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SECTION 1 EXECUTIVE SUMMARY

The goal of this report is to provide a solution and design concept to reduce one of ArcelorMittal’s, one of the world leaders in steel production, waste streams. ArcelorMittal’s three main waste streams are (1) wooden pallets, (2) large drums and totes, and (3) waste refractory brick. This report takes an in-depth look at ArcelorMittal’s wooden pallet waste stream and provides a cost and waste reducing solution and design concept. By implementing a simple three-step recycling process, ArcelorMittal can effectively reduce its wooden pallet waste stream and reduce the company’s overall costs and environmental footprint.
SECTION 2  INTRODUCTION

2.1  PROJECT OBJECTIVES.

Reduce ArcelorMittal’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.

2.2  PROJECT BACKGROUND.

Steel is one of the most common materials used by modern societies. It is also a good example of a resource with large known reserves that are finite. As with most of the finite resources we utilize, our industries that use iron and steel initially developed a linear production cycle, often referred to as “Cradle-to-grave.” Given that iron is seemingly abundant in the Earth, it was common for steel to be disposed of like everything else: in a landfill.

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. By recycling most of our materials over and over again, we greatly reduce the strain on resources and on waste disposal. For the greatest impact, this must be combined with lowering growth in consumption, eventually reaching a steady-state or even shrinking consumption.

Use of recycled steel has been a part of the steel industry since its beginnings, with major efforts made in wartimes when resources were scarce. While steel is often recycled effectively, some of the byproducts of production are not. Many steel companies are able to sell the slag produced in the process of making liquid steel for roadbed filler, and some also sell the iron oxide mill scale byproduct. ArcelorMittal espouses company values of Sustainability, Quality, and Leadership. In support of the value of sustainability, we look to reduce our overall waste stream to improve the sustainability of our processes. 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.

2.3  SPONSOR BACKGROUND.

Our partner in this project is ArcelorMittal USA, the largest steel producer in North America and the largest integrated steel producer in the United States. ArcelorMittal is the leader in all major global steel markets, including automotive, construction, household appliances, and packaging. It is the world’s largest and most global steel company by both revenue and production, with over 285,000 employees in 60 countries.
ArcelorMittal operates in three divisions in the USA: Flat Carbon, Long Carbon, and Tubular. The Steelton, PA, plant is in the Long Carbon division. Similar to the other Long Carbon plants, the Steelton plant manufactures steel from recycled scrap metals. This plant has a liquid steelmaking capacity of about 1.1 million net tons of steel per year. Product lines include cast and rolled blooms for the forging and rerolling industries; rails for railroad, transit, and crane application; rolled billets, squares, and flats; construction equipment sections; and large diameter specialty ingots.

2.4 PROJECT CATEGORIES.

There are typically three types of resources:
1. Wood pallets from incoming material delivery
2. Empty drums or totes received from delivery of fluids
3. Waste refractory brick

2.5 PROBLEM STATEMENT.

Nowadays, recycling of wood has become more and more important because plenty of wood resources are wasted. Every day all around the world, households may purchase new wood as furniture or building materials. After these wood are broken or too old for their functions, they will be disposed as used wood and replaced by new wood. Therefore, forests are kept getting salvaged and new wood are produced even though there are still numerous wood which are used but still useable for other purposes. As a result, this huge amount of resource waste has become significant from time to time and it is exactly what research teams are trying to fix.

Researches have indicated that there are many efficient ways in recycling wood resources. Reusing of wood chips, wood fuels and transforming into paper can be very functional. According to the analysis of both economic efficiency and environmental advantages, our research team will choose a most practical and workable disposal of wood in the following details.
SECTION 3 METHODOLOGY

3.1 SUSTAINABILITY.

Sustainability is when any material is being taken away at the same rate it is being replenished in an effort to preserve the world we live in and leave Earth looking the same way we entered. The global impact is vast. Commercial expansion has its benefits but we are approaching a vital point in environmental destruction. The more trees we remove for space and production needs, the more pollution we are outputting into the environment and the less pollution is being naturally removed by trees and other plants. The more usage we can get out of the wood from a single tree the longer another tree can grow and the better we can sustain and maintain proper tree levels worldwide.

3.2 RATIONALE FOR SELECTION.

Our design team chose to take on the task of developing a waste stream for the wood pallets being used at ArcelorMittal. Our idea is to develop a nearly fully sustainable process that would maximize the usage of each and every piece of wood pallets that comes through ArcelorMittal. When this process is fully implemented and proven successful, we plan to take this idea outside of the company due to its major positive environmental impact. We understand that this process may lend a competitive edge to ArcelorMittal and this will be assessed before the process is expanded beyond the company. Essentially, we chose to create a waste stream for the wood pallets because of the larger environmental aspect to the process as compared to the drums or refractory bricks. The world is currently cutting down trees at the rate of 4 billion per year which is an alarming rate. Our company would like to be part of the larger solution in protecting the world’s natural ecosystem and preserving places like the rain forest, Antarctica, and many other places in danger from global warming and mass industrial expansion. Our goal is to help future generation have the privilege of these locations and reduce the company’s carbon footprint.

