Deliverable B: Needs Identification and Problem Statement

Chayton Munro

September 30, 2023

Table of Contents

1. Introduction

At AMBICO, a labourer in their factory currently spends a significant amount of time measuring and marking the placement of the holes required in doors to attach hinges. Once the holes are marked, they are drilled by hand in a very precise location. AMBICO has come to the University of Ottawa with the intention of the young engineering minds being able to bring light to their problem. Giving the engineers a glimpse of what is to come in their future. AMBICO has tasked these engineers within GNG1103 to create a jig that reduces the amount of time their labourers in the factory spend measuring, drilling, and tapping the holes for the hinges to be attached.

2. Client Needs

- Needs a jig that reduces time drastically or would like an automatic jig that allows the labourer to just hit a button or line the jig up and just push it to the door.
- The jig needs to be able to be adjusted to fit different size hinges as well as drill bits and taps.
- The jig needs to be able to be swapped from drill bits to taps quickly.
- Cut holes for wood and metal doors.
- The jig must increase the accuracy of the holes and must have a 100% success rate when working properly.
- Must be user-friendly.
- Be able to withstand the factory conditions, which include lots of dust and vibrations if placed on a table.
- The total time of 30 minutes must be cut down during the drill and tapping stages.
- The company makes metal and wood doors so correctly supporting the doors is a must, making sure the metal ones don't warp, and bend and the wood ones don't crack or break.
- The jigs must not be able to move after the labourer locks it in the correct position for a proper drilling and tapping angle.
- Must be able to stay in place as drilling and tapping are happening.

3. Interpreted Needs

- The jig needs to be automatic or very close to automatic removing the amount of labour required for these two stations by up to 80%
- The jig needs to be able to have different settings for different-sized hinges and holes to fit the customer's needs.

- Swapping between drill bits and the tapping bit must be quick and efficient.
- The jig can't move after the labourer locks it into place and has to be able to withstand vibrations and complete the job with 100% accuracy so drilling and tapping at different angles goes smoothly.
- The jig must be supported well so that the wooden or metal doors aren't warped or cracked.
- The jig must be able to operate within dusty conditions.

4. Prioritizing Interpreted Needs

- The jig needs to be automatic or very close to automatic removing the amount of labour required for these two stations by up to 80%. (5)
    - This is very important as it is the main reason for the company coming to us.
- The jig needs to be able to have different settings for different-sized hinges and holes to fit the customer's needs. (5)
    - The company needs to be able to adjust the holes on one jig and not have many for a simple job.
- Swapping between drill bits and the tapping bit must be quick and efficient. (2)
    - There are two stages the drilling and tapping stage so this jig needs to be able to switch between the two quickly but as long as it can switch between the two is fine.
- The jig can't move after the labourer locks it into place and has to be able to withstand vibrations and complete the job with 100% accuracy so drilling and tapping at different angles goes smoothly. (4)
    - The purpose of the jig is to stay in the same place and put less stress on the labourer for making mistakes.
- The jig must be supported well so that the wooden or metal doors aren't warped or cracked. (4)
    - The jig has to be functional as there is no point to one if it always damages the type of door it is used on.
- The jig must be able to operate within dusty conditions. (4)
    - If the jig can't operate within dusty conditions or average factory conditions and has to be 100% clean, then there is no point in having one, so it has to be durable.
- Must be user-friendly and safe to operate by an average labourer. (5)
    - If the labourer doesn't feel safe using it or it is too complicated, then that's more money for the company.

5. Problem Statement

AMBICO needs a jig that goes on wood or metal doors that drills and taps holes for hardware the door is required to have. The company needs this jig to be able to withstand dusty factory conditions, have variable settings for the size of holes and the spacing between the holes, and reduce the amount of time spent during the drilling and tapping stages.

6. Benchmarking

Many companies like Amazon are selling products of different companies' ideas which consist of little 3D printed jigs that when dropped at the wrong height and angle will be damaged or broken. They all have many pieces and aren't all for the correct size of doors and might not work. So, the options are just 3D-printed pieces of plastic that would break in an instant in a factory. Some of these jigs are made out of metal and would withstand factory conditions but they require external resources like the drill and drill bits as well as taps. Those jigs are also only supported by one clamping device which can be easily rotated by accident and to get the holes perfect you need both hands on the drill lining up the holes. So these jigs are very inaccurate and would affect AMBICO in a negative way.