



Excellence Award Corporate - Wide



A Two-Pronged Approach to
Noise Control and
Hearing Conservation

February 9, 2024





Dow Company Profile

- Operates over 100 manufacturing sites in more than 30 countries
- Approximately 37,800 employees
- Approximately \$57 billion in sales in 2022
- Dow's ambition is to become the most innovative, customer centric, inclusive and sustainable materials science company in the world.
- Dow's portfolio of plastics, industrial intermediates, coatings and silicones businesses delivers a broad range of differentiated, science-based products and solutions for its customers in high-growth market segments, such as packaging, infrastructure, mobility and consumer applications.

Dow Global Team



Corporate Industrial Hygiene

- Karen Study
- Matt Szczepanski
- Karen Millison
- Sara Joswiak

Regional/Local Industrial Hygiene

- Grace Battista
- Simon Peake
- Jessica Miller

Corporate Engineering

- Vanessa Marshall
- Rita Hartman

Occupational Health

- Dr. Rassull Suarez

Operations

- Steve Mynhier
- Ben Davidson

Learning Outcomes

- Recognize the need for targeted hearing protection solutions
- Communicate the importance of fit testing
- Assess gaps in traditional training
- Identify high noise risks being managed
- Prioritize high noise risks to target for risk reduction
- Recall noise solutions



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One-Pronged Approach Hearing Conservation Program (HCP)

- Traditional HCP, manage worker exposure to high noise
 - Monitoring (Area and Personal)
 - Audiometric Testing
 - Hearing Protection Devices (HPD's)
 - Training
 - Recordkeeping
- Outcome could still be employee hearing loss, even with the best efforts.
- Idea, move from a compliance mindset to a control mindset (from risk management to risk reduction)



Two-Pronged Approach Better Hearing Protection and Noise Controls

1. Implement better hearing protection, fit testing and training (while we get noise reduction projects identified, scoped and executed)
2. Identify High Priority (Priority 1*) noise risks, prioritize list and **FIX** noise issues

*Priority 1 = P1

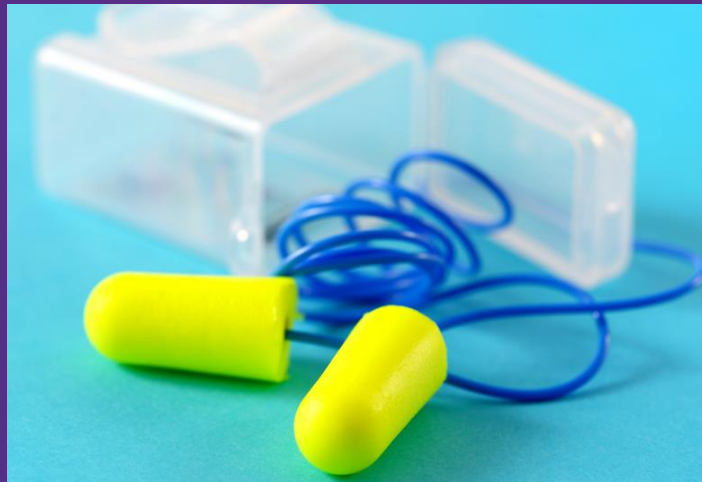


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First Prong - Implement Better Hearing Protection, Fit Testing and Training

- Identify high risk employees
- Identify medium risk employees
- Implement custom molded HPD for employees in high-risk group
- Implement fit testing on all HPD's (initial and periodic)
- Augment employee HCP training with a periodic skill check
- Augment employee HCP training with a periodic fit check course (go beyond the regulations)
- Add noise control training for engineers



Identify High Risk Employees

- Employees in the HCP
- This group has potential noise exposure at or above 85 dBA 8Hr TWA (we use 85 dBA criterion, 3 dB exchange rate, threshold off/none).
- Improve the quality and consistency of quantitative assessments to determine those in the HCP.
- Examples: Statistical analysis tool, guidance for low outliers, minimum number of samples, current data (<5 years).



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Identify Medium Risk Employees

- Employees with routine exposure to high noise levels
- This group works in areas and does tasks at or above 85 dBA, but their full shift exposure is less than 85 dBA as an 8-hour TWA.

