Use of Leading Measures to Prevent CBD in the Beryllium Supply Chain

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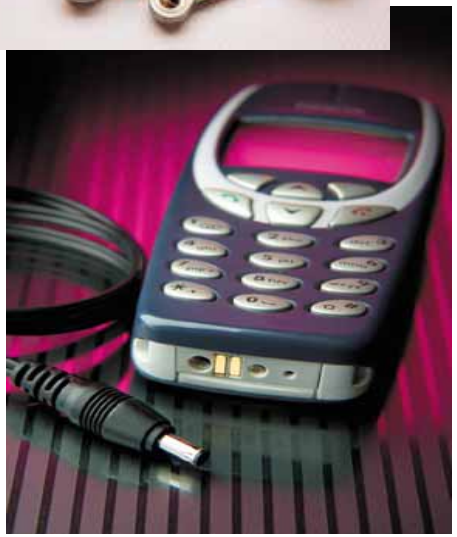

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Key Messages

- Beryllium-containing materials and products can be produced and recycled safely
- Effective beryllium safety model has been demonstrated
- Managing leading measures will result in worker protection
- Managing Be safety process with lagging measures typically results in failure

Evidence of Safe Production of Beryllium-containing Materials

Beryllium Sensitization Experience 2002- 2004 (Tucson)

N= 76 people with BeBLPT at 3 and 6 months of employment

Observed number of BeBLPT positives: 0

Expected* number of BeBLPT positives: 13

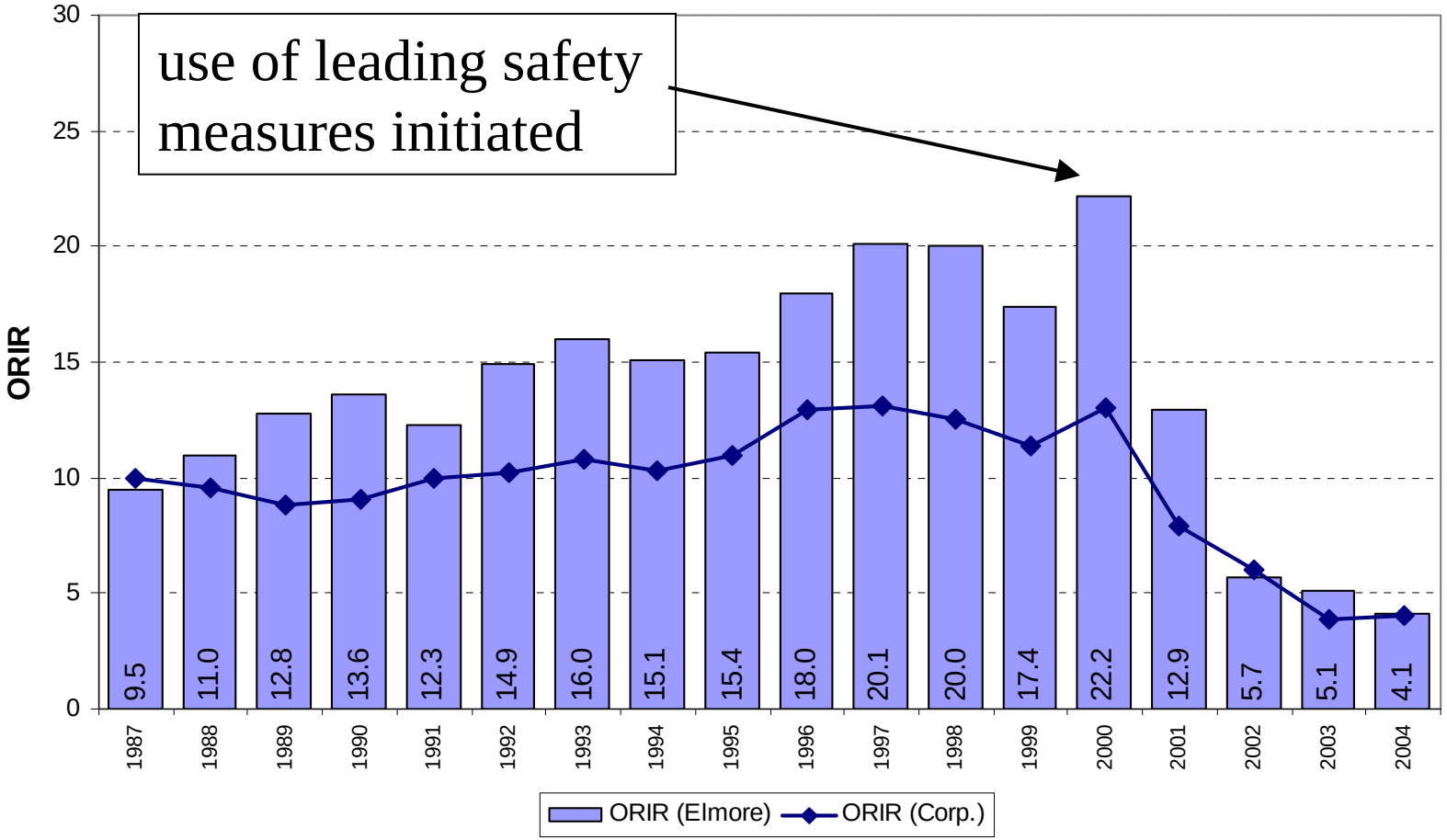
* Expected number based on a overall prevalence rate of 18% (9/50) at the 4-8 month testing interval from cross sectional surveys conducted prior to implementation of exposure interventions.

