Water Impeller Pump Project 2024

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Aim of the Project

The Aim of the project is to design, build and test a centrifugal impeller water pump. This is to be produced using Solidworks, SolidCAM and manual machining processes within the engineering workshop.

Background

Centrifugal pumps were first developed in the late 1600s in Europe. Pumps are required to transmit liquid from a region of low pressure to a region of higher pressure. Centrifugal pumps are defined as hydraulic machines which converts mechanical energy to hydraulic energy by means of centrifugal force acting on the fluid. These pumps are most commonly used to raise liquid from a lower level to a higher level.

Figure 1: Centrifugal Pump

The typical centrifugal pump consists of five main components.

1. Input Shaft
2. Impeller
3. The casing/housing
4. The intake Pipe
5. The outlet Pipe

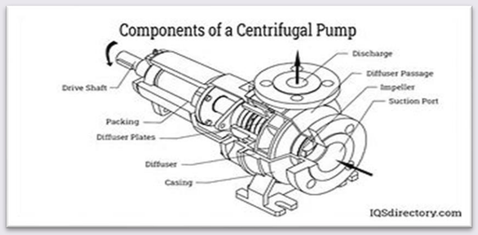


Figure 2: Parts of Pump

CAD Design

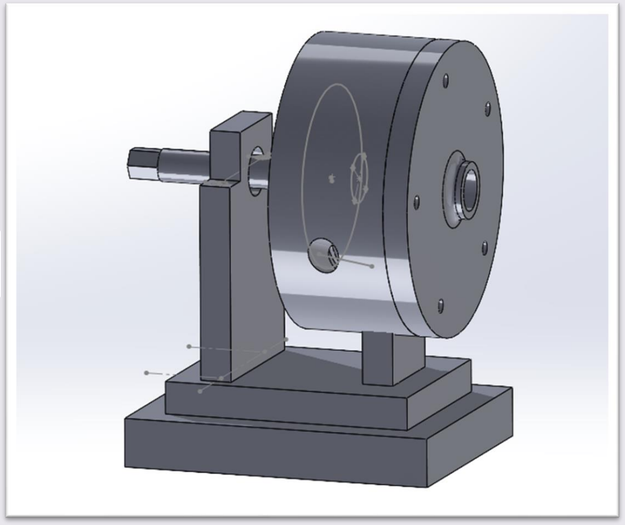


Figure 3: Completed Model

The image above shows the completed assembly of the impeller pump. This includes the impeller, casing, stand and base.

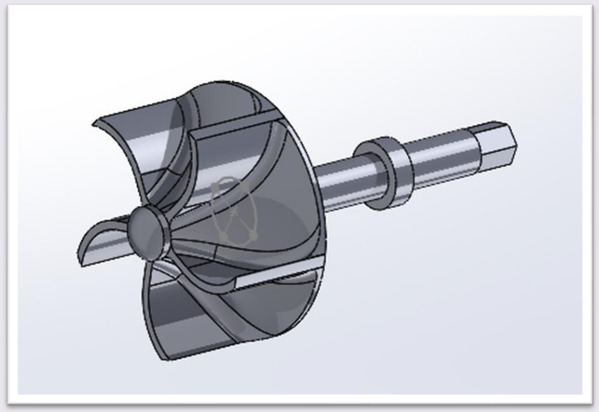


Figure 4: Impeller and Shaft

This shows the impeller and shaft in more detail. The complexity of the impeller allows for an increase in efficiency. The material chosen for both is aluminium to allow for easier manufacturing and weight distribution.

Simulation

Shown below is a simulation test of the shaft and impeller.

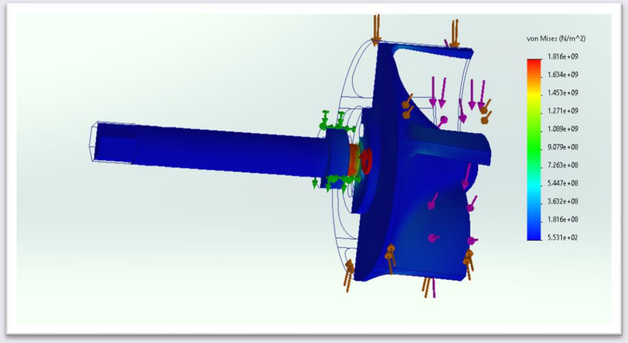


Figure 5: Simulation

.It can be seen that the majority of stress placed on the shaft and impeller is on the very end of the shaft at a narrow point. This indentation is needed to allow the grub screws space to slot in to connect the impeller and shaft together.

Machining

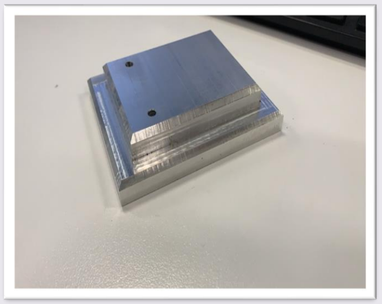


Figure 6: Base

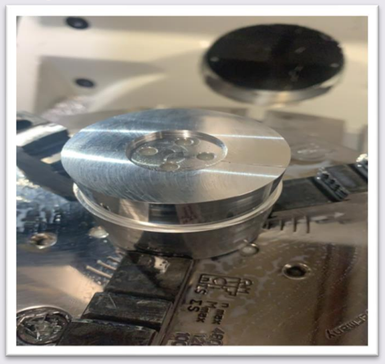
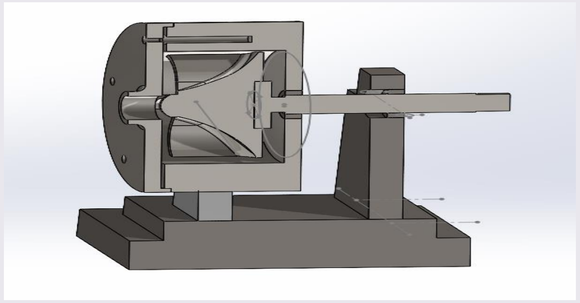


Figure 7: Impeller

The two images to the left show some examples of the machining used within this project. The top being the base machined on the mill within the workshop. While the bottom picture shows the first half of the impeller being machined on the Spinner U – 620.

Conclusion

To conclude, the objective of this project was to design and create a unique centrifugal impeller pump. We believe this was done to a sufficient standard to where we could see a functioning pump at the end of the year. Therefore overall this project can be deemed a success. Challenges in this project mainly revolve around time management and a small lacking of communication between group members. As when the deadline approached it became a struggle to keep up with the tasks left to be completed.



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Available at: https://www.zoompumps.com/article/eight-body-materials-of-centrifugal-pumps/
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