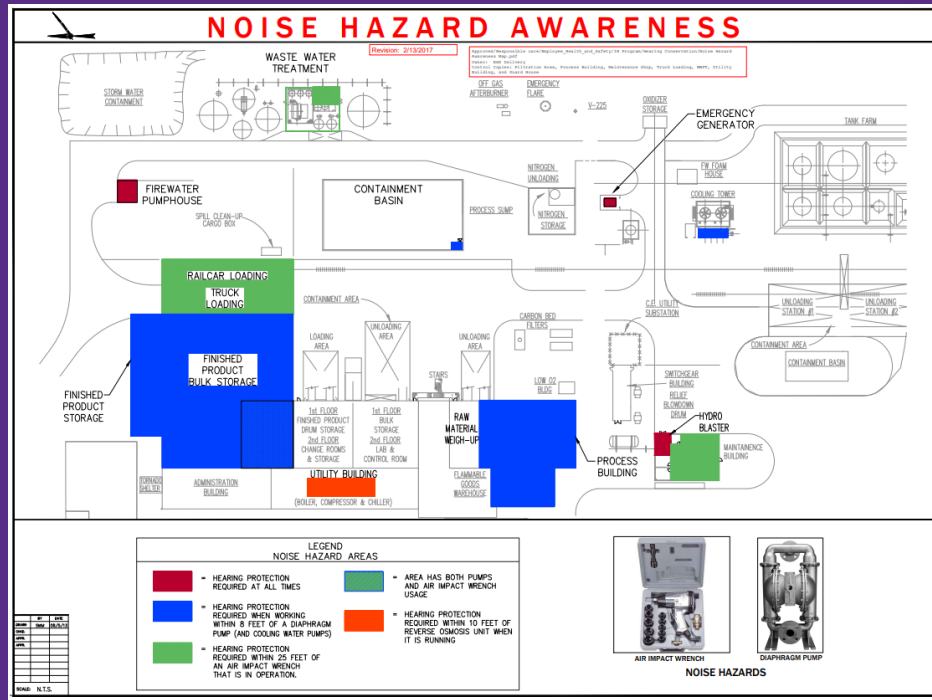


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Implement Custom Molded HPD for Employees in High-Risk Group

- Lagging indicators show that HPD's may not be effective enough
- Custom molded HPD's fit perfectly and can only go in one way
- HPD's that fit are more likely to be worn
- This was already common among some sites in Europe; now a global requirement

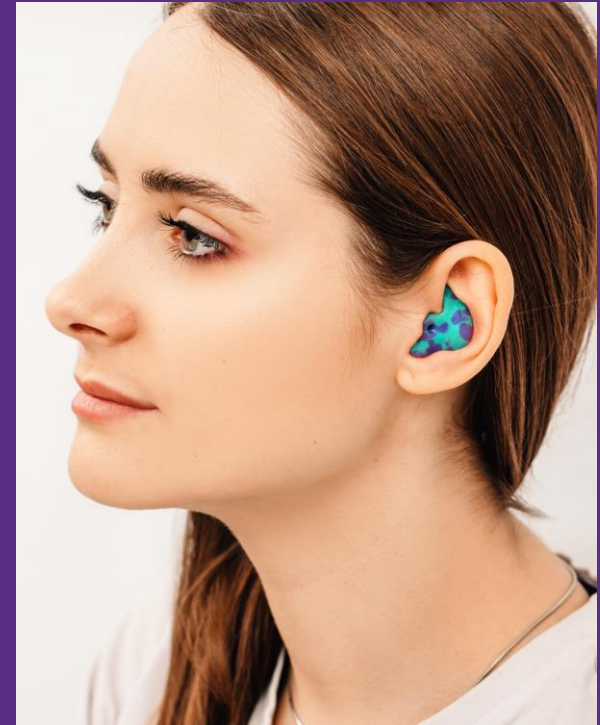


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Implement Fit Testing on all HPD's

- Use [OSHA and the National Hearing Conservation Association \(NHCA\) Alliance, \(August 2008\)](#) best practice document which provides information on fit-testing of hearing protectors.
- Individual fit testing on all HPD's (custom, disposable, muffs)



NIOSH HPD Well Fit™ fit testing system for earplugs. Photo by Mr. Scott Childress, US Army Aeromedical Laboratories

