



**MINING INDUSTRY  
OCCUPATIONAL  
SAFETY & HEALTH**



**MINERALS COUNCIL  
SOUTH AFRICA**

What should

# **I KNOW ABOUT NOISE?**



**A PRACTITIONER'S AND MANUFACTURER'S GUIDE**



Gunshot  
(140-162 dB)



Jet taking off  
(140 dB)



Jackhammer  
(130 dB)



Firecrackers  
(125 dB)



Rock concerts  
(120 dB)



Snowmobile riding  
(110 dB)



Headphones  
(Same as a chainsaw)  
(100 dB)



Motorcycle  
(95 dB)



Lawnmower, Truck traffic  
(90 dB)



Dog barking  
(70 dB)



Normal conversation  
(50-60 dB)

LOUD



Loudness in decibels (dB)



SOFT

140 dB

130 dB

120 dB

110 dB

100 dB

90 dB

80 dB

70 dB

60 dB

50 dB

40 dB

30 dB

20 dB

10 dB

0 dB

## NOISE LEVELS

**160 dB**

Immediate physical damage

**130 dB**

Immediate pain threshold

**115 dB**

Risk of hearing damage  
in 15 minutes

**105 dB**

Risk of hearing damage  
in 1 hour

**95 dB**

Risk of hearing damage  
in 4 hours

**85 dB**

OSHA hearing protection  
regulations start here

**75 dB**

"Non-hazardous" noise

**50 dB**

Comfortable sound

# CONTENTS

<b>Introduction</b>	<b>2</b>
<b>What is noise?</b>	<b>3</b>
<b>Noise induced hearing loss</b>	<b>4</b>
<b>Legal requirements</b>	<b>5</b>
Manufacturer's and supplier's duties	6
Occupational exposure limits	6
Occupational Health Programme	6
<b>Noise measurement</b>	<b>6</b>
Equipment and/or processes measurement	9
Personal noise exposure monitoring	11
<b>Reporting</b>	<b>13</b>
<b>Noise guidance note</b>	<b>14</b>
<b>Medical surveillance</b>	<b>15</b>
<b>The role of institutions within the South African mining industry</b>	<b>16</b>
Mine Health and Safety Council (MHSC)	16
Mining Industry Occupational Safety and Health (MOSH)	16
Minerals Council South Africa	17
<b>Journey to zero harm</b>	<b>18</b>
<b>Milestones</b>	<b>20</b>
<b>Noise leading practices and initiatives</b>	<b>21</b>
<b>My notes</b>	<b>30</b>

# INTRODUCTION

The aim of this information booklet is to facilitate adequate awareness among practitioners (health, safety, engineering, procurement, labour), manufacturers and suppliers of equipment on their duties pertaining to the health and safety requirements, stipulated in the Mine Health and Safety Act (MHSA) (Act No.29 of 1996), as amended.

Noise induced hearing loss (NIHL) is a significant occupational health risk within the South African mining industry, due to the noise levels generated by various equipment and/or processes within the mining environment.

Equipment producing noise should therefore comply with the MHSA regulations, which stipulate that the equipment is safe and without risk to health and safety.



## WHAT IS NOISE?

Noise is any unwanted sound that is too loud, could interfere with hearing and communication, may be unpleasant and could damage your hearing.

Noise has also been proven to cause or increase stress, hypersensitivity to noise, high blood pressure and high heart rates.

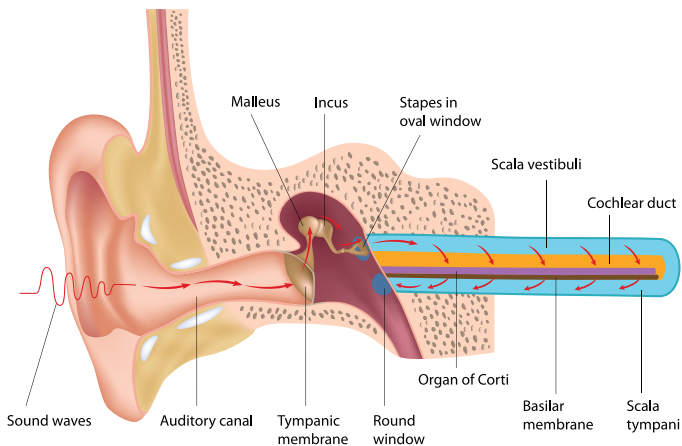
Noise can also make it difficult for persons to hear instructions or warning signals, which can cause both frustration and danger.

