Multi- Stage Filtration System Phakisa Mine

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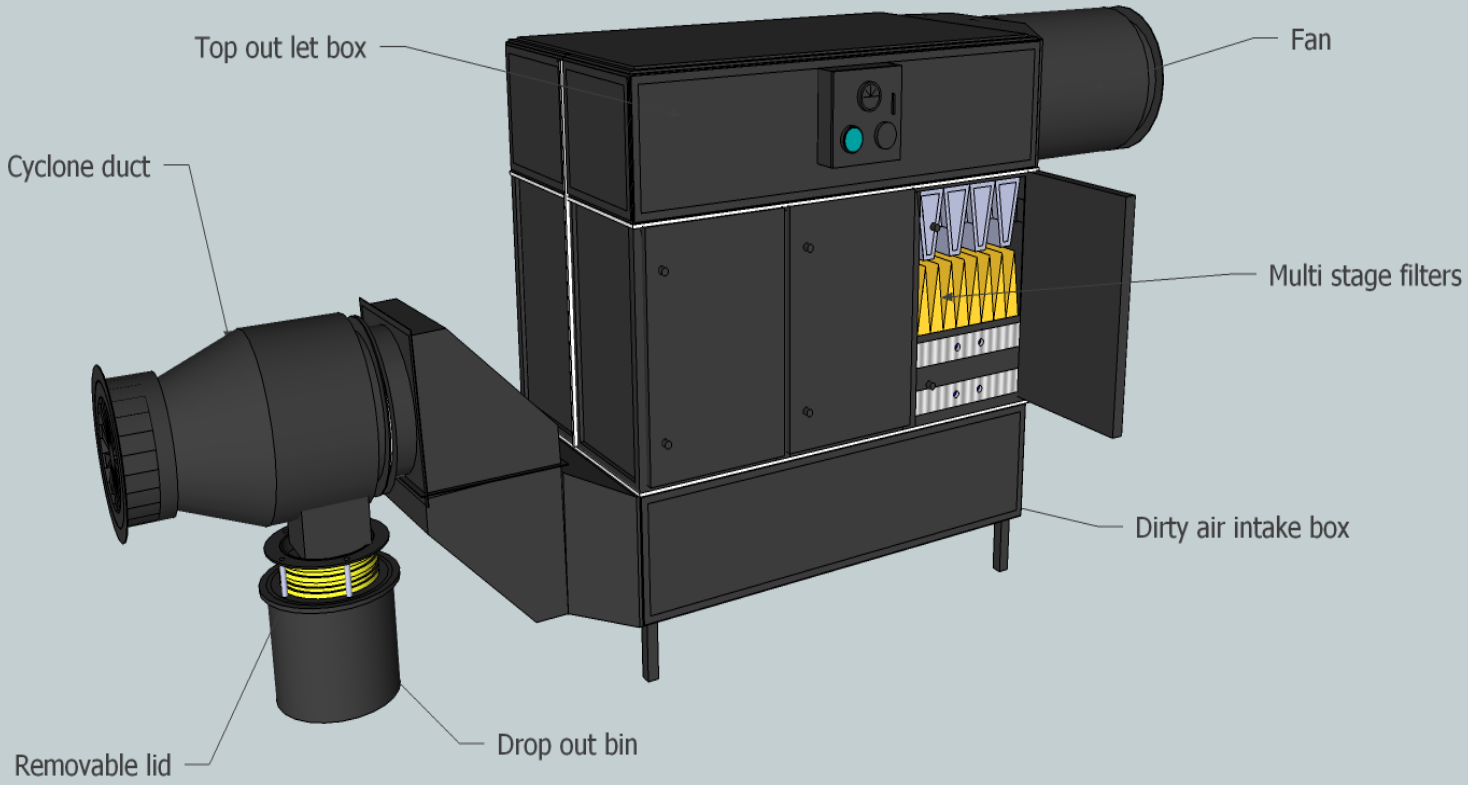
Multi-stage filtration system unit



Multi-Filtration System

Contents

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Multi-Filtration System Overview

- The system was identified as primary preventative measure
- Implemented in May 2012
- Ten units installed, initially with three stages
- Pre-filtration stage added on high dust load tips
- Pocket filters were replaced with the HEPA filters
- Robotic predictive maintenance system installed

