

DESIGN AND DEVELOPMENT OF TEST RIG FOR PIV FLUID FLOW EXPERIMENT FOR BIOMEDICAL ENGINEERING APPLICATION

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PRODUCT BACKGROUND

Particle Image Velocimetry (PIV) is the process of using a laser in conjunction with a camera to measure particle velocities. PIV is usually used to study the flow dynamics of wind in a tunnel and fluid in a complex structure. Therefore, the specialized test rig for PIV has to be made for specific cases to be studied. The test rig is mainly concentrated on the design and development of a test rig for a PIV experiment for the investigation of blood flow dynamics in a blood vessel, which must be able to allow the laser to pass through and shine on the fluid and the seeding particles. Hence, a test rig contains the connection between artificial blood vessels and the fluid flow pump with adjustable position of inlet and outlet is developed. PIV setup is equipped with laser and stand, camera and seeding particles in CARIFF, UMP Gambang.

METHODOLOGY



STEP 1
Brainstorming

STEP 2
Design concept and 3D drawing

STEP 3
Material selection

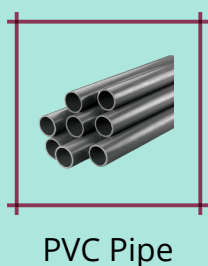
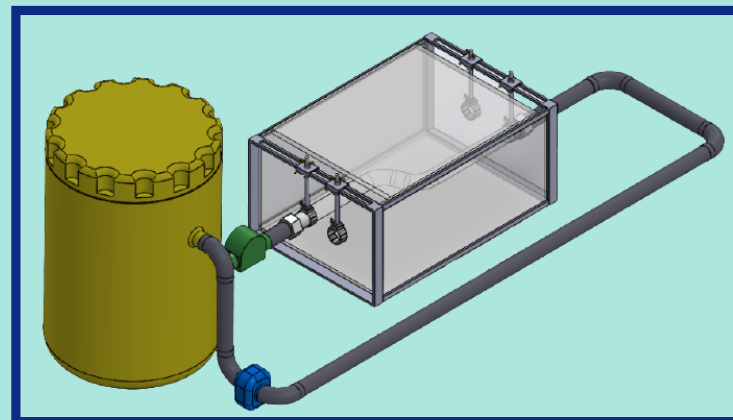
STEP 4
Purchase material

STEP 5
Fabrication process

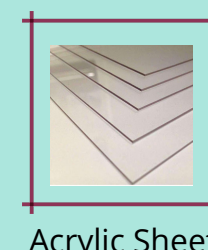


Mild Steel Bar

Silicone Tube



PVC Pipe



Acrylic Sheet

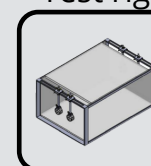


Pump



Hose Pipe Clip

Test rig



USEFULNESS

- The problem of the existing test rig used for specific application is solved by using a variation size and adjustable position of inlet and outlet.
- Test rig can be use for every usage for different test of phantom.

NOVELTY

- The design of the existing test rig for fluid has a fixed size of inlet and outlet valve. (Büsen 2017)
- The improved design has a variation size and adjustable position of position of inlet and outlet.

MARKETABILITY

Market Position

- Own design based on previous experiment since there are no test rigs available in market except for pump.

Cost

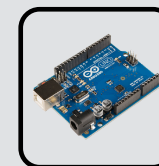
Cost (Pump)	Existing	RM100k
	Current	RM260

COST

- Piping system



- Arduino



- Pump



CONCLUSION

As the conclusion, the design of a test rig, pump and piping system for PIV experiment of fluid flow for the investigation of blood flow in human blood vessels that have the adjustable inlet and outlet valve can be developed with the lowest cost as possible. Hence, the fixed length of aorta is the disadvantages for this design that can be subjected to future work and make an improvement to make it more sustainable.

STATUS OF INNOVATION

- TRL Level 1 or 2
- Prototype under development

COLLABORATION



Center of Excellence for Advanced Research in Fluid Flow (CARIFF)