AngloAmerican

Acoustic Control Innovations for Iron Ore Crushing Plants

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Contents

Acoustic Control Innovations for Iron Ore Crushing Plants

Road Map

Noise measurement methodology

- Case Study: Guidance note for equipment noise measurement, Sishen mine, 2021.
- Measurements or all equipment in accordance with the **guidance note for noise measurement of equipment to ensure conformance with mine health and safety council (MHSC) milestones.**
- Structured approach on identification and prioritisation of high emitting noise equipment using the Mosh Critical Noise Screening Tool.
- Developed a Top 10 Noisy Equipment Register.
- DMS Quaternary Crusher had average noise level of 109.5dB(A) (i.e. 107.7dB(A)-113.2dB(A).
- Commenced with investigation of noise control initiatives.
- 2022: SAIOH Annual Conference presentation on Engineering Noise Controls; Acoustic Engineer.
- Commenced engagements with Acoustic Engineering Company in 2023.

Problem Area

DMS Quaternary Crushing Plant

Complete Crusher Unit

Crusher Unit – Feeder Level

Feeder level noise measurements in progress

Engagement with Acoustic Engineer – April 2023

Communication Strategy

- Enquiries were sent to Acoustic Engineer via emails
- Teams meeting were set up for clarification
- Pictures, videos, technical and engineering drawing of the problem area were sent to the Engineer
- Noise measurement report were sent to the Acoustic
- All consultation process was conducted off-site
- Involvement with site Engineers

Acoustic Engineer's Feedback – June 2023, Jan 2024

Noise Control Audit

- Frequency analysis of noise measurements was conducted to isolate each item of plant as far as practical and to evaluate the changes in noise level
- Detailed noise diagnostic analysis to identify and distinguish the sources of noise
- Provide a cost v/s benefit analysis report

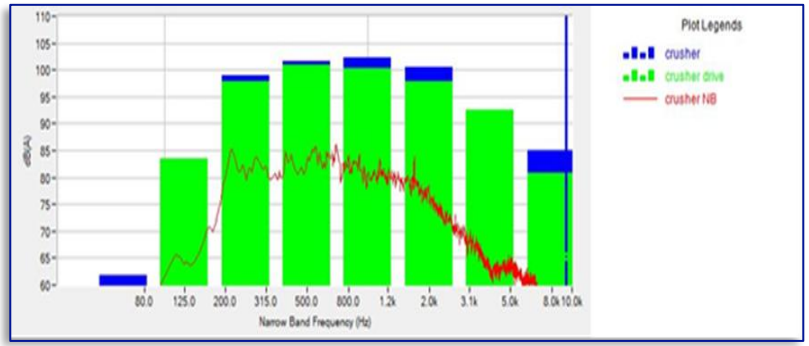


Figure 2: crusher noise with and without material: 110dB(A) v 90dB(A)

Acoustic Engineer Recommendations – September 2024

Noise Control Design

Findings

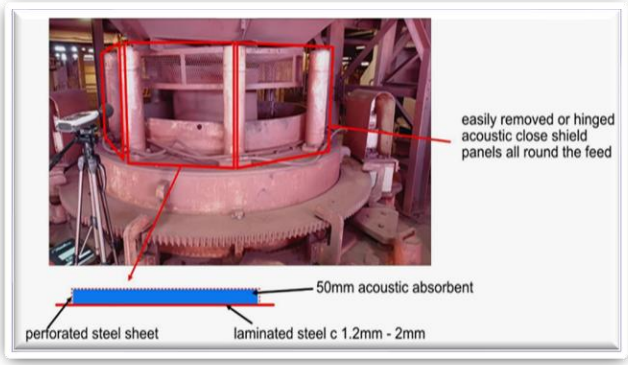
- Both structure and airborne were identified as the main problem, with airborne sound being the dominant.

