Case Study: Adoption of Conveyor Belt Automated Transfer Point Dust Suppression and Continuous Real Time Monitoring at Exxaro Matla

Happy Morebodi

MINERALS COUNCIL
SOUTH AFRICA

Biography

Happy Morebodi has 28 years experience in the ventilation department of which 6 months was in underground deep mines and the rest in underground coal mines. He is married and has four kids (two boys and two girls).

Happy Morebodi started his mining career as a ventilation trainee at South Deep in 1995 while it was still owned by JCI. He then moved to Tavistock Collieries the same year where he obtained his practical and intermediate certificates in Environmental Control. Early in 1996, he was appointed Ventilation Assistant at Arthur Taylor. He then moved to Greenside Colliery in 2004 as a Ventilation officer till 2009. He obtained his Certificate in MEC in 2010 passed my whilst at Kroonfontein. I was then Appointed as Vent Supt.

Moved to Exxaro Matla since 2013 to date as Head Ventilation. I have 9 years proto experience.
He is currently a Ventilation Superintendent [12.1 Appointee] at Exxaro Matla. He is a member of both Mine Ventilation Society South Africa and SACESHA where he serves as a Council member.

EXXARO MATLA COAL

Adoption of

Conveyor Belt Automated Transfer-Point Fogging Dust Suppression System and Continuous Real Time Dust Monitoring Leading Practices

"Safety always, all the way"

Background

- Our responsibility as Matla Operation is to ensure workers' exposure to respirable dust is at acceptable levels and does not exceed 2mg/m³ average concentration for an 8-hour period.
- Hence Matla decided to adopt the CBAT fogging Dust Suppression System and Continuous Real Time Dust Monitoring.
- With the recent increase in world-wide environmental legislation, there has evolved a general requirement for the employer to continuously monitor dust and ensure that emissions to atmosphere are kept below the maxim legal enforcement level.
- Also, Mineral Council of South Africa is engaging mining companies to look at how they can effectively control dust and have stringent measures in place to ensure dust levels are lowered to below the prescribed limits.
- During 2019, Matla Coal Mine also embarked in an initiative of installing continuous real time dust monitors at the conveyor belts drives. The name of these monitors are called GST 13D and Energy Tech 301 – Dust Monitors for mine 2 and 3 respectively.

Overview

1.Scope of the Leading Practice
- Dust Suppression Installations

2.Adoption of the Leading Practice (CBAT SLP)
- Leadership Involvement
- Underground Installation - Sampling Results
  - Pre-installation & Post installation
- Challenges & Learnings

3.Use of Real Time Dust Monitors (CRTM – LP)

-Continuous real time dust monitor

-Benefits of the monitor

-Progress of CRTM : Current Installation

-Success of CRTM

-Challenges of CRTM

3.Conclusion

4.Acknowledgement

"Safety always, all the way"

Scope of the Leading Practice

Underground Installation

- **Selection of the system** – engaging preferred Supplier
- **Identification and select(Fogger unit)**
- **Ion of pilot site** – baseline dust measurements