BWI Safety Performance Using Leading vs. Lagging Measures

Elmore, OH Facility

Key Success Factor: Safety Performance

Measurement: OSHA Recordable Injury Rate (O.R.I.R.)



Examples of Leading versus Lagging Measures

Leading- Factors that influence future events (before the fact)

- Auditing (employee behavior, training, mgt. systems, equipment, etc.)
- Qualitative exposure assessment
- Quantitative Exposure Assessment
- Failure Mode Effects Analysis (FMEA)

Lagging- Measures of past performance, do not influence future events (after the fact)

- Medical monitoring (BLPT, x-ray, PFT, etc.)
- OSHA Recordable Injury Rate (ORIR)
- Injury log review and analysis
- Routine air monitoring

Effective Beryllium Safety Model Elements

- Inhalation action level of 0.2 ug/m^3
- Control of migration pathways
  - Keep Be off skin and clothing
  - Keep Be at the source,in the work area and on the facility.
  - Keep work areas clean and ship shape
  - Employee training

Application of Model Elements Vary

Dependent on the following variables:

- chemical/metallurgical form
- operation/process
- epidemiological experience
- exposure conditions experienced by the worker

Leading Measures Matrix for Beryllium Safety

Model Element: Control Beryllium Inhalation

Principle	Leading Measure
• 0.2 ug/m3 action limit exposure value	• Statistical exposure assessment completed
• “seat belt” model of respiratory protection usage	• Periodic worker observation audits
•account for exposure variation in determining level of respiratory protection	•Statistically rigorous exposure assessment used for respirator usage decision
•Understand process stability	•Failure Modes and Effects Analysis(FMEA) completed for: each process, support equipment, work practice. Process change authorization procedure used
•Ventilation is used as primary control method	•Capital budget appropriations for ventilation identified and supported

Application of Beryllium Safety Model Elements- CuBe Strip Slitting

Process Description- Mechanical slicing of CuBe strip into thinner widths

Model Element:	Description:
•Chemical Form	•Clean CuBe strip
•Operation	•Slitting does not produce small particles, stable process, stable work practices
•Epidemiology	•Two studies, no reported cases of sensitization or CBD

Application of Beryllium Safety Model Elements- CuBe Strip Slitting

Model Element:	Assessment:
•Exposure Potential	Air: levels consistently < 0.2ug/m^3 Migration: •Source/building/site: large particles; not transported by air currents; mechanically movable •Person: no contact with salts or small particles Education: general beryllium production safety awareness

Application of Beryllium Safety Model Elements- CuBe Strip Slitting

Conclusions:

- No special controls required
- Maintain equipment and personal cleanliness
- Train operator on general beryllium production safety principles