Augment Employee Training with a Periodic Skill Check

- Hands on employee demonstration of don/doff during fit test






Hearing Protection Types, Care, Uses, and Limitations	
<input type="checkbox"/>	Hearing Protectors come in two basic types – plugs which are inserted into the ear canal, and muffs which cover and form a seal around the external ear
<input type="checkbox"/>	<p style="text-align: center;"><i>Care of Ear Plugs - Foam and Flanged Protectors</i></p>  <ul style="list-style-type: none"> • Handle with clean, dry hands • Replace or wash flanged type and foam type plugs with warm, soapy water and air dry frequently.  <ul style="list-style-type: none"> • Do not use solvents to clean any ear protectors • Discard ear plugs if soiled, cracked or distorted
<input type="checkbox"/>	<p style="text-align: center;"><i>Care of Ear Plugs – Custom Molded Protectors</i></p>  <ul style="list-style-type: none"> • <i>Handle with clean, dry hands</i> • <i>Clean daily following the manufacturer's instructions</i> • <i>Do not use solvents to clean any ear protectors</i> 
<input type="checkbox"/>	<p style="text-align: center;"><i>Care of Ear Muffs</i></p>  <ul style="list-style-type: none"> • Wipe down the surfaces of the muffs with clean, damp cloth and air dry • Discard or replace the padded ear muff cup when it becomes soiled, brittle, distorted or cracked

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Augment Employee Training with a Periodic Fit Check Course

- Microlearning module on how to properly don/doff all HPD's including how to check the fit in the field.



NIOSH – How to Wear Soft Earplugs using the Roll-Pull-Hold technique



Add Noise Control Training for Engineers

- Added noise control training course for engineers
- Target those who support high noise facilities and those in Central Engineering responsible for purchasing equipment to meet Dow's equipment noise engineering standards.



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Dow Total Worker Health®



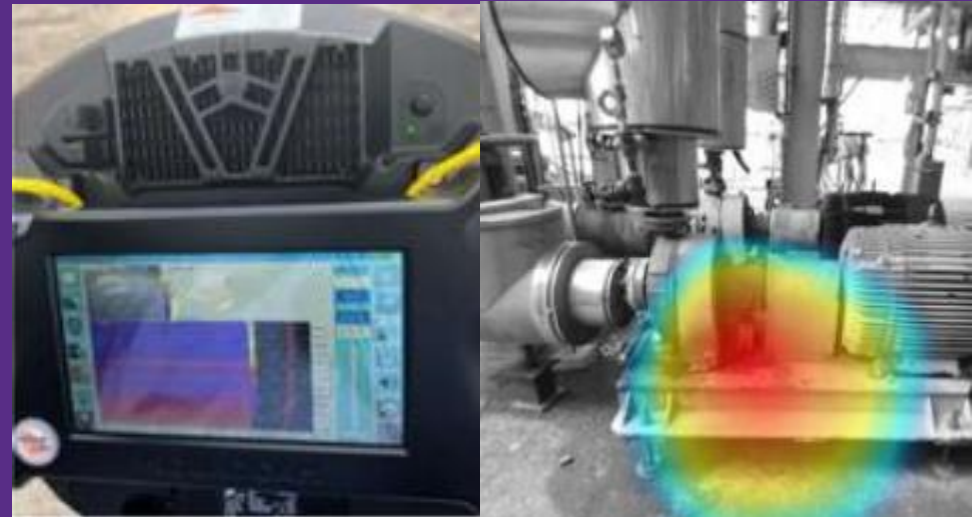
- Healthy Workplace Initiative: Risk Reduction
 - Healthy Workplace and the reduction of high-priority health risks (P1s) is one of three metrics within the Total Worker Health (TWH®) index.
 - Noise P1s represent over 80% of the P1 health risks at Dow.
 - Elimination of noise P1 risks translates to savings in reduced hearing conservation program costs, plus fewer hearing loss cases.
 - In addition, quieter operations will improve safety, equipment reliability, employee experience and productivity.



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Noise P1 Reduction

- Additional Actions Taken
- Noise control solutions are leveraged on a company web page.
- Acoustic camera technology has been implemented to help identify noise sources that might otherwise be missed (e.g., turbulent flow through piping; gaps in acoustic enclosures; bearing failure).
- Design Quiet: Dow has a global engineering standard to specify equipment noise levels for all new equipment.
- Predictive noise modeling is done in-house or by outside consultants to generate additional recommendations.