Demonstration of the Leading Practice

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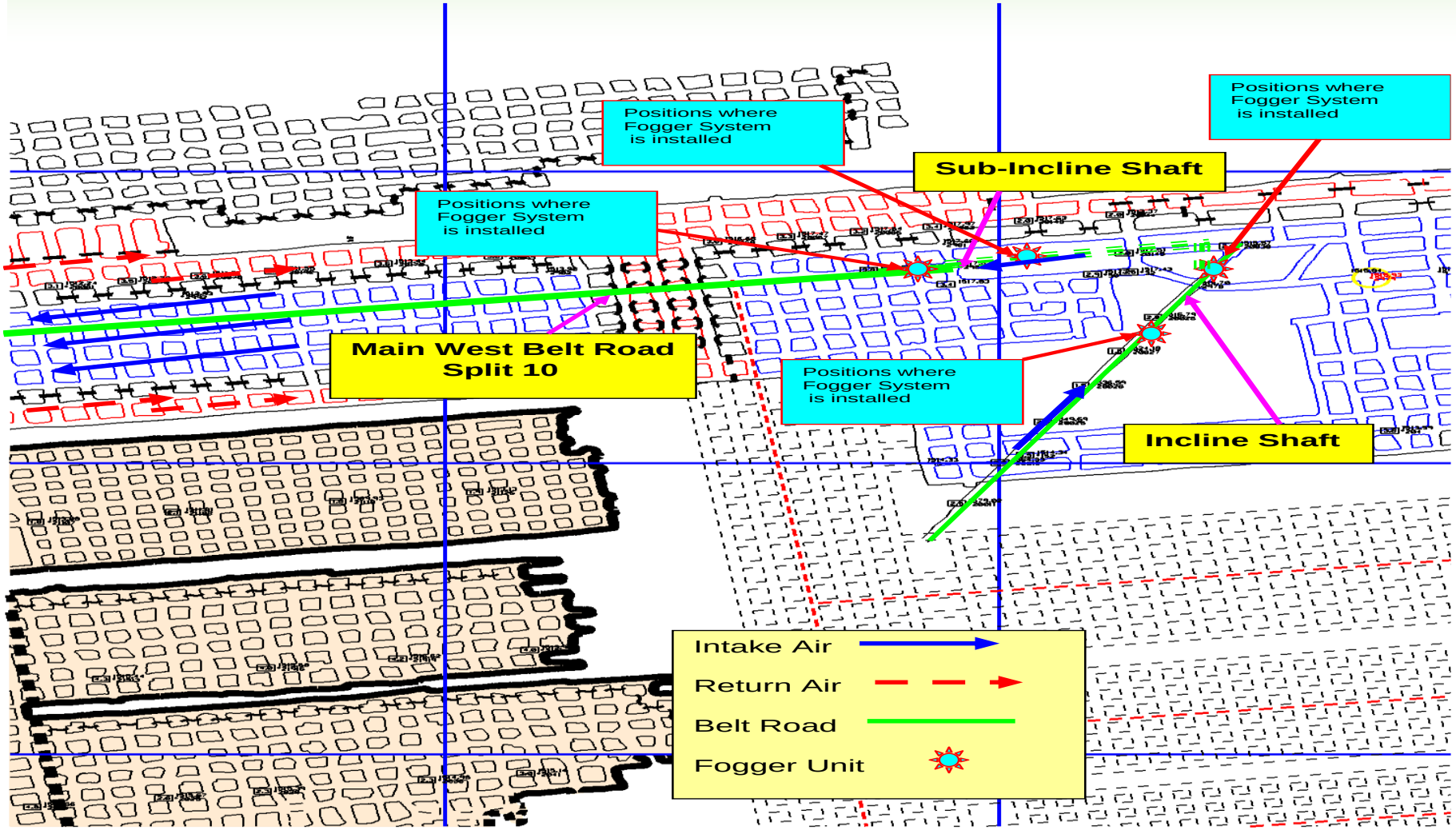
Leadership Involvement

- **Project Sponsor**
  - Manager Mining
- **Project Manager**
  - Head Ventilation
- **Unions & Associations**
  - Solidarity Representative
  - NUM Representative
- **Mine Team**
  - Chairperson(Engineers)
  - VOHE Practitioners
  - Shaft managers
- **Other Members**
  - MOSH Dust Team
  - Suppliers

Underground Installed fogger – 2 Seam Shaft Area @ Matla 2



Technical Specifications of the Fogger Dust Suppression System

Fogger Dust Suppression System	
Energy consumption	•380 VAC, 7.5 kW Electrical Motor
Water consumption	• 40 litres/min, High pressure pump (machine rated up to 120 bar) • 0.2mm nozzle orifice (number of nozzles installed = 420) • Operating pressures of between 70 and 90 bar
Application	•Vapour Fogger at Transfers, Crushers, Tip Screens, Haulages, Roadways, Footwall, Air Scrubbing of Airways, Bunkers and Silos
Installation	•Four to Six weeks after delivery. Two weeks lea way after order has been placed
Operation	•Manual •Automated start up signals. Audio, air movement, IR, mechanical
Maintenance	•Regular maintenance
Impact on occupational environment	•Cleaner Environment •No impact on environment •Product bio gradable
Cost to purchase and install	•R233, 191, 04
Operating costs Maintenance	• R68 000,00/month average per shaft