# NOISE INDUCED HEARING LOSS

NIHL is a permanent hearing impairment resulting from prolonged exposure to high levels of noise. Excessive noise exposure is the most common cause of hearing loss but studies show an alarming increase in hearing loss in young people as they attend loud music concerts and/or use portable radios with earphones.

When noise is too loud, it begins to destroy cells in the inner ear. As the exposure time to loud noise increases, more and more hair cells are destroyed. As the number of hair cells decreases, so does your hearing. Currently, there is no way to restore life to dead hair cells; the damage is permanent.

## Mechanism of hearing



# LEGAL REQUIREMENTS

## Manufacturer's and supplier's duties

Section 21 of the MSHA explains the manufacturer's and supplier's duties in terms of health and safety.

1) Any person who:

- a) designs, manufactures, repairs, imports or supplies any equipment for use at a mine must ensure, as far as reasonably practicable:
  - i) that the equipment is safe and without risk to health and safety when used properly and
  - ii) that it complies with all the requirements in terms of this Act.

To ensure that equipment in use at mines complies with the milestones set for the South African mining industry, it could be a pre-requisite for manufacturers or suppliers to provide a third party report, specifying the noise emissions and performance of the product, prior to it being purchased. The reasons for this include:

- To have a portfolio of evidence available on the noise emissions of equipment, demonstrating compliance towards meeting the set milestones
- To have records available on the equipment which needs to be silenced for the milestones to be met
- For the manufacturer or supplier to demonstrate that the modification or silencing of the equipment will have the desired effect and how the performance of the product would be affected
- The test results will assist the manufacturer or supplier to do the necessary alterations to the risk assessment and pre-use checklists if required

## LEGAL REQUIREMENTS CONTINUED

The noise measurements taken by the mine will not be regarded as a third party measurement or report but will only serve as verification measurements as part of the verification of the information contained within the third party report and to demonstrate compliance to the set noise milestones.

### Occupational exposure limits

The MHSR regulation 22.9(2)(b) dictates the following occupational exposure limits for noise:

#### i) Noise

- 1) Noise exposure: 85 dB  $L_{Aeq, 8h}$
- 2) Peak sound level: 135 dB(A)

It is the responsibility of every mine to ensure compliance to the exposure limits listed above.

### Occupational health programme

In addition to regulation 22.9(2)(b), regulation 9.2(2) also requires the employer to establish and maintain a system of occupational hygiene measurements, where noise is equal or exceeds 82 dB  $L_{Aeq, 8h}$ .

#### Noise measurement:

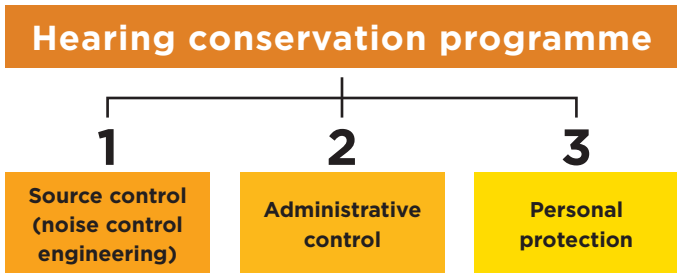
Measurements for noise exposure must be done by a qualified person, and the records must be linked as far as practicable to each employee's record of medical surveillance.



## Hearing conservation programme:

A successful hearing conservation programme (HCP) invariably consists of three distinct but complementary elements (figure 1.1) intended to reduce the risk of NIHL.