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Second Prong – Identify P1 Noise Risks, Prioritize List and FIX Noise Issues

- Identify P1's
- Prioritize list
- Use visual dashboards
- Set targets to fix problems
- Track progress
- Change culture (Safe In Sound, Listen Up)
- Sustain the gains with Preventive Maintenance (PM) and behavior observations

Identify P1's

- Area noise data
- Personal noise data
- Job roles (who, where, what)



Sound Level Meter and Noise Dosimeter - OSHA Technical Manual

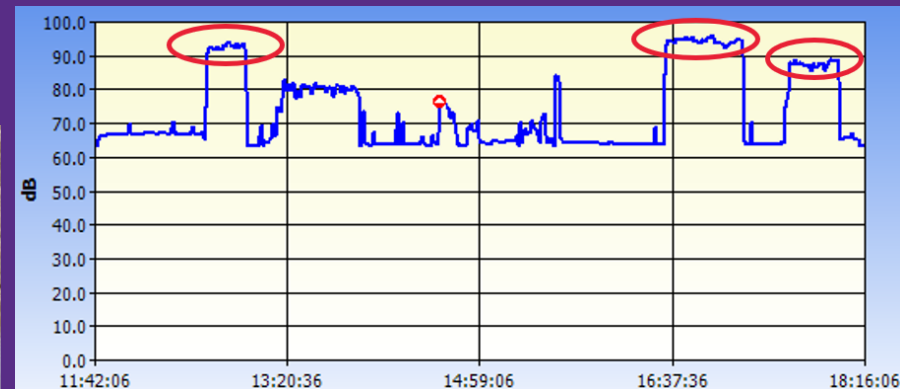


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Prioritize List (how loud and how many in job)

- Noise mapping software includes noise prediction based on where people spend time.
- Noise ranking tool to show contributions of high noise area/equipment to people on a relative basis.
- Noise abatement tool compares two noise control techniques for a given task or area and gives the relative effectiveness and cost.



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Use Visual Dashboards Accessible to Leaders

- P1 risks and improvement targets (how many, common equipment, locations, business)
- Occupational injury and illness data
- Early loss indicators
- Leaders and Engineers assigned to reduce risk



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Set Targets to FIX Problems

- Number to fix each year
- Goal cycle of 10 years
- Company targets for reduction in noise P1's
- Business targets tiered
 - Quantify risks
 - Scope projects
 - Execute projects



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Track Progress

- Visual dashboards updated daily
- Oversight of goals by global team
- Leadership communications



Change Culture



- Special global learning sessions for awareness (define the problem, share solutions, common equipment solutions)

Safe in Sound

We hosted a Safe in Sound webcast in 2021 to highlight the importance of reducing exposure to noise and introduced resources offered by Dow to help successfully implement noise reduction projects. The audience included EHS&S colleagues, engineers, technicians and leaders aligned to facilities with noise reduction opportunities targeted to achieve by 2025. The Safe in Sound panel discussed a variety of topics, from the identification and prioritization of noise sources to how to scope and implement noise exposure reduction solutions. These sessions were key to driving awareness and leveraging proven solutions, which will help us achieve our Total Worker Health® 2025 target of reducing high-priority noise risks.

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Change Culture

- Special global emphasis program, Listen Up! (employee testimonials, leadership support, introduction video, employee feedback on health)
- Listen Up! Videos and resource materials to promote hearing loss prevention, inclusion, and noise exposure reduction.
- Personal Stories - Global video series included employees who shared firsthand accounts of hearing loss or deafness, to help advocate for noise exposure reduction.
- Operations Perspectives - Dow colleagues share their voices to make sure we all understand the impacts of workplace noise and hearing loss.
- Distributed all videos to a global audience through email campaigns and internal web communications that were highly appreciated by employees and made a significant impact across the organization.

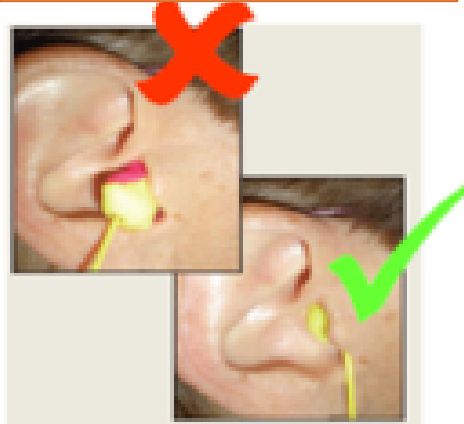


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Increase Awareness

- PM process to inspect, replace, and validate noise controls in place.
- Behavior observation checklist (demarcation, barricades, noise controls, HPD worn).

