



Asia-Pacific
Economic Cooperation

2005/SOM2/CTTF/012
Agenda Item: V E

Effects of Radioactive Materials on the Steel Recycling Industry

Purpose: Information
Submitted by: USA



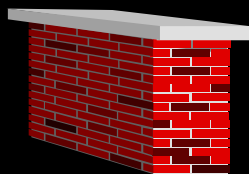
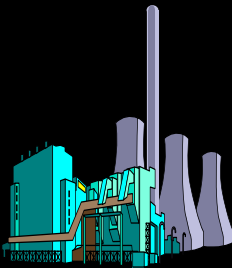
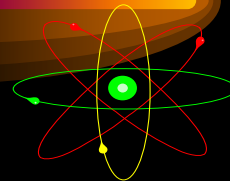
Counter Terrorism Task Force
Jeju, Korea
26 - 27 May 2005

Effects of Radioactive Materials on the Steel Recycling Industry

Presented to
**Asia-Pacific Economic Cooperation
Counter Terrorism Task Force Meeting
Cheju, South Korea
May 26-27, 2005**

by
Ray Turner, River Metals Recycling, LLC,
The David J. Joseph Company

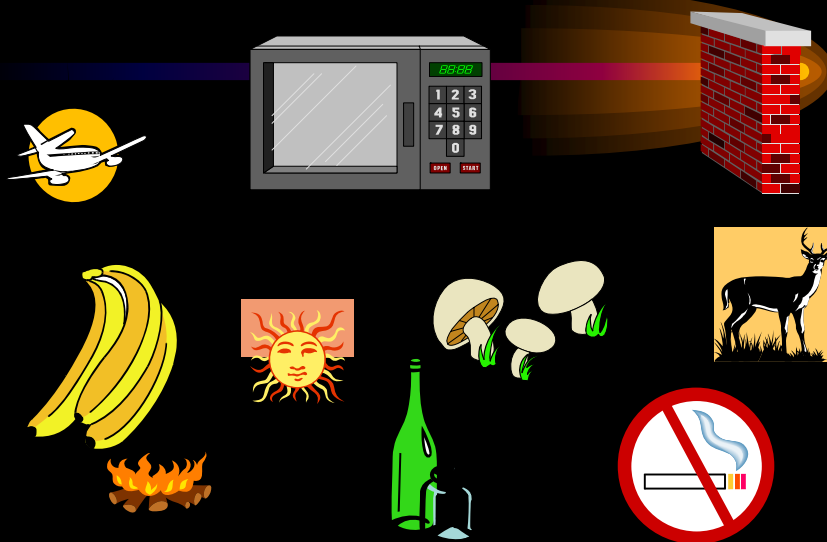
Radioactive Material Where Does it Come From?



RADIO-PHOBIA



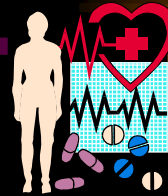
Radiation in our Everyday lives



Healing Arts



- Medical
 - Medical Diagnosis



- Dental Diagnosis

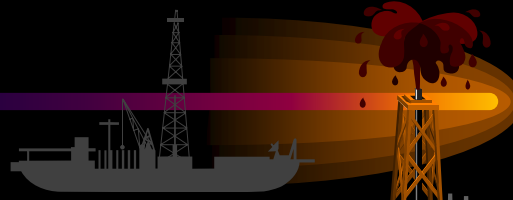


- Therapy

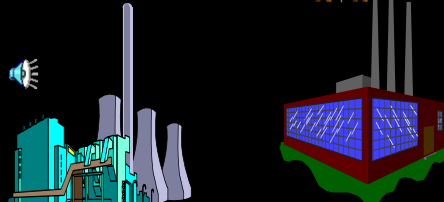


Industrial Activities

- **Exploration**



- **Power Generation**



- **Manufacturing**

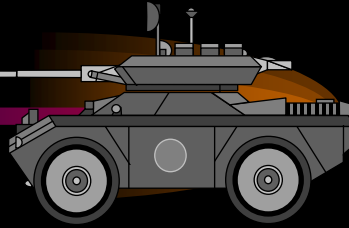


- **Research**

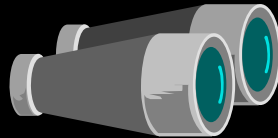


Military Activities

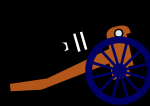
- Gas/fog detection



- Lens coatings

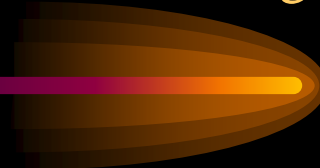


- Offensive Weaponry



Good Planning

- Everyone is trained
- Everyone is informed
- Everything goes smoothly
- **SAFETY FIRST** is always paramount
- Normal operation



But...Sometimes....



