Make a Quick Buck

Pineapple Express (Team 6)
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Abstract
Our goal in this project was to reduce the amount of waste that ArcelorMittal threw away in either bricks, barrels, or lumber as well as reduce the disposal costs of these landfilled wastes. Our group decided to tackle the problem of lumber being wasted and how we can reduce that. At first, we thought the best way to solve this problem was to use a device that acted like a pineapple corer and core out the area around the nails and sell the leftover wood. We realized that it would be more efficient to just saw the pieces of wood that had nails off and sell the rest of the lumber to a third party company. We found a few companies who would buy the wood and analyzed the cost of this option. There were many pros and cons with our design but we feel that we were effectively able to reduce waste.

Definition of Sustainability
Our definition of sustainability is creating and maintaining the conditions that allow humans and the environment to exist on an equal playing field, thus allowing the social and economic situations of the present and the future to be solved. In our opinion, this definition covers the true meaning of sustainability. We feel that every engineering project should be based on this belief so that life on earth can be maintained for future generations.

Introduction and Problem Statement
We would like to help ArcelorMittal reduce the amount of waste they currently produce and reduce disposal costs. ArcelorMittal uses a variety of wooden materials, like pallets to make it easier to transport specific materials. However, after they transport those materials, what happens to the wooden materials? ArcelorMittal doesn’t reuse, and the companies that send the materials don’t want it back, so it gets wasted. ArcelorMittal wants an idea, so the wood material used in this process can be reused. As a group we must come up with an idea that is inexpensive, and feasible to ArcelorMittal. Also the idea must be efficient, and can be used for years to come. Lastly, it must be environment friendly, because ArcelorMittal is trying to reduce its waste, and if our idea creates more. Then we honestly didn't help or solve anything. As we were looking for a solution, we tried to find out what each material was. We looked into the current process of
how they use the material they waste and tried to think of solutions going from there. Their process was to take the materials they had an excess of and dump it in a landfilled waste.

**Background**

We originally wanted to design a product that worked like a pineapple or ice corer and would remove the the chunk of wood with the nails. We researched patents for products that were similar the to our idea. There were patents for a wrench to remove the nails, a reverse drill nail gun, and a nail removing hammer. All of these patents were found on www.google.com/patents. We combined the ideas we got from these products to come up with our idea of reverse nail gun wood remover.

**Customer Needs**

<table>
<thead>
<tr>
<th>Cost</th>
<th>Environmentally-Friendly</th>
<th>Safety</th>
<th>Durability</th>
<th>Efficiency</th>
<th>Portable</th>
<th>Ease of Mnf.</th>
<th>Ease of Use</th>
<th>Total</th>
<th>Weight</th>
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<tbody>
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<td>2</td>
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<td>1</td>
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<td>6.58</td>
<td>0.09</td>
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<td>6.58</td>
<td>0.09</td>
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<tr>
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<td>2</td>
<td>2</td>
<td>1</td>
<td>15.5</td>
<td>0.19</td>
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</tbody>
</table>

You may notice that in our AHP Matrix that environmentally friendly is weighted the least. For our first idea we made it so it wouldn’t endanger the environment, so when it came to the table we didn’t believe it was significant for environmentally friendly to be high. If our idea was already providing that need. The three highest weights we had was safety, ease of use, and cost. We believe that these three would satisfy ArcelorMittal’s needs the most, because they need safe, easy, and inexpensive way to reduce it’s wood waste. We believe that with our first idea that included the ice corer, the safety of the workers was extremely important, because we didn’t want them getting injured on the job. Also we wanted it to be easy to use with little room for error, and it shouldn’t cost ArcelorMittal a lot to purchase such equipment.

**Concept Generation**

After hearing the problem that ArcelorMittal had, we came up with four different ideas to try and solve it. Our ideas were to make a device of some sort to core out the area around the nails, turn the pieces of wood into fencing material, turn the pieces of wood into outdoor decor, and sell the
pieces of wood to a third party. We decided that in order to do anything with the wood that we would need to take out the nails first. We had also decided that the simplest solution would be to sell the leftover pieces of wood instead of turning it into outdoor decor because that would opening up a new branch in ArcelorMittal and that would just complicate the whole situation.

**Concept Selection**

<table>
<thead>
<tr>
<th>Designs</th>
<th>Cost</th>
<th>Environment Friendly</th>
<th>Safety</th>
<th>Durability</th>
<th>Efficiency</th>
<th>Portable</th>
<th>Ease of Mnf.</th>
<th>Ease of Use</th>
<th>Total</th>
</tr>
</thead>
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<tr>
<td>Reverse Rail Gun</td>
<td>0.56</td>
<td>0.4</td>
<td>0.88</td>
<td>0.36</td>
<td>0.5</td>
<td>0.44</td>
<td>0.32</td>
<td>0.95</td>
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</tr>
<tr>
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<td>0.4</td>
<td>1.1</td>
<td>0.36</td>
<td>0.5</td>
<td>0.33</td>
<td>0.32</td>
<td>0.76</td>
<td>4.05</td>
</tr>
<tr>
<td>Outdoor Décor</td>
<td>0.56</td>
<td>0.4</td>
<td>1.1</td>
<td>0.45</td>
<td>0.5</td>
<td>0.33</td>
<td>0.24</td>
<td>0.76</td>
<td>4.34</td>
</tr>
<tr>
<td>Sell to a Third Party</td>
<td>0.7</td>
<td>0.4</td>
<td>1.1</td>
<td>0.45</td>
<td>0.5</td>
<td>0.22</td>
<td>0.4</td>
<td>0.57</td>
<td>4.34</td>
</tr>
</tbody>
</table>

