Refractive-Index Matching Facility

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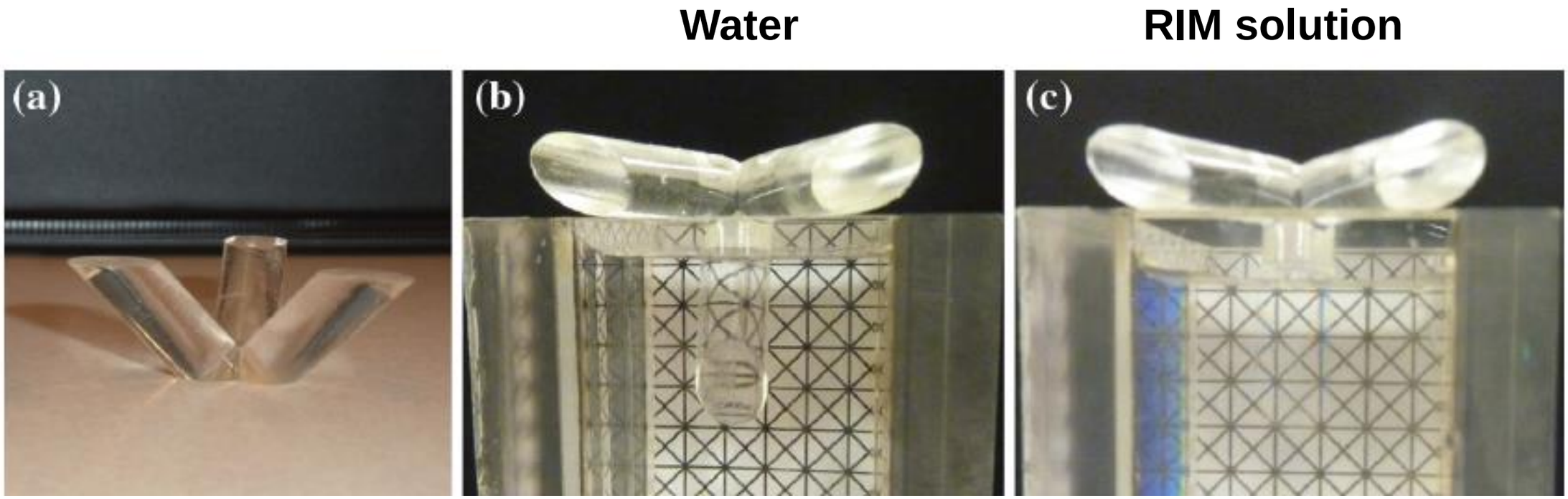
Overview