**Figure: 1.1**



The first of these is an engineering-based strategy to eliminate or reduce dangerous noise at its source, or at least to control its transmission through the workplace. Source and transmission control through noise control engineering (NCE) offers the greatest potential for reducing the risk of NIHL and accordingly, should be regarded as the preferred approach to hearing conservation.

Although initially more costly and time-consuming to implement, it amounts to a systematic solution to the noise hazard and reduces reliance on individual employee's compliance with what are often inconvenient, unpopular and ultimately more expensive strategies.

## LEGAL REQUIREMENTS CONTINUED

Administrative controls are aimed at limiting employee exposure and the resultant risk of hearing loss could be incorporated into the HCP and include changes in the organisation of work, alternative scheduling of noisy tasks and, in some instances, the rotation of employees into and out of noisy areas to limit individual exposure.

The extent to which NCE and administrative controls are successful in reducing the risk will determine the level of reliance on the third element of an HCP, i.e. personal protection. Unfortunately, most hearing conservation programmes embrace this approach as the final or only solution to the noise hazard, even though it should be regarded as a temporary solution or as a last resort. Personal protection is a form of receptor control, in that it seeks to limit noise emission (the level of unwanted sound energy incident on the ear), through the individual use of hearing protection devices.

### **Medical surveillance:**

The system of medical surveillance of employees as required by Section 13(2)(c) must consist of an initial and other medical examinations (periodic and exit) to determine the health of the employee.

# NOISE MEASUREMENT

## Equipment and/or processes measurement

Equipment and/or processes that generate noise must be measured. (The complete cycle should be measured).

Noise exposure can only be measured by a person qualified in occupational hygiene techniques. The person referred to, will know that a type 2 sound level meter (SLM) must at least be used in accordance with the requirements of SANS 10083.

The type 2 instrument referred to, must be calibrated at least annually by a suitably equipped and certified laboratory that complies to SABS 0259. A class 2 calibrator must be used prior to and after each shift to ensure that the two calibration checks do coincide to within 1.0 dB.

For a specific noise source, the noise must be measured at a distance of 1m from the source. A video is available on the MOSH website on how to conduct equipment noise measurements. (<http://www.mosh.co.za/noise/day-of-learning>)

The following general procedure must be followed:

- For area noise measurements, each workplace or area selected for measurements, at least 3 microphone positions must be selected, to ensure a representative coverage of the area
- For noise source or equipment noise measurements, at least one measurement to be conducted at a distance of 1m from the source, refer to the video on the MOSH website on how to conduct equipment noise measurements. (<http://www.mosh.co.za/noise/day-of-learning>)

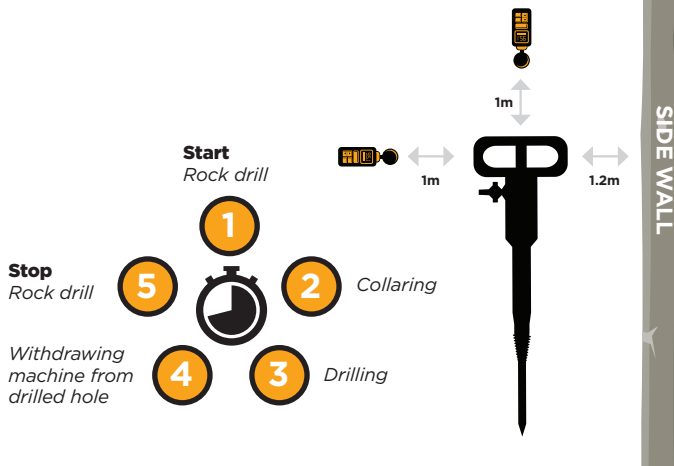
## NOISE MEASUREMENT CONTINUED

- Microphone positions to be in accordance with the following:
  - Standing persons - 1.5m above the floor
  - Seated persons - 0.9m above the seat
  - Fixed workstations - employee's most exposed ear
  - Specific noise source - 1m from the source
  - 1.2m from walls or sound reflecting surfaces

The following noise measurement procedure must be followed:

- Measure the  $L_{Aeq, T}$  for a representative time at each selected microphone position
- For steady noise, a measurement time of **1 minute** is adequate
- Where the noise varies or is cyclical, the **measurement time** should be sufficient to capture variations in the noise level and include a reasonable number of work task cycles, to ensure representative results
- This  $L_{Aeq, T}$  measurement for the variation or cyclical noise level will then be recorded as the **representative noise level** for the individual piece of equipment

An inventory of all noise sources in use (types and numbers) and their typical emission level, by activity area and constituent workplaces, be maintained by the mine as part of its risk management system.