Poor Fit and Good Fit



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Improvement Categories (some of many)

1. Fans (3)
2. Blowers (3)
3. Venting Air (3)
4. Forklifts (4)
5. Tools (1)
6. Acoustic Curtains & Enclosures (3)

Example Projects



Projects

Reduction (dBA)

• Railcar Venting	32
• Aeration Blower	31
• Isotainer Venting	21
• Tank Truck Venting	21
• Industrial Fan	20
• Blower (no enclosure to enclosure)	12
• Forklift Backup Alarm	10
• Compressed Air Ratchet to Electric Ratchet	10
• Acoustic Curtains	9
• Acoustic Plenum to Disconnects	8
• Forklift Horn	7
• Exhaust Fan	7
• Cooling Fan	5
• Exhaust Blower	5
• Diesel Forklift to Electric	5
• Motor Enclosure	5
• Diesel Forklift Insulation	4





Fan Before

Exhaust Fan

Noise 90 dBA (High)



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Fan After

Cylindrical Silencer
Noise 83 dBA (Moderate)



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Fan Before

Standard Industrial Fan
Noise 87 dBA (High)



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Fan After

Industrial Fan (Quiet Design)
Noise 67 dBA (Very Low)



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Fan Before

Cooling Fan

No Curtain

Noise 87 dBA (High)

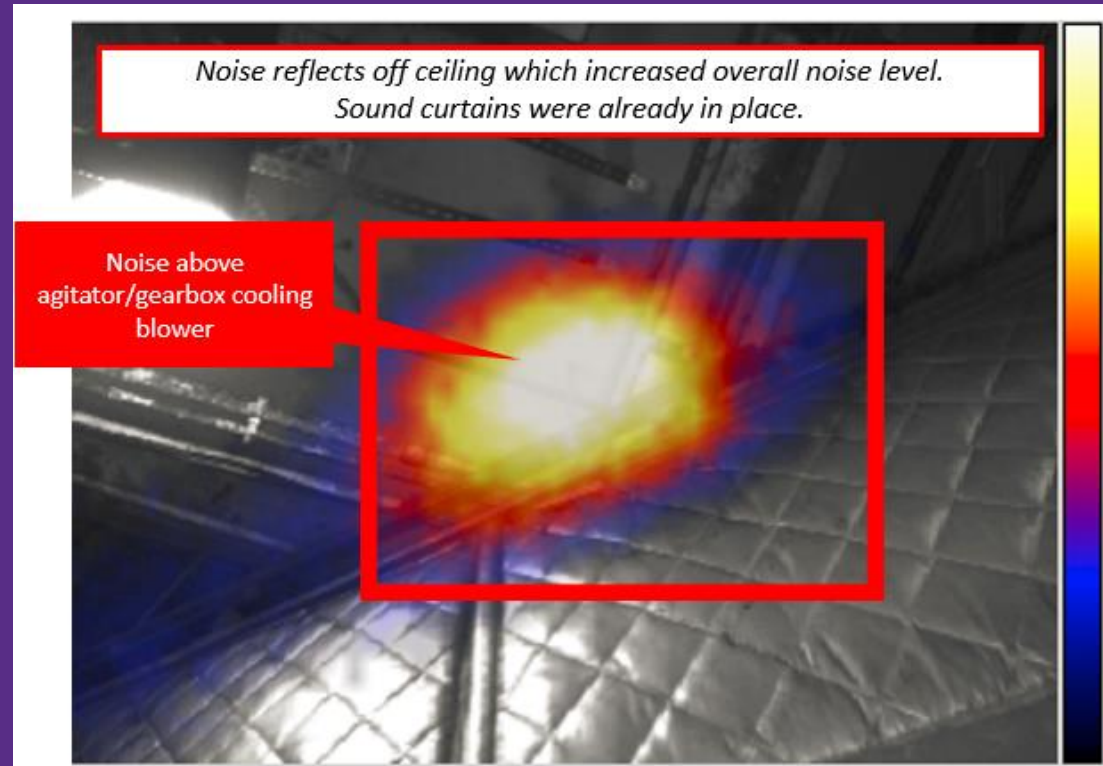


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Fan After

Cooling Fan
Additional Noise Curtain
Noise 82 dBA (Moderate)