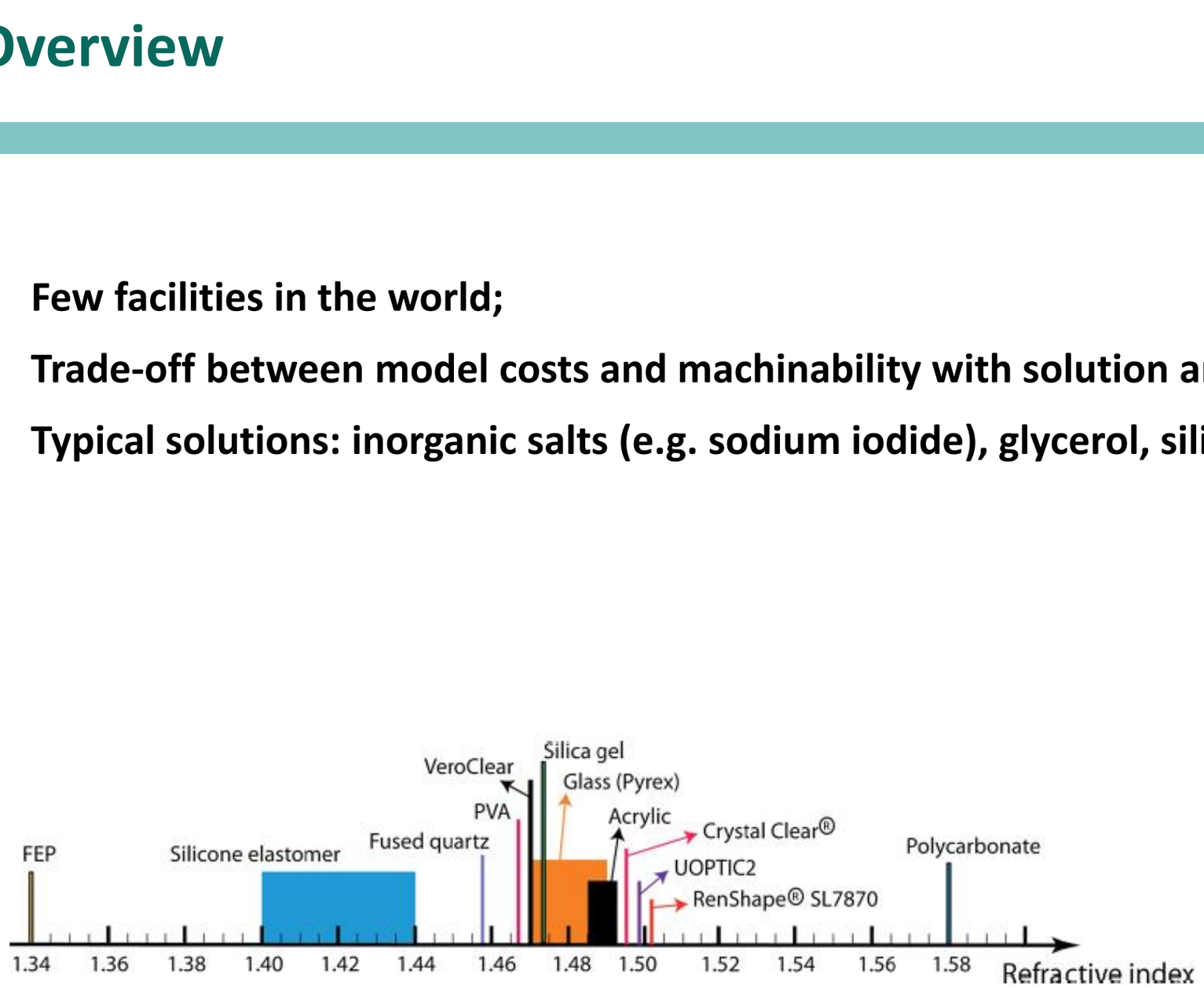
- **Refractive-Index Matching: essential to visualise all the regions of the flow;**
- **No shades, reflection and refraction effects**
- **Fluid-wall interface**
- **Complex/moving geometries**



Reproduced from Bai & Katz (2014)

Overview

- **Few facilities in the world;**
- **Trade-off between model costs and machinability with solution and facility maintenance;**
- **Typical solutions: inorganic salts (e.g. sodium iodide), glycerol, silicone/mineral oils,**



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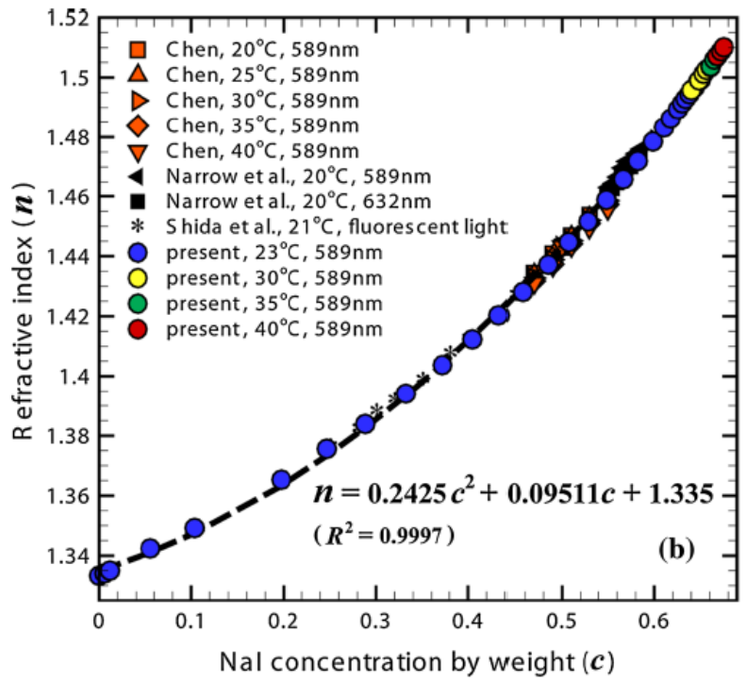

