



THE IMPLEMENTATION AND INCORPORATION OF THE CRITICAL NOISE SCREENING AT AN OPERATION



CRITICAL NOISE EQUIPMENT SCREENING CASE STUDY

FULL DESCRIPTION OF THE RISK ADDRESSED

The Gold Fields South Deep operation is situated in Gauteng, and is classified as a bulk, mechanised, ultra-deep level, gold mining operation, hence high human/machine interaction. The mining areas are fully mechanised with integrated mining methods including horizontal development ends, destress development, and long-hole stoping supplemented by scattered drift and benching.

The mining method and design requires the utilisation of multiple high-pressure, high-volume axial-flow fans installed in the same location to ensure the mining areas are adequately ventilated and controlled (heat, gas and dilution of airborne pollutants). However, in most cases these types of installations are remote from the working faces.

With reference to the risk assessment conducted on noise exposure, the following features have been identified that have an impact on occupational noise exposure at South Deep mine:

1	2	3	4	5
Utilisation of mechanised machinery and equipment – drill rigs, LHDs, dump trucks, utility vehicles, bolters, various impact tools, etc	Mechanised ventilation – high-pressure, high-volume fans, fan stations, etc	Utilisation of refrigeration and cooling – compressors and pumps on refrigeration plants (surface and underground), pumps and fans on bulk air coolers (surface and underground)	Pumping of water – pump stations, pumps, diaphragm pumps, etc	Compressors – for the provision of compressed air to refuge bays and agitation at settlers and pump station

“The mining areas are fully mechanised with integrated mining methods including horizontal development ends, destress development, and long-hole stoping supplemented by scattered drift and benching.”

OVERVIEW

Mining company

Gold Fields

Commodity

Gold

Operation/Mine

South Deep

Health and safety case study

The implementation and incorporation of the critical noise equipment screening tool at South Deep mine

Number of employees affected by the health and safety case study

15

Stakeholders consulted


Ventilation Occupational Hygiene and Engineering (VOHE) Department

Occupations affected/benefited

All high-risk employees as per the noise risk management strategy

FULL DESCRIPTION OF THE RISK ADDRESSED CONTINUED

In terms of noise risk management, South Deep has the following mitigation and preventative measures in place:

 <p>Remote operation of impact breakers from a controlled environment</p>	 <p>Remote operation of load and haul equipment (automation and tele-remote loading)</p>	 <p>Installation of “whisper” silencers on high-volume, high-pressure auxiliary fans</p>	 <p>Doubling up on fan silencers where noise emission is still above 105dB(A)</p>	 <p>Silenced air supply lines in refuge bays</p>
 <p>Personalised hearing protection for high-risk employees (noise clipper)</p>	 <p>Noise zone demarcation</p>	 <p>Effective noise exposure monitoring programme</p>	 <p>Medical surveillance programme</p>	 <p>Training and awareness campaigns</p>

In addition, South Deep also adopted the Industry-wide Buy and Maintain Quiet Initiative (IBMQI), which was developed from a standing decision supported by mining companies to procure equipment (machinery) and maintain existing equipment in a responsible manner.

The Mine Health and Safety Act (29 of 1996) require mines to assess the noise levels to which employees are exposed to within the working areas. These noise

measurements could be considered the most important and key measure for the identification of critical machines for noise management purposes.

Noise measurement methodology plays a pivotal role in the quantification of the noise emissions of equipment within the IBMQI framework. To ensure the successful facilitation of the noise management criteria set, the “Critical Noise Equipment Screening Tool” was developed within the IBMQI.



The screening tool incorporates the key factors identified within the IBMQI, which influences the noise exposure risk of employees to noisy equipment, which includes the following:

<p>1</p> <p>Noise measurement result in dBA</p>	<p>2</p> <p>Number of people exposed</p>	<p>3</p> <p>Number of machines within the work environment</p>	<p>4</p> <p>The duration of exposure</p>	<p>5</p> <p>The acoustical environment / confined workspace</p>
<p>6</p> <p>Machine vibration</p>	<p>7</p> <p>Equipment maintenance</p>	<p>8</p> <p>Equipment improvements and solutions</p>	<p>9</p> <p>Hearing protection devices</p>	<p>10</p> <p>Critical noise frequency range</p>

As a primary output, the screening tool assists mines in the identification and selection of the most appropriate machines for consideration of repair and maintenance.