## Personal noise exposure monitoring

Personal noise is measured with a dosimeter, which measures and stores the sound pressure levels (SPL) and, by integrating these measurements over time, provide a cumulative noise-exposure reading for a given period, such as an 8-hour workday.

Dosimeters can function as personal or area noise monitors. In occupational settings, personal noise dosimeters are often worn on the body of a worker with the microphone mounted on the middle-top of the person's most exposed ear.

## NOISE MEASUREMENT CONTINUED

In workplaces where employees move about in different areas or where the noise intensity tends to fluctuate over time, noise exposure is generally more accurately estimated by the personal monitoring approach.

Noise dosimeters are also used to collect data for use in legal proceedings, development of engineering noise controls, and other industrial hygiene purposes. Dosimeters must also be calibrated and operated according to manufacturers' specifications.

# REPORTING

Equipment and/or process noise measurements are used to populate a noise inventory. These measurements are used to determine which equipment should be prioritised to start research and development to ensure future noise milestone targets are met. These measurements are also used to compile mandatory and/or *ad hoc* reports for management, health, safety and environmental (HSE) committees, Department of Mineral Resources (DMR), MOSH and industry reporting.

Personal noise measurements taken, form part of the system of occupational hygiene measurements and reports are compiled and reported to management, HSE committees and the DMR.



## **NOISE GUIDANCE NOTE**

The guidance note for noise measurement of equipment to ensure conformance with MHSC Milestones was drafted to provide guidance to the South African mining industry on noise measurement and reporting best practice and is available at the link provided below:

<http://www.mosh.co.za/component/jdownloads/send/12-noise/1484-guidance-note-for-noise-measurement-of-equipment-to-ensure-conformance-with-mhsc-milestones>



# MEDICAL SURVEILLANCE



An audiometric test determines a person's hearing ability at various frequencies, with the use of an audiometer. The results of audiometric tests are given in a form of an audiogram, and this can be used to diagnose hearing loss or diseases in the ear or auditory system.

The audiometric test is aimed at the identification of employees who are at risk of noise induced hearing loss. The results of the audiometric test also form the basis of on-site investigations in diagnosed cases of noise induced hearing loss.

# THE ROLE OF INSTITUTIONS WITHIN THE SOUTH AFRICAN MINING INDUSTRY

## MHSC

The Mine Health and Safety Council (MHSC) is a national public entity established in terms of the Mine Health and Safety Act, No 29 of 1996, as amended.

The MHSC was set up in 1996 to direct safety in the mining industry and to respond to industry safety challenges. This body was built on the achievements of decades of fundamental research and funded by the mining industry.

The entity comprises a tripartite board represented by state, employer, and labour members under chairmanship of the Chief Inspector of Mines. The MHSC is funded by public revenue and is accountable to Parliament.

The main task of the Council is to advise the Minister of Mineral Resources on occupational health and safety legislation and research outcomes focused on improving and promoting occupational health and safety in South African mines. The Council also oversees the activities of its committees, promotes a culture of health and safety in the mining industry, arranges a summit every two years to review the state of occupational health and safety at mines, and liaises with the Mining Qualifications Authority and any other statutory bodies about mining health and safety.

## **MOSH**

In June 2003, the Minerals Council South Africa and its social partners, government and labour, established MOSH to focus on the adoption of leading practices to address health and safety concerns and accelerate the progress towards achieving zero harm. Amongst other practices to be addressed was NIHL.