Underground Installation - Dust Results

SUMMARY FOR THE DRIVE SAMPLES AT THE BEGINNING

SECTION	AVE. DUST COUNT BEFORE	AVE. DUST COUNT/NO AFTER
	Fogger Sytem off.	Fogger Sytem on
sub incline feeders	0.64	0.08
main west one spilt10	0.28	0.18
tripper spilt 57	4.36	0.35
section drive	0.66	0.02
main west two drive	0.19	0.11
Ave dust	1.23	0.15

Notes:
Measurement methodology

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Challenges

Fogger Dust Suppression System

- Numerous problems were experienced during the sampling period, for example
    - Employees tampering with the system – closing of valves
    - Employees closing main water feeding line, etc
    - Challenges on installation and operation of the system not foreseen
    - OEMs competencies not compatible to mine's requirements
- Reasons for these tampering
    - Wind chill factor and poor visibility

A positive change only transpired after the issue of the Fogger unit was discussed with employees during the pre-shift safety meetings.

Supplier has an extensive service and maintenance plan for the Fogger units – without the cooperation of any mine or host it is an impossible task to ensure the smooth running of any system.

Learnings

- The composition of the project team
  - Include the engineering department as per the MOSH leading practice adoption guide
  - Include operators to facilitate better “buy in”
- Ensuring Supplier competency and compliance to the mine standard
- System required modifications to suit specific areas. “One size does not fit all”
  - Visibility issues need to be addressed
- The involvement of unions and associations facilitated a better behavior change communication process
- Positive feedback received once system was operational.
  - Some employees questioned if the same principle can be applied elsewhere within the mine to alleviate high dust counts
- The leading practice adoption guiding principles has assisted management in attaining skills for the use of adopting and rolling out other best practices
  - Communication, stakeholder involvement and employee “buy in”
- The project has raised the awareness on the hazards and controlling of dust in an underground mine.

CRTM

- **Continuous Real Time Dust Monitoring Leading Practices**

Belt drives where monitors are installed

- At Mine 2 We have 7 Sensors installed on Drives namely the:
- Main West 1
- North 1 Belt Drive
- North 2 Belt Drive
- East 1 Belt Drive
- East 2 Belt Drive
- South 1 Belt Drive
- South 2 Belt Drive

