Impeller Water Pump
Team A2 – Mark English, Eman Bereda, Jack Crowley, Hoi Ming Chow
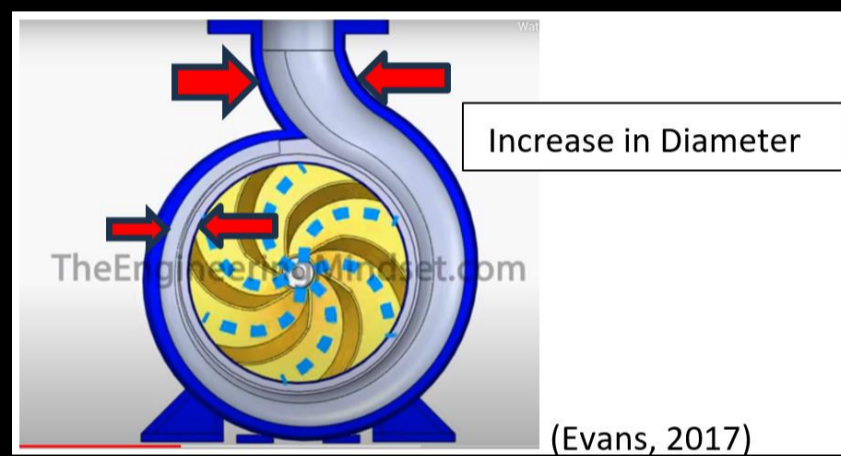
TUS

Aim of the Project

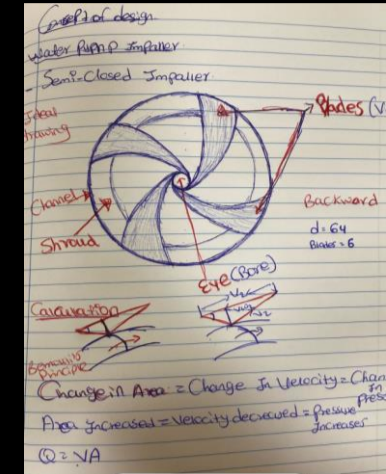To build a centrifugal pump with the capability to pump 5 litres of water.

Background theories

Volute has an increasing cross-sectional area allows the fluid to decelerate, which in turn increases the pressure. This is achieved through the principle of conservation of energy.
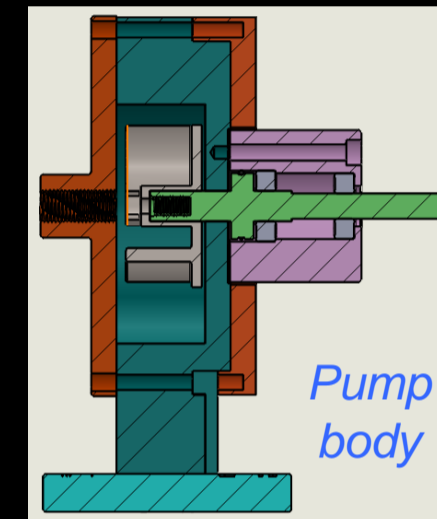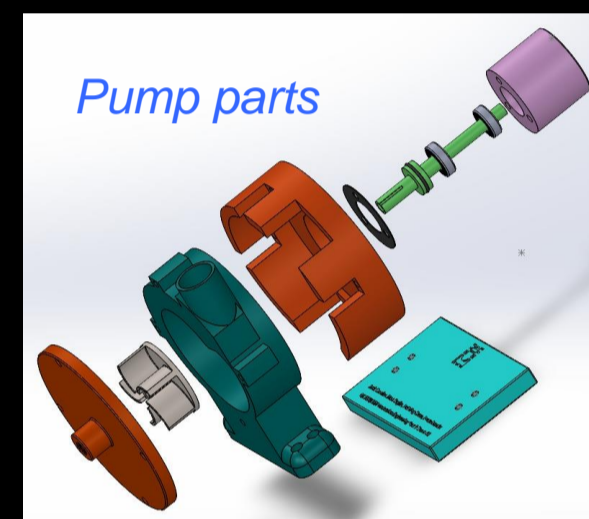
Increase in Diameter

TheEngineeringMindset.com

(Evans, 2017)

Conceptual Design

Brainstorm as to produce draft designs.