Leading Measures Matrix for Beryllium Safety for Slitting Operations

Model Element	Principle	Leading Measure
EXPOSURE CONDITIONS	• prevent beryllium migration away from site	• worker observation audit developed and completed on regularly
	• prevent beryllium migration away from source	• housekeeping audit developed and completed regularly
TRAINING	• employees prepared to work safely	• training topic tracking system used; periodic training records audit

Application of Leading Measures

Beryllium Metal Polishing

Process Description- Mechanical polishing of beryllium mirrors for James Webb Space Telescope

Model Element:	Description:
•Chemical Form	• clean beryllium metal
•Operation	• machine polishing with lapping compound; produces small particles; air and fluid dispersion, greater potential process and work practice variations
•Epidemiology	• several studies report CBD risk in similar operations

Application of Leading Measures **Beryllium Metal Polishing**

Model Element:	Assessment:
•Exposure Potential	Air: levels likely > 0.2ug/m^3 + particles < 1.0 micron created Migration: •Source/building/site: small particles; transportable by air currents; fluid dispersion likely; mechanically movable •Person: contact with small particles and solutions likely Education: general beryllium awareness, job /task qualification on specific Be safety measures

Application of Leading Measures Beryllium Metal Polishing

Conclusion:

Detailed leading measure control needed to reduce risk

- Inhalation
- Area
- Source
- Skin
- Clothing
- Employee Training
- Facility
- Clean and Ship Shape

- see handout for detailed leading measures information

Bottom Line

To be successful one must:

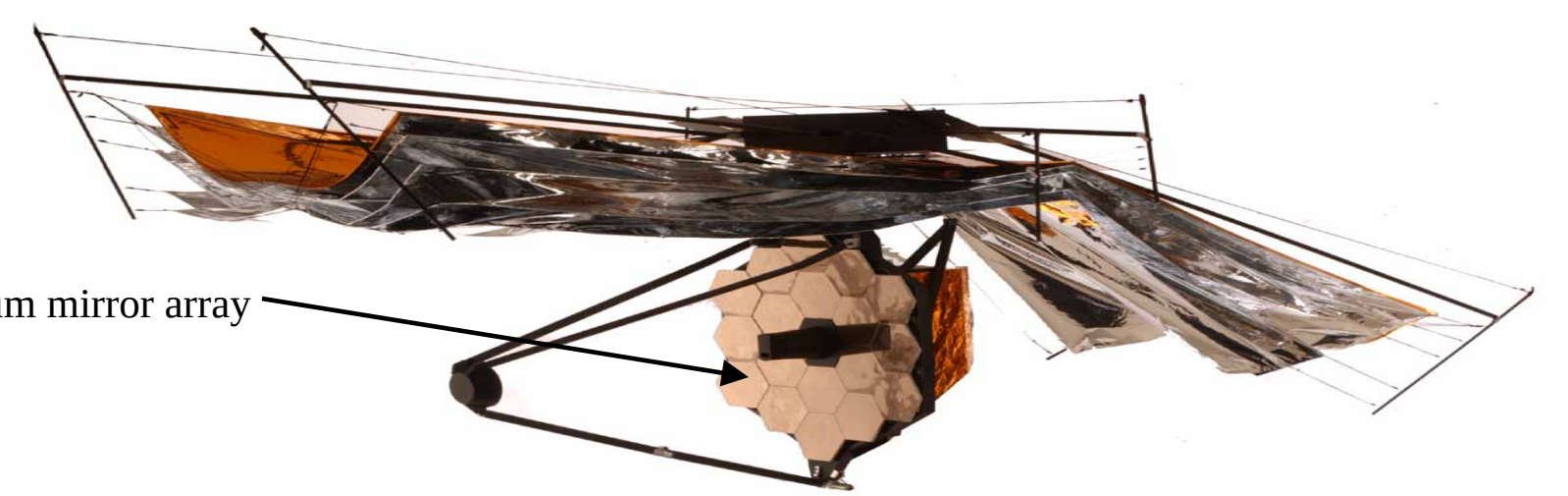
- Apply a general proven safety model with leading measures and adapted to specific situations
- Set expectations of performance against leading measures
- Audit performance, reward success and quickly correct deviations

TAKE CARE OF THE LEADING MEASURES AND THE LAGGING WILL FOLLOW

Questions?

call (800) 862- 4118 or

http://www.brushwellman.com



James Webb Space Telescope

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