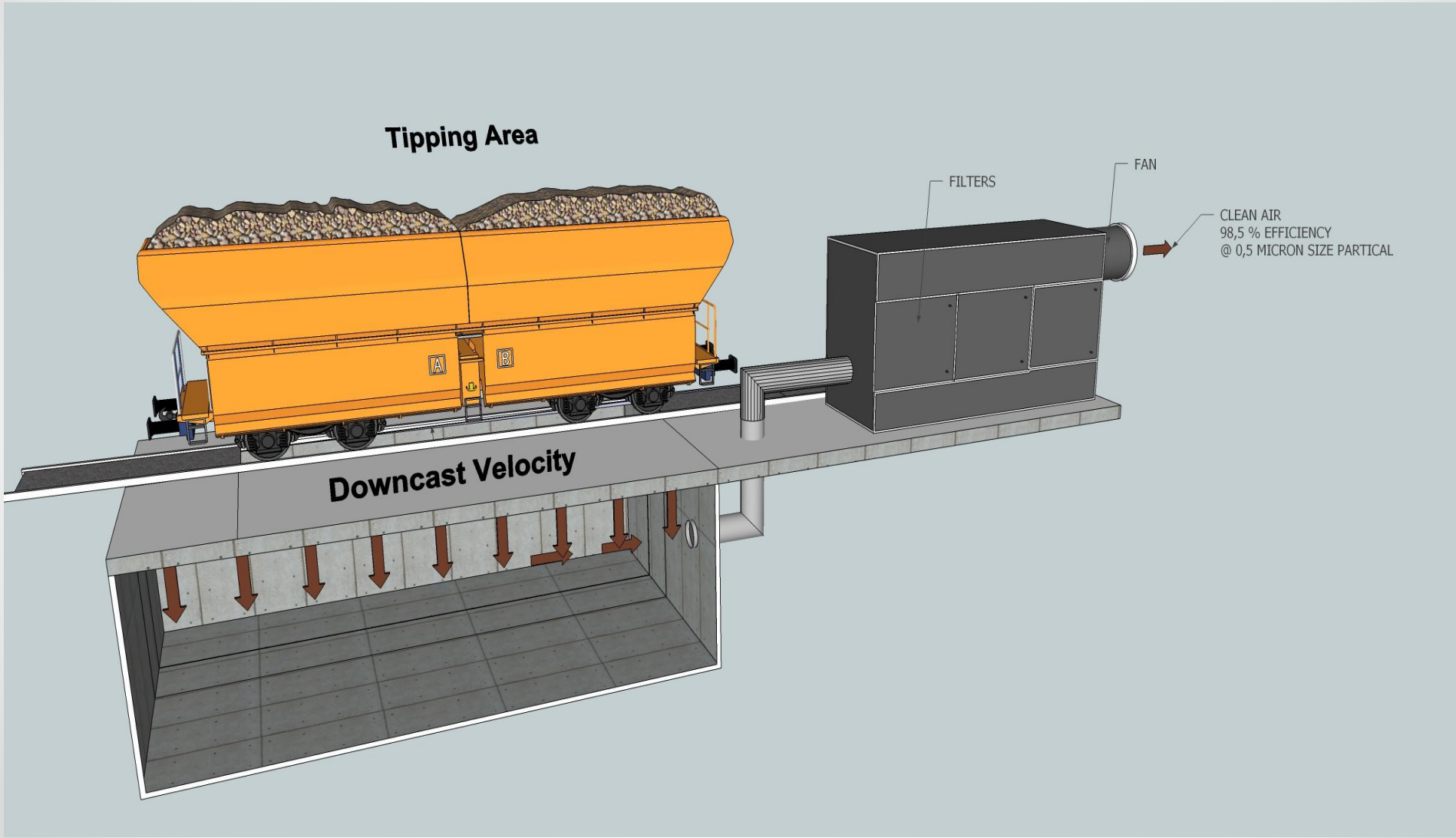
Principle Of Operation

- This system entails:
  - Exhausting dusty air from the main tips through a series of filtration stages
  - This removes dust particles and releases clean air into the intake air system

- Each filtration stage is made up of a different filtration material

- Efficiency of dust filtration depends on the number of filtration stages, size and the general conditions of the filter unit