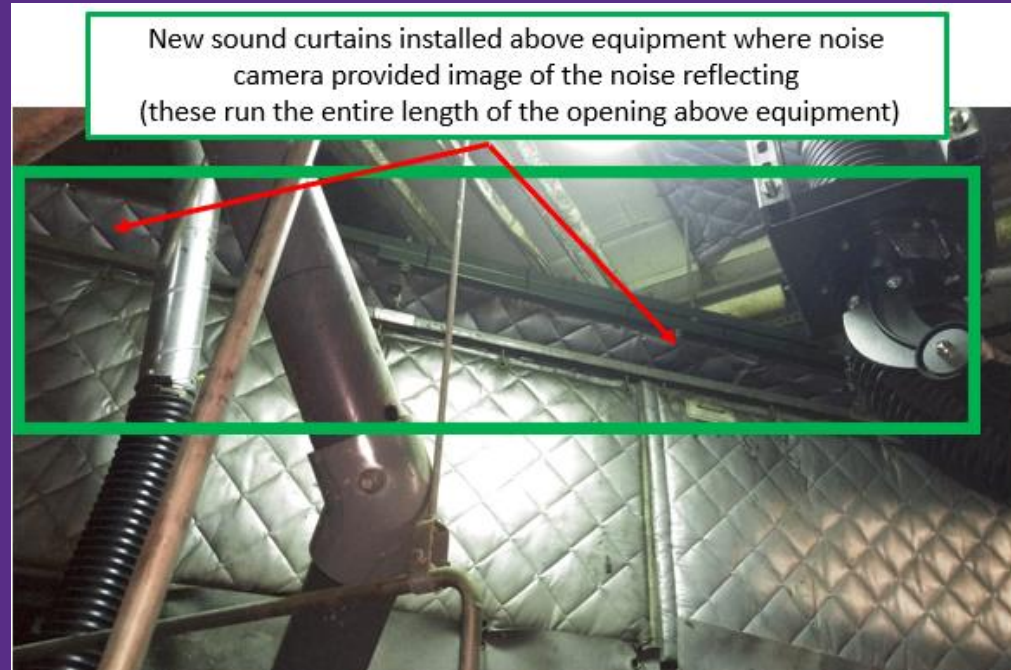


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Blower Before

Aeration Blower

Noise 106 dBA (Extreme)



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Blower *After*

New Technology Blower
Noise 75 dBA (Very Low)



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Blower Before

Blower No Enclosure
Open Design
Noise 98 dBA (High)



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Blower After

Blower Enclosure
Open Top Walled
Enclosures
Noise 86 dBA (High)



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Blower Before

Blower No Sound Curtain

Noise 87 dBA (High)



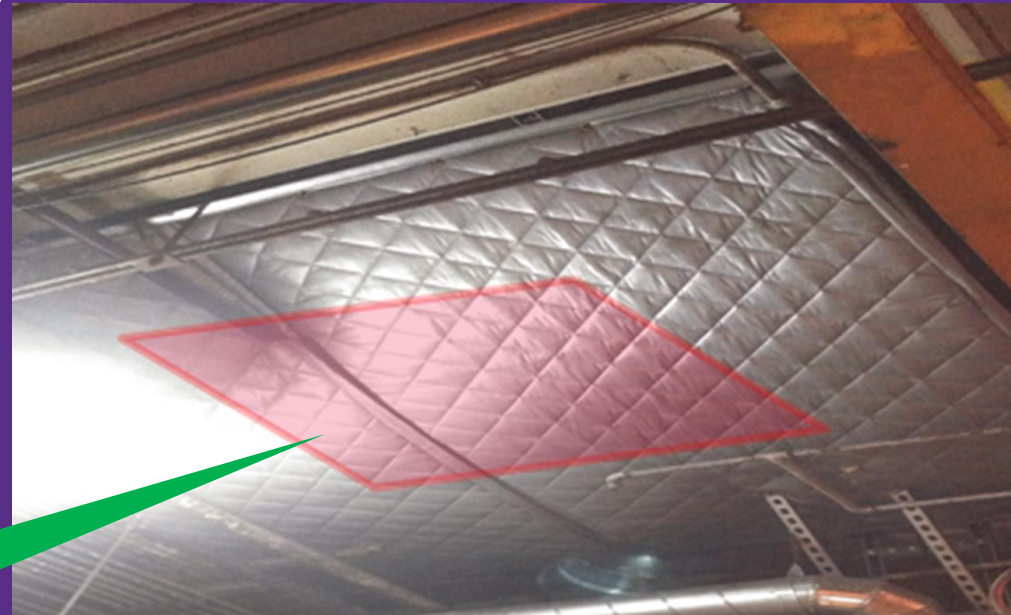
Location of Exhaust
Ventilation Blower

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Blower **After**

Blower with Sound Curtain
Noise 82 dBA (Moderate)