The screening tool provides guidance on the process to follow based on the various contributing factors as listed above. The screening tool further possesses the capabilities for the application towards the screening of existing equipment, as well as toward the screening of new technology and/or new equipment to be procured.

This case study explains the appropriate use of the Critical Noise Equipment Screening Tool as part of the identification and prioritisation of critical machines in terms of noise generation and exposure to individuals at South Deep mine.

FINDINGS AND LESSONS LEARNED FROM THE IMPLEMENTATION AND INCORPORATION OF THE GUIDANCE NOTE

With the internalisation process, initially the system had some challenges where incorrectly logged information could not be revised/corrected. Incorrect recordings could not be completed on the system and had to be removed by an external party which proved to be time-consuming and cumbersome. Some functionalities were not clear to the VOHE team initially. This was clarified using the guideline provided as well as bilateral engagements with the MOSH Noise Team.

To capture information into the online screening tool system the capturer needs to ensure that the relevant information is available. When Gold Fields commenced with the noise measurements, it was identified that the VOHE team did not have the correct noise instruments on site (integrated sound pressure instrumentation) and were struggling to get the correct readings. This had to be addressed first, since the quality of the noise measurements would impact the results obtained from the risk ranking tool.

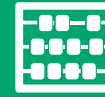
Additionally, capturers initially felt that the tool had too many questions to answer, which required additional time. VOHE team had to be engaged in an awareness briefing by VOHE management to be brought to a joint level of understanding the influence of the key factors utilised within the Critical Noise Equipment Screening Tool System, as well as the various weightings allocated to each item. Understanding the results and how they would be utilised helped the VOHE team in the overall buy-in and usage of the online Critical Noise Equipment Screening Tool System. As VOHE employees got better with capturing the required data into the system and as they familiarised themselves with the tool, the inputs improved which resulted in better risk ranking outputs.

Equipment noise risk rankings made it easier to understand which pieces of equipment is indeed high-risk equipment and furthermore it assisted the VOHE Department to prioritise high-risk equipment for management and control purposes.

Purpose of the critical noise equipment screening tool



Noise risk analysis tool



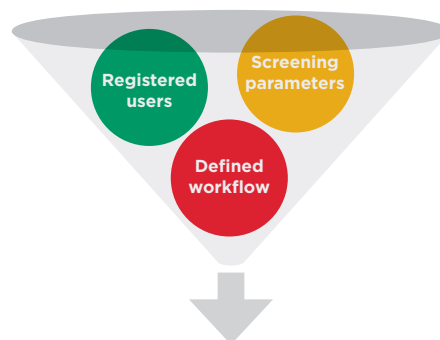
Understand various parameters influencing your noise risk



