Process management and tool selection to minimize risk of hand-arm vibration syndrome

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Presented by
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SAF/AQRE Acquisition ESOH Risk Management
Outline

• Hand-arm vibration (HAV) - Background
  – Under-recognized occupational disease
  – Potential for prevention

• Defense Safety Oversight Council
  – Project objectives

• Anti-vibration gloves

• Power tools

• Challenges
What is Hand-Arm Vibration?

• Energy into the hands/arms from vibrating tools

• Important Factors:
  – magnitude
  – direction
  – frequency
What is the Deal?

• Hand/arm vibration exposure can be excessive in the workplace
• Many highly exposed groups have incidence of disease in the range of 10 to 50%
• Poorly recognized – improvements often limited or absent
  – Quarry workers studied in 1918 has 80% incidence of disease
  – Follow-up in late 1970s showed same tool, similar disease incidence and included some grandson’s of original study group
• Many of the exposures can be reduced significantly.
• Lowering hand/arm vibration can have several benefits
Health Effects
Hand-Arm Vibration (HAV) Syndrome

Disease States:

• Reynaud's Phenomenon of Occupational Origin
• Carpal Tunnel Syndrome
• Bone and Joint Disorders
• Neurological Disorders
Hands of vibrating pneumatic hand-tool operator in later stages of irreversible Hand Arm Vibration Syndrome1
<table>
<thead>
<tr>
<th>TOOL TYPE</th>
<th>PRIMARY PROCESSES INVOLVED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maritime / Shipyard</td>
</tr>
<tr>
<td>Grinders</td>
<td>X</td>
</tr>
<tr>
<td>Polishing</td>
<td>Limited</td>
</tr>
<tr>
<td>Welding and Pre-Post Grinding</td>
<td>XX</td>
</tr>
<tr>
<td>Mechanical Metal Cutting</td>
<td>X Submarine Recycling</td>
</tr>
<tr>
<td>Wood Cutting/Finishing</td>
<td>X (support structures)</td>
</tr>
<tr>
<td>Concrete Work; Finishing and Set-up, Cutting</td>
<td>X</td>
</tr>
<tr>
<td>Impact Wrenches</td>
<td>X</td>
</tr>
<tr>
<td>Demolition</td>
<td>X</td>
</tr>
<tr>
<td>Foundry Operations and “Finishing” Cast Work</td>
<td>X</td>
</tr>
<tr>
<td>Drilling</td>
<td>X</td>
</tr>
<tr>
<td>Stone Cutting</td>
<td>X</td>
</tr>
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Metrics and Outcome

**Metrics & Outcome:** The occupational exposure limits for hand-arm vibration demonstrate a very good correlation between exposures to vibration (measured as acceleration) and the incidence/prevention of disease. An example from the forestry industry is provided below (Koskimies et al 1992)

<table>
<thead>
<tr>
<th>Equipment type (Chain Saw)</th>
<th>Vibration</th>
<th>Prevalence of HAV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing equipment (unimproved) (1972)</td>
<td>14 m/s²</td>
<td>40%</td>
</tr>
<tr>
<td>Anti-vibration design</td>
<td>2 m/s²</td>
<td>5% (1990)</td>
</tr>
</tbody>
</table>
Hand-Arm Vibration Standards

• ISO 5349-1986
  Guidelines for measurement and evaluation
• ISO 8662-5-1992
  Handle measurement pavement breakers/hammers
• ANSI S3.34-1986
  Guidelines for measurement and evaluation
• ACGIH-TLV
  Guidelines for evaluation and control
ACGIH Hand/arm Vibration TLV

<table>
<thead>
<tr>
<th>Total Daily Exposure Duration</th>
<th>Acceleration Level (m/s²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 hours and less than 8</td>
<td>4</td>
</tr>
<tr>
<td>2 hours and less than 4</td>
<td>6</td>
</tr>
<tr>
<td>1 hour and less than 2</td>
<td>8</td>
</tr>
<tr>
<td>Less than 1 hour</td>
<td>12</td>
</tr>
</tbody>
</table>
Discussion

• Productivity increases when vibration/ergonomic equipment/tools are incorporated into a process
• Injuries and disability are expensive, quality of life diminished
• Side-benefit: better quality products
Defense Safety Oversight Council (DSOC) 
Hand-Arm Vibration Project Task Objectives

• Provide **procurement guidelines** for anti-vibration gloves and power hand tools that will reduce personnel exposure to crippling hand-arm vibration exposures while reducing noise exposures and promoting process efficiency (Completed Feb 08)

• Support GSA/DLA procurement of special **anti-vibration gloves** which reduce the vibration transmitted to the fingers and hands during tool use (In process, required information provided)
Defense Safety Oversight Council (DSOC) Hand-Arm Vibration Project Task Objectives

• Support the Federal (GSA/DLA) procurement of more modern designs for **powered hand tools** meeting current performance criteria for reduction of transmitted vibration to the hands when in use (Ongoing)