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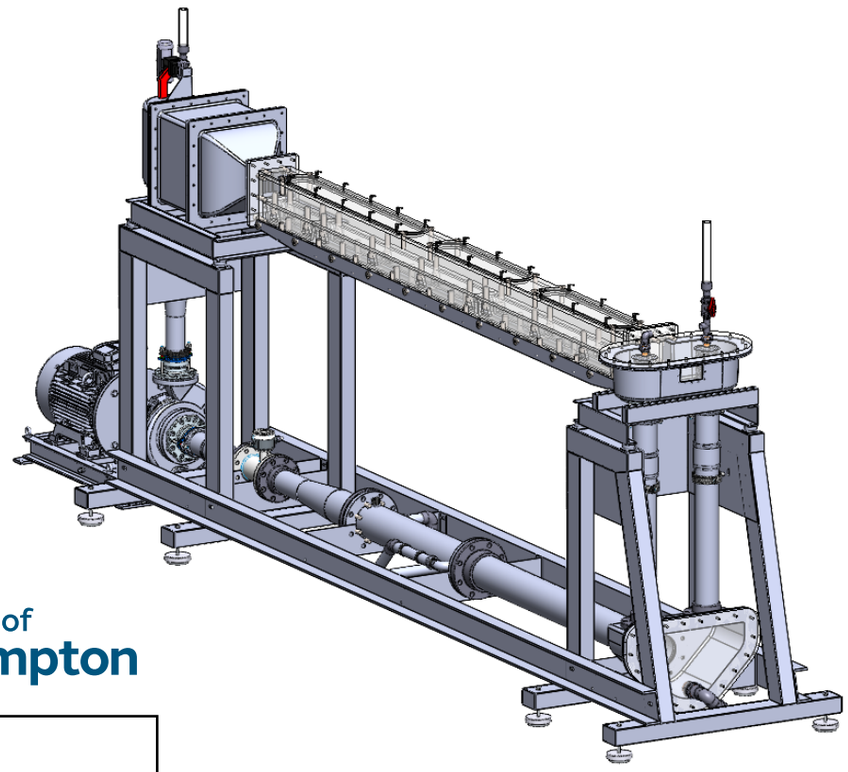
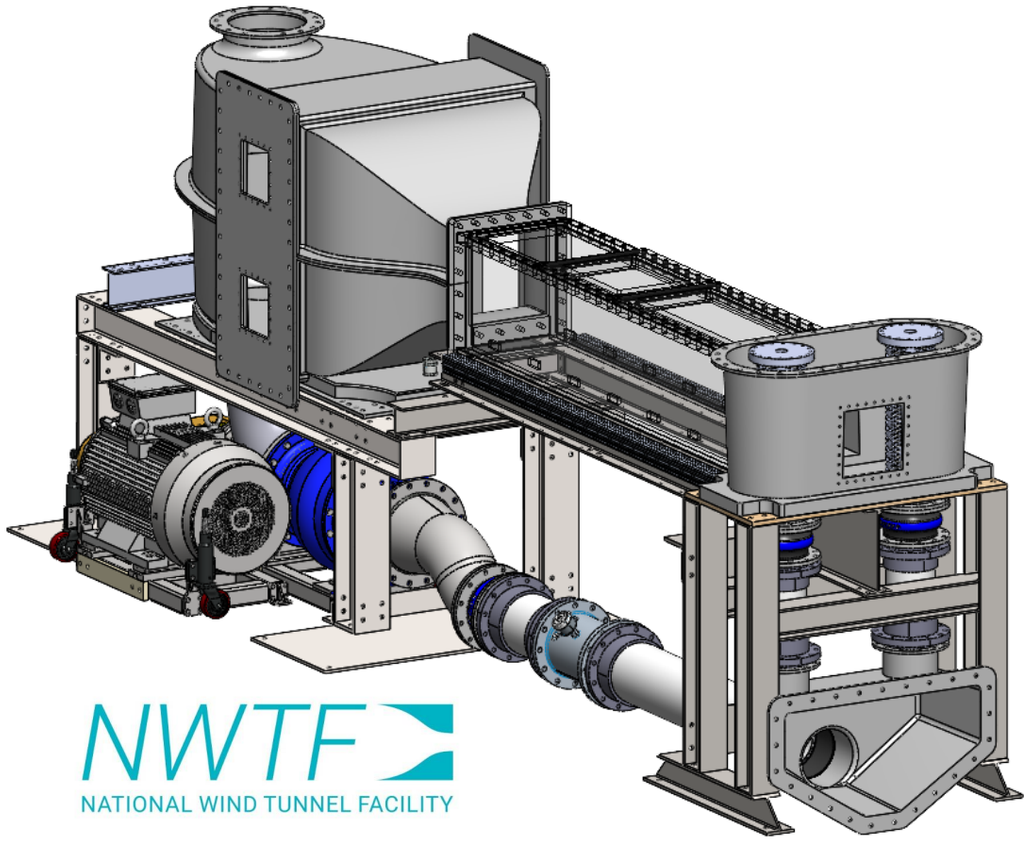
- **Solution of Sodium Iodide (NaI), RI matching with Acrylic;**
- **Density and viscosity of the same order of water – keeping the same range of Reynolds number;**
- **Two recirculating flow loops:**



