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

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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

Hand Power Tool Use in the Department of Defense

TOOL TYPE	PRIMARY PROCESSES INVOLVED					
	Maritime / Shipyard	Construction	Aircraft and Vehicles Mx	Ground/Road and Facility Maintenance	Forestry	Mining/ Milling/ Quarry
Grinders	X	X	X			
Polishing	Limited	Limited	XX			
Welding and Pre-Post Grinding	XX	X	X		Limited to Support Ops	X
Mechanical Metal Cutting	X Submarine Recycling	XX	X	X Concrete Work		XX
Wood Cutting/Finishing	X (support structures)	XX		X	XX Chain Saws	X (Support Structures)
Concrete Work; Finishing and Set-up, Cutting				XX Mixers, Jackhammers		
Impact Wrenches	X	X Riveting and Airframes Maintenance	XX Tires and Wheel	X		XX Assembly
Demolition	X			XX Jackhammers	X (Tree Stump and Rock Removal)	XX
Foundry Operations and “Finishing" Cast Work	X		Limited			Support areas
Drilling	X	XX	XX	XX	X	XX
Stone Cutting		XX		XX	X	XX Quarry Work

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)

Equipment type (Chain Saw)	Vibration	Prevalence of HAV
Existing equipment (unimproved) (1972)	14 m/s2	40%
Anti-vibration design	2 m/s2	5% (1990)

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

Total Daily Exposure Duration	**Acceleration Level (m/s^2)**
4 hours and less than 8	4
2 hours and less than 4	6
1 hour and less than 2	8
Less than 1 hour	12

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), http://safetycenter.navy.mil/acquisition/vibration/downloads/Anti-Vibration_Gloves.pdf

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

New Tools in Federal Supply System

- 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?

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