Location of Exhaust
Ventilation Blower

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Railcar (RC) Venting Air **Before**

Open Venting
Noise 102 dBA (Extreme)



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Railcar (RC) Venting Air **After**

Venting to Silencer

Noise 70 dBA (Very Low)



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Isotainer Venting Air **Before**

Open Blow Downs
Noise 107 dBA (Extreme)



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Isotainer Venting Air **After**

Blow Down to Muffler
Noise 86 dBA (High)



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Tank Truck Venting Air Before & After

Blown Down to Muffler
Noise from 107 (Extreme)
to 86 dBA (High)

Location of Muffler



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Forklift Before

Backup Alarms

Noise 90-95 dBA (High to Extreme) standing >8 feet away



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Forklift **After**

Forklift manufacturer installed new self adjusting backup alarms

Noise output 10 dBA louder (at alarm face) than background noise

Noise 80 – 85 dBA (Low to Moderate)



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Forklift **Before**

Forklift Horn

Noise 87 dBA (High)

Location of Horn



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Forklift **After**

Forklift Horn

Forklift manufacturer adjusted horns position and sound level

Noise 81 dBA (Low)

Location of Horn



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Forklift Before

Diesel Forklift

Noise 88 dBA (High)



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Forklift *After*

Electric Forklift

Noise 83 dBA (Moderate)



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Forklift **Before**

Diesel Forklift

Old, no noise controls

Noise 87 dBA (High)



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Forklift **After**

Diesel Forklift

New, noise controls

Noise 83 dBA (Moderate)



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Forklifts - Other Considerations

- Old forklifts loud. Lease new quiet ones and use PM schedules to maintain them.
- Forklift checklist created (problem/potential solution)

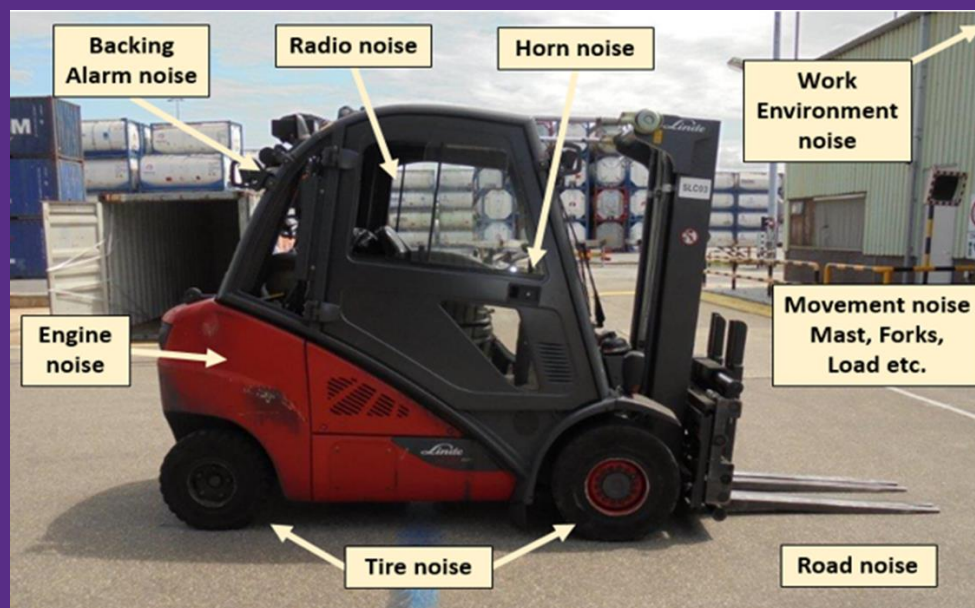


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Hand Tools **Before**

Compressed Air Ratchet
Noise 88 – 91 dBA (High)



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Hand Tools **After**

Battery Powered Air Ratchet
Noise 80 – 81 dBA (Low)

