Waste Handling Optimization: Operational Cost and Environmental Impact Minimization

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Abstract

Eli Lilly established environmental goals to reduce waste and manage resources more effectively. From this, the pharmaceutical site in PR underwent a waste generation evaluation of its current operations, to determine the course of action towards the 2030 environmental goals. The project objectives were to minimize waste generation from site processes, minimize environmental footprint from generated waste to landfill, maximize the possible recycled materials and the hazardous waste reduction on site. From design to implementation, objective results yielded a 20.9% cost reduction and a 60% generated waste to landfill reduction. The long-term execution of these actions will significantly enforce site compliance with regulatory aspects to a higher degree, will help identify any new material which could impact the waste metric and enforce continuous improvement on site processes.

Introduction

Lilly is a pharmaceutical company founded in 1876. Since its beginnings, it has focused on creating high-quality medicine to those in need [1]. As many other industrial processes waste is generated, at which could be seen as a common problem in the industry. Agencies enforce environmental compliance via regulations and permits, among other methods, to mitigate the impact it may have on the environment. Eli Lilly requested all sites to run an assessment of their processes and the waste generated to find ways to eliminate, substitute and/or mitigate the handling of waste in an eco-friendlier way, if possible.

Background

Waste and Pollution

Pollution via emissions, landfill waste, energy generation, transportation and even agriculture aspects are leading precursors that directly affect the environment around us and our health [2, 3].

Environmental Footprint

The environmental impact caused by industrial pollution is one of the top contributors which directly affects the ecosystem, leaving Significant traces and impact on the earth's climate and our health [2].

E-Waste and Implications

Out of the growing offenders, E-waste has been identified to have direct impact to both humans and the environment, it has been growing throughout the decades as a byproduct of the fast technological changes within society and industries [4, 5].

Problem

Waste generation is a common problem seen in the company's site processes. Agencies enforce environmental compliance via regulations and permits, among other methods, to mitigate the impact it may have on the environment. Eli Lilly requested that all sites to run an assessment of their processes and the waste generated, either direct or indirectly, to find ways to eliminate, substitute and/or mitigate the handling of waste in an eco-friendlier way, if possible, per the established 2030 environmental goals. The objectives of this project were to:

- Minimize waste generation to landfill, reducing overall environmental footprint.
- Maximize the amount of recyclable material, from site consumption.
- Reduce hazardous waste inventory on site.

Methodology

Phase 1: Site Evaluation

- Waste generation analysis per site area.
- Conducted to narrowed down to the scope of material, e-waste was identified as one of the major offenders on site that was not being recycled.

Phase 2: Company Assessment

- Company material handling assessment, to determine recycling possibilities and possible limitations.
- Company selection, during this phase of the project, was based on material handling, processing capabilities and cost analysis.
- Companies selected were RDN, JQ Recycling, E-Cycling.

Phase 3: Waste Management Plan

The scope of the modifications to the waste management plan contemplated the following additions:

- Storage area modification, per company specifications to attend possible integrity issues.
- Spill prevention and personal protection equipment addition, to the new designated area, as per assessment overview integrity issues and EHS requirements.
- Designated specific handling equipment for the transport in site of the e-waste, to avoid cross contamination issues.
- Dispatch inspection checklist and transaction procedure.

Phase 4: Pilot Run

- Pilot run evaluation conducted throughout a period to identify any potential opportunities regarding handling and storage aspects.
- After the period was completed, a qualitative assessment was performed and identified opportunities were added to the plan to start the full site implementation.

Phase 5: Full Site Implementation

- Pilot run was reviewed during the assessment period and approved for full site implementation.
- Areas adapted quickly to the modifications performed, effectively executing all activities regarding classification of waste, handling and storage.

Results and Discussion

In Figure 1, information regarding to the current average annual waste disposal cost in comparison to the established waste recycling process costs can be seen in detail. This projection was based on a three-year average consumption, from which the recycling cost was calculated based on recycling company rate per pound of recyclable material. The projected cost reduction, as showed in Figure 1, would result in free capital which could be distributed to other areas or processes, based on the site necessities. It is important to denote that the projected costs presented in Figure 1 are subjected to possible changes caused by multiple variables.

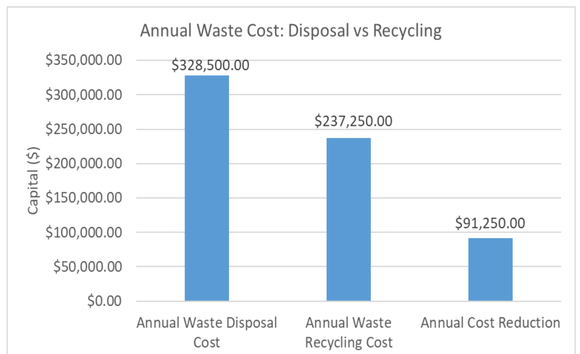

Figure 1
Cost Comparison for Disposal and Recycling of Waste

Material consumption, material acceptance due to integrity issues, recycling cost rising or declining when renewing contracts, finding more cost-efficient contracted companies and/or processes, etc. are some of these key indicators. These factors affect cost reduction and sites' environmental footprint at a long-term perspective. To maintain the positive impact, periodic assessment was determined to be needed and KPI's were stablished for this process oversight to sustain the positive environmental impact throughout the years, identify and mitigate potential detrimental factors within the sites' processes.

Conclusion

Approximately a 21% cost reduction resulted from the final contract settlement, with the recycling companies. Translating to a 60% waste to landfill reduction and a significant reduction in term of ecological footprint will be achieved, if sustained at a long term. Current site operations will increase material re-use metrics and lower the amounts of hazardous waste disposal and storage from site, due to the recycling implementation.

Overall objectives were met successfully, periodic revision of the waste management plan will cover any potential changes to the scope of the materials involve on site processes and/or any other related to a new process incorporation on site. Any potential material which could be processed via new and/or innovative recycling technology or processes will also be identified within the revision. This is to enhance any possible environmental compliance aspect, within site, and/or possible regulation developed in the future that may affect site operations.

Future Work

The next steps to enforce compliance with the company 2030 environmental goals will focus mainly on energy and transportation, maximizing the renewable energy sources that can power our operations while mitigating air pollution sources.

Solar Panel
Project Development

Electric Transportation
Project Development

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