

Pitot Tube Attachment Rig

Thomas Ralfs
BEng Mechanical Engineering

Introduction — The Aim

- Design and manufacture an easy to operate Pitot Tube attachment rig for Solent University's TecQuipment Water Channel
- Choose a suitable, reliable design
- Use CAD modelling software
- Use trusted fixing and clamping methods
- Incorporate beam theory into design
- Select suitable materials for every part

How is the Pitot Tube Incorporated into the design of the attachment rig?

A simple elevated rail design using reliable retort rods and clamps and G-clamps commonly found in engineering and science labs

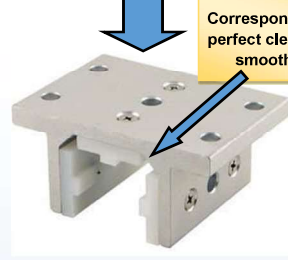
Solent University's TecQuipment FC50 – 2.5m Water Channel

Conclusion

The design criteria and the 'core DNA' was met. 3 extra weeks would have seen the build and testing completed.

I was happy to extend budget by £40 to ensure correct materials were used.

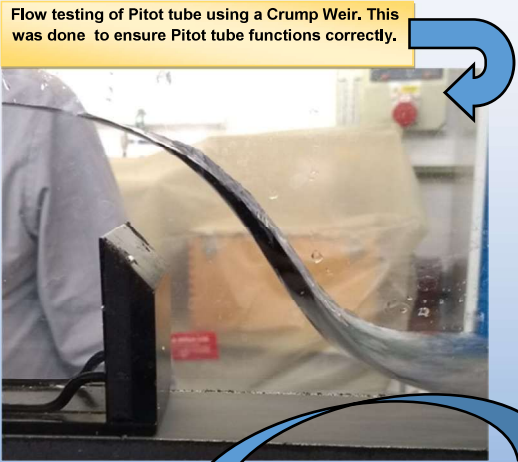
Linear Bearing provides smooth running with the ultra low friction UHMW bearing pads (shown here in white)



Corresponding profiles of perfect clearances enable smooth operation!

High stiffness, low weight extruded 6082 T6 alloy rail provides excellent Pitot Tube reading accuracy and stability

Carriage consists of a linear bearing with an alloy plate bolted on top. Linear bearing then mounts to rail



Flow testing of Pitot tube using a Crump Weir. This was done to ensure Pitot tube functions correctly.



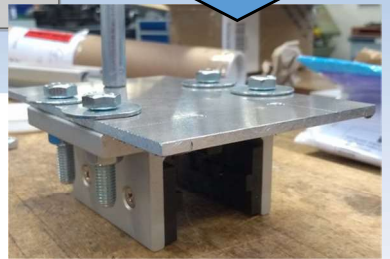
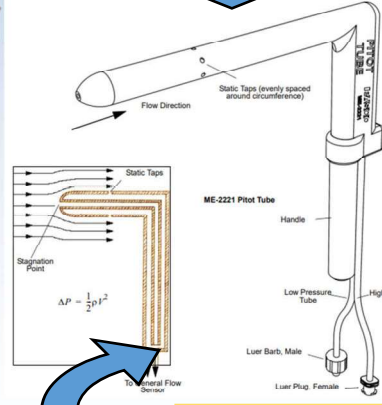
Data logger and transducer connects to pitot tube to record and display water velocity readings



Carriage which slides along the extruded rail with Pitot tube attached

What is a Pitot Tube?

A pitot-static tube contains two separate, concentric air chambers. Its job is to provide a difference in pressure between 2 chambers which is then measured by a connected transducer, feeding to a computer with specific software.



The Problem

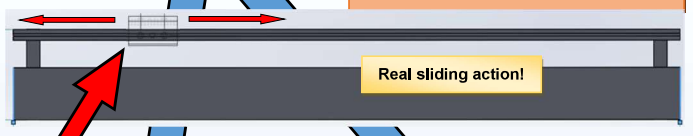
- Supplied attachment rig that originally came supplied with the water channel does not perform adequately and is fiddly to set up
- Cheap materials and lack of adjustability make accuracy difficult.

The Method

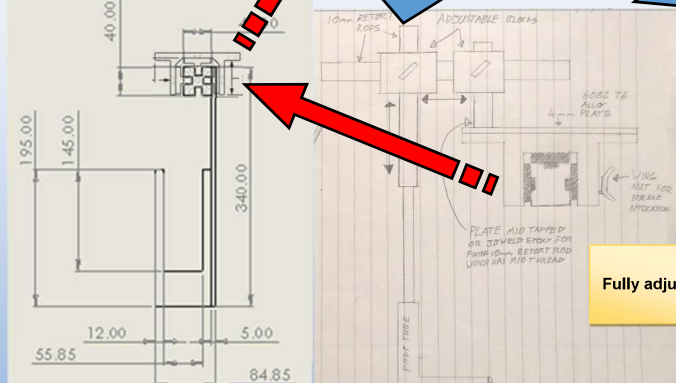
The Pitot tube is mounted in the desired position within the water channel by 3 retort rods and 2 clamps to ensure easy adjustability. One rod is mounted to the carriage plate. The carriage is then fixed into position on a rail by a locking bolt and nut.

The rail is mounted to the water channel by vertical supports. The vertical supports are mounted by 2 G-clamps, which enable them to be removed easily

The Pasco ME-2221 Pitot Tube which mounts to carriage using simple science lab retort rods and clamps



Real sliding action!



Fully adjustable in every dimension!

- Materials testing using an Xray Fluorescence Camera
- 3 Point beam testing of deflection

Results

The outbreak of Covid 19 meant that the assembly could not be completed, despite being very close.

However Pitot tube testing was conducted using a range of flow rates with data collected

Parts Drawings:

- Spacer Blocks
- Carriage Plate
- Side Support Plates

