ArcelorMittal Pallet Recycling Formal Report

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Amanda Schimmoller
aks5588@psu.edu

Nick Suffern
nicksuff88@gmail.com

Mengying Li
mfl5156@psu.edu
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a) Abstract

This ArcelorMittal Pallets Recycling Project was a design project to allow our group members to design a cradle-to-cradle recycling process for the wasted wooden pallets. We first examined our customer needs and looked into the background of the ArcelorMittal company, and then generated our own ideas for the process. In the final process, each part of the wooden pallets, including the wood chips, were all reused for different purposes. The recycling of the wooden pallets was efficient and the money that we saved could also be used for purchasing and planting new trees, which made our process form an end-to-end loop.

b) Introduction

Wooden pallets are usually used for protecting the loads in shipment and helping them to be more easily handled, stacked, and moved. (1) Our partner, ArcelorMittal, the largest steel producer in North America, also uses wooden pallets for the forklifts’ efficient mobility. But the problems is that while the wooden pallets are used in large quantities, a majority of them are replaced each year. It is estimated that nearly 2 billion wooden pallets are currently in circulation in the US alone and roughly half of these pallets are intended to be used only once and then discarded. Since the pallets tend to be full of difficult-to-remove materials, a percentage of these single-use pallets often end up in landfills. So it is essential for us to design
a way to deal with the excessive wasted wooden pallets and protect our environment.

c) Mission Statement

In this project, we are required to design a proper way to reuse or recycle one or more of the three unsustainable resources that ArcelorMittal use for production. These materials are refractory brick, metal drums and wooden pallets. The process we design should be close-looped and the strain on resource and the waste disposal should decrease after the recycle. What’s more, the process should also reduce the disposal costs and improve the profitability of the company.

Our team decided to focus on the recycling of the wooden pallets in our project.

d) Customer Needs Analysis

Table 1: Customer Needs Analysis

<table>
<thead>
<tr>
<th>Customer Statements</th>
<th>Customer Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Arcelor Mittal’s waste stream at one of its facilities by designing an opportunity to reuse and/or recycle one or more of the largest sources of refuse: pallets from incoming material delivery, empty drums or totes received from delivery of fluids, and waste refractory brick.</td>
<td>Pallets, empty drums, totes and waste refractory brick are reused and recycled at one of the Arcelor Mittal's facilities.</td>
</tr>
<tr>
<td>As with most of the finite resources we utilize, our industries that use iron and steel initially developed a linear production cycle (see figure below, from <a href="http://www.storyofstuff.org">www.storyofstuff.org</a>), often referred to as “Cradle-to-grave.”</td>
<td>Initially our industries use the linear production cycle: extraction--manufacturing--sales--use--disposal.</td>
</tr>
<tr>
<td>Imagine, then, that, in this project, we are contributing to taking the linear cradle-to-grave process and making it a cyclical “cradle-to-cradle” process.</td>
<td>The recycling process for the product is a close loop.</td>
</tr>
<tr>
<td>By recycling most of our materials over and over again, we greatly reduce the strain on resources and on waste disposal.</td>
<td>The strain on resource and the waste disposal decrease after the recycle.</td>
</tr>
</tbody>
</table>
Also, reducing the amount of waste will, in turn, reduce disposal costs, and improving profitability also helps the long-term sustainability of a business unit.

Disposal costs is reduced and profitability is improved.

While many drums of oils or lubricants may be refilled with waste oil for proper disposal, some other commodities come in containers that are not returned. Design a proper way of disposal for the items that cannot be returned to the manufacturer.

Finally, many other purchases, such as motors or rollers, come on wooden pallets. Design a proper way to recycle or reuse the wooden pallets in the motors or rollers.

We do not wish to receive this material completely without pallets, as the pallets facilitate the movement of material by forklift. The final products have some of the pallets in order to facilitate the movement of material by forklift.

However, we have not been able to work to an ongoing solution for removal of the used pallets. Design a solution for removal of the used pallets.