CAD CAM Design

Pump parts

Pump body

APPROVED

Conclusion

The project motivates the team for:
1. Concept to Hardware development.
2. Literature research.
3. CAD, CAM and Workshop machining.
4. FEA and CFD simulations.
5. Report writing.
6. Presentation.
7. Work and helping each other.

References

1. Parker O-Ring Handbook.
2. SolidWorks Simulation Student Guide.
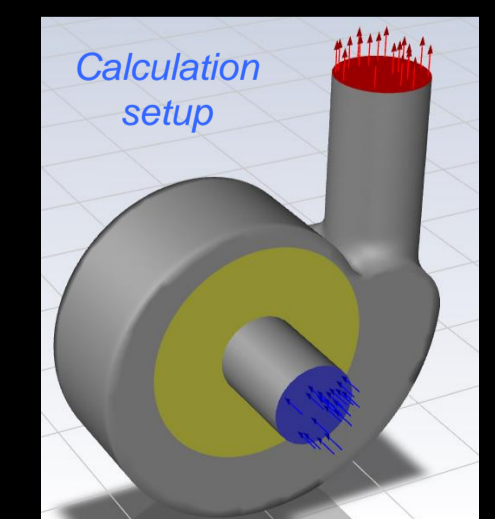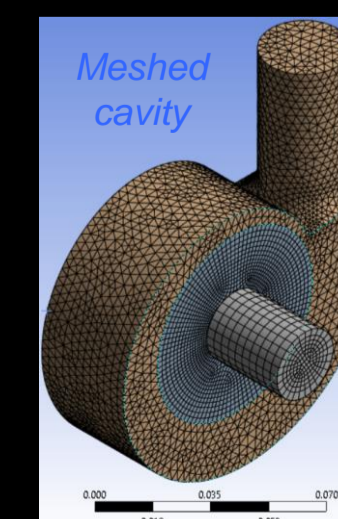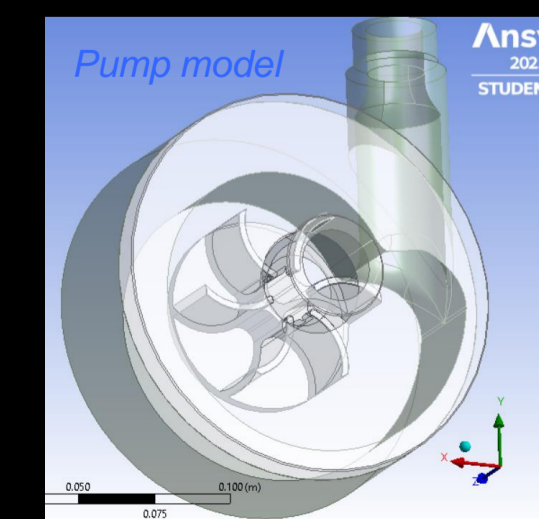3. Ansys Fluent 18 tutorial guide.

Calculations

Shaft O-ring
volute O-ring
I.D = 0.0235m
I.D = 0.062150m
O.D = 0.0275m
O.D = 0.064150m
C.S = 0.0275-0.0235
C.S = 0.064150-0.062150
  = 0.004m/2
  = 0.002m/2
  = 0.002
  = 0.001m
G.D = 0..002m
G.D = 0.0007m
Squeeze = 0.002-0.002
Squeeze = 0.001-0.0007
    = 0(compression value)
= 0.0003(compression value)
Compute squeeze= 0/0.002*100
Compute squeeze=0.0003/0.001*100
= 0%
=30%