Test section:
120 x 120 x 3500 mm



Test section:
450 x 450 x 3100 mm

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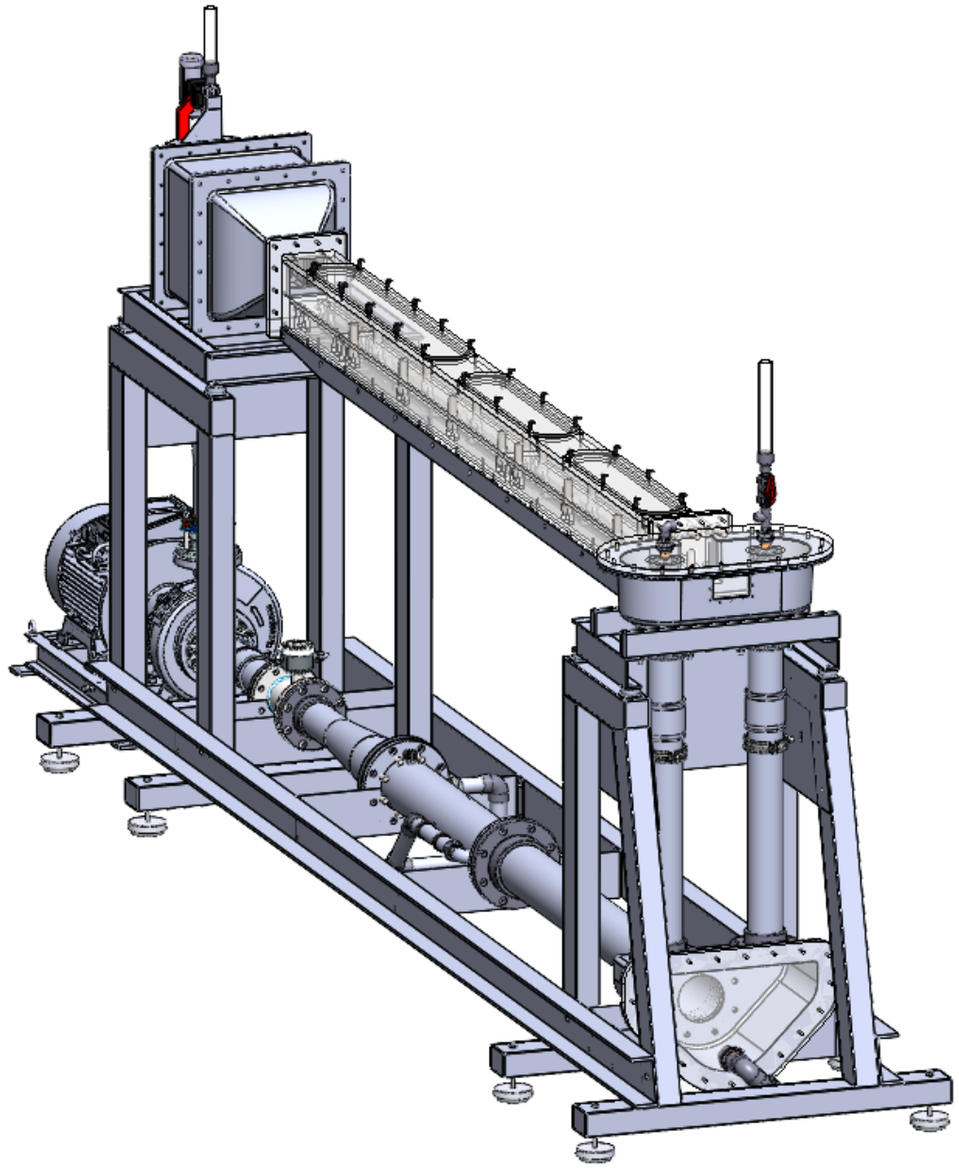
- **Secondary Flow Loop:**



