

Guidelines – Cleaner production, Waste minimization, RRR options

Issued by: Inspection Department – Operations Section

1.0 Waste

In broad term, waste includes any product discharge from process in gaseous, liquid and solid phases. It is any substance or object which the producer or the person in possession of it, discards or intends or is required to discard but with exception of anything excluded from the scope of the Waste Management Licensing Regulations 1994.

2.0 Cleaner Production

Cleaner Production is the continuous application of an integrated preventive environmental strategy to process and products to reduce risks to humans and the environment. For production process, cleaner production includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes before they leave a process. For products, the strategy focuses on reducing impacts along the entire life cycle of the product, from raw material extraction to the ultimate disposal of the product.

3.0 RRR Options

During the past 35 years, the amount of waste each person creates has almost doubled from 2.7 to 4.4 pounds daily. The most effective way to stop this trend is by preventing waste in the first place.

Waste prevention, also known as *source reduction*, is the practice of designing, manufacturing, purchasing or using materials (such as products and packaging in ways that reduce the amount or toxicity of trash created. Reusing items is another way to stop waste at the source because it delays or avoids that item's entry in the waste collection and disposal system.

Source reduction, including reuse, can help reduce waste disposal and handling costs, because it avoids the costs of recycling, municipal composting, land filling and combustion. Source reduction also conserves resources and reduces pollution, including greenhouse gases that contribute to global warming.

In the past Waste Management concentrated on end-of-pipe treatment. However, at present emergence of a different philosophy includes:

- Waste Prevention; and
- Waste reduction / re-use / recycle techniques (i.e., RRR options)



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Produce less waste by practicing RRR:

- a. *Reduce* the amount and toxicity of trash you discard.

Waste prevention, or "source reduction," means consuming and throwing away less. It includes:

- Purchasing durable, long-lasting goods;
- Seeking products and packaging that are as free of toxics as possible;
- Redesigning products to use fewer raw materials in production, have a longer life, or are used again after its original use.

Source reduction actually prevents the generation of waste in the first place, so it is the most preferred method of waste management and goes a long way toward protecting the environment.

- b. *Reuse* containers and products; repair what is broken or give it to someone who can repair it.

Reusing items -- by repairing them, donating them to charity and community groups, or selling them -- also reduces waste. Reusing products, when possible, is even better than recycling because the item does not need to be reprocessed before it can be used again.

Source Reduction and Reuse Benefits

- *Saves natural resources.* Waste is not just created when consumers throw items away. Throughout the life cycle of a product – from extraction of raw materials to transportation to processing and manufacturing facilities to manufacture and use – waste is generated. Reusing items or making them with less material decreases waste dramatically. Ultimately, fewer materials will need to be recycled or sent to landfills or waste combustion facilities.
 - *Reduces toxicity of waste.* Selecting non-hazardous or less hazardous items is another important component of source reduction. Using less hazardous alternatives for certain items (e.g., cleaning products and pesticides), sharing products that contain hazardous chemicals instead of throwing out leftovers, reading label directions carefully, and using the smallest amount necessary are ways to reduce waste toxicity.
 - *Reduces costs.* The benefits of preventing waste go beyond reducing reliance on other forms of waste disposal. Preventing waste also can mean economic savings for communities, businesses, schools, and individual consumers.
- c. *Recycle* as much as possible, which includes buying products with recycled content.



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Recycling turns materials that would otherwise become waste into valuable resources. In addition, it generates a host of environmental, financial, and social benefits. Materials like glass, metal, plastics, and paper are collected, separated and sent to facilities that can process them into new materials or products.

Recycling is one of the best environmental success stories of the late 20th century. Recycling, including composting, diverted 82 million tons of material away from landfills and incinerators in 2006, up from 34 million tons in 1990. By 2006, about 8,660 curbside collection programs served roughly half of the American population. Curbside programs, along with drop-off and buy-back centers, resulted in a diversion of about 32 percent of the nation's solid waste in 2005.

Benefits of Recycling

- Conserves resources for our children's future.
- Prevents emissions of many greenhouse gases and water pollutants.
- Saves energy.
- Supplies valuable raw materials to industry.
- Creates jobs.
- Stimulates the development of greener technologies.
- Reduces the need for new landfills and incinerators.

4.0 Waste Minimization

It means the reduction of waste, to the extent feasible, at the source.
Based on the belief that *“Prevention is better than cure!”*

4.1 Why minimize waste?

- a. Increasingly stringent legislation;
- b. Rising disposal costs;
- c. Possible fines and clean-up costs;
- d. It makes commercial sense;
- e. Demand for *greener* products;
- f. More responsible attitude towards environment; and
- g. Environmental performance.



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4.2 Waste Minimization Benefits

a. It could reduce:

- Quantity and toxicity of hazardous and solid wastes generation;
- Production cost;
- On-site waste monitoring/treatment costs;
- Handling, transport and off-site disposal costs;
- Raw material costs;
- Raw material and product losses;
- Workplace accidents and worker exposure;
- Energy and water costs;
- Compliance violations;
- Long-term environmental liability costs; and
- The risk of spills and accidents.

b. It could improve:

- Overall operation efficiency and environmental performance;
- Production efficiency;
- Product quality;
- Profits;
- Income through sale of re-usable waste;
- Employee participation morale;
- Good community relations;
- The safety of employees; and
- The company's image.

4.3 Waste Audit

To minimize waste generation, a key tool – a systematic audit of waste generating / handling activities should be conducted. Its purpose includes:

- a. Identify the waste generated and examine where, how and why it is being created;
- b. Identify costs involved;
- c. Set waste reduction targets which are realistic;
- d. Identify opportunities for waste prevention, reuse/recycling of waste produced;
- e. Make workers more aware of the need to reduce the waste generated; and
- f. Develop more efficient monitoring system.



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A waste minimization audit will help to identify the various options for minimizing waste; options which can then be evaluated to assess the technical and economic impacts and select the suitable technique.

4.4 Waste Minimization Techniques

There are various waste minimization techniques, which PCFC entities can adopt. For example: source reduction, good housekeeping, recycling, technology changes, process changes, use of alternative raw materials, re-use, solvent recovery, reclamation, recycling by-products, product innovation, modifications to plant, alternative use of waste products and treatment.

Further elaboration of some techniques is as given below:

- a. Raw material changes
 - Less toxic alternatives
 - Replace solvent based raw materials
 - Change specifications
 - Redesign finished product
- b. Good housekeeping
 - Floating ceiling storage
 - Spilling controls
 - Planned maintenance
 - Sensors and meters
- c. Technology Changes
 - Mechanical for chemical
 - Membrane technologies
 - Micro processing
 - Non solvent paints and inks
- d. Process Changes
 - Closed loop for single pass
 - Catalyst changes
 - Production scheduling
 - Clean procedures
- e. Re-use
 - Solvent recovery
 - Process water recycle



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- Scrap metal recycle
- Plastics recycle
- Paper recycle
- Glass recycle
- Aluminum goods recycle

f. Reclamation

- Ultra filtration
- Ion exchange
- Adsorption
- Condensation

g. Production Innovation

- New uses for rejects/waste streams
- Conversion of wastes to saleable products
- Product design to aid recycling

4.5 Cleaner Production / Waste Minimization Pay-off

A clean, healthy environment and sustainable industrial development with economic returns for generations to come.