Recycling Industry

- Notable Orphan Source Accidents

Thailand, 2000:

- Disused Co-60 teletherapy unit not stored securely.
- Machine dismantled, source falls out when further disassembled at scrap recycling yard.
- 10 people severely exposed, 3 die.
- “Rogue source” suggested when physicians see patients with similar signs and symptoms at local hospital and notify authorities.

• James Yusko

Recycling Industry

Brazil, 1987:

- Disused Cs-137 teletherapy source dismantled, source breached, causing exposures, contamination.
- 4 people died; 249 others exposed.
- Widespread contamination of portion of city; clean-up costly.
- Severe economic consequences for region.

Yusko

Economic Consequences

- Goiania, Brazil, 1987: Treatment and care of the victims estimated at US\$ 750,000.
- 125,000 individuals voluntarily monitored.
- 8,000 residents certified “non-contaminated.”
- Hotels refused registrations; airlines, buses refused travel; vehicles stoned, etc.

Yusko/Lubenau

Economic Consequences

- Agriculture value dropped 50%;
- Prices for textiles, finished products fell 40%, stayed depressed for over 1 month;
- Sales loss estimated as >US\$ 7,000,000;
- Clean-up cost > US\$ 7,000,000;
 - (In an area where labor cost is very low)
- Housing prices fell; tourism dropped; etc.

➤ Yusko

Economic Consequences

Spain, 1998:

- Cs-137 source mixed with recycled metal not detected. Source melted in steel mill.
- “Radioactive cloud” drifts away from national monitors, floats over Mediterranean
- Plume in Italy, France, Switzerland, etc.
- “8000 x background” and “worst since Chernobyl” causes international crisis.

• Yusko/Lubenau









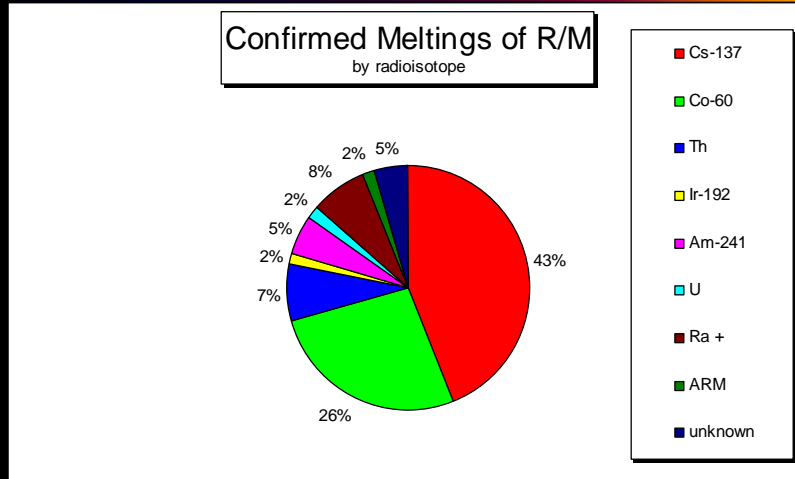
Color Photo C-24. Accident at Meet Halfa: The elder son; July 1, 2000. Extensive skin burns appear in the lower right quadrant of the abdominal wall extending laterally. The thumb and middle finger show evidence of healing radiation ulcers.

Color Photo C-25. Accident at Meet Halfa: The younger daughter; July 1, 2000. Severe skin burns are seen with scabbing and finger contractures of both hands involving palms, index finger, and thumb; a deep localized ulcer occurs on the right knee, and a localized ulcer on the outer aspect of the right thigh.