Continuous real time dust monitor : Energy Tech 301
Mine 2 and 4 Seam

AF18 DRIVE

H28 BELT DRIVE

E19WB BELT DRIVE

NORTH BELT DRIVE

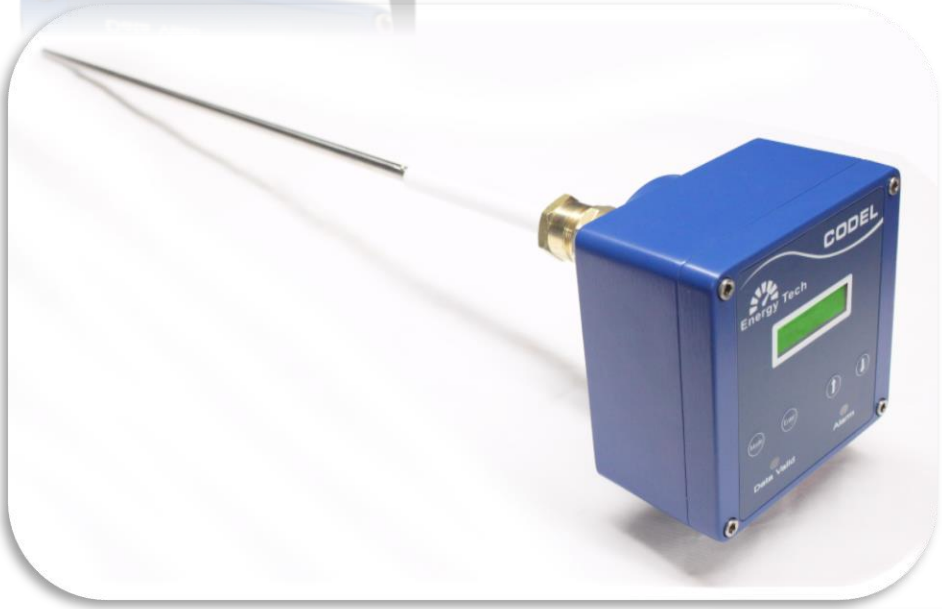
SOUTH BELT DRIVE

EAST BELT DRIVE

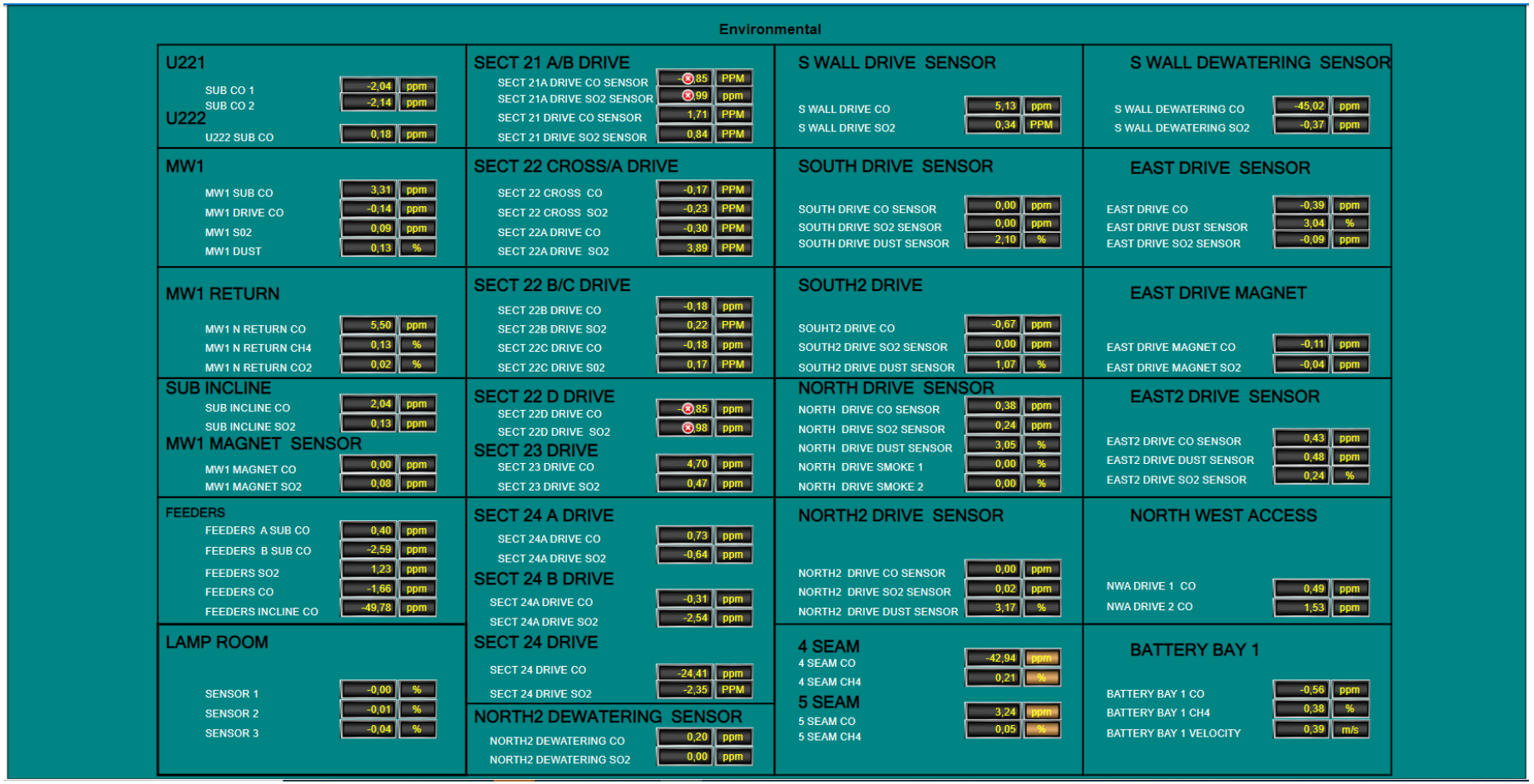
H28 BELT DRIVE

SOUTH BELT DRIVE