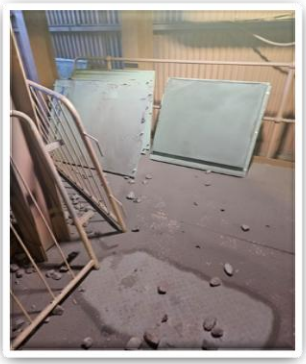
Materials Recommend

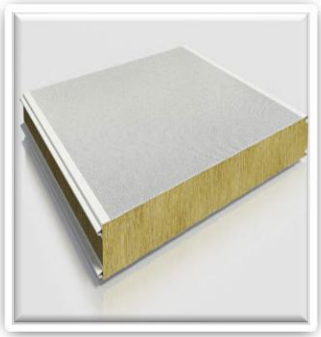
- 50mm acoustic absorbent: rockwool or fiberglass or acoustic foam, thin film faced to prevent dust ingress.
- Perforated steel sheet: typically 22swg, c 3mm holes, 25% open area
- The panels (perforated steel and rockwool) can either be bolted or hinged such that they are easy to remove for access

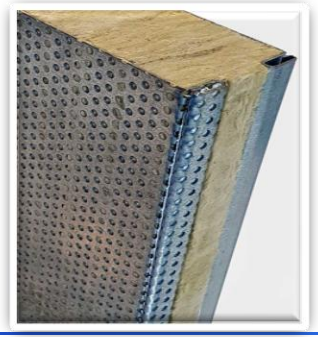
Properties

- High strength, durable and not easy to deform.
- Light weight and easy installation.
- Low cost, economic and practical.
- Moisture proof and corrosion resistant.
- Easy to clean and maintenance free.





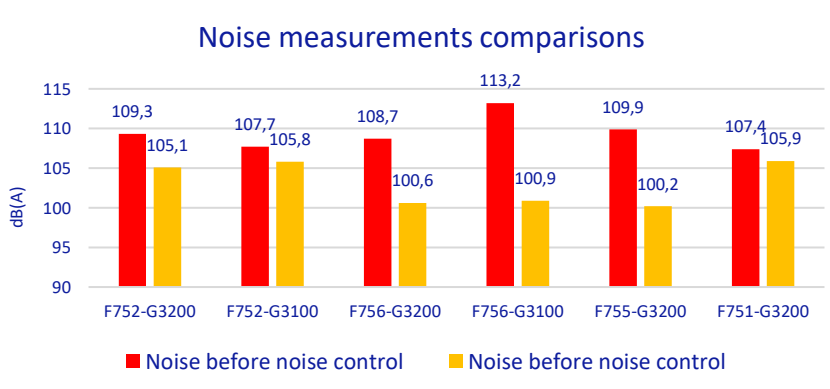




Noise Control Results – November 2024

Noise Control Design

- On a first of it's kind for Sishen mine at the Quaternary Crusher acoustic perforated steel were installed on the crushers which resulted in 1.5dB(A) – 12.3dB(A) reduction. Average noise levels reduced from 109.5 to 102.8dB(A)
- This led to the achievement of the 2014 MHSC Occupational Health Milestones of 107dB(A)



Before noise control treatment

After installation of noise acoustic material

Noise Control Results – November 2024

Noise reduction, Cost and Benefits

Noise reduction

Average noise levels reduced from 109.5dBA to 102.dBA

Highest equipment noise reduction from 113.2dBA to 100.9dBA

Cost

Cost of Project

- **Consulting fees = R303K**
- **Installation fees = R720K**
- **Total Cost: 1,023 000M**

Benefit

Personal noise exposure reduction

- Noise exposure reduction for fitters and boilermakers from HEG B – HEG C category
- Doubling effect using the 3 decibel exchange rate it means the sound intensity was halved 4 times from one of the crusher. This also halved employee noise exposure to that specific crusher by 4 times

Conclusion

Key Learnings and way forward

Conclusion

- Identify, acknowledge your noise problem (Using appropriate noise measurement methodology and MOSH Screening Tool)
- Challenge the status quo
- Collaborate with other stakeholders'. OEM, Engineering Teams, MOSH Team, Acoustic Engineers, Experts. etc.
- Garner Leadership/Management Support
- Continual Improvements
- Sharing of best practices

Way forward

- Treatment of noise on chutes
- Treatment of noise on grizzly feeders
- Treatment of noise screens

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