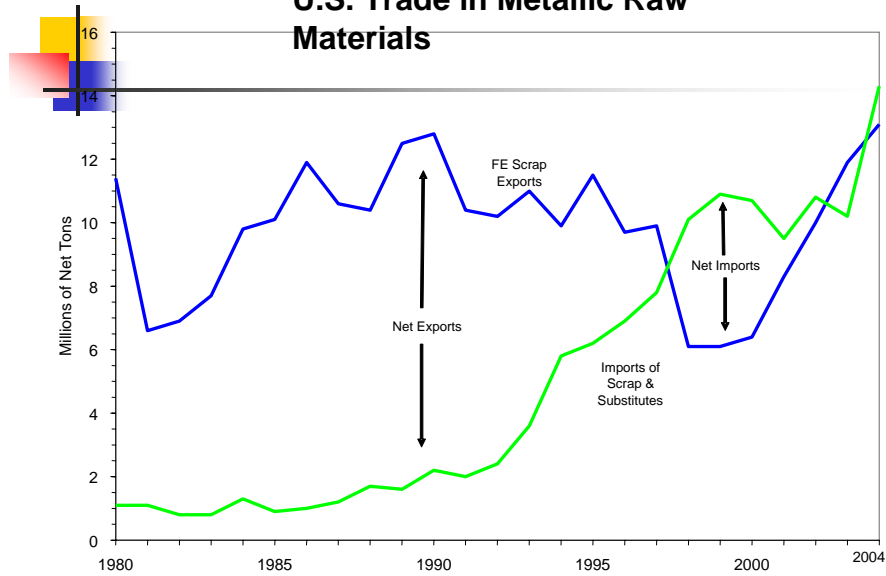
Burned torso
Fatality

Confirmed Meltings by Material



The David J. Joseph Company

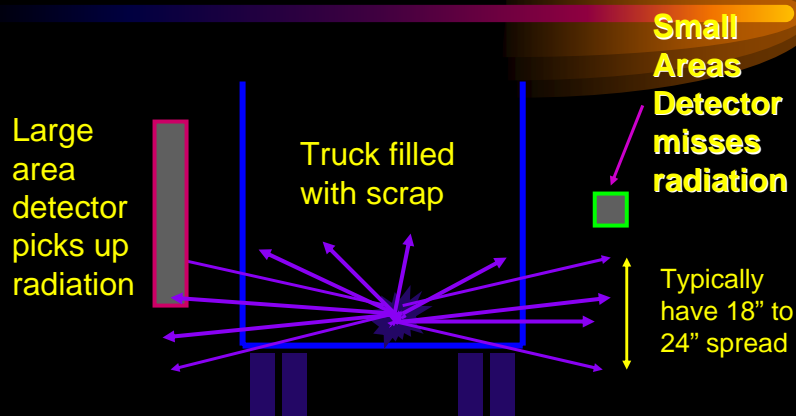
U.S. Trade in Metallic Raw Materials



Common Radiation Detectors (Scrap and Steel Industry)

- Sodium Iodide (Most scrap yards)
- Cesium Iodide (Some steel mills and some scrap yards in Europe)
- Plastic Scintillators* (All U. S. steel mills)
 - *This is the only material in use in steel mills that will detect neutrons.
 - Average cost to steel mills - \$100,000-\$250,000

Advantage of Large Area Detectors



Controlled Test - Side Detectors

<u>Detection category</u>	<u>Overall percentage</u>
Easy ($\leq 6''$ Frag)	100%
Moderate (7''-13'' Frag)	100%
Hard (14''-16'' Frag)	84%
Very Hard (17''-19'' Frag)	69%
Extremely Hard (20''-22'' Frag)	6%
Almost Impossible ($> 22''$ Frag)	0%

Radioactive Materials Effects Scrap and Steel Industry

- More than 84 accidental smeltings of radioactive materials in steel mills worldwide
- Most recently in 2004 (USA and China)
 - Yes, it still happens!
- Multi-million dollar decontamination efforts
- Deaths and Injuries are occurring

Cost of Decontamination

- Average steel mill \$12,000,000
- Highest U.S. steel mill \$30,000,000
- **Highest worldwide***
 >\$100,000,000
 – still counting







Imported Radioactive Material

- Caske weighing 1171 lbs.
- Numerous gamma spec evaluations, even using hyper pure germanium detector.
- Appeared to be an empty caske made of DU.
- Subsequent evaluation in hot cell revealed very large quantity of ^{60}Co cobalt.
- Becoming more prevalent, especially with increased imports.



Depleted uranium caske filled with cobalt 60





Lead-wrapped radioactive source (Cs 137)



Beer kegs



Beer keg



Removed from beer keg



Radioactive Cylinder

*Military gear co-mingled with
Radiation sources*



*Radioactive Vehicle
41 “Orphaned” Sources*



Radioactive Vehicle



Radioactive Vehicle



Radioactive Equipment



U235/U238



Radioactive Equipment



Radioactive Equipment



U 235



Radioactive Vehicle



“Orphans?”