Critical input information for future OEM engagements



Prioritisation of noise equipment for silencing/maintenance/replacement



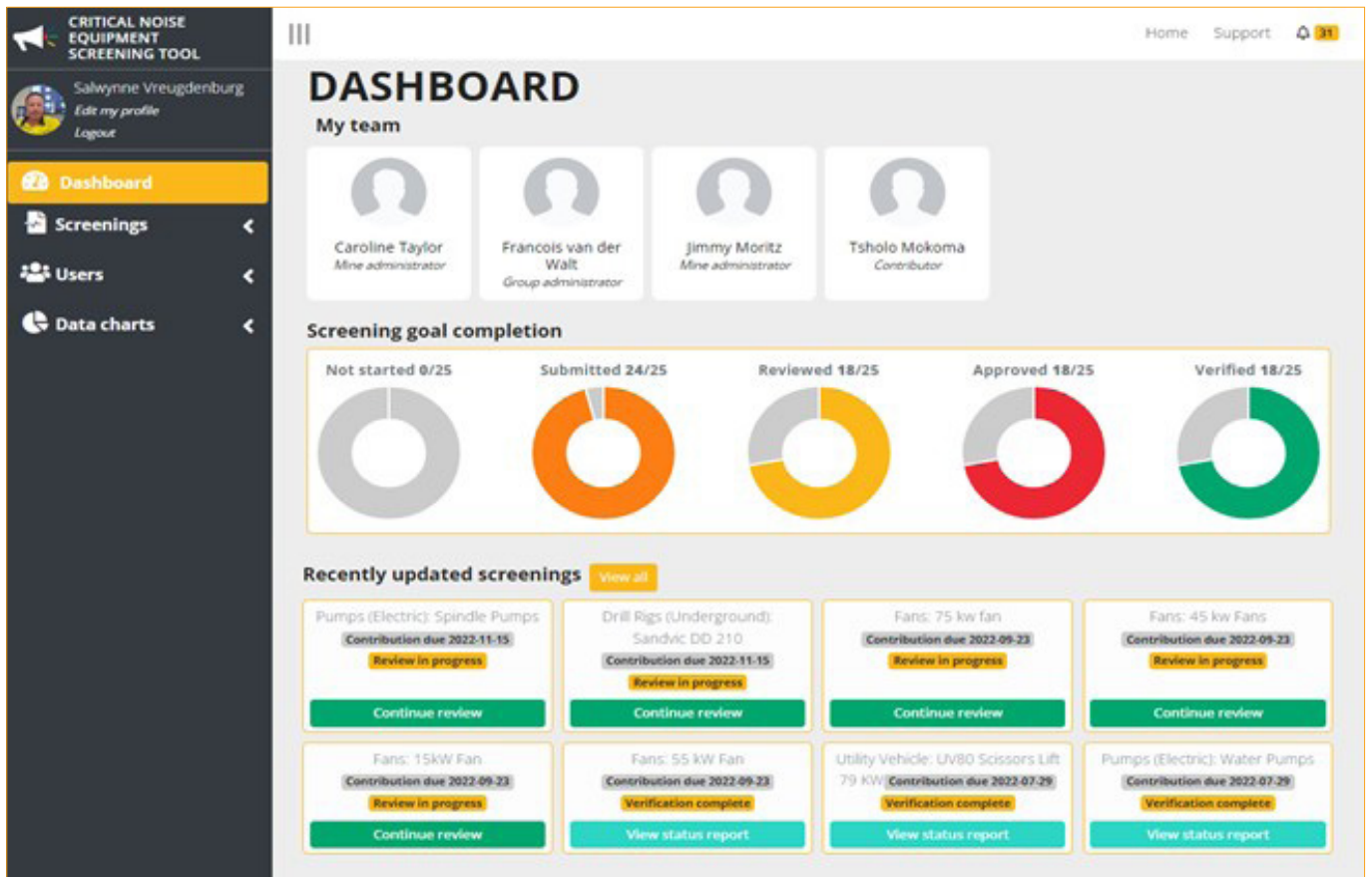
Screen equipment

Average risk ranking on equipment that you recently screened vs global category average

Water pumps 4.07 3/5 in category pumps (electric)	55kW Fan 5.07 3/5 in category fans	Axial flow fan 45kW 5.46 5/18 in category fans
DD321-40 5.58 1/5 in category drill rigs (underground)	Diaphragm pumps 6.14 3/3 in category pumps (pneumatic)	37kW Fan 6.26 13/18 in category fans
Roof bolter 6.35 1/1 in category roof bolters	AARD UV 80 6.6 4/6 in category utility vehicle	22kW Fans 6.7 15/18 in category fans
LH514 6.81 2/3 in category load haul dumper	UV80 Scissors lift 79kW 7.06 4/6 in category utility vehicle	75kW Fan 7.58 18/18 in category fans
Dump trucks 7.66 2/3 in category dump trucks	Drill rigs - Simba double boom 7.84 3/5 in category drill rigs (underground)	Sandvik DD 210 8.53 4/5 in category drill rigs (underground)
S25 Hand held drill rig (Sandvik) 8.74 5/5 in category drill rigs (underground)		

BENEFITS AND IMPROVEMENTS REPORTED BY AFFECTED STAKEHOLDERS

The Critical Noise Equipment Screening Tool dashboard gives a quick analysis of what the risks on the mine are, which is easy to understand and present to other departments during formal communication sessions. Since it assisted the mine in developing a list of high risk equipment, even when the noise level was not the highest contributing factor (e.g. when people are exposed for long periods of time, or when large numbers of people are exposed to the same noise source) it was possible to engage with the VOHE Department and discuss the noise emitting pieces of equipment with the biggest impact, and prioritise them for consideration in management programmes.