Schematic overview

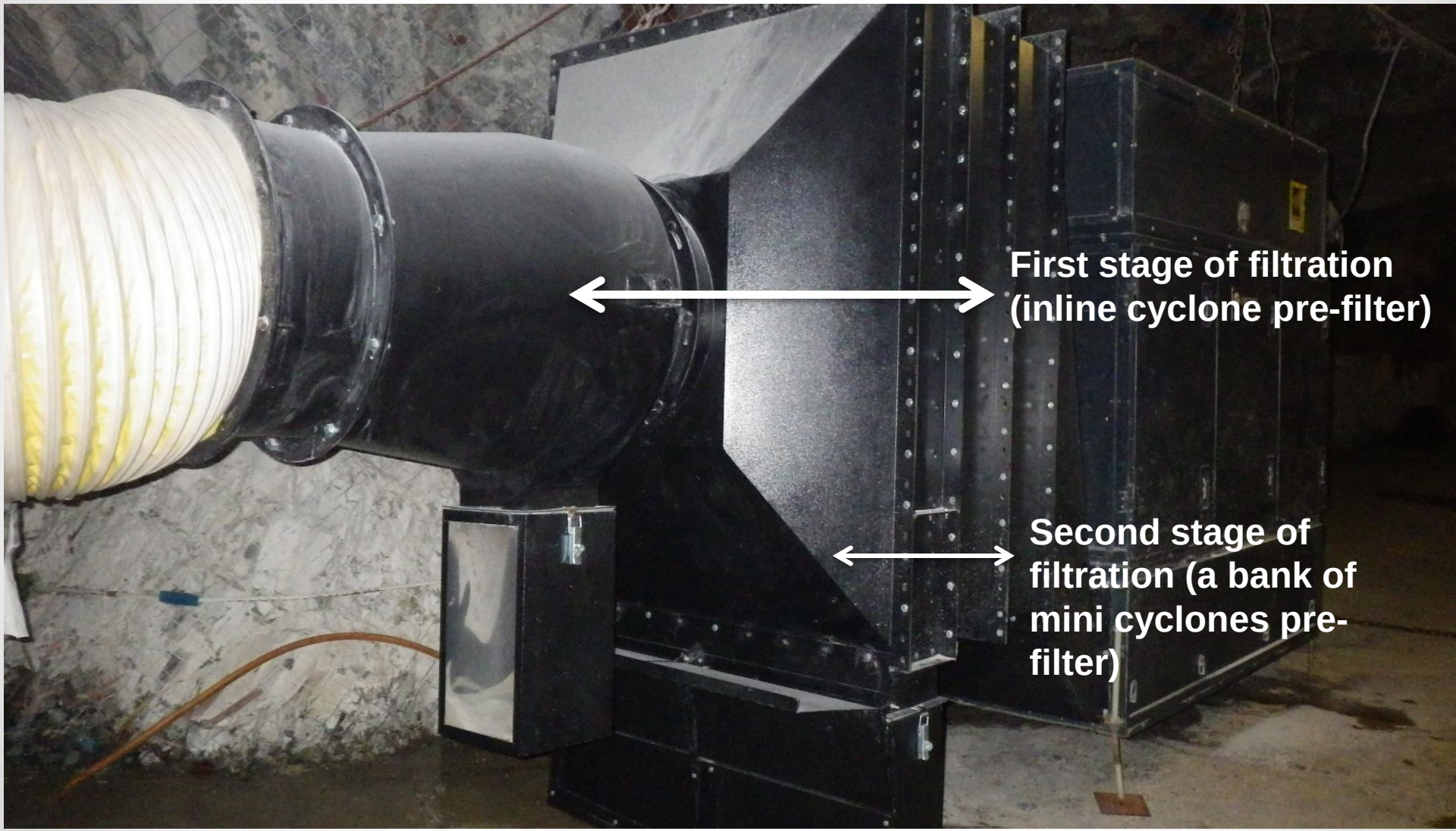


Multi-Filtration Stages Effectiveness

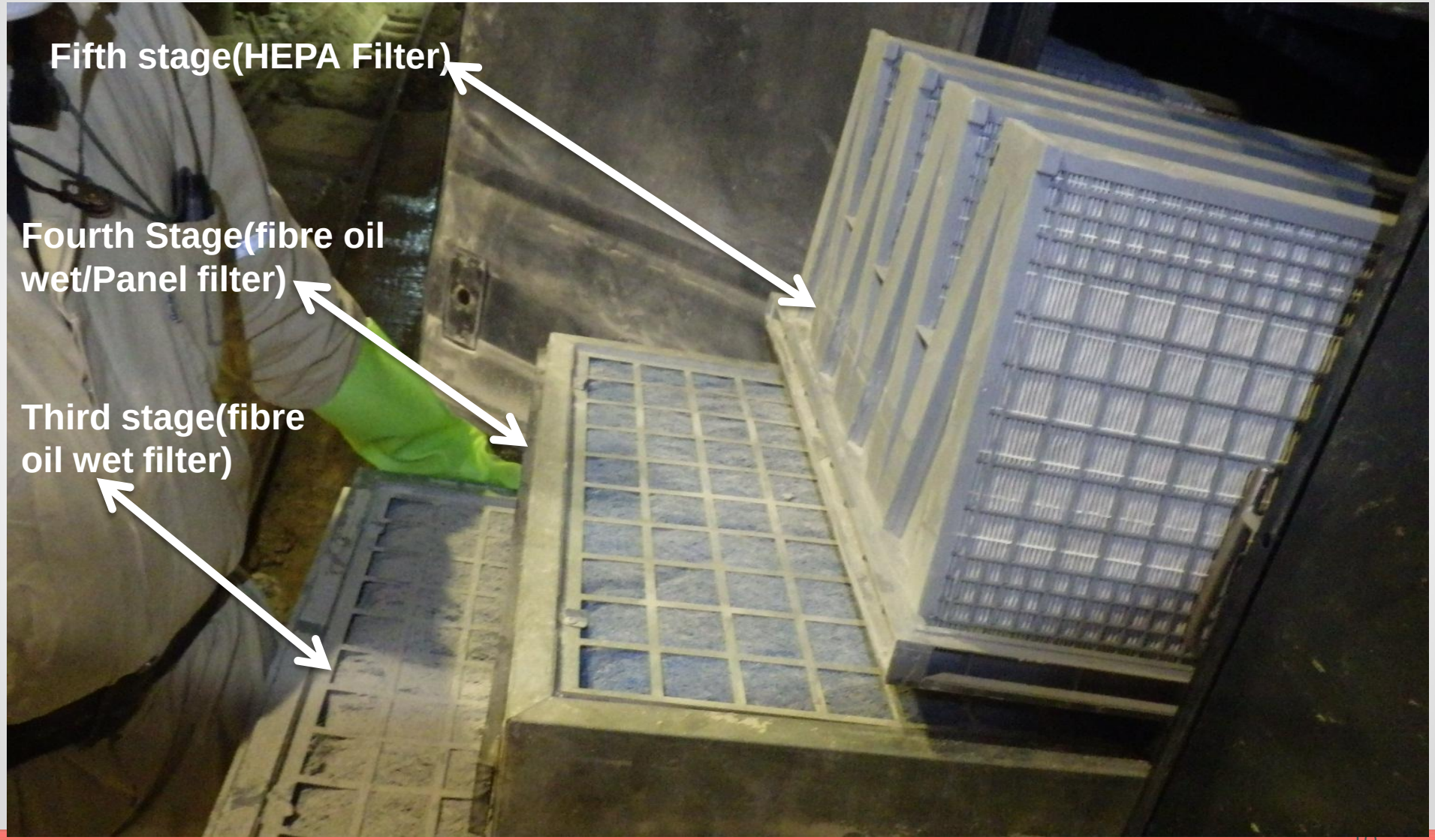
- With three stages of filtration, an average improvement of 71% in terms of dust load (TWA) on the intake airways was achieved.

- With a pre-filter added and the pocket filters being replaced with HEPA filters, an average improvement of 86% was achieved.
  - Installation of a of pre-filtration system resulted in positive cost implications
  - HEPA filter designed to eliminate 98.5% of 0.5micron and 100% at >1 micron particle size.