The Minerals Council established the Learning Hub in 2009 to encourage mining companies to learn from the pockets of excellence that exist in the industry through an adoption process which involves identifying, documenting, demonstrating and facilitating widespread adoption of leading practices that have the greatest potential to address the major risks in health and safety areas such as amongst others, noise.

## **Minerals Council South Africa**

The Minerals Council South Africa is a mining industry employers' organisation that supports and promotes the South African mining industry. The Minerals Council South Africa serves its members and promotes their interests by providing strategic support and advisory input.

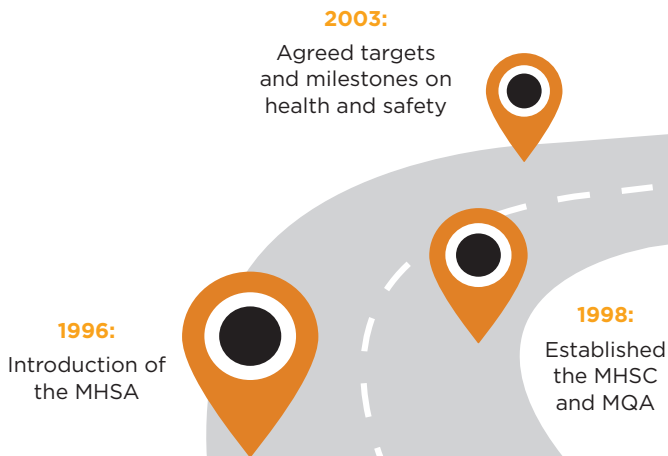
A key role of the organisation is to facilitate interaction among mining employers to examine policy issues and other matters of mutual concern to crystallise and define desirable industry standpoints.

# JOURNEY TO ZERO HARM

The first Indaba was held in 1998 where the MHSC was officially introduced to the public for the first time.

From 2003 onwards, the tripartite summit agreed on industry milestones, amongst others, the prevention of NIHL.

Below is a road map to zero harm.



# ZERO HARM

## December 2024:

The total operational or process noise emitted by any equipment must not exceed a sound pressure level of 107 dB(A)



## December 2013:

The total noise emitted by all equipment installed in any workplace must not exceed a sound pressure level of 110 dB(A)



## 2008:

Developed Tripartite Action Plan to achieve the milestones

## December 2008:

No deterioration in hearing greater than 10%

# MILESTONES

The MHSC, as per the mandate of the Mine Health and Safety Act of 1996 as amended, decreed at the 2014 Occupational Health and Safety Summit Milestones, that by:

- **December 2024**, the total operational or process noise emitted by any equipment must not exceed a milestone sound pressure level of 107 dB(A) and,
- **December 2016**, no employee's standard threshold shift (STS) will exceed 25 dB from the baseline when averaged at 2000, 3000 and 4000 Hz in one or both ears.



# NOISE LEADING PRACTICES AND INITIATIVES

The MOSH Learning Hub encourages mining companies to learn from the pockets of excellence that exist in the industry through an adoption process. Such processes amongst others, include noise. Leading practices that were introduced are:

## HPD TAS Tool Leading Practice:

The HPD TAS Tool consists of:

- Educational, motivational and training materials:
  - Hearing protection device training, awareness and selection (HPD TAS) Tool. The objective of the HPD TAS Tool leading practice is to assist the mining industry with the elimination of NIHL by improving the effectiveness of the mines hearing conservation programmes (HCP).
- Educational, motivational and training materials for trainers, comprising:
  - A script for induction talks on the noise hazard, with a demonstration of the benefits of using hearing protection devices in noisy areas and their correct use and care, with four supporting overhead transparencies
  - Guidelines for trainers volume 1
  - Use of the video programme “To Hear or not to hear: The choice is yours”, Educational/motivational module and HPD training module guidelines for trainers Part 2
  - Addressing typical concerns raised by individuals who are resistant to using hearing protection devices
  - Guidelines for trainers part 3
  - Use of the handout for trainees “Make safe your ears”
  - Guidelines for trainers part 4