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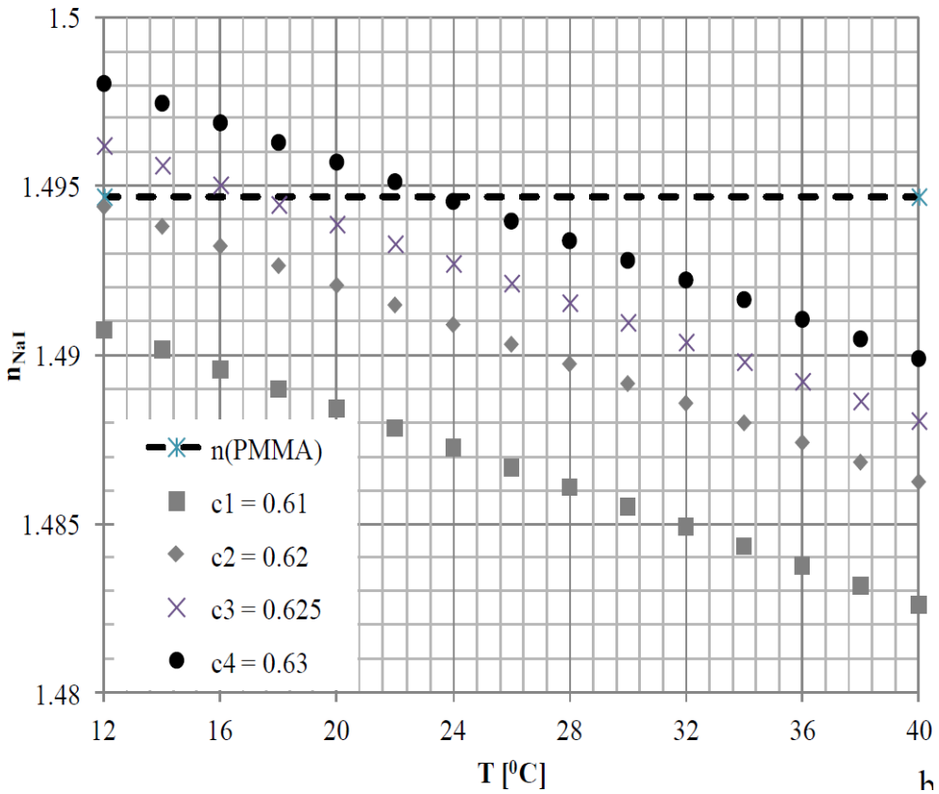
