

OSC 10
Ohio Safety Congress & Expo

Maximizing your waste management program to minimize your costs
144
Dianne Grote Adams, MS, CIH, CSP, CPEA
Safex President

Thursday, April 1, 2010 1 to 2 p.m.

Learning Objectives

- Review Hazardous Waste Regulations
- Review Generator Status
- Five Steps for Waste Minimization
- Examples and Case Studies
- Summary



2010

RCRA Overview

- 1976 -Promote and protect human health and the environment.
- Implement a “cradle to grave” management system when hazardous waste is generated.
- 1984 amendments - Reduce or eliminate the generation of hazardous wastes as expeditiously as possible.
- 1990 – Pollution Prevention Act – minimize toxic releases to all environmental media and natural resources.

2010 3

Review - Hazardous Waste

- Hazardous waste - 40 CFR definition:
 - “A solid waste or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may ... pose a hazard to human health or the environment.”



2010 4

Hazardous Waste Characteristic or Listed

- Ignitability
- Reactivity
- Corrosivity
- Toxicity
- F Wastes: Nonspecific source wastes
- K Wastes: Specific source wastes
- P & U Wastes: Off-specification, discarded, residual or spilled



2010 5

Review - Generator Status

- Conditionally Exempt Small Quantity Generator
 - Less than 100 Kg (220 lbs.) per month
 - Less than 1 Kg (2.2 lbs.) acutely hazardous waste
- Small Quantity Generator
 - Between 100 and 1,000 Kg (220 – 2,200 lbs) per month
 - Less than 1 Kg (2.2 lbs.) acutely hazardous waste
- Large Quantity Generator
 - More than 1,000 Kg (2,200 lbs) per month
 - More than 1 Kg (2.2 lbs.) acutely hazardous waste

2010 6

Waste Minimization Program Requirements

- LQGs must have a written program to reduce the volume and toxicity of wastes generated through
- SQG are to make a best faith effort to reduce wastes
 - Substitution of non-regulated substances.
 - Reduction in the volume of waste through process and/or operational changes.
- Recycle, recover, or sell waste.



2010

Benefits of Waste Management/Minimization

- Protects environment
- Economic and business sense
 - Reduce generator status
 - Production efficiency
 - Increase profits
 - Reputation as good neighbor
 - Product quality
 - Environmental performance



8

What is Waste Minimization?

- Source reduction
- Environmentally sound recycling
- Prior to energy recovery, treatment, disposal of waste
- Does not include waste treatment
 - Compacting, neutralizing, diluting, incineration

9

National Waste Minimization Program

- Promote more sustainable society
- Reduce waste generated
- Lower toxicity and persistence of waste
- 31 Priority Chemicals targeted
 - Examples: 1,2,4 trichlorobenzene, PAHs, PCBs, dioxins, cadmium, lead and mercury

10

Waste Management Hierarchy

- Source Reduction (P2)
- Recycling –reclaim value from by-products
- Material Recovery – processed to recovery usable product or regenerated
- Energy Recovery –waste converted to usable fuel
- Treatment
- Disposal

11

National Waste Minimization Program

- Innovative and effective approaches
 - Lean Mfg.
 - Energy Recovery
 - EMS
 - Green Chemistry
 - Chemical Management Services
 - http://www.chemicalstrategies.org/implement_manualstools.htm

12

5 Key Steps to Waste Minimization

1. Source Reduction
2. Replace
3. Re-use
4. Recycle
5. Treat

2010

13

"Source Reduction" Examples

- Purchase smaller quantities (labs, hospitals, schools)
- Use non hazardous reagents or fixative substitutes
- Replace with 'green' products for parts and facility cleaning (Citrus based cleaning compounds instead of organic solvents.)
- Latex over oil paints
- Integrated Pest Management to replace pest treatment

14

"Replace" Case Study

- Company X
 - Company X paints truck axles
 - Paint is highly flammable and slightly toxic
 - Axles are painted on "waterfall" line using a large amount of paint
 - High production + waterfall painting method = large quantity of hazardous waste

2010

15

"Replace" Case Study

- How can they reduce the amount of hazardous waste they generate?
 - Replace painting system
 - Use less hazardous paint



