Occupational Health in the Scrap Metal Industry:

An Integrated Approach to Worker Safety and Health

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Goals: Occupational Health in Scrap Metal Industry

- Support OSHA's Region IV Emphasis Program on the scrap metal industry
- Provide companies with coordination of OSHA's chemical specific standards
    - Lead, Arsenic, Cadmium, Hexavalent Chromium
- Develop recommendations for best practices
    - Identify and integrate successful occupational health strategies
- Aggregate exposure data from multiple sites

Hazards Overview

- Air Contaminants
- Noise
- Hygiene, skin exposure, ingestion
- Heat
- Trips, slips, falls
- Material handling
- Fires/explosions
- Sharp objects/edges
- Ionizing Radiation

INDUSTRY AND PROCESS OVERVIEW

Divisions of Industry

Ferrous

Nonferrous

Ferrous Scrap (Iron/Steel)

- 74 million metric tons annual
- Provides 60% of industrial steel supply
- $26.4 Billion annual revenues
  - $8 Billion in exports
- Environmental impact
  - Recycled ferrous scrap requires 60% less energy usage
  - Reduces CO^2 impact by 58%

– Source: ISRI

Nonferrous Scrap

(Aluminum, copper, lead, nickel, zinc, etc)

- High demand for nonferrous metals
  - Aluminum—4.6 million tons
  - Copper--1.8 million tons
  - Lead– 1.2 million tons
  - Nickel/stainless steel—2 million tons
- Revenues 2010 -- $40 billion
- Export Revenue--$16.7 billion
- High recycling rates
  - Lead-acid batteries –97%
  - All aluminum since 1880's—75% remains in production
    - Source: ISRI

Scrap Yard Work Flow

- **Receive:** Industrial waste, recycled products
- **Sort:** ferrous, nonferrous, hazardous metals and hazardous objects
- **Process to size**: shear or torch cut
- **Package:** compress, bale
- **Store:** material handling
- **Ship out:** to metal processors (smelters, etc)