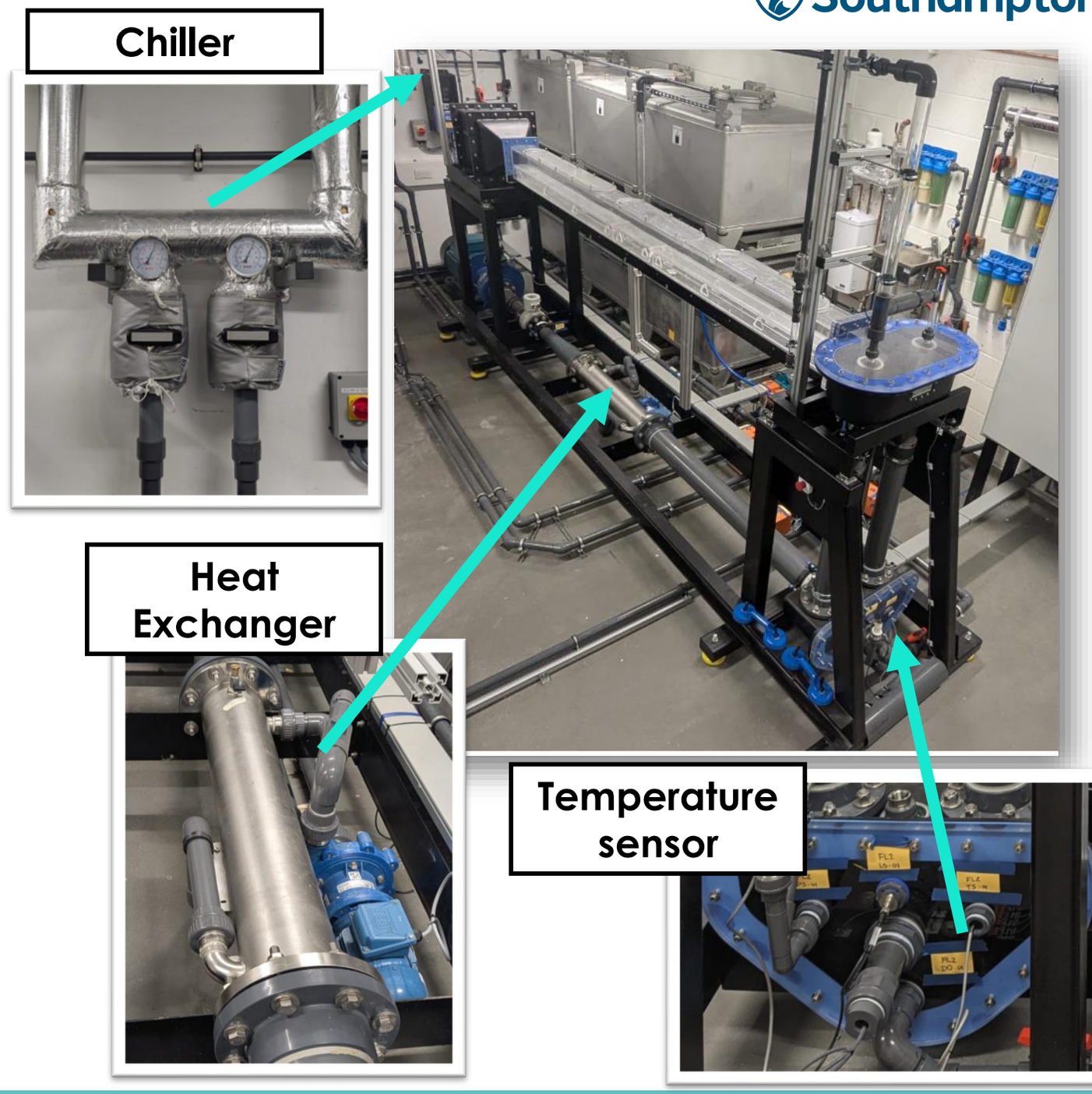
- **Challenges:**