Filtration Stages

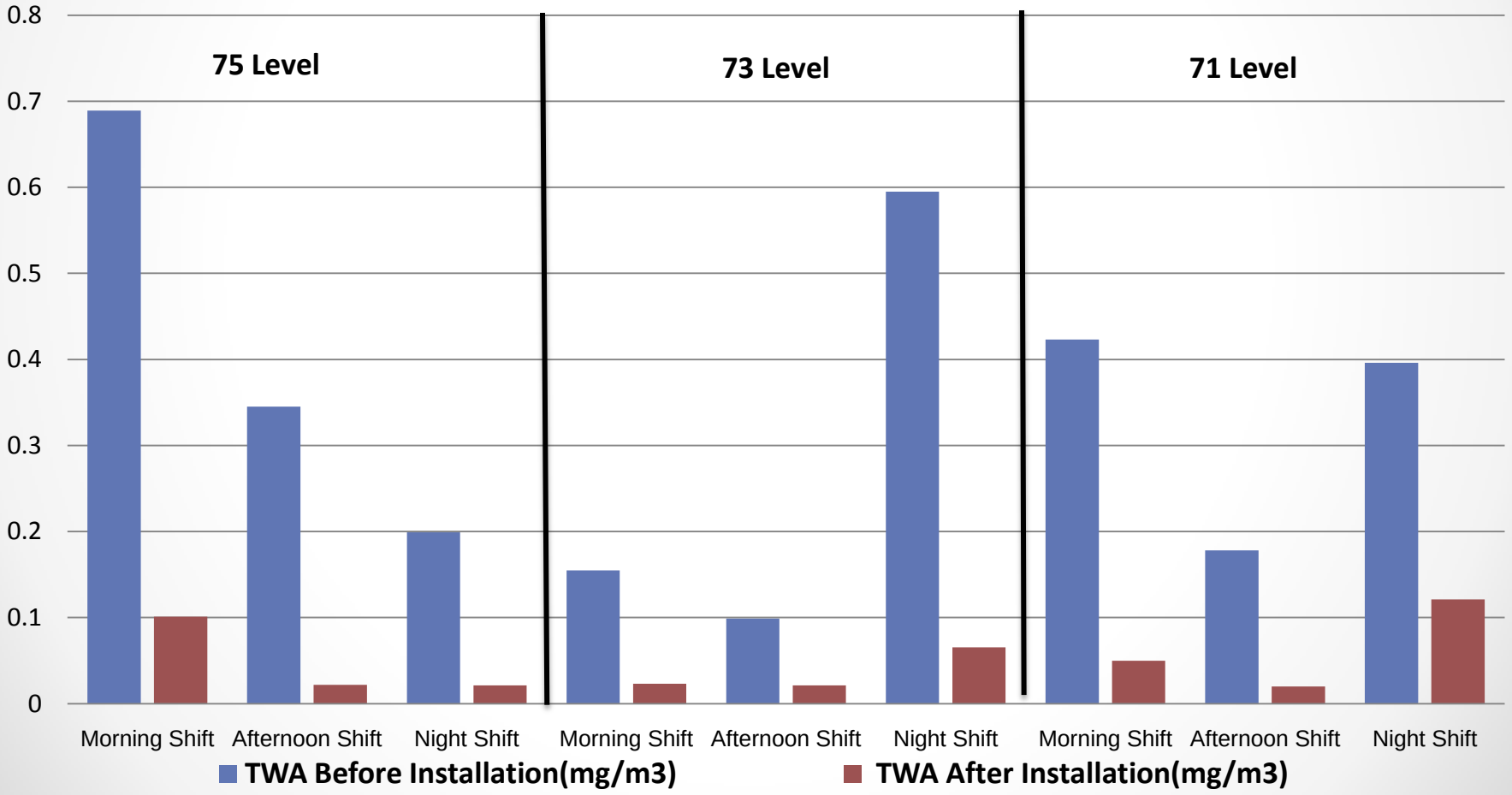


Filtration stages

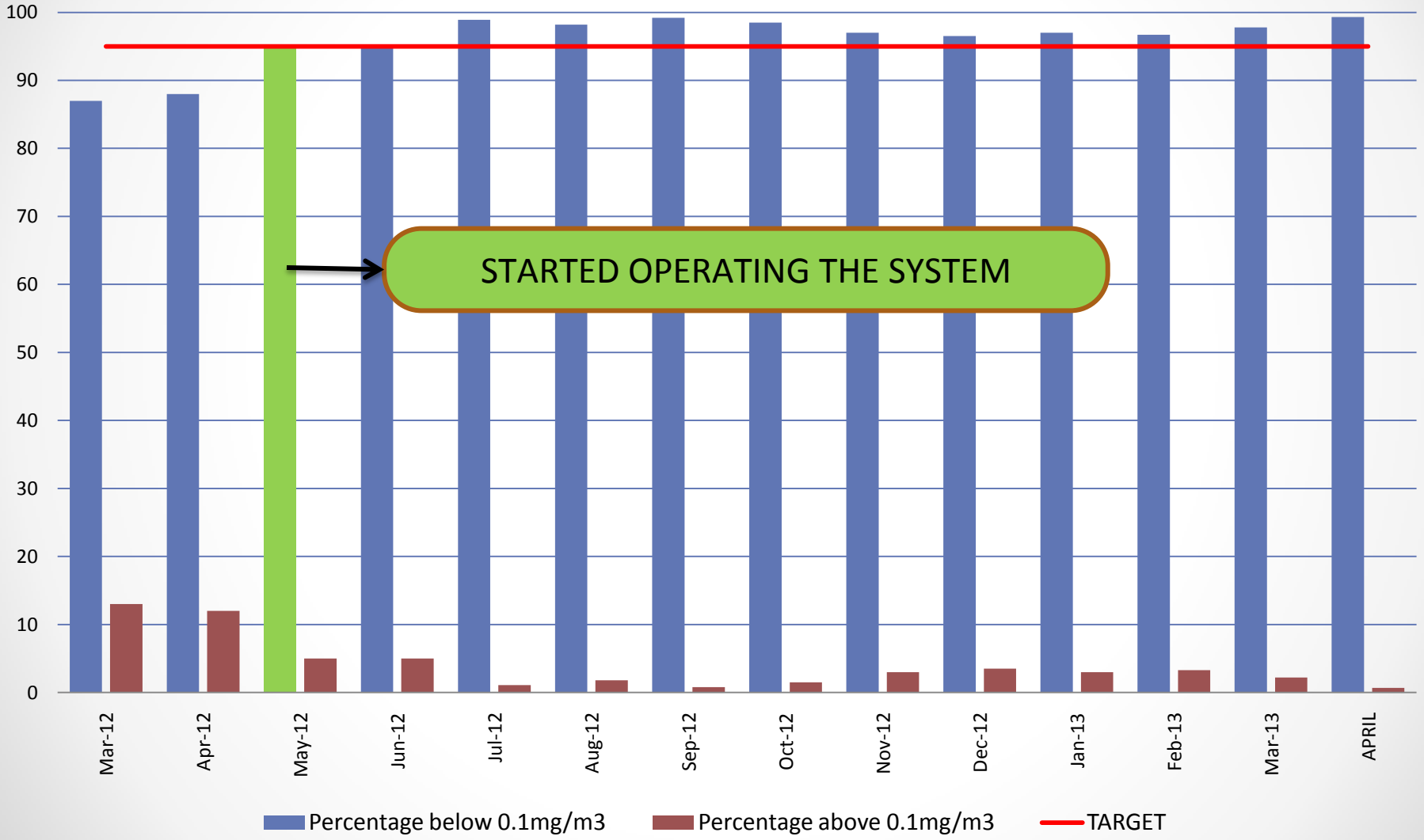


Benefits to date

Area Sampling Results Before and After Installation

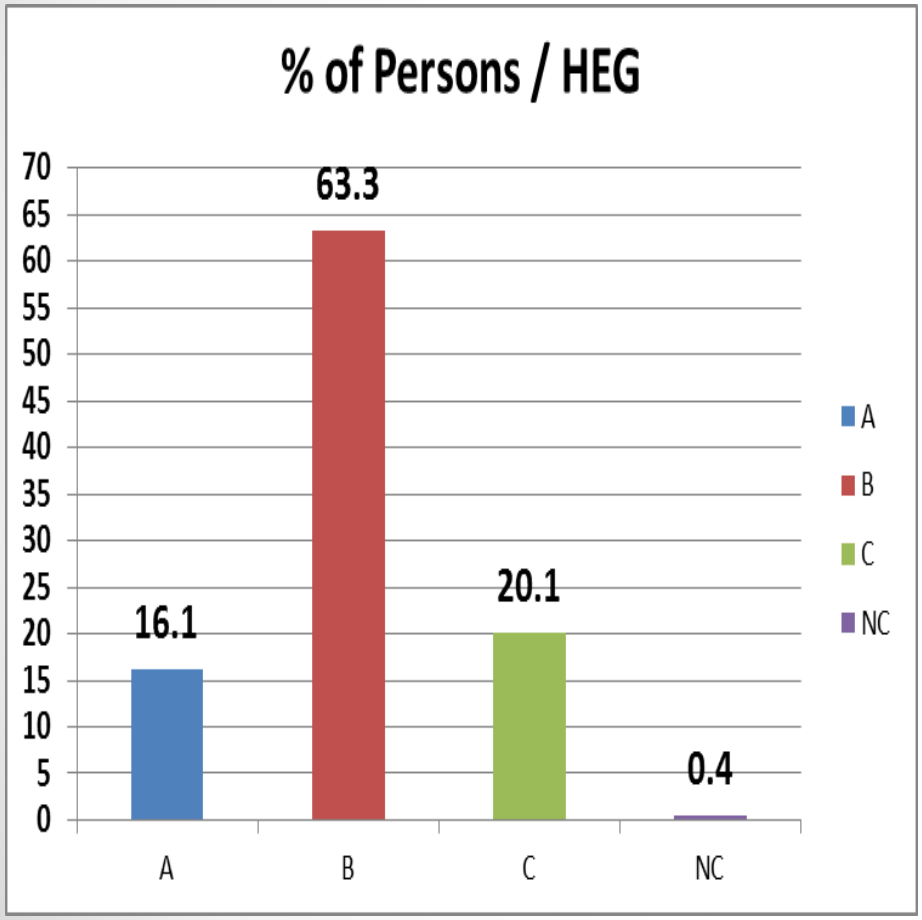


Compliance to 2008 Silicosis Elimination Milestone

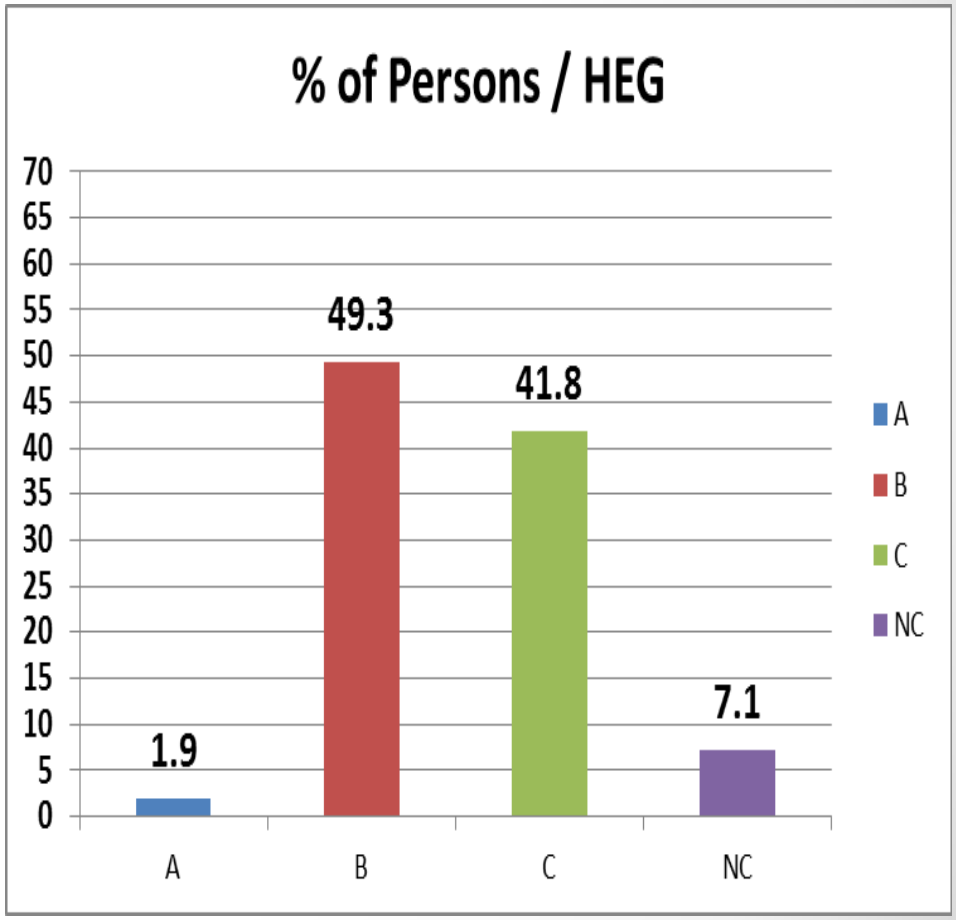


Homogenous Exposures Group Summary

HEG SUMMARY - 2012



HEG SUMMARY - 2013

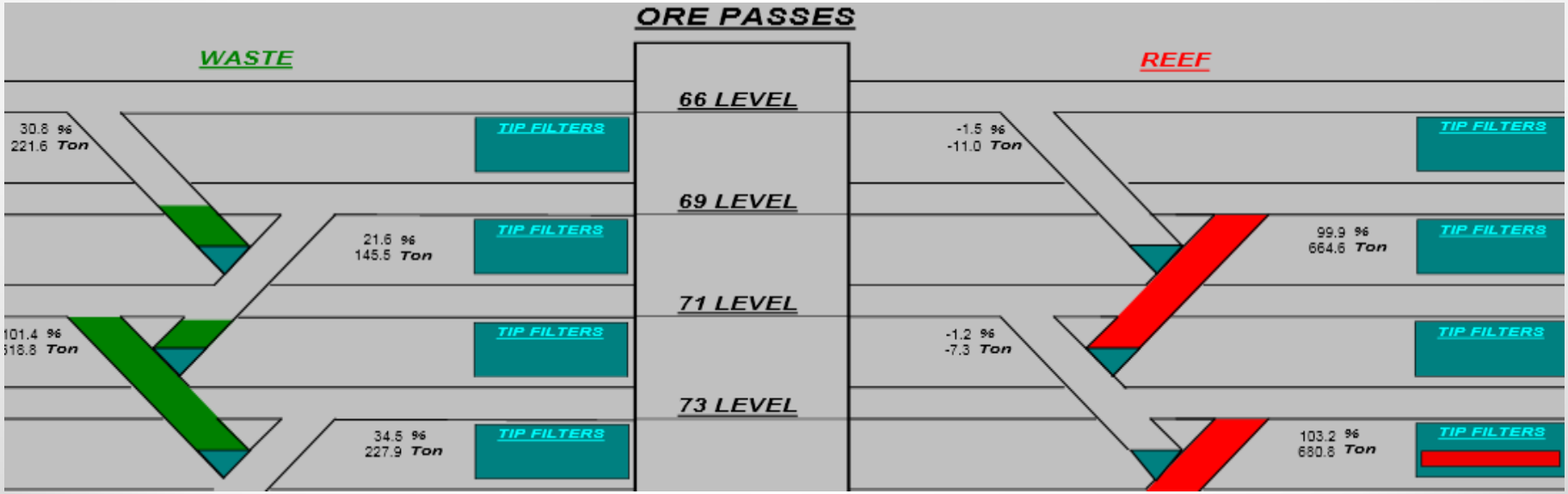


Installation

- Installation was physically demonstrated and a demonstration Video issued by the OEM.
