Noise Management - Best Practice

Introduction

- Noise Management Assessment: quality, utility, digital
- Noise Control: assess the options, costs and benefits
- Buy Quiet: simple and effective purchasing policy

Noise Management Assessment - quality; utility; digital; ACTION

Noise Control - assess the options, costs and benefits

Buy Quiet - simple and effective purchasing policy

New Regulations – New Mindset

- These regulations are concerned with controlling noise, not measuring it...

Ask yourself...

- Why do we repeat risk assessments? Risk assessments?
- Are we inflicting PPE on the workforce unnecessarily?
- Can we eliminate PPE and audiometry?
- PPE can only be used for long term risk management if you can show that noise control is impractical
- Do we have high quality template digital assessments?
- Must include useful evaluations of the noise control options
- Can we guarantee no future hearing damage claims?
- Have we quantified the costs and benefits of noise control?

R.I.P?

Effective Noise Assessment

"Write Only" Noise Assessments

2002 HSE figures

65% of noise assessments were deemed "inadequate" i.e. a reassessment would be required to bring them up to the necessary standard.
Noise Control

- **Noise Management - Best Practice**

  - **Noise Control Best Practice Elements**
    - **Attitude**
    - **Noise Control Audit**
      - based on detailed diagnosis and costing of the options and benefits using the best of current technology
    - **Implement Noise Control Programme**
      - based on the results of the audit
    - **Update Noise Assessment**
      - de-regulate areas; reduced PPE costs...
    - **Buy Quiet purchasing policy**

  This approach can produce noise control measures that actually improve productivity and reduce costs - in contrast to reliance on conventional enclosures and acoustic guarding.

- **Conventional Palliative Solutions**

  - Enclosure: press has to be run with the doors open ...
  - Hanging Absorbers: 5 - 8 dB average and up to 15dB reduction quoted. In fact, there is no reduction close to noisy plant (2 - 4 m) - which is the natural habitat of operators

- **Placebo Silencers**

- **Noise Control is ...**

  - Noise control is **not** a safety issue
    - Noise control is an engineering problem that should be solved by engineering means, in particular through noise control at source.
    - Effective noise control **must** be based on an accurate diagnosis and **not** on assumptions
    - **All** the options must be considered, not just the conventional high cost palliatives of enclosures and silencers. These techniques should only be used where it can be proved that there is no engineering alternative.

- **The Noise Control Audit**

  - **Objectives**
    - assess company noise control options using the best technology
    - generate cost vs noise reduction trade-offs for each item of noisy plant
    - plan a practical and cost effective noise control programme

  The results of the Audit also take into account factors such as:
  - **Hygiene - access / maintenance**
  - productivity

  Surprisingly often, implementing good engineering noise control measures will actually improve productivity and reduce costs.

  Where the audit proves that control is impractical, it also provides certification so that PPE can be used for long term risk control.
Site Audits: Noise Control Project Benefits

Cadbury conservatively estimate that the noise control programme will pay for itself within 7 years......

Self-Financing Noise Control

Sounds like an oxymoron, but potential cost savings include:

- <85dB(A)
- PPE only advisory: £50 - £200 per head per annum savings
- no requirement for audiometry
- reduced management hassles (policing etc)
- improved working conditions (no PPE)
- improved communications
- no hearing damage claims

Plus the potential for improved efficiency / productivity.

Improved efficiency / productivity due to noise control modifications.

A company had spent £1,600,000 on acoustic enclosures. The Noise Control Audit proved that best practice would have saved over £1,000,000 with lower noise levels and substantially reduced operating costs.

Pay-back Period

- 4 weeks
- 1 year
- 2 years
- 1 minute
- 2 years

Noise control costs - £000's

conventional best practice

Noise source category

- vibrations
- fans
- weighing
- burners
- presses

BFM Noise Control Audit Steps

- List all the potential noise sources on each piece of noisy plant
- Rank the sources
- Assess all the noise control options for the dominant source
- potential reduction in noise from this source
- operational, productivity, hygiene, operator constraints
- cost
- If engineering control is not practical for the dominant source, then you have proved that screening / enclosure etc are the only options

The results are used to generate cost v noise reduction trade-offs for each item of noisy plant and to plan the most practical and cost effective noise control programme possible across the company.

Centrifugal Fan Installation

High pressure
Low pressure

Quieter

Axial Fan Installations

2-3 duct diameters
**Fan Speed v Noise**

<table>
<thead>
<tr>
<th>Speed Reduction (%)</th>
<th>Noise Reduction dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>2</td>
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<tr>
<td>20%</td>
<td>5</td>
</tr>
<tr>
<td>30%</td>
<td>8</td>
</tr>
<tr>
<td>40%</td>
<td>11</td>
</tr>
<tr>
<td>50%</td>
<td>15</td>
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**Scrap Can Extract and Chopper Fans**

- **Problem:** Occupational and environmental tonal noise
- **Conventional:**
  - silencers, lagging and enclosures
  - capital cost > £35000 + maintenance costs
- **BPM Engineering:**
  - Internal fan modification reduced tones by 23dB and overall noise by 22dB(A)
  - Cost c £3000 - no maintenance costs (lasts the lifetime of the fans despite passage of cans)

**PVC Granule Cyclone Separator**

- PVC Granule Cyclone Separator
- 110dB(A) dominated by a 4975Hz whistle
- 25dB reduction - cost of £0...