  <u>Temperature control:</u>



Reproduced from Blois et al. (2012)



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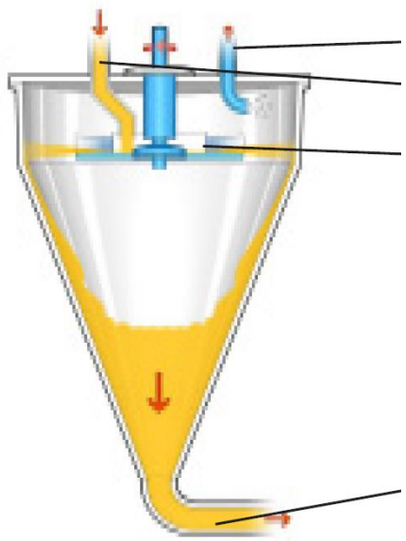
- **Challenges:**

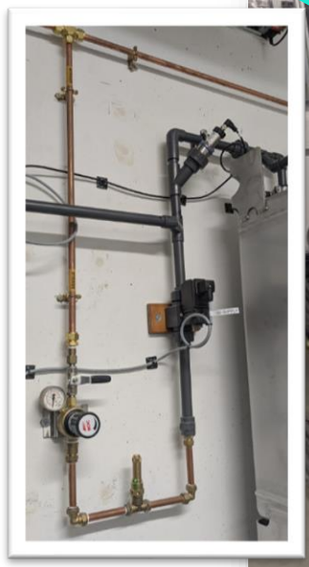
  Temperature control

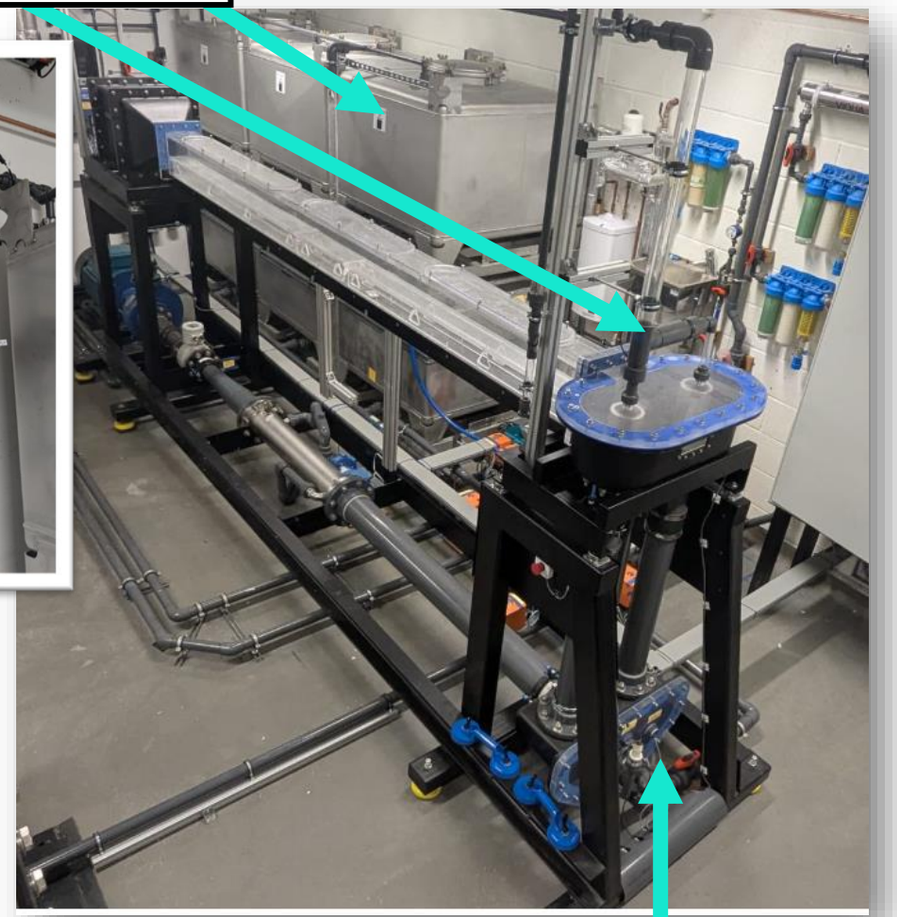
  <u>Contamination with oxygen:</u>

Deaerator

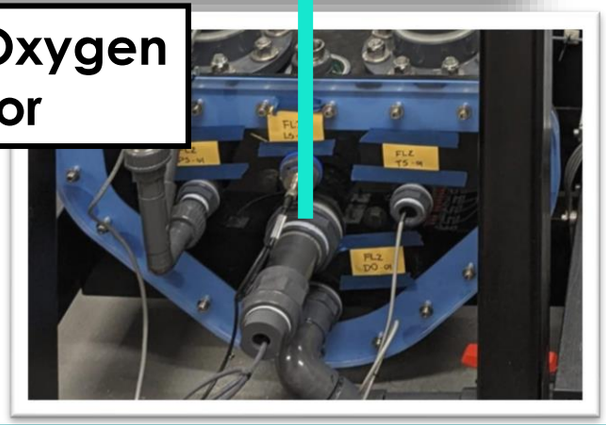


Nitrogen





Dissolved Oxygen monitor



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