Manufacturing

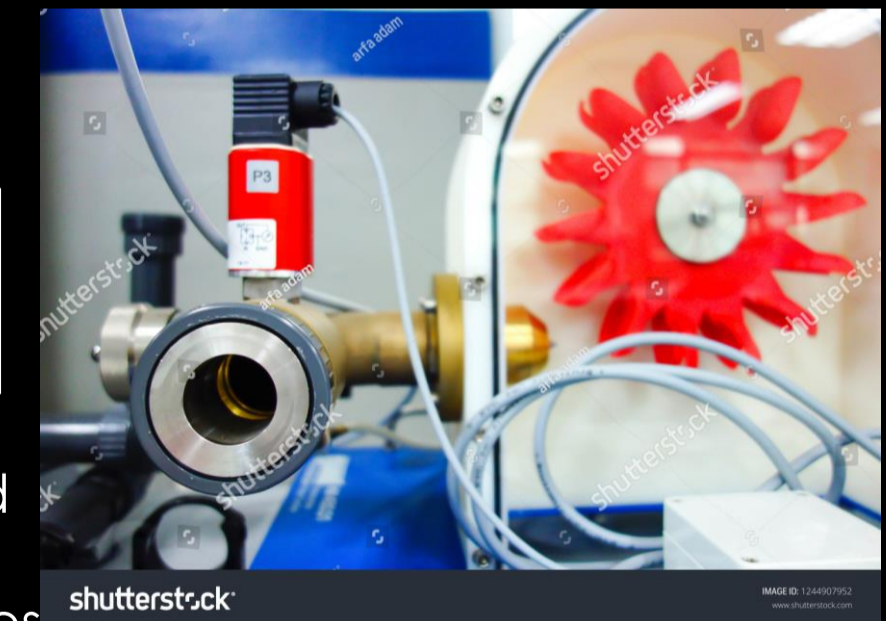*Lathe, Milling operations*

3D printing
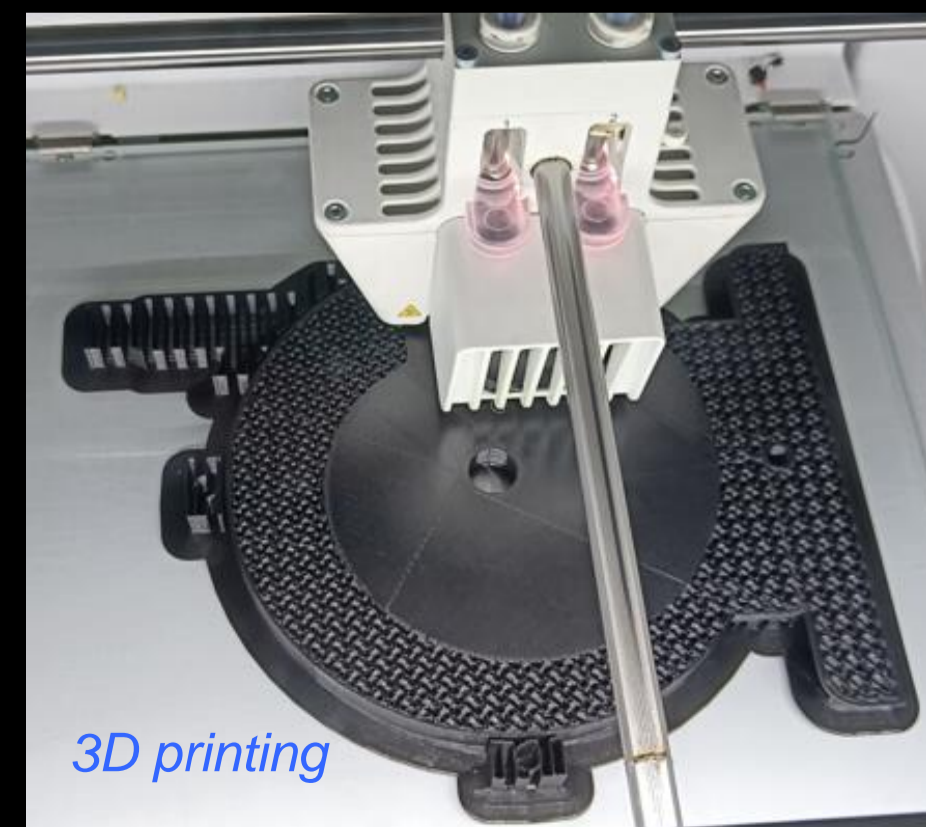
Simulations

Simulations (FEA) were used to estimate Stress, Strain that pump parts experiences.

Simulations (CFD) were used to estimate Head, Volume Flow Rate of pump.

Pump model

Meshed cavity

Calculation setup

Pumping tests