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Business: Toray Composite Materials America, Inc.
Industry: Carbon and Graphite Manufacturing (NAICS: 335991)
WASI Project: Hazardous waste reduction and cost savings

Toray Composite Materials America, Inc.

Company Description

Toray Industries, Inc. is a multinational company based in Japan that produces industrial fibers, textiles, performance chemicals, and carbon fiber composite materials using organic synthetic chemistry and polymer chemistry. The company also develops products for environmental engineering and life science advancements. Toray Composite Materials America, Inc. (Toray), a subsidiary, manufactures carbon fiber and thermoset epoxy prepreg for use in aerospace, industrial, automotive, and defense industries.

Toray Industries, Inc. is committed to zero carbon emissions by 2050 and pursues measures to reduce its environmental impact and minimize hazardous waste.

Incentives to Change

Toray aims to reduce waste and lower operational costs with operational performance targets to reduce the amount of hazardous waste produced by 10% by the end of 2024. These goals include:

- Recycling hazardous waste instead of shipping it off-site for treatment.
- Optimizing solvent usage to reduce costs.
- Implementing a process to reduce hazardous waste volume and shipping expenses.

Project Description

Project 1: MEK tank connection

Toray ships Methyl ethyl ketone (MEK) offsite for treatment and disposal since the MEK dip tanks are not connected to the distillation unit. This incurs additional costs to the organization.

The WASI intern identified a pollution prevention project to recycle their waste MEK, reduce the amount of MEK shipped out for disposal, and nearly eliminate the amount of virgin MEK purchased. This is achieved by plumbing the MEK from the dip tanks to the distillation unit.

Using 3D modeling software, the WASI intern created a piping layout and consulted with maintenance and manufacturing engineers at Toray to ensure project feasibility. With their agreement, the intern compiled a list of necessary parts by referring to the existing n-methylpyrrolidone (NMP) dip tank connections and drawings, researching prices, and ensuring the correct parts were ordered.

Project 2: Solvent usability testing

The WASI intern established an easy test to determine the usability of the solvent in the dip tanks and to establish a solvent replacement schedule based on need.

- Both the MEK and NMP dip tanks were flushed and replaced every two weeks for ease of operation.
- The testing and analysis focused on the NMP tanks which became dirty more quickly.

The test measured the specific gravity of the solvent at various resin saturations, using the most difficult resin to dissolve. Measurements were taken at the operating temperature of the tanks to ensure easy replication for technicians. The WASI intern found that measuring specific gravity could be a viable option for measuring the usability of wash tanks, but further testing is required.

Project 3: Compacting hazardous waste

The WASI intern compiled data to determine if a compactor would reduce the cost of hazardous waste disposal. They looked at:

- Current waste accumulation.
- Shipping and disposal costs, and projections.

The cost-benefit analyses conclude that purchasing a compactor is the best course of action for reducing costs.

Recommendations

The WASI intern recommends three actions:

Project 1: MEK tank connection

Toray should continue to discuss pricing with the pipefitters, get a quote, and work with technicians to determine where pipes can be bent to reduce the amount of piping used.

Continual collaboration is encouraged with the vendor to program the pneumatic actuator to prevent tanks from overflowing which will also advance this project.

Project 2: Solvent usability testing

Using the gains made in the MEK tank connection, and conducting further research into the solvent usability threshold will help Toray:

- Extend the use of the solvent.
- Reduce operational costs and the overall amount of virgin solvent needed.
- Establish consistent usability thresholds allowing for developing technician-friendly testing methods to extend solvent usage further.

Whether it's continuing the research or pursuing another approach, it is strongly recommended that Toray pursue solvent usability threshold testing and establish these parameters.

Project 3: Purchase additional compactor

While buying a compactor won't reduce the amount of hazardous waste being produced, it will encourage Toray to continue reducing the amount of hazardous waste sent for incineration. Compaction will reduce costs by minimizing the number of boxes sent for disposal, priced per box.

Table 1: A list of pollution prevention projects showing estimated costs, estimated annual reductions, and project status for Toray.

P2 Projects	Estimated Costs		Estimated Annual Reductions	Status
	Implementation ($)	Annual Savings ($)	Hazardous Waste (lbs.)	
MEK tank connection	19,536.67[1]	34,258	14,025	In Progress
Solvent Usability Testing	Unknown[2]	3,350[3]	0	Proposed
Buying Compactor	6,116	4,602	0	In Progress

[1]This is the cost of parts for the piping assembly only.
[2]Cost will be based on the technical method Toray pursues.
[3]These savings are based on technician wages. One hour is needed to cycle out NMP tanks completely.