“Orphans”?



Orphan?



Cs 137



Smuggled Radioactive Material



*United Nations Economic
Commission for Europe – April 2004*

- Goals:
- Support IAEA Code of Conduct on Safety and Security of Radioactive Sources
- Support IAEA Guidance for the Import and Export of Radioactive Sources

*United Nations Economic
Commission for Europe – April 2004*

- Goals (continued)
- Generate ideas on appropriate radiation detection systems and detection of radioactive sources during transport of “clean” recycled metals (import and export) that have become uncontrolled or “orphaned”
- Adopt a harmonized approach to dealing with detected radioactive sources found in recycled metals during international transport
- -in a method that would not impede trade and commerce

United Nations Economic Commission for Europe – April 2004

- Sent questionnaire to UNECE members, IAEA, World Customs Organization, Bureau of International Recycling
- Generated 55 responses from 48 countries
- Resulted in meeting in April 2004 at UN in Geneva, attended by delegates from 21 countries, WCO, IAEA, and BIR
- Resulted in publication of document entitled “Group of Experts on Monitoring of Radioactively Contaminated Scrap Metal”

• United Nations Economic Commission for Europe (UNECE) report, April 2004

UNECE Questionnaire results

- 55 responses from 48 countries
- some have not adopted IAEA Code of Conduct
- 73% already are currently releasing radioactive materials for recycling from nuclear facilities
- 27% do not monitor imports/exports
 - Of those that do - additional problems from non-monitoring of motorized barges (up to 40% of some cargoes)
- 44% already have a regulatory requirement for monitoring imports and exports
- 52% have no reporting protocol for detections

UNECE Questionnaire results

- 17% of countries do NOT support polluter pays principle (disincentive to report)
- 13% had no protocol for transporting back across international boundaries
- 44% reported there is no recourse to return or reject shipments after unloading
- 58% do not notify scrap buyers that shipments contain “cleared” scrap from nuclear facilities
- 23% do not even investigate detection reports

• Ron Pope. Presentation in April, 2004, UNECE

Port Monitoring Pilot Project U S Environmental Protection Agency (USEPA / US Customs)

- Port of Charleston, SC
- Port of New Orleans
- Port of North Carolina (was not part of the EPA pilot but purchased the same type systems)

EPA/Customs Port Monitoring Pilot Project

- Grapple monitors
- Very effective for those radioactive materials which would otherwise be shielded by dense scrap.
- Effective for vessels where no detectors were used
- Durable/rugged (more than 4 million tons unloaded)
- Easy to isolate found materials safely
- Unmanned
- More than 4 million tons monitored

US EPA Port Monitoring Pilot Project



Solutions?

- Better, more capable detection systems
- Fewer false alarms
- Multiple locations, more ports monitored
- Better training of employees
- Better awareness, i.e. EPA-developed interactive cd/rom training video that furnishes information to demolition contractors (furnished at no cost by US Environmental Protection Agency)

Solutions?

- All economies need to adopt “IAEA Code of Conduct on the Safety and Security of Radioactive Sources”, and
- “IAEA guidance for the Import and Export of Radioactive Sources”.

IAEA Code of Conduct

- Helps to prevent accidents caused by “Orphaned” sources
- Helps to prevent malicious acts involving radioactive sources in the Asia-Pacific region, as well as other regions of the world
- Facilitate harmonization of practices within the global economic community
 - Can’t dry a river in mid-stream- must begin at the headwaters

IAEA Guidance for the Import and Export of Radioactive Sources

- Provides international standard for trade in radioactive sources
- A commitment by all APEC economies would reduce the risk of accidents or malicious acts that could have devastating disruption to local economies and international trade
- Agreement by all APEC economies to use a common approach based on IAEA guidance would simplify trade and help develop a “level playing field” or fair approach

IAEA Guidance Advantage

- Concerned companies would be more comfortable doing business with recipients committed to following IAEA Guidance
- 5 APEC economies have already agreed to implement by the end of 2005

Conclusion:

- The problems continue. Risk is increased
- Need for harmonization of efforts
- Need for regulatory requirement for detectors at import and export facilities
- Need for better locating/reporting/tracking mechanisms for radioactive sources
- Need better disposal options
- Need to adopt IAEA recommendations

Asia-Pacific Economic Cooperation



Questions?