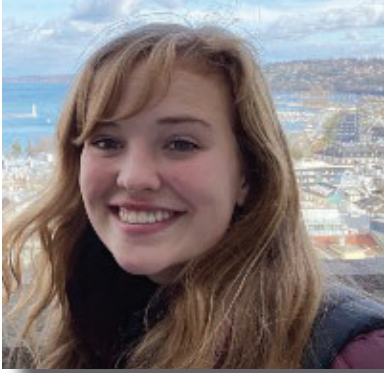




St Croix Forge



Leah Ness

Mechanical Engineering
University of Minnesota Twin Cities

Company Background

St. Croix Forge's production facility and warehouse are located in Forest Lake, MN.

Owned by Mustad, an international hoofcare product company, St. Croix Forge is the leading manufacturer of steel horseshoes in North America, and they are Mustad's only location in the United States. They produce over 500 different varieties of steel horseshoes. They employ about 50 people at the plant.



ST. CROIX FORGE

FORGING EXCELLENCE

"Through this internship I was able to receive valuable industry experience while impacting the environment in a positive way. Working for St. Croix Forge provided me with the opportunity to gain skills involving writing and performing my own test procedures as well as improving upon my communication skills. I also became familiar with a large manufacturing environment and working with people of varying disciplines." ~ LN

Project Background

One of Mustad's current goals is to reduce their carbon footprint as a company. This project focuses on two methods of reducing the carbon footprint of the production facility of St. Croix Forge: reducing electrical energy consumption and waste generation in the form of scrapped steel. In the past, St. Croix Forge has completed several projects in order to reduce waste and energy consumption including another internship with MnTAP, but there are still opportunities to reduce further. Currently about 31% of all processed steel becomes scrap and 93% of the energy consumption is electrical energy. Upgrading equipment and reducing scrap by implementing new standard operating procedures will reduce energy consumption and waste generation at the facility.

"We would like to thank Leah for her outstanding summer internship. She was great and disciplined to achieved the expected goals of our company. The results are showing and we are beyond happy about it. This is our second partnership with MnTAP and we are looking for future projects that we can both work on together."

*~ Douglas Escobar Moran
Production Support Supervisor*

Incentives To Change

The primary motivation in pursuing the intern project was to reduce material consumption and energy usage. It is a companywide goal to reduce their carbon footprint as much as possible, which can be done through both of these methods. St. Croix Forge and Mustad as a whole are always looking for ways to improve the efficiency of their processes through standardization and reducing waste in the form of energy and scrap.



Solutions

Optimize Lighting

Currently, the majority of the lighting at St. Croix Forge is fluorescent lighting. Upgrading lighting in the production building by replacing all current fixtures with LED fixtures will reduce energy consumption and energy costs. Along with saving energy and associated costs, these new fixtures have a longer life, higher efficiency, and will provide a safer working environment than the current fixtures. This recommendation is estimated to save 79,000 kWh and \$11,000 in annual energy and bulb costs.

Install Flow Meter for Die Lubricant

Die lubricant is used as a release agent between the dies and the forged shoes. Installing flow meters on die lubricant lines will give St. Croix Forge better control over usage and allow for optimization. The savings associated with installing flow meters on all lines is 320 lbs of die lubricant and \$420 annually, but there is also predicted to be a savings due to increased die life and reduced scrap from standardizing the die lubricant usage.

Defect Correction

A defect is when an issue occurs during the manufacturing process that causes a shoe to be incomplete or of bad quality. Implementing standard operating procedures for when a certain number of defects of a specific type have been produced will allow issues to be addressed immediately and reduce scrap. The potential savings for this recommendation is 60,000 lbs of steel and 19,000 kWh for a total cost savings of \$17,000.

Standardize Crop Length

There is a portion of the horseshoe, called the crop, that is held during the forging process that is trimmed off once the horseshoe is fully formed. The current standard crop length is 5/8 inches. By establishing a standard operating procedure for checking crop length during production and altering the necessary fixtures, 25,000 lbs of raw steel and 5,200 kWh in energy from heating could be saved, with an annual cost savings of \$8,700.

Reduce Idling Time of Forge Press Motors

Currently, the forge press motors spend an average of 12.5% of the time idling when they aren't producing horseshoes. The time forge press motors spend idling can be reduced to 5% by putting a standard operating procedure in place for when the forge press motors should be turned off when the production line is shut down. This reduction option is estimated to save 44,000 kWh of electrical energy and \$4,400 in energy costs.

Implement New Die Steel

The molds used to form the steel into horseshoes are called dies. Replacing the current tool steel H13 that is used to make the dies with LSS 2367, which has a potentially longer life, could provide a savings of 11,000 lbs of tool steel per year. This is assuming the same amount will be spent on tool steel annually, but there is potential for further reduction. Also, there is predicted to be a savings regarding reduction in scrap, improved quality, reduction in heat treatments, and reduction in downtime to replace dies.

Recommendation	Annual Reduction	Annual Savings	Status
Optimize Lighting	79,000 kWh	\$11,000	Implementing
Die Lubricant SOP	320 lbs	\$420	Implementing
Standardize Crop Length	25,000 lbs	\$8,200	Implementing
	5,200 kWh	\$520	
Defect Correction	63,000 lbs	\$16,000	Implementing
	26,000 kWh	\$2,600	
Reduce Idling Time of Forge Press Motors	44,000 kWh	\$4,400	Recommended
Implement New Die Steel	11,000 lbs	N/A	Waiting on test results

MnTAP Advisor: Michelle Gage, Engineer