



# Mustad USA



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## Organization Background

Mustad USA's production facility and warehouse are located in Forest Lake, MN. Owned by Mustad, an international hoofcare product company, Mustad USA is the leading manufacturer of steel horseshoes in North America. They produce over 500 varieties of steel horseshoes and employ 85 people.



*"This internship was a great experience! I was blessed to work with some really friendly people and lead a handful of exciting projects. This summer showed that my schooling and passion for engineering can have a positive impact and make a meaningful difference in the world." ~ NM*

## Project Background

In the past, Mustad USA has completed several projects in order to reduce waste and energy consumption, including two other internships with MnTAP, but there are still opportunities to reduce further. Currently, about 31% of all processed steel becomes scrap, and 93% of energy consumption is electrical energy. Improving practices and reducing scrap will reduce energy consumption and waste generation at the facility.

## Incentives To Change

The primary motivation in pursuing the intern project was to reduce material consumption and energy usage. It is a company-wide goal to reduce their carbon footprint as much as possible, which can be done through energy reduction

Consequently, many dies have excess material. Making the die dimensions proportional to the shoe dimensions could save up to 6,100 lbs. of steel and \$37,000 annually.

## Punch Material Change

A2 tool steel is used for punches. However, it is only rated for applications that don't exceed 400°F, whereas the punches used in production can reach 500°F or more. Switching to M2, the common tool steel used in this application, would reduce punch changeouts and increase machining energy efficiency, saving 1,700 lbs of steel, 15,000 kWh and \$58,000 annually.

## Reducing Crop Length

The crop is the part of the shoe the robot holds onto during the forging process. The current crop length is 5/8 inches. Purchasing new grippers for the robots that have greater grip strength may allow a reduction of 1/16 inches; doing so would have annual savings of 41,000 lbs. of steel and \$27,000.

## SOLUTIONS

### Die Material Change

Currently, the material used for dies is H13 tool steel. Switching the engraved die material to LSS 2367 and the rib die material to CPM 1V can increase die lifetime significantly. Increasing die lifetime reduces scrap and machining energy consumption, leading to savings of 10,600 lbs of steel, 20,000 kWh and \$139,000.

### Reducing Die Size

The majority of the dies used are all sized according to the dimensions of the largest shoe produced.

### Reducing Robot Re-teaching Time

At each startup, the operators re-teach the robots where to position the horseshoe at each point of the process. There is a function in the robot programming to save the previous positioning of the robot for a given shoe. Implementing a standard of having the operators check if the previous programming will work could save downtime. A 10% reduction in re-teaching time through standardizing changeovers would lead to an annual savings of \$10,000.

# Solutions

## Lighting Optimization

The Mustad warehouse uses fluorescent lighting fixtures for its lighting, and the forge does not have occupancy sensors or dimming features. Converting all warehouse lighting to LEDs and installing occupancy sensors and dimming in the production facility would annually save of 100,000 kWh and \$8,200.

## Punch and Clip Press Motor Shutoff

The punch/trim and clip press motors are always running unless a tooling change is required or the entire line goes down. When just one side of a line goes down, the motors on that side continue to run, which wastes energy. Programming these motors to turn off when their side goes down would save 35,000 kWh and \$2,500 annually.

*“Nathan Miller has had self-confidence and ability to get his project done successfully.”*

*~ Bill Nguyen, Manufacturing Engineer  
Mustad USA*

## Additional Opportunities

Mustad can realize additional energy, steel scrap and cost savings through induction heater upgrades, installing a new pyrometer control loop, and power factor correction.



Recommendation	Annual Reduction	Annual Savings	Status
Die Material Change	10,600 lbs 20,000 kWh	\$139,000	Recommended
Reducing Die Size	6,100 lbs	\$37,000	Testing
Punch Material Change	1,700 lbs 15,000 kWh	\$58,000	Testing
Reducing Crop Length	41,000 lbs	\$27,000	Recommended
Reducing Robot Re-teaching Time	N/A	\$10,000	Testing
Lighting Optimization	102,000 kWh	\$8,200	Implementing
Punch and Clip Press Motor Shutoff	35,000 kWh	\$2,500	Implementing
Correct Power Factor	N/A	\$2,600	Recommended
Pyrometers with Control Loop	58,300 lbs 4,500 kWh	\$33,400	Recommended
Replace Induction Heaters with 25 kHz models at end of life	240,000 kWh	\$17,000	Recommended

**MnTAP Advisor:** Gabrielle Martin, Associate Engineer