3.3 DESIGN CONCEPT.

Our concept is a several step process with multiple loops and ending destinations. First, we conduct an inspection on the wood pallets that ArcelorMittal intends to dispose of. If these pallets pass inspection, they have been deemed structural stable and do not yet need to be run
through our process. This first step is often overlooked, but will save hundreds of thousands of dollars over the long run. We will be sure that the inspection standards are higher than needed to insure a safe and accident free workplace. The next step is to take all the failed wood pallets and prepare them to be wood chipped. Now we have a pile of varying quality wood chips that can be used for many purposes. The primary use will in the papermaking process. Paper requires slightly higher quality wood and is at the top of the recycling chain. Once our wood chips are turned into paper they will follow the paper recycling hierarchy. The second purpose for our wood chips will be to create an artificial composite wood containing both plastic and wood. We will simply sell the wood chips to a company creating this composite because they are likely in need of recycled wood already into chipped form. Lastly, the remaining woodchips will be available for wholesale to parks, townships, or anyone who requires a bulk purchase. We essentially combined all of our proposed ideas because of the versatility of recycled wood chips.

3.4 REGULATORY ISSUES.

Some possible environmental issues would include the amount of land required to produce and store millions of tons of wood chips as well as the pollution and energy consumption that are a byproduct of our production process. We may need to develop a new state-of-the-art storage center and highly efficient wood chipping process. Legal issues may include safety requirements which must be taken extremely seriously with such heavy duty equipment. Other issues could be zoning problems for our storage facility and even approval of a new design and production process.

3.5 STAKEHOLDERS.

By recycling the wood pallets into varying quality wood chips we possess the option to sell bulk quantities of wood chips or transforming them into paper. Our recycling techniques allow many companies to continue to use wood pallets and not worry about disposal of the deteriorated wood pallets any longer. The wood pallets can be checked for stability or used in other appropriate ways. Industries will no longer need to plunder and destroy more forests because a portion of our wood chips will be sold at low cost to manufacturers of composite wood, made with a 50/50 plastic wood mixture. This means fewer transportation and processing costs for large companies leading to a decrease in environmental problems and no price increase due to our middle man company. Based on the laws for environment protection, there shall be limitation on salvaging forests. Big industries can now avoid situations that may compromise the integrity of their company by breaking these laws, they may avoid both an embarrassing situation and a costly re-branding process. For government and other environmental protecting agencies, it is definitely a step in a positive direction for their cause. For those industries that are working on furniture or other false wooden products, they can
make their products using these cheaper materials, thus providing a cheaper alternative to authentic wood decor.

3.6 ASSESSMENT OF AMOUNT OF WASTE DIVERTED FROM LANDFILLS.

Based on data our research team collected, recycling 1 ton of wood can save about 18,000 BTU heat energy. This is the energy that we save from damaging more forests or salvaging more trees after all. Besides, transforming into paper may also save energy and costs. In fact, 90% of paper pulp are made of wood, which has only 9-16% of new wood. Most of them are made of waste or old wood that we decide to burn inefficiently in the past. Paper production are the biggest consumer for 35% of tree cutting, which has a percentage of 1.2 in total economic all around the world. What is more, recycling one ton of newsprint, printing or copier paper means an amount of 1 ton of wood and slightly more than 2 tons of wood separately. 20 million acres of forestland can be saved by recycling half of the total number that we use all over the world nowadays.

3.7 ECONOMIC ASSESSMENT.

According to the data collected, 18000 BTU is equal to approximately 5.28 KWh. For US electricity price, 1 KWh costs $0.104 or 10.4 cents. Based on data above, recycling 1 ton of wood can save about half dollar of energy. However, we are dealing with millions of tons wood every day, and it would equate to a large amount of money. In addition, the costs of transportation and time-consuming problems have yet to be accounted for in this assessment. It will worth more money and we could save this number of money if we recycle wood properly.
3.8 SYSTEM DIAGRAM/MODEL.

System Model

3.9 ENVIRONMENT IMPACTS. Since the wood is being reused it is helping the environment in the long run. We can use the same wood over and over essentially and will help to save as much forestland as possible. The only decide to using a wood chipper will be the high cost of fuel which can potentially harm the environment if we run the wood chipper at a high rate. Other than that the process should work fine. There isn’t too much conflict with the paper making process.

3.10 PRODUCT DEVELOPMENT AND MARKETING. Wood chippers are already widely used today. With that being said it won’t be too hard to market and sell this as a viable option since people already use wood chippers and wood chips so widely today. Wood chips can be used for anything from making mulch to making paper. The target audience for selling both the mulch and the paper can be the average home owner because both are typically needed.
SECTION 4 SUMMARY

ArcelorMittal’s waste stream of wooden pallets has, in recent years, become a problem for the company both economically and environmentally. By implementing our teams three phase recycling process where wooden pallets are (1) inspected for reuse, (2) those not selected for reuse are chipped into wood chips, and (3) those wood chips are recycled into paper or composite wood made from wood chips and plastic. There is also an option for the wood chips to be sold to companies who already make composite wood or who need wood chips for any other reason. The advantages of implementing this design include but are not limited to (1) less money spent on wooden pallets overall, (2) less waste produced from ArcelorMittal, (3) a new product that the company can sell (wood chips, paper, composite wood), and (4) preserving the environment. Disadvantages of implementing our design are if ArcelorMittal does not have the necessary equipment to produce wood chips they would need to invest money in the equipment to do so increasing the costs of the company and they may need to find clients who are willing to buy either wood chips, recycled paper, or composite wood from the company.
SECTION 5 REFERENCES