RECEIVING AND SORTING

Radiation Detection for Incoming Scrap Metal

Source:
www.radcommsystems.com/pic/RC4000_WhitePaper(Sept06).pdf

Danger of compressed gases and fuel tanks

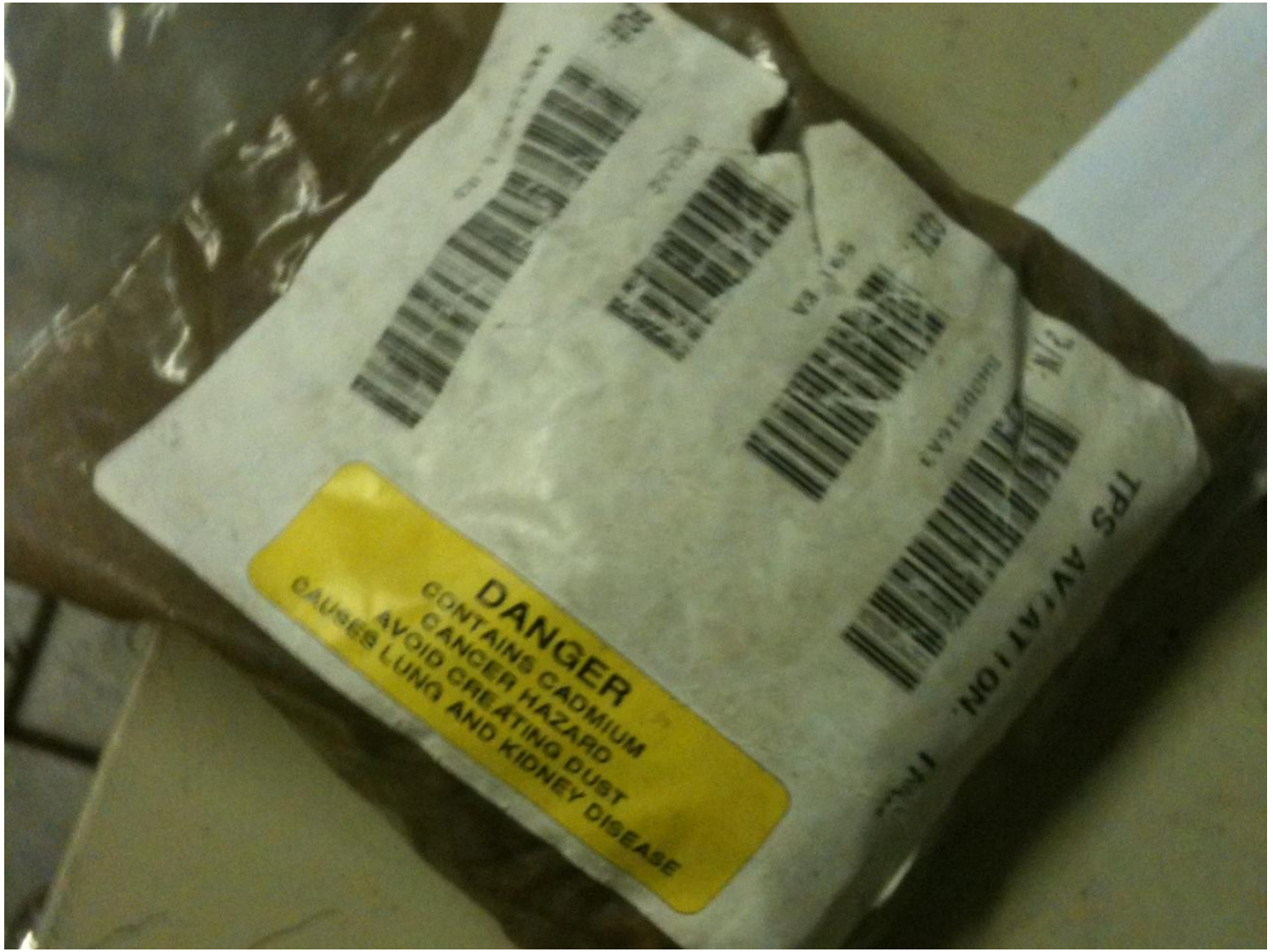
Value of copper and Law Enforcement concerns

Batteries shipped out to “Breakers” for recycling

Disassembled car and truck radiators bailed for shipping. Torching radiators to melt solder can cause severe lead poisoning in workers

Source: State of Washington Dept. of Labor and Industries "Preventing Lead Poisoning in Scrap Metal Recycling",
*www.lni.wa.gov/Safety/Research/files/**lead**_scrap.pdf*

Recycling Beverage cans--Aluminum



Identify and Separate Hazardous Metals

Grappler moving scrap

PROCESSING MATERIALS TO SIZE:

1. Mechanically Shear

   or

2. Manually Cut

   (Oxy-Propane Torch Cutting)

Mobile Hydraulic Shear Cutting
(and Grapplers Staging Materials)

Iron Castings scrapped by foundry

Disassembly of Industrial Tractor

Industrial Hygiene Interventions

(Georgia Tech's OSHA Safety and Health Consultation Program)

- 12 sites visited (10 sites with torch cutters)
- Air Samples
  - 25 Air samples (TWA-fullshift)
  - Sorted by "Torch Cutter" or "Yard and Equipment Operations" (Shaker table, balers, grapplers, etc.)
- Noise Exposures
  - 46 noise dosimetry samples
  - All in the "Yard and Equipment Operations"

Air Contaminant Concerns


Torch Cutting-- work area challenges


Torch Cutting: Mixture of scrap

Exposures of Torch Cutters

	LEAD (mg/m^3)	CADMIUM (mg/m^3)	ARSENIC (mg/m^3)	HEXAVALENT CHROMIUM (ug/m^3)
AVERAGE	0.028	0.001	0.002	0.441
OSHA PEL (AL)	.05 (0.03)	.005 (.0025)	.010 (.005)	5 (2.5)
MEDIAN	0.015	0.000	0.003	0.000
Standard Deviation	*0.035*	*0.001*	*0.002*	*0.873*
n, sample count total	*25*	*25*	*19*	*14*
Range	*ND--0.140*	*ND--0.004*	*ND--0.006*	*ND--3.000*