This is the table of the customer statements and customer needs about recycling the wooden pallets. According to this table, we designed a cyclical process to effectively recycle our used wooden pallets as well as reduce the disposal costs and improve the profitability.

e) External Research

i) Literature Review

ArcelorMittal Steelton is a factory in Pennsylvania responsible for the production of railroad rails, specialty blooms, flat bars, and ingots. They produce their products for construction, ship-building, military, and automotive purposes. Our task was to refine the recycling process of the three main unsustainable resources required in the manufacturing of Steelton’s exports: refractory brick, metal drums for hazardous fluid transportation, and wood pallets for the forklifts’ efficient mobility. We chose the latter of the three to pursue. The company already had some measures in place for recycling of the wood, such as giving away the pallets to employees for firewood or decoration in their homes. Wood pallet decoration is surprisingly common in households, used as coffee tables or broken down into two by fours for other decorative or constructive purposes. Other companies besides ArcelorMittal have taken to using the pallets in other ways by handing them over to specific plants designed for the recycling of such pallets. They reconstruct the pallets on landscape mulch, animal bedding, and wood stove pellets, to name a few.
ii) Library/online/patent research

**Process for recycling wooden pallets and installation for practicing such a process**

Since it requires a large amount of hand labor and great cost to repair or redimension the large quantity of wooden pallets that are damaged or of an unmarketable size, Bouchain Alain, et al suggest a new process to recycling the waste wooden pallets.

First, the wooden pallets go through a reception region for the first separation. The pallets that can be easily repaired and those that cannot are separated and sent to a repair station and disassembly station by two conveyors during this process. In the assembly room, all the constituent elements of the pallets are separated from each other. Then these elements are sorted, recalibrated and stored in a storage station which extends along the installation. In the end, the damaged elements are repaired with the constituent elements in the reconstruction station one by one.

![FIG. 1](image-url)

FIG. 1, a side elevational view showing the five most common types of pallets on the market.

f) Concept Generation

ArcelorMittal’s pallets went one of two places. Mainly to a certain section of the dump designated for “recycling” woods, and less often were given to employees willing to take the broken pallets for decoration in their home. Our initial thought was to design a system inside the Steelton factory specific for breaking down the used pallets into wood chips or pellets and sold. To address the concern of cost, the idea of selling or giving the used pallets to a recycling company came up. This would alleviate any need to change the Steelton factory whatsoever,
which is cost efficient. Further research indicated a new movement towards the use of plastic pallets, which require significantly less effort to recycle because they were more durable and simply needed to be rinsed after use, if necessary.

**g) Concept Selection**

The basis for our concepts all began in forming a new, efficient system for pallet use and reuse. We wanted to provide a simple solution for a company that has a lot of intricate and moving parts. For ArcelorMittal to recycle their own pallets, they would need to erect an entirely new section of their facility dedicated to the process. Plastic pallets, while easy to recycle, would cost a considerable amount to replace the wooden pallets, not to mention the increase in energy use and raw materials needed in the initial creation of the pallets. To save money while remaining environmentally friendly and efficient, we chose the final option, the use of a specific company for our pallet recycling needs.

**h) Final Design Description**

Companies exist that are dedicated solely to recycling these pallets, and one company, IFCO recycling, offers quick pickup and drop off from their recycling plant only 45 minutes from Steelton, in Biglerville, PA. Included in this is a free inspection by consultants, where they examine the use of the pallets and offer advice as well as specific designs on how to improve the efficiency of materials transported by forklift and pallet. For this reason, we chose to rely on an external recycling company.
i) Conclusion

The final design was chosen for its effective use of both the reusable pallets and the ones that are too far beyond repair. By allowing the broken pallets to be turned into wood chips we have offered an option to Arcelor Mittal that can benefit the community and help to solidify their public approval. Our group was able to decide on this particular method of recycling by cross checking it with other possible methods before we made our final decision. We worked consistently with the idea in mind that our final plans would have to be relatively
low in costs and that it would have to meet the requirements set in place by Arcelor Mittal that stated that the cycle had to be a true cradle-to-cradle system which we succeeded in creating.

Reference

(1) McCarrick, D. “The problem with pallets”  


(3) "Home – ArcelorMittal." Home – ArcelorMittal. Web. 1 Apr. 2015.  

(4) Choosing IFCO Pallets." Pallets from IFCO, the Worldwide Pallets Leader. Web. 1 Apr. 2015.  