During the design process our group had to take out the idea of the ice corer, and take a new path. For our idea that included the ice corer, we realize that after we remove the five to six nails from the wood, that then we would have a larger piece of wood with several holes in them. Afterward we wanted to sell the remaining wood to a third party for a product, but why would they purchase wood with large holes in them. So our group decided that we would just remove the ice core idea, and simply cut off the wood that contained these long nails. Since we took out the ice core idea, our design criteria has also change. Since we aren’t dealing with the corer the safety of the worker won’t be that high, and since there no tool ease to use will also decrease. Although we have change our idea to simply cutting off pieces of the wood, we as a group still believe we can reduce ArcelorMittal eco footprint. During our process we still will having wood waste, but it will be significantly reduced from what they have now. Also our model will show ArcelorMittal on how they can change from a cradle to grave, but to a cradle to cradle. All ArcelorMittal have to do is start gather all their wood that is in good or even bad
conditions. Start researching companies that will purchase their wood and sell it them. It a simple and easy process not only are they reducing their wood waste, but also making a profit.

**Design Review**

At the time of the design review, we were still focused on trying to remove the nails by trying to cut out the area around the nails in order to safely and efficiently prepare the wood to sell to a third party company. The biggest problem that Team 7, aka Interstellar, found with our design was that it would take too much force to manually cut that piece out and that it would be much for effective to make the device powered by something besides other than just manpower. We had decided that we should make the device powered by a battery. After a few days of trying to make a design that would effectively remove the area around the nails, it dawned on us that a third party company would not want to buy pieces of wood with really big holes in them, so instead we changed our plan to just sawing off the pieces with nails in them and selling the leftover pieces to a third party company.

**3D Model/System Diagram**

For our model we took the had the workers cut the pieces of the wood with nails off with a saw. The part with the nails was waste. They then put all the pieces of wood that were the same size together and bundled them. The wood was then sold to one of the companies listed and reused to make other wood products. Since our idea was a process, there was no real prototype we could make.
Cost and Feasibility Analysis

ArcelorMittal currently pays employees $30 per hour to move the wood from the carts and individually remove the nails from the wood. This process takes a long time and the workers often have to work overtime. They would then take the wood home with them and burn it. The only upfront cost would be purchasing the saws. ArcelorMittal will still have to pay workers to cut the wood and bundle it so it can be sold. The cost of our idea will vary also on the amount each third party (Elmwood Reclaimed Timber, Pioneer Millworks, and Longleaf Lumber) will pay for the wood and how much the cost to transport it will be. Depending on the size of the wood and if ArcelorMittal would be willing to ship it, they could make a good profit. We feel that our idea is quite feasible and can be carried out by the company’s workers without much change in the company. There are no ethical or legal issues with our idea so ArcelorMittal should have no problem implementing our design idea.
Life Cycle Analysis

For our system we believe that the best way for ArcelorMittal to be able to reduce their waste and reuse all the wooden materials they use is by cutting off the pieces of wood that contained the five to six inch nails, and removing all other materials within the wood. Afterward, they would sell the remaining wood to a third party, whom would likely be a company who use wood. The wood would then be reuse in various of ways depending on the company that receive them. One decision that our group made that actually made us rethink and change our system was the process of removing the nails. At the beginning we wanted a to create a tool similar to an ice corer, which would cut out the entire area where the five to six inch nails was located. For the record the these long nails are located in the wood brought by the railroad cars. To continue we realize that our ice corer idea was smart, but it had its side effects. It would leave a multiple holes within the wood, and honestly who would buy wood with holes in them. So our group decide to change the idea from the ice corer to just simply cutting off the parts with that contained the large nails. Then selling the remains to a third party. Our idea is completely using all the wood, but the wood waste will significantly be reduce.

Conclusions

Some pros of our design is that our system is very simple to implement and would only require ArcelorMittal to pay their workers a little bit extra in order to profit from selling these leftover pieces of lumber that they would usually waste otherwise. A con of our design is that even though some of waste would be reduced, all of the waste would not be completely eliminated. A main point that our team learned is that we should get all the information we need before tackling a project and that we shouldn’t fall in love with an idea before considering what our customer needs are. Our design will take time to improve upon, but after a while, we will be able to figure all the costs and which company would be the best to sell the wood to.
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