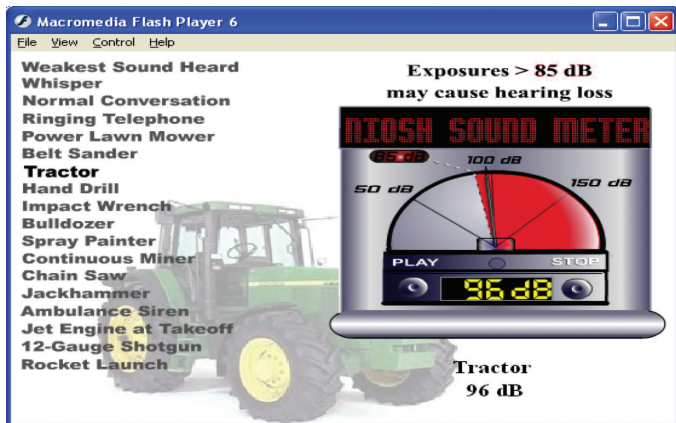
# NOISE LEADING PRACTICES AND INITIATIVES CONTINUED

- Other educational materials includes:
  - The National Institute for Occupational Safety and Health (NIOSH) hearing loss simulator

The screenshot shows the NIOSH Hearing Loss Simulator software interface. The window title is "NIOSH Hearing Loss Simulator". The interface includes a menu bar (File, Play, Help), control buttons for foreground and background audio, and a volume slider. The main display area shows two frequency spectra: "Foreground" and "Background". The foreground spectrum shows a complex noise profile with peaks around 1000 Hz and 4000 Hz. The background spectrum is flat. Below the spectra are frequency band sliders for 30, 75, 125, 200, 275, 325, 450, 625, 1700, 3000, 4500, and 9000 Hz. The sliders are currently set to 0 dB. On the right side, there are settings for "Hearing loss" (None, Predicted exposure and age effects, Mild, Moderate, Moderate/severe, Manual), "Predicted exposure and age effects" (checked), "Gender" (Male), "Exp. effects" (Years of exp. 25), "Age effects" (Age 55), "Exp. level dB(A)" (95), and "Fractile" (0.5). The status bar at the bottom indicates "Foreground: Male" and "Background: (none)".



- The National Institute for Occupational Safety and Health (NIOSH) sound meter



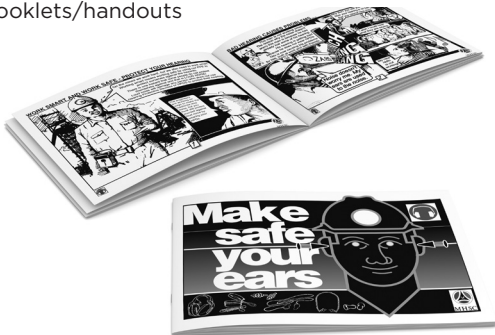
# NOISE LEADING PRACTICES AND INITIATIVES CONTINUED

- YouTube videos

Educational/motivational video (15 minutes), which conveys the message that loud noise is hazardous and illustrates the potential consequences of exposure to it.

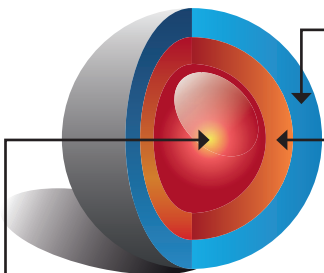


- Booklets/handouts



## Industry Buy and Maintain Quiet Initiative:

The Industry-wide Buy and Maintain Quiet Initiative (IBMQI) is an industry-wide arrangement where mining companies procure equipment and maintain existing equipment that conforms to specific noise emission requirements.



