSURES

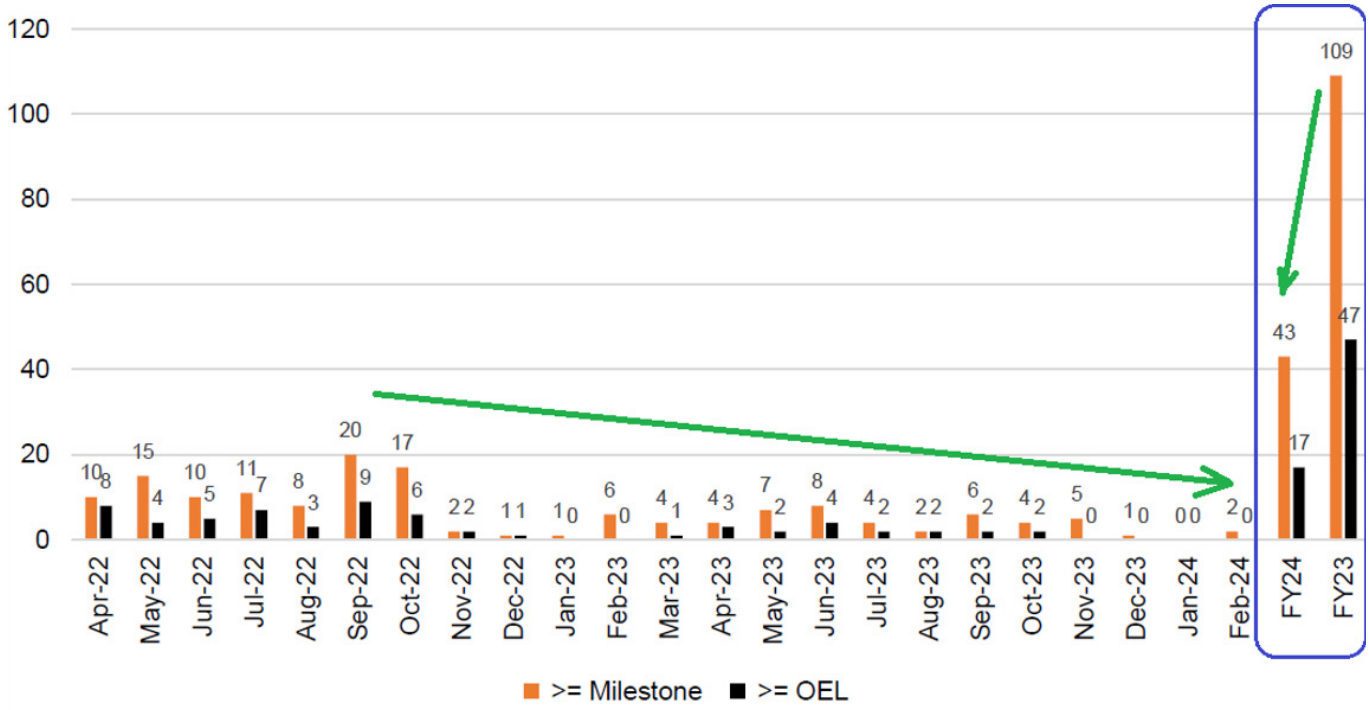

Figure4: A graph indicating Seriti Khutala Colliery's number of respirable coal dust personal samples which are above the Occupational Exposure Limit and the Milestone Target. *Source: Seriti Khutala Colliery*

ANNEXURE 1: CRTM INTEGRATED SHIFT REPORT

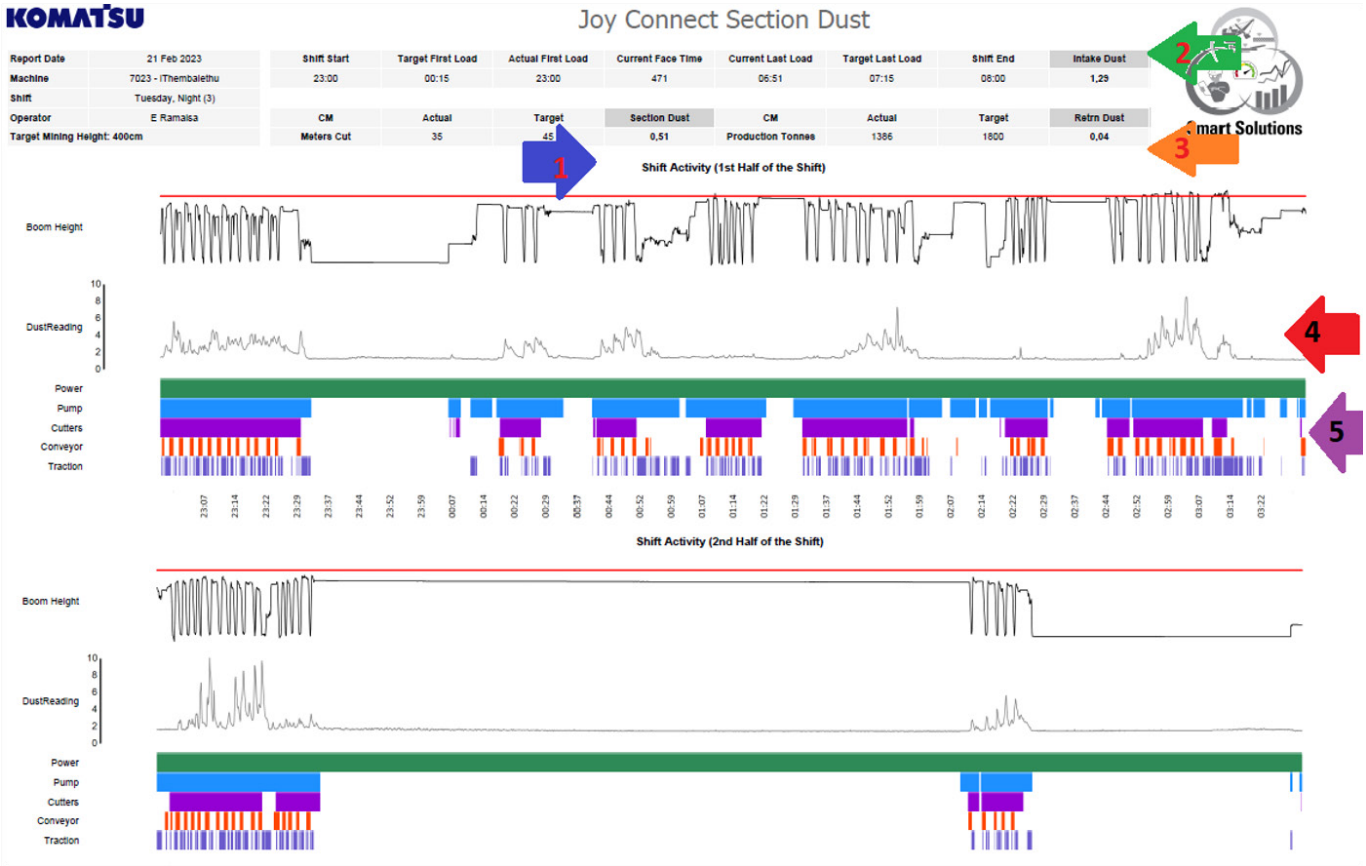

Figure 3: Sketch indicating an example of CRTM Integrated Shift Report. *Source: Seriti Khutala Colliery*

1. Section Dust Level (rolling average)
2. Intake Dust Level (intake measurement)
3. Return Dust Level (return measurement)
4. Real Time Dust Measurement (instantaneous)
5. CM Cutter Activity