The following benefits were also identified:

- 1 Identification of the high-risk equipment helped the VOHE Department to prioritise high-risk areas for measurement and control management
- 2 Enhanced focus on critical information regarding noise emitted by high-risk equipment
- 3 Develop a monitoring and measurement programme for high-risk equipment
- 4 Improved quality assurance of noise measurements conducted and data capturing processes through the various levels of verification

Opportunities of application:

From the data obtained using the Critical Noise Equipment Screening Tool the following opportunities were identified:



Use of the Critical Noise Equipment Screening Tool graphic output to assist with noise induced hearing loss case investigations



Improve the understanding of the operational noise risks in the working environment



Creating better understanding with key stakeholder departments such as procurement and VOHE as to where the focus should be with regards to high-risk equipment, and also establishing improved preventative maintenance programmes for those identified pieces of equipment

PHOTOS / INFOGRAPHICS

1 A supervisor/superintendent presenting the data from the Critical Noise Equipment Screening Tool to the Department of Mineral Resources and Energy

SCREENING AT SOUTH DEEP GOLD MINE

of pumps (electric): water pumps

Screening team:

- Group Administrator: Francois van der Walt
- Mine Administrator: Jimmy Moritz
- Screening Administrator: Salwynne Vreugdenburg
- Contributor: Tsholo Mokoma

Screening complete, result:

	Low risk			Moderate risk			High risk		
	Review	Approval	Verification	Review	Approval	Verification	Review	Approval	Verification
#1: Noise measurement result in dBA Submitted response: noise >85 <89dBA	Complete	Complete	Complete						
#2: No. of persons exposed Submitted response: no exposed persons	Complete	Complete	Complete						
#3: No. of machines Submitted response: number of machines >30 but <100	Complete	Complete	Complete						
#4: Time of exposure Submitted response: exposure <10 minutes	Complete	Complete	Complete						
#5: Confined work space Submitted response: multiple sources in underground confined space	Complete	Complete	Complete						
#6: Machine vibration Submitted response: no exposure to machine vibration	Complete	Complete	Complete						
#7: Maintenance Submitted response: noise levels increase marginally as condition deteriorates	Complete	Complete	Complete						

MY ACTIVE SCREENING

Question Key

Q1 Noise measurement result in dBA	Q2 No. of persons exposed	Q3 No. of machines	Q4 Time of exposure	Q5 Confined work space
Q6 Machine vibration	Q7 Maintenance	Q8 Equipment improvements and solutions	Q9 Hearing protection	Q10 Critical frequency range

Equipment	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Actions
For South Deep Gold Mine											
Sandvik DD 210 <small>Review in progress</small>	7	8	8	8	10	10	6	7	8	10	Continue review
Axial flow fan 75kW <small>Contribution in progress</small>											View status report
15kW Fan <small>Review in progress</small>	1	8	4	8	10	0	3	7	4	10	Continue review
22kW Fans <small>Contribution in progress</small>	1	10	8	2	10	0	3	7	4	10	View status report
45kW Fan <small>Review in progress</small>	1	10	8	2	10	0	3	7	4	10	Continue review
75kW Fan <small>Review in progress</small>	3	10	9	4	10	0	3	7	8	10	Continue review
Spindle pumps <small>Review in progress</small>	1	8	8	8	10	2	6	7	4	10	Continue review
Diaphragm pumps <small>Contribution in progress</small>	4	8	9	8	10	2	6	7	8	10	View status report

PHOTOS / INFOGRAPHICS CONTINUED

1 A supervisor/superintendent presenting the data from the Critical Noise Equipment Screening Tool to the Department of Mineral Resources and Energy **continued**

All screenings conducted at your operation(s) in the last 12 months

South Deep Gold Mine	Low risk	Moderate risk	High risk	
DD321-40 <i>South Deep Gold Mine, completed: 2022-02-25 11:47:10</i>				5.58/10
Drill rig - Simba Double boom <i>South Deep Gold Mine, completed: 2022-02-25 11:47:37</i>				7.84/10
S25 Hand held drill rig (Sandvik) <i>South Deep Gold Mine, completed: 2022-08-11 15:44:11</i>				8.74/10
Sandvik DD 210 <i>South Deep Gold Mine, completed: 2022-09-13 11:22:03</i>				8.53/10
Dump Trucks <i>South Deep Gold Mine, completed: 2022-07-28 13:48:00</i>				7.66/10
Dump Trucks <i>South Deep Gold Mine, completed: 2022-02-25 11:48:00</i>				7.5/10
22kW Fans <i>South Deep Gold Mine, completed: 2022-02-25 11:48:26</i>				6.7/10
37kW Fan <i>South Deep Gold Mine, completed: 2022-02-25 11:46:14</i>				6.26/10



MINERALS COUNCIL
SOUTH AFRICA

www.mineralscouncil.org.za

www.mosh.co.za