- The installation of the units was done simultaneously with the tip covers.
- Purpose of tip covers is to avoid up casting of tips and to allow improved suction by the fans.

Maintenance

- Pressure indicator lights have been installed on all filtration units.
- The indicator light turns red once the differential pressure exceeds 400pa.
- Indicator lights are also monitored from the control room.
- When the robot turns red it is investigated within 12 hours and rectified within 24 hours.


ORE PASSES
WASTE
REEF
66 LEVEL
69 LEVEL
71 LEVEL
73 LEVEL
TIP FILTERS
30.8 %
221.6 Ton
21.6 %
145.5 Ton
101.4 %
618.8 Ton
34.5 %
227.9 Ton
-1.5 %
-11.0 Ton
99.9 %
664.6 Ton
-1.2 %
-7.3 Ton
103.2 %
680.8 Ton

Safety & Maintenance

- The maintenance crew has to know the procedure for changing the tip filters and the fan lock out procedure.
- Sealable carry bags and Protective Equipment (respirators, long gloves, goggles etc.)
- Dirty filters are carefully put in a zipper bag, sealed and send to wash bay on surface
- The filter bags are disposed of as general waste

Adequate PPE

Responsibilities & Communication

- The Shaft Foreman is directly responsible for the tip covers and tip multi-filtration system.
- The tramming section reports any deviations to the Shaft foreman.
- All loco operators are aware of the robotic system principle.
- Occupational Hygiene department does visual inspections, evaluate the effectiveness and PTO’s to ensure compliance to the procedure.

Conclusion

- The Multi-Stage Filtration system resulted in significant improvement
- Reflected on the milestone achievement
- Reduction in number of employees exposed to ≥ OEL
- Can get to as low as reasonably achievable crystalline silica dust exposures

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