Bandsaw Blade Guide UX Design

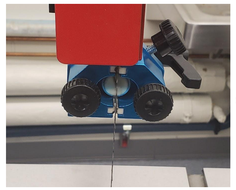
Laguna Tools Sponsors: Benjamin Helshoj and Matt Henry
Faculty Advisors: Professor Walter and Moatasem Fouda
Student Team: Caleb Dodd, Jonathan Kung, Sonya Ni, Nestor Ojeda, Roy Yang

UCI Samueli School of Engineering
University of California, Irvine

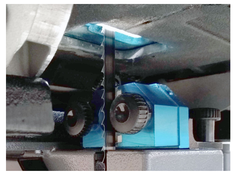
Introduction

- Bandsaw guides are used to keep the blade straight when cutting material
- Current design utilizes ceramic blocks for both the rear and side guides which make contact with the blade and deliver a high quality cut
- Adjusting the current design is difficult due to a sliding adjustment and knobs being placed in cramped spaces
- Replacing parts used is complicated and takes upwards of 30 minutes
- Working for Laguna Tools, we are seeking to improve the mechanical design of the bandsaw guides and the user experience when adjusting them

Laguna Tools 14|12 Bandsaw*



14|12 bandsaw current upper guides



14|12 bandsaw current bottom guides

Design Requirements

- Reduce adjustment time by 30%
- Each side guide has 5 mm of movement in x-direction (direction perpendicular to the cutting edge of the blade)
- Easily replaceable guides
- Improved functionality with table tilt
- Last 5,000 hours of active use

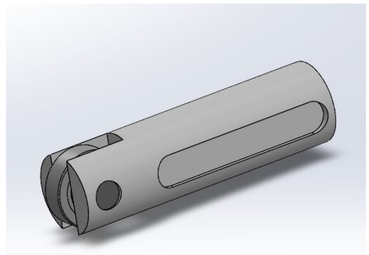
Acknowledgements:
- Professor Walter and Moatasem Fouda for their guidance throughout the project
- Benjamin Helshoj and Matt Henry for giving us the opportunity to work on a valuable and rewarding project.

References
- * Adapted from: https://lagunatools.com

Design Solution

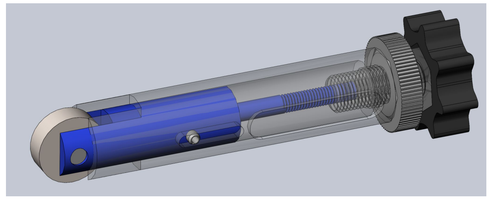
Thrust Bearing

Design 1



- Direct replacement of the current thrust bearing cylinder
- Uses the existing thumb screw to lock it in place
- Slide & lock, easy and quick adjustment
- Uses a ball bearing instead of a ceramic block to eliminate sparks and reduce friction

Design 2



- Can replace the current thrust bearing cylinder
- Utilizes an adjustment screw with fine threads for more precise adjustment

- Adjustment bolt features external and internal threads
- Blue cylinder slides inside the outer casing and is aligned with the internal thread

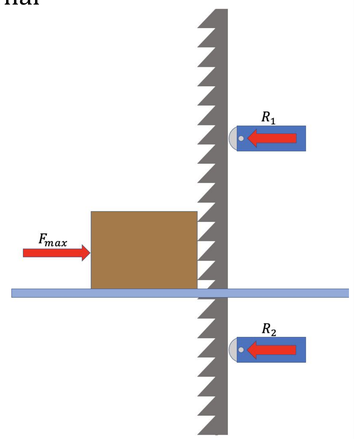
Thrust Bearing Life Calculation

$$L_{10} = \left(\frac{C * 10^6}{SF * R_{max}}\right)^{\rho}$$

Maximum Load: $R_{1,2\,max} = F_{max} = 15\ lbs$
Safety Factor (SF): 2
Load Rating (C): 516 lbs
$\rho = 3$
Bearing Lifespan (L_{10}) = 5.1 Billion revs

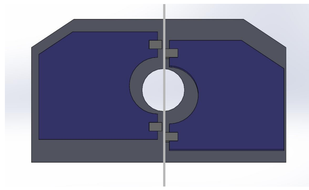
$$\text{Operating Hours} = \frac{L_{10} * D * \pi}{V}$$

Blade Velocity (V) = 60000 ft/hr
Bearing Diameter (D) = 19mm = 0.062 ft
Operating Hours = 16,500 hours



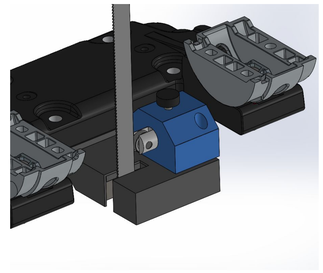
Side Guides

- Replaces the current side guides with offset ceramic guides
- Allows for more stability, doubles the friction benefits and helps with vibrations
- Side guides have two degrees of movement: both blocks move in the x direction (right and left in the image) and backing plate rotates around thrust bearing



Bottom Guide

- Replaces the bottom sliding bracket with a fixed base
- Uses a thumb screw to lock thrust bearing in place
- Able to adjust from the table top with a larger insert plate
- Side guides will be attached onto thrust bearing with a thumb screw at 45° angle



Conclusion

Hardware performance
- We are currently prototyping both thrust bearing designs. Once we have the 3D-Printed prototypes, we will begin testing.

Team contribution
- We have completed the thrust bearing design and the base for the bottom guide. Our thrust bearing designs successfully achieved project goals of quick and easy adjustment.

Future work
- We need to complete design phase 2, which is the side guides design, to achieve easy and quick adjustment for side guides.

With our work, we hope to be a part of creating innovative new designs to vastly improve the user experience with quick adjustability and maintenance.