2010

16

"Replace" Case Study

- Company X started out as a LQG
- They removed the old waterfall paint line
- Installed new high flow – low volume spray guns and dry filters
- Company X is now SQG
- Cost savings
 - Reduce Rqmts
 - Less paint
 - Less waste

2010

17



"Reuse" Case Study

- Specialty Chemical Manufacturer
- 4 thousand gallon reactor used for manufacturing process
- 2 reactants totaling 800 gallons required per batch
- The balance of the reactor was filled with approximately 2800 gallons solvents

18

"Reuse" Case Study

- Reactant cost averaged \$10/gallon
- Total reactant (\$800 gal.) cost per batch \$8,000
- Solvent cost averaged \$2/gallon
- Total solvent (2800 gal.) cost per batch \$5,600
- Total raw material cost per batch \$13,600

19

"Reuse" Case Study

- Solvent waste 2600 gallons
- Cost of waste disposal \$0.70 per gallon (\$0.25 for disposal \$0.55 for transportation)
- Total waste cost \$1820.00
- Total of raw material and waste \$15,540 for each batch of product

20

Reuse of Solvent 1st Batch

- Same raw material cost \$13,600
- No cost for solvent waste
- Savings of 12%

21

Reuse of Solvent 2nd Batch

- Solvent reused from previous batch 2600 gallons
- Cost \$0
- Additional solvent required 200 gallons
- Cost for additional solvent \$400
- Total of raw material and waste \$8,400 for second batch of product.
- Savings of 46% from before minimization

22

Reuse of Solvent 4th (Final) Batch

- Total of raw material \$8,400 for final batch of product.
- Solvent waste 2600 gallons
- Cost of waste disposal \$0.70 per gallon (\$0.25 for disposal \$0.55 for transportation)
- Total waste cost \$1820.00
- Total Cost of final batch \$9,220

23

Increased Product Yield

- Second benefit
- Product yield was normally 88% (704 gallons)
- Product yield in the second, third and fourth batch increased by 2% to 90% (720 gallons)
- Additional 16 gallons of product per batch

24

"Reuse" Cost Summary

	Before	After
Batch 1	\$15,540	\$13,600
Batch 2	\$15,540	\$8,400
Batch 3	\$15,540	\$8,400
Batch 4	\$15,540	\$9,220
Total	\$62,160	\$39,620
Gallons Made	2816	2864
Cost/Gallon	\$22.07	\$13.83

25

"Recycle" Ideas

- Return waste material into original process
- Use waste as raw material substitute in another process
- Process waste for resource recovery
- Process waste as a by-product
- Engage contractors to recycle waste
- Advertise/sell waste
- Re use packaging waste
- Ink toners mailed for recycling
- Cell phones/batteries
- Compact fluorescent bulbs
- <http://www.aashe.org/user/register> Association for the Advancement of Sustainability in Higher Education

26

"Recycle" Case Study

- Raw materials come packaged in corrugated cardboard boxes.
- Cardboard represents half the company's waste.
- Company rents a 30-yd³ roll-off container from a private waste hauler for \$50 a month. The hauler takes full loads to the landfill once a week and charges \$70 per haul. Company is charged a tipping fee of \$20 per ton at the landfill; each of its loads weighs about 4 tons.
- Decide to purchase baler and find market for cardboard

27

"Recycle" Case Study

Waste Costs	
52 weeks x 4 tons	208 tons
208 tons x \$20/ton tipping fees	\$4160
Container rent 12 x \$50	\$600
Annual Hauling 12 X \$70	\$3640
Total Annual Hauling	\$8400

28

"Recycle" Case Study

After Baler Purchase Costs	
Baler cost over 5 years (12 year life)	\$1500
Baling wire per year	\$ 210
Electricity/maintenance of baler	\$ 400
Personnel to operate	\$ 830
Hauling fees and tipping fees savings	(\$3900)
Revenue from cardboard sales (\$10/ton)	(\$1040)
Total Annual Savings	\$2000

29

"Treat" Examples

- Neutralize acids and bases
- Polymerize acrylamide solutions
- Oil /solvent separators

30

Closing Thoughts

- Associate Training
- Associate Involvement
- Don't underestimate value of small changes

31

Questions?

Thank You!
dgroteadams@safex.us

2010

32