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# Vertical Lathe Tooling Optimization

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# Vertical Lathe Tooling Optimization

## **Problem Statement**

In order to run Sandvik Coromant Capto C8 tooling, the operator must remove the existing stick tool holder from the vertical lathes ram. This process takes multiple hours and has the potential to damage the ram. Our sponsor would like to avoid removing the stick tool holder when running C8 and cam lock style tooling.

## **Disciplines**

Bioresource and Agricultural Engineering | Industrial Technology

## **Authors**

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# IOWA STATE UNIVERSITY

Department of Agricultural and Biosystems Engineering (ABE)

TSM 416 Technology Capstone Project

## Vertical Lathe Tooling Optimization

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\*course instructors and corresponding authors.

**Client:** Emerson, 1702 S 12th Ave, Marshalltown, IA, 50158, [www.emerson.com](http://www.emerson.com)

Contact(s): Brian Hageman, Tool Design Engineer

## 1 Problem Statement

### Problem Statement

In order to run Sandvik Coromant Capto C8 tooling, the operator must remove the existing stick tool holder from the vertical lathes ram. This process takes multiple hours and has the potential to damage the ram. Our sponsor would like to avoid removing the stick tool holder when running C8 and cam lock style tooling.

### Business Case Statement -

The current tool change causes irreparable wear to integral parts of the lathe. This wear will eventually cause the lathe to be useless, meaning the value of the machine is reduced to scrap value. The case for our solution is that the life of the lathe will be extended, and it can be fully

utilized by using all types of tooling.

## 2 Goal Statement

Our goal is to design a tool adapter plate to reduce wear on the lathe and tool change time.

### Main Objectives and Specific Objectives

- Develop an improved tool adapter
- Create a loading plate fixture
- Create work instructions

### Specific objectives include:

- Design a new tool adapter design that meets all client criteria and constraints:
  - § Must be compatible with CAT 40 tools, stick tools, and C8 tools
  - § Production and material cost must not exceed \$600
- Tool adapter loading plate must hold tool adapter
  - § Clamps must hold tool adapter securely and flush against the surface
  - § Plate must be spring loaded, being able to withstand the weight of the tool adapter

### Rationale

Once this tool-change problem is resolved our client will be able to perform tool changes faster and easier than ever before, and without fear of damaging the machine.

### Project Scope

Our scope included a preset \$600 production and manufacturing budget as well as keeping most of the tool change adapter dimensions the same as to ensure compatibility with the lathe ram. We were required to produce the new design on Emerson's personal computers only using SolidWorks. Our project only required the involvement and recommendations of two operators and our client.

## 3 Project Plan/Outline

### Methods/Approach

Reference Material(s): Brian Hageman, two Emerson Machine Operators, Jacek Koziel, Joe Vanstrom, and Shweta Chopra, [www.amesweb.info](http://www.amesweb.info)

### Data collection:

Our goal was pretty unclear at the beginning of the project, however after speaking with two machine operators and our client, we understood exactly what was asked from us. Speaking with the Machine Operators was immensely beneficial to our project since they will be the

people directly affected by our results.

**Skills:**

Skills and information vital to our project's success would be:

ABE 271: Engineering Applications of Parametric Solid Modeling

TSM 216: Advanced Technical Graphics, Interpretation, and CAD

TSM 340: Advanced Automated Manufacturing Processes

**Solutions:**

Before we could make substantial progress with our project, we required a site visit at Emerson to see the machinery. After this visit, we gained critical knowledge necessary to complete our project. This was due to talking with our stakeholders; our client and two machine operators. Our final solution was reached by strategically planning what tasks needed to be done and their respective completion dates. We had two members do the CAD designs of the tool change adapter and the spring loaded tool adapter loading plate. After our CAD designs were complete, they were sent to our client for approval. Our sponsor was consistent with responding to any emails or questions we had in a timely manner. Our proposed solution met all of the client's requirements and expectations.

**Organization:**

Our team communicated with our sponsor at least once a week to ensure we could produce the best possible solution for Emerson. We didn't really have any issues getting tasks done because there would always be someone willing to take charge on a certain task. We didn't have any setbacks due to the excellent communication of our sponsor.

## 4 Results

**Results/Deliverables**

Our deliverables were completed as planned and are as follows:

- Design of tool change adapter
- Design of tool adapter loading plate
- Work Instructions are written as Fisher Manufacturing Procedure(FMP)

Follow up steps for Emerson include, but are not limited to:

- Manufacturing tool change adapter
- Manufacturing tool adapter loading plate
- Testing finished products
- Updating us on test results

## 5 Broader Opportunity Statement

Our newly designed tool change adapter could be used by any company in need of a new vertical lathe tool change adapter as long as it is compatible, however, in this case, our design is only for Emerson. Other companies are doing the same thing Emerson is doing, by having a Capstone teamwork on solving a similar problem. Companies like Emerson have no problem spending a couple of hundred dollars to manufacture a concept that will ultimately save them much money in avoiding wear and tear on tools and equipment.

## 6 Graphical Abstract



## 7 References

[www.amesweb.info](http://www.amesweb.info)

## 8 Appendixes