### Manage noise at source - “critical control”

- Noise is an engineering/ design problem
- Noise source measurements, after-effect analysis etc - occupational health and supplier/original equipment manufacturer (OEM) domain
- It is more cost effective to manage noise at the source

### What is it?

A standing decision from mining companies to procure equipment and maintain existing equipment that comply with specific noise emission requirements

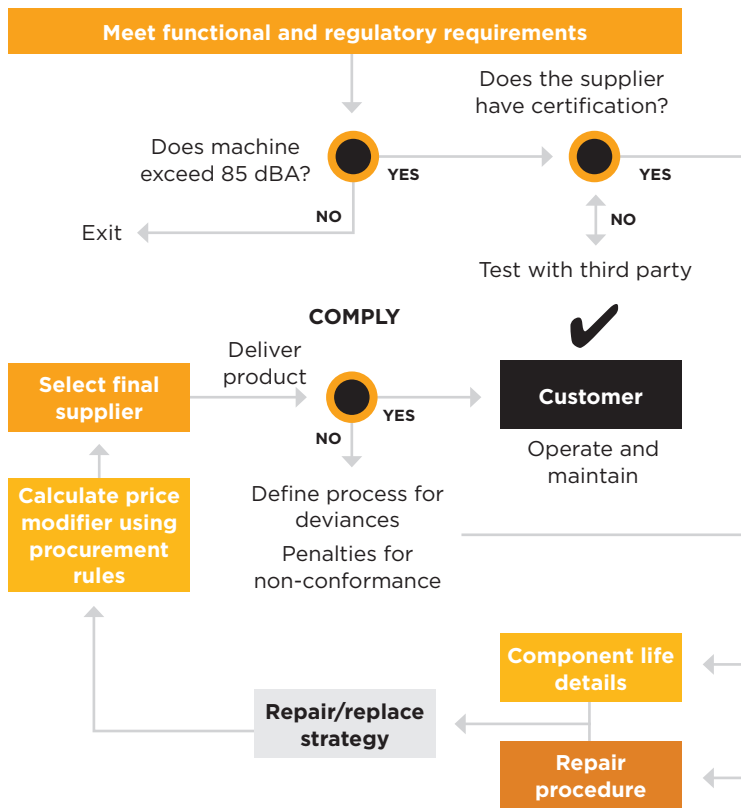
### Purpose

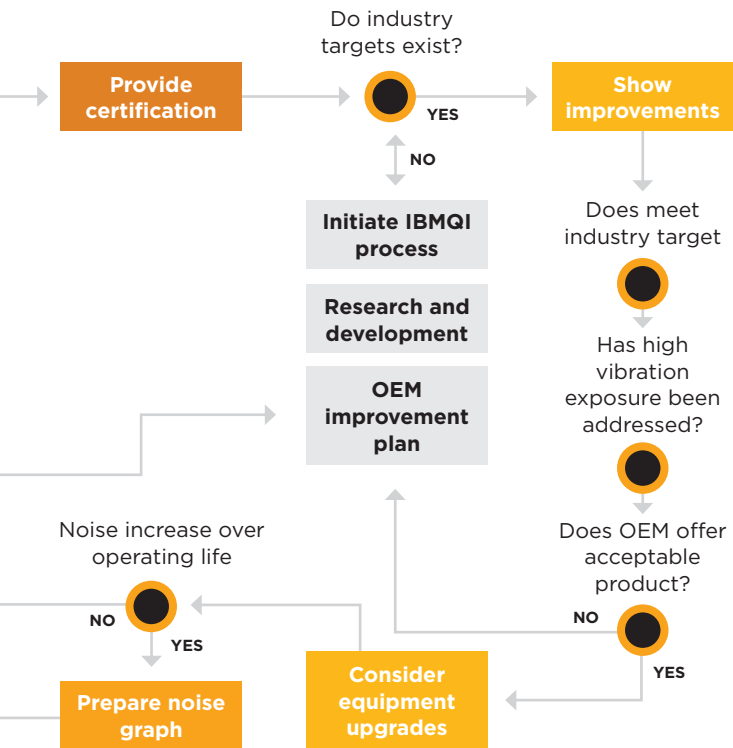
To provide the mining industry leaders with a consolidated industry-wide strategy for an IBMQI as well as a practical path-forward to execute the strategy