**Extruder Vacuum System Noise Control**

- 91dB(A) dominated by a 4975Hz whistle
- <85dB(A) manifold silencer

**Extruder Drive Noise Control**

- Precise analysis of sources:
  - 93dB(A) - silence fan tone
  - 85dB(A) - Drive motor modifications (damp guard + silence cooling system)
- c £23/D(A)

**Pneumatic Silencers and Nozzles**

- Silencer Solutions
  - zero back pressure silencers
  - standardise on 3 sizes
  - fix piped silencers to machine and manifold multiple exhausts
- Extruding Nozzles
  - 10dB(A) quieter for the same thrust
  - use ±20% less air per for themselves very quickly
  - intrinsically safe
Filer Cooling Pipes

Problem
- 94dB(A) from cooling pipes for sealed tube ends - rapid cooling a necessity

Conventional Solution
- enclosure - high cost with hygiene and productivity issues

Best Practice Solution
- Coanda effect linear nozzles
  - 12dB(A) noise reduction (82dB(A))
  - improved performance (less turbulence disturbing tubes)
  - 20% less air consumption - pay for themselves very quickly
  - no effect on access or operation

Hopper Vibrator

- design and angles of chute
- vibration isolation of chute to reduce required vibrator amplitude
- separate vibrator from chute - tuned to amplify low frequency
- vibration isolation of chute to reduce high frequencies
- vibrator material inside rather than whole chute
- fit purpose designed "anvil" to allow hammering without damage

Granulator Noise Control at Source

90dB(A)/Leq noise dominated by web radiated noise.

18dB(A) reduction via web damper on similar machine

Vibratory Bottle Unscrambler

Problem
- Vibratory feed hopper for unscrambler generating 90dB(A)

Best Practice Solution
- poor design, vibrations at high level to vibrate whole hopper - feed still inefficient
- laminated plate inside existing hopper (grommet isolation), connected to vibrators through holes in hopper - cost £400
- reduced vibrator level, improved feed, noise reduced from 90dB(A) down to 82dB(A)

Pellet and Component Transport System

Pellet transport system
- Typically 90dB(A) at 1m
- Pipe dampers (shown) gave 10 - 20dB reduction

Component transport fan system: 95-100dB(A)
- 95dB(A) reduction (85dB(A))
- impact damping + geometry changes
- Overall noise reduced to < 85dB(A)
Problem
High speed strip fed press at 101dB(A) in a quiet area

Conventional
Manufacturer supplied "acoustic guards" gave only 3dB(A) reduction. Full enclosure suggested.

BPM
- Noise Control Audit showed dominant source to be fabricated press legs.
- Tico isolation fitted between frame and legs tuned to give natural frequency of 85Hz for both legs (different loads)
- 9dB(A) noise reduction at closest operator position. £45 materials, 1 man day to fit.

“Ultrasonic” Plastic Welding
99dB(A) dominated by 8kHz and 16kHz octave bands
Acoustic close shields: <85dB(A)

Quiet Tape
- quiet tape uses stronger glue - generating more tension
- may have to adjust machines to use the new tape

Noise Management - Best Practice

Buy Quiet
Purchasing Policy

Buy Quiet Purchasing Specification
Probably the single most cost effective long term noise control measure that a company can take.

BUT...
Do not allow your suppliers to spend your money on noise control without close scrutiny and evidence that they have followed diagnostic best practice.

Most suppliers do not have technical expertise in noise control and usually buy-in proprietary materials, enclosures, silencers etc and add these to the cost - regardless of what constitutes Best Practicable Means with current technology.

Buy Quiet BPM Standards
Require that your suppliers meet specific and measurable standards re noise
- defined target noise levels
- defined measurement procedure
- lay down the measurement procedure, operating conditions etc in detail
- results format
- define the format of the results (use a standard form)
- BPM diagnostic procedure
- insist that they follow the BPM procedure when considering noise control - they must be able to supply you with a ranked list of sources with noise control options.

c.f. Quality and testing standards for suppliers.
Weighing Machine Enclosures

Problem:
- Typically 97-98dB(A) - high hygiene

Convention Enclosure
- Enclosures - 5dB(A) reduction
- Often increases operator noise exposure by 2-3dB(A)

£8k - £15k + capital + access / hygiene / maintenance problems

Best Practice Engineering Control
- 10dB(A) reduction, 20% of the cost
- 4x performance
- Maintenance, access and cleaning as for unmodified machine

Key Performance Issues

- Noise Management Assessments
  - Quality and utility of reports (specific programme of action)
  - Implement Digital Noise Assessment - DNA
  - Training requirements

- Noise Control
  - Noise Control Audit - assess engineering options, costs and benefits
  - Use the best available techniques and technology
  - Training - many techniques should become standard practice

- Buy Quiet
  - Introduce a simple and effective noise purchasing policy
  - Police the policy (contracts)

Implementing an efficient, proactive management plan under the new Control of Noise at Work Regulations may significantly reduce the overall costs of managing noise compared with those incurred under the previous regulations.