• Incorporate criteria for **3rd party evaluation** of vibration for gloves and tools into procurement criteria (Completed Feb 08)

• **Communicate** this information **to logistics and safety communities** via DLA, GSA, NIOSH and Service websites (Linked to updated product availability)
DSOC Project Team

• Army
• Navy
• Headquarters U.S. Coast Guard
• Air Force Research Lab
• Defense Logistics Agency, Headquarters
• Government Services Administration
• Contract Support
  – Coordinated by Concurrent Technologies Corporation for OSD Personnel and Readiness (P&R)
  – Don Wasserman (Vibration expert)
  – Robbins Gioia (Logistics Contractor)
Anti-Vibration Gloves (AVG): The Problem

• Many gloves marketed as AVG do not meet the criteria of ISO 10819/ANSI S2.73
  – These include 2 products in the GSA system as National Stock Number (NSN) items

• There are no US regulations for manufacturers to test, certify, and label gloves that meet the ISO/ANSI criteria

• Products currently marketed by GSA as “anti-vibration gloves” do not meet these criteria
AVG: The Approach

• Develop procurement criteria consistent with anti-vibration standard and incorporate into GSA procurement (Completed at NIOSH meeting 2-08)
  – Evaluate compliance with ANSI S2.73 for all gloves intended for use where vibration is a hazard
  – Develop estimates of glove use from current glove National Stock Numbers (completed 5-08)

• Develop a plan to address the need for AVG and ways to procure only ANSI S2.73 compliant gloves
Getting Certified Anti-Vibration Gloves in Supply System

- Two-year effort requiring
  - Intervention of DLA Headquarters, OSD Manpower and Personnel
  - Support of Navy Clothing and Textile Research Facility, Natick, MA
  - Defense Logistics Information Service cataloging
- Process challenges included
  - Poorly described process
  - Differences in motivation among supply contacts
  - Challenges in “new” vendors gaining access to established supply channels
  - Buy-American requirements- overcome by vendors willing to produce American-made products at slightly higher costs
- Certified Anti-Vibration Gloves (photos and sources of),
Power Tools: The Problem

• ANSI adopted the European Union Directive in ANSI S2.70 (2006), but it does not contain specific criteria as does the ANSI S2.73 for AVG

• There are no US regulations for manufacturers to test, certify, and label power tools

• Limited prior customer input to GSA/DLA for reduced vibration or noise
Power Tools: The Approach

- Evaluate power hand tools where vibration is a hazard
- Establish procedures for the Qualified Products List (QPL)
- Evaluate possible approaches to facilitate and document labs which can provide testing and evaluation
- Crosslink GSA, DLA, and NIOSH websites
- Make improved products available via GSA schedule both to Federal and Federal contractor buyers
Power Tool Selection Criteria and Request For Vendors Information

• 3rd party report of transmitted vibration
  – Measured in accordance with ANSI 2.70 and NIOSH guidelines under standard, specified conditions

• Air blow off directed away from hands

• Other ergonomic criteria (somewhat dependent on product)
  – Weight – balance – grip dimensions of handle
  – Surface area and force of trigger
  – Recoil or impulse (different than “steady state” vibration)
  – Wrist deviation associated with use

• Consistency with design guidance, noise and vibration to be weighted factors in selection
  – Minimum eligibility criteria likely to be established for the Qualified Products List (QPL) for specific equipment and products
  – Data may be reported in item description and reflected in GSA, DLA and safety/health websites

• Consider warning labels as needed re: noise and vibration
• GSA is continuing to incorporate low vibration and other ergonomic characteristics into procurement criteria for new and updated power hand tools

• Pneumatic riveting hammer, described as HAMMER, PNEUMATIC, PORTABLE 5130-01-5716908.
  – Its vibration (<2.5 m/s²) is less than half the level created by many legacy tools.

• Pneumatic reciprocating saw, listed as SAW, RECIPROCATING, PNEUMATIC 5130-01-572-5529.
  – Its vibration (<4 m/s²) is less than half the level created by many legacy tools.

• Needle scaler (needle gun), listed as SCALER, PNEUMATIC, PORTABLE 5130-01-317-2453.
  – To date, GSA has been unable to specify a maximum vibration level for this tool.
  – However, one vendor's product, which served as a guide for the item specification, reportedly had vibration levels in the range of 3.5 m/s, also considerably lower than many legacy products.

• Continued availability will depend on demand!
Challenges

• Educating industrial hygienists to understand and engage in existing processes for feedback and glove and tool improvement
• Educating safety and industrial hygiene managers to understand the importance of improving workers gloves and tools as opposed to traditional surveys and reports
• Streamlining and clarifying current processes and policies
• Incorporating risk management in glove and tool selection
  – Involves identifying and communicating with responsible technical authorities and program offices
• Communication
Questions?

Dina Koza, NAVAIR