# NOISE LEADING PRACTICES AND INITIATIVES CONTINUED

## Procurement of new equipment:

Considering noise during procurement process

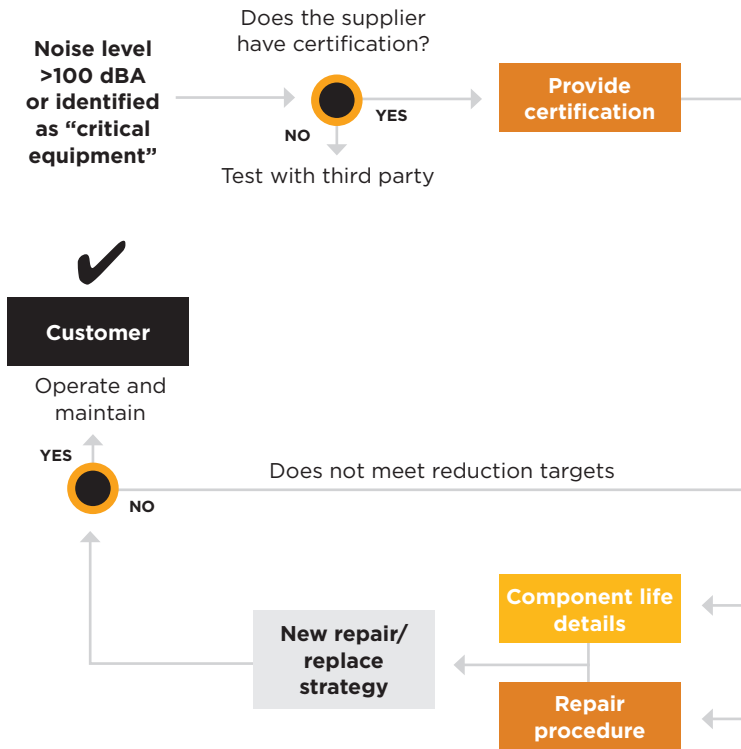


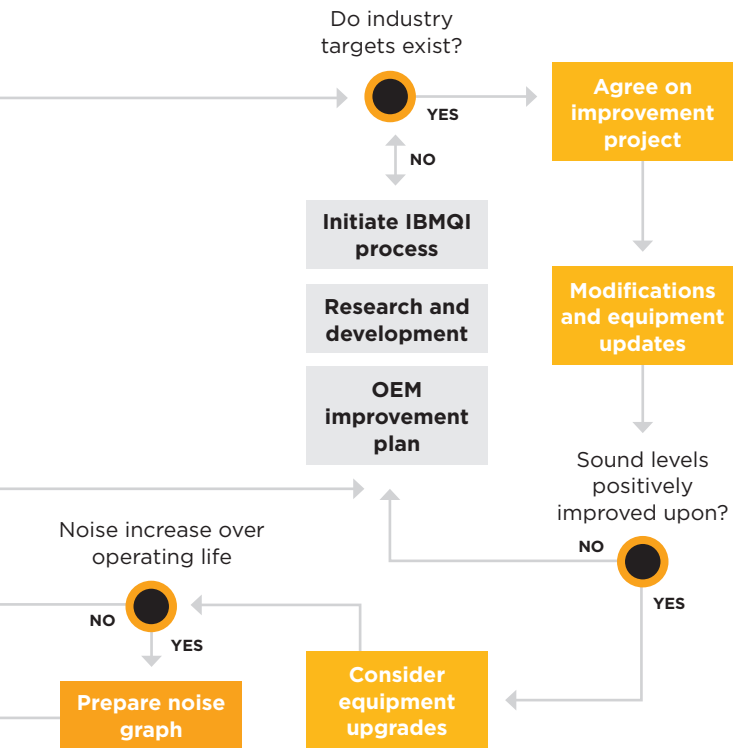


# NOISE LEADING PRACTICES AND INITIATIVES CONTINUED

## Silencing of existing equipment:

Considering noise reduction of existing equipment





## NOTES

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[www.mineralscouncil.org.za](http://www.mineralscouncil.org.za)  
[www.mosh.co.za](http://www.mosh.co.za)