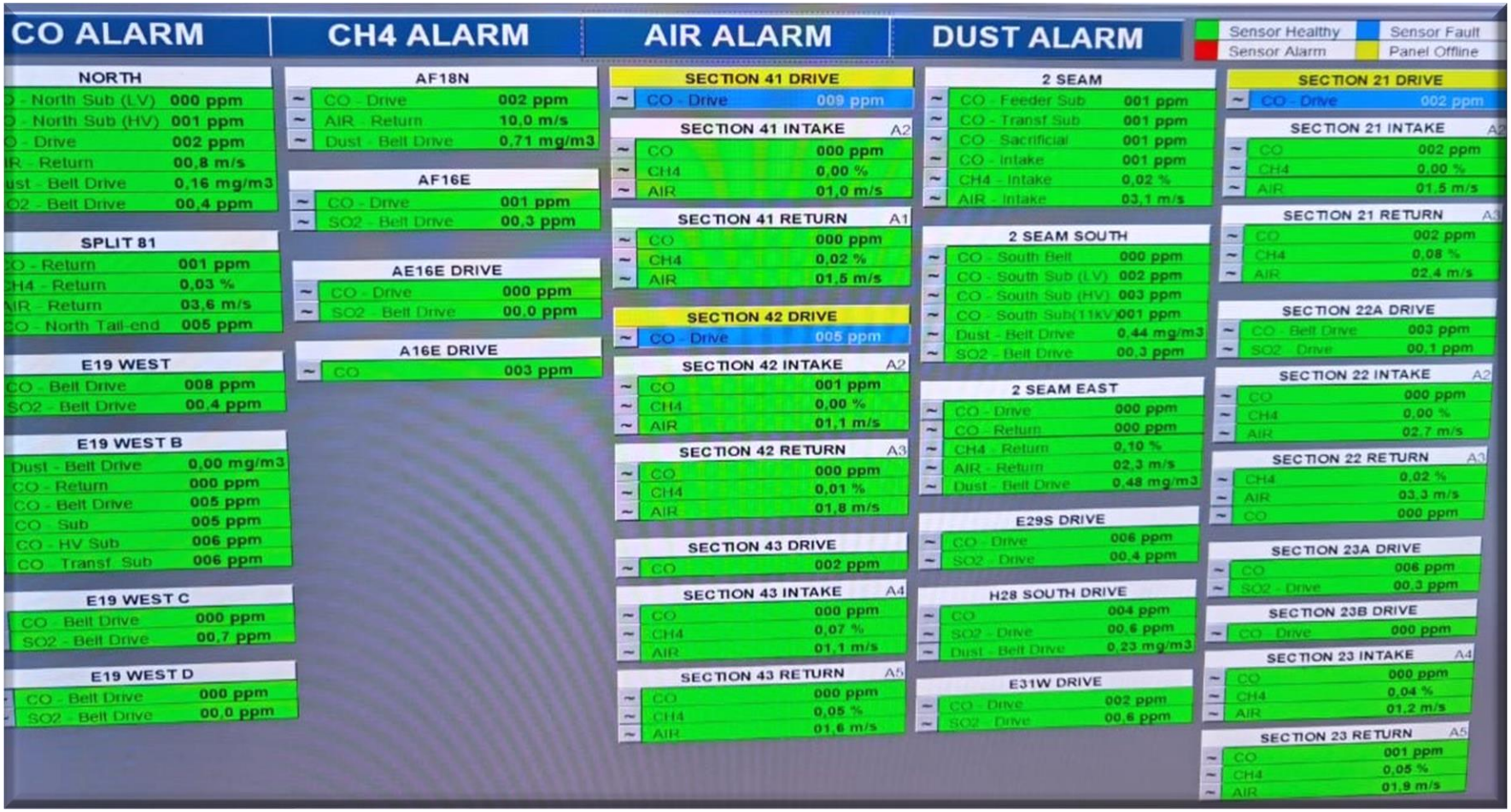
AF18 DRIVE



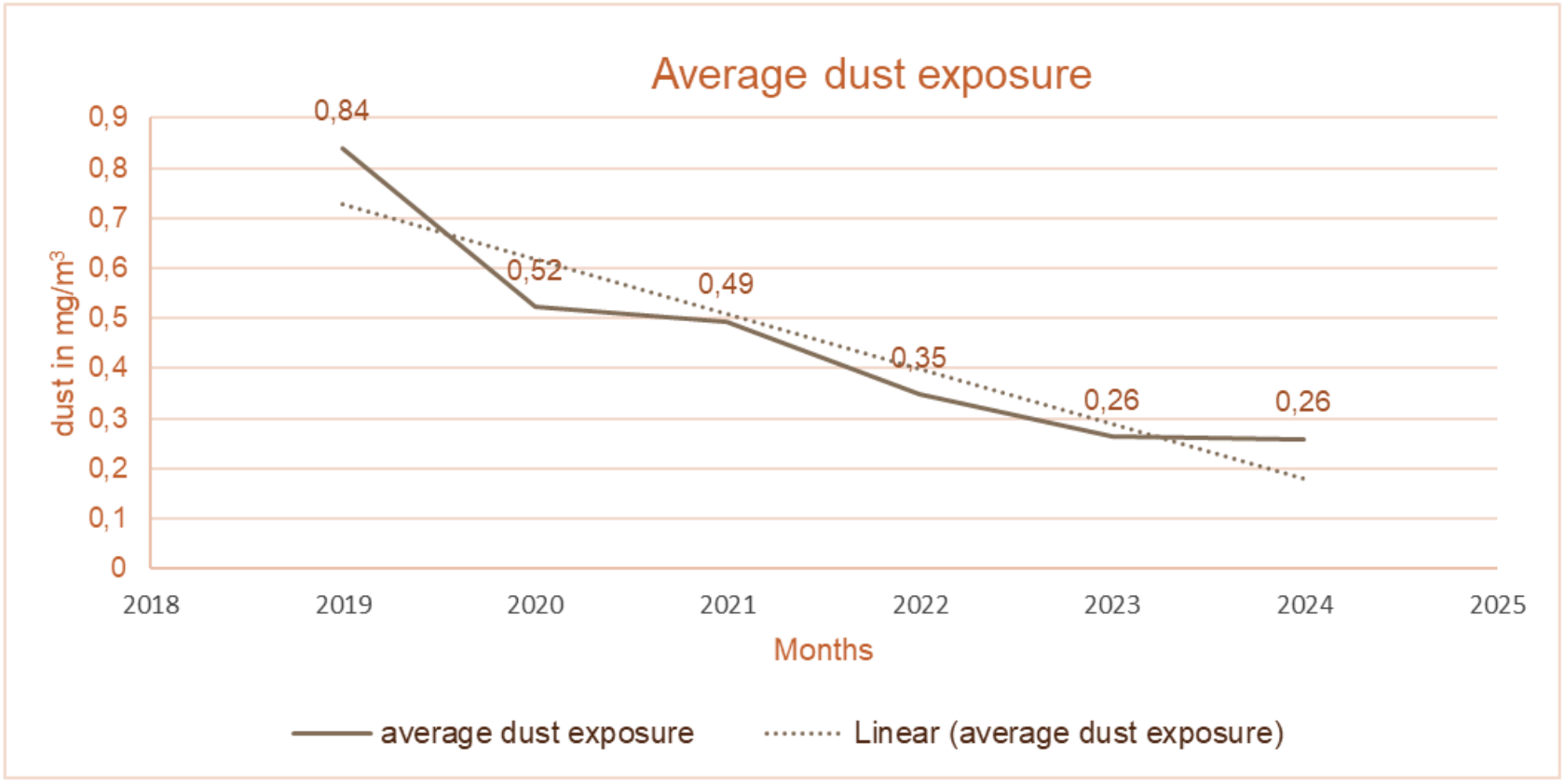
Continues real time dust sensors As shown in the Control room