Exposures > OSHA Limits
(Torch Cutters)

	LEAD	CADMIUM	ARSENIC	HEXAVALENT CHROMIUM
COUNT>PEL	5 (20%)	0	0	0
COUNT>AL	7 (28%)	2 (8%)	3 (16%)	1 (7%)
sample count (n)	*25*	*25*	*19*	*14*

Exposures to Noise
(Yard and Equipment Operators)

# Exceeding OSHA Action Level of 85 dBA	**27 (59%)**
# Exceeding OSHA PEL of 90 dBA	**11 (24%)**
Count of Samples	46
Median Exposure	86 dBA*
Range of Exposures	70.6-98.6 dBA*

* Dosimetry cutoff criteria 80-115 dBA

Limitations of OSHA Industrial Hygiene Standards

- Substance specific standards have **PEL or Action Level triggers** based on air concentrations
  - Biological/medical surveillance
  - Respiratory protection
  - Engineering controls

- 13% citations* from 10/1/2005-9/30/2010 involved chemicals standards (136 of 1036 citations)
  - Few of the 13% were from “overexposure”

- *Data source OSHA IMIS, inspections in SIC 5093: “Scrap and Waste Material Recyclers and Processors”

Limits of OSHA Compliance

- If an exposure exceeds PEL/AL, then:
  - Required to resample at 3-6 month intervals
  - BUT----2 consecutive samples < PEL/AL taken 7 days apart coverage of standard ends
  - If exposure > PEL/AL persists
    - Determine if frequency is greater than 30 days per year
    - Difficulty of limited data set for individual company

Other Regulatory Difficulties

- Ingestion of toxic metals vs air exposure
  - Risk may from ingestion, but regulatory trigger is air concentration
- Reference standard for surface contamination is undefined
    - HUD?
    - EPA?
    - Brookhaven National Lab?

Other Regulatory Difficulties, cont.

- Metals may be toxic below the OSHA PEL/AL
  - Ex: Hexavalent Chromium, what level prevents lung cancer?
  - Multiple exposures to CR^{+6} occur, but rarely will levels exceed AL
- Overlapping medical requirements
  - Lead, Cadmium, Arsenic
  - Each have medical testing and schedules that can overlap

Recommendations

- Presumption of Torch Cutter exposures
  - 28% exposures to lead above Action Level
  - 16% arsenic above Action Level
  - Occasional exposures >AL to Cadmium and Hexavalent Chromium
- Implement provisions of OSHA's Lead and Arsenic standard for all torch cutters

Recommendations for Torch Cutters

- Medical surveillance programs for lead and arsenic
  - Preferably to include cadmium and hexavalent chromium
- Training programs for lead, arsenic, cadmium, and hexavalent chromium
- Quarterly industrial hygiene sampling for metals
- Use of respirators and a Respiratory Protection Program
- Designated work clothes and boots (left at workplace)
- End of shift showers in facility with separate "clean" and "dirty" lockers
- Lunch room with decontamination procedures for entry and daily cleaning schedule for all surfaces

Recommendations--Noise

- Noise Exposures
  - Assume exposures exceed 85 dBA Action Level
    - (Data shows 59% > AL)
- Hearing Conservation Program
  - Implement hearing conservation for workers throughout facility
  - Annual hearing tests, training, ear protection, noise dosimetry, records retention

Acknowledgements

- ISRI: Institute of Scrap Recycling Industries, Inc.
  - www.isri.org
- Photos, courtesy of Schnitzer Southeast
- OSHA: *"Guidance for the Identification and Control of Safety and Health Hazards in Metal Scrap Recycling" 2008, www.osha.gov/Publications/OSHA3348-**metal**-**scrap**-**recycling**.pdf (Accessed 10/26/2011)*
- New York State Dept. of Health, Bur. Of Occ. Health, "Metal Recycling Industry Project, Rev. 2007" *http://www.health.state.ny.us/environmental/workplace/metal_recycling/metal_recycling_report.htm (Accessed 10/26/2011)*