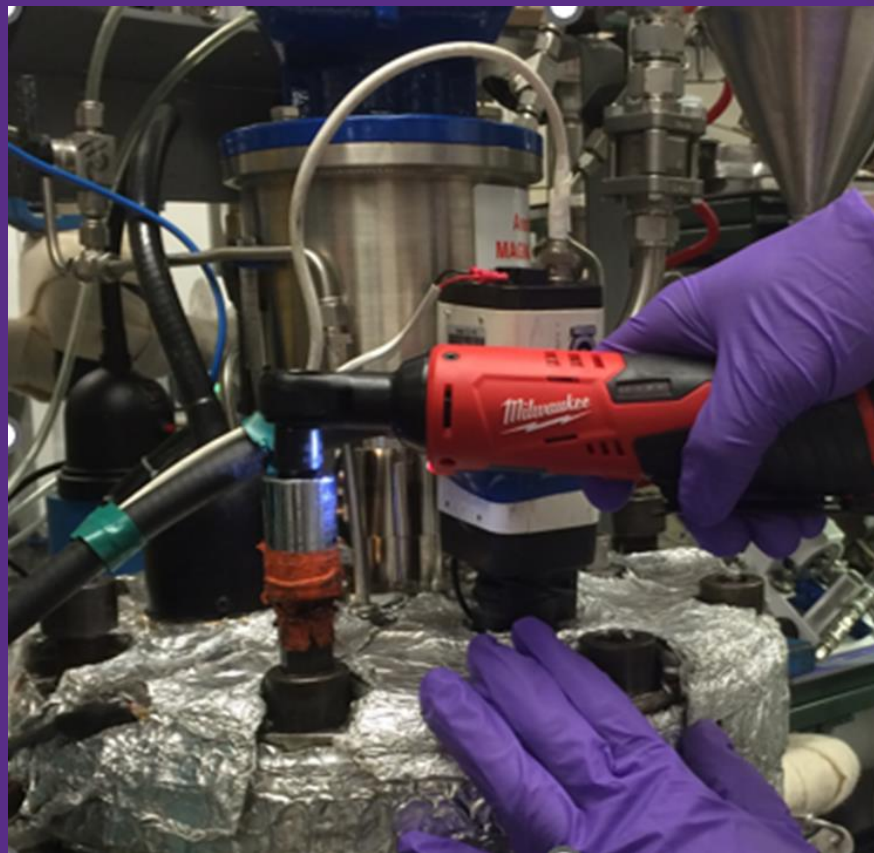


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Acoustic Plenum Before & After

One on each side

Noise 85 (Moderate) – 77 dBA (Low)

2" Acoustic Plenum over air louver on side of electrical disconnect cabinet, directs noise upwards



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Acoustic Curtains Before & After

Noise 92 (Moderate) – 83 dBA (Low)

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Curtains 12 feet high and have noise blocking material sandwiched between noise absorption materials.



Motor Enclosure Before & After

Noise 87 (Moderate) – 82 dBA (Low)



Direct Noise sources upwards and away from operators

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Steam

- Steam can be a challenge to isolate and fix. Steam leaks can be noisy (100 dBA or higher).
- Target during turnarounds
- Steam buster program to identify, tag and list these leaks
- Design facility so steam leaks can be segregated and fixed instead of waiting for a turnaround when the entire facility is down.



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Initiative Impact

- Over 1200 employees removed from the hearing conservation program globally
- Over 90 noise global improvements (P1 eliminations) made since 2015
- Cost savings due to less employees required to be in the hearing conservation program
- One location avoided placing 50 employees in the hearing conservation program by implementing engineering solutions.
- Many fixes are relatively inexpensive.
- Quieter workplace with no hearing protection needed.



Future Plans to Increase Awareness

- Integrate worker hearing health and home hearing health through the existing wellness programs
- Sustain the gains with Preventive Maintenance (PM) process to inspect, replace, and validate noise controls in place



Lessons Learned

- What gets measured gets done.
- Noise control engineering gaps must be addressed.
- Using qualified consultants to target noise source reductions can be beneficial.
- Noise can be connected to equipment maintenance issues.
- Noise solutions exist, but often are “extra” features and additional cost.
- Many noise solutions can be simple and affordable.



Significance of the Award

- Positive recognition for many years of hard work.
- Validates our efforts of protecting workers from noise exposure.
- Provides momentum to keep the progress going in the next 10-year goal cycle.
- Let's our workers know noise control is a real and achievable priority for the Company.



Contact Information

Sara Joswiak

EHS&S Expertise Improvement Manager

SRJoswiak@dow.com