Current Installations – Mine 3 Underground

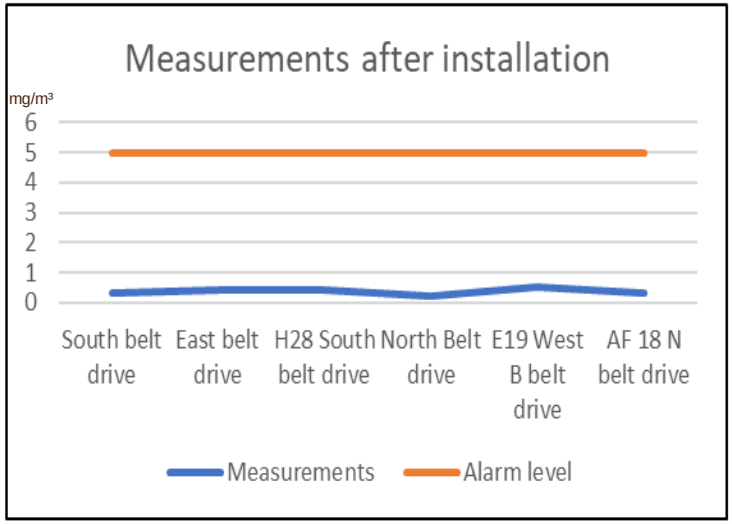


Success of CRTM
Average Backbye Dust Exposure Mine 2



Success of CRTM
Baseline measurements vs measurements after installation

Positions	Dust reading on the monitors	Occupations	before measurements	after measurements
2 seam				
South belt drive	0,31 mg/m3	Attendant, belt sweeper	2,80 mg/m3	1,08 mg/m3
East belt drive	0,42 mg/m3	Attendant belt	1,59 mg/m3	0,20 mg/m3
H28 South belt drive	0,42 mg/m3	Operator belt	1,07 mg/m3	0,11 mg/m3
		Electrician	0,73 mg/m3	0,13 mg/m3
		Fitter	0,95 mg/m3	0,40 mg/m3
4 seam				
North Belt drive	0,20 mg/m3			
E19 West B belt drive	0,55 mg/m3			
AF 18 N belt drive	0,31 mg/m3			



- Predominantly, the instrument is used to determine and control the efficiency of engineering controls on the belt road
- The following benefits have been observed:
  - Reduced respirable dust
  - Reduced risk of dust explosion
  - Improved travelling roads treatment

Challenges of CRTM

CRTM System

Numerous problems were experienced during the installation of the systems underground example

- Misalignment between various disciplines (Engineering not coping with installation schedule due to staff shortages)
- Poor or no communication - Control room not alerting mining and engineering personnel to investigate high dust readings on time to fix or unblock sprays.
- No Audible alarm in the control room if the dust system indicate high dust reading
- Changes of the control room systems to Wonderware causing the delays

Conclusions

The MOSH process is a comprehensive system which yield positive results if implemented as described in the Leading Practice Adoption Guide.

Though the use of the fogger system, the reduction of the respirable intake dust is significant and will assist in achieving the silicosis milestones as well as having a future potential financial benefit in reduced dust risk levies.

- After evaluating the results, it is therefore evident that the continuous monitoring of the belts with the real time dust monitors assisted Matla in reducing dust levels. The personal dust results on the "Belt sweeper" shows an overall improvement of 78,6% at mine 3 and 90% at mine 2
- The mine could easily identify from the control room if the belt has high concentration of dust and that can be reported to Engineering department to investigate the root course of the dust.
- Coal dust exposure related illnesses/condition are preventable, if we take care of our controls
- It is still your duty as an employee to protect your own health and that of your brothers or sisters
- Hazardous dust is not always visible, so it needs to be always monitored. Therefore, do not tamper with measuring instruments

Acknowledgement

- Matla Management
- Union Leadership
- Health and Safety Reps
- Environclear & Guduza Contractors
- Minerals Council of South Africa (MOSH Dust Team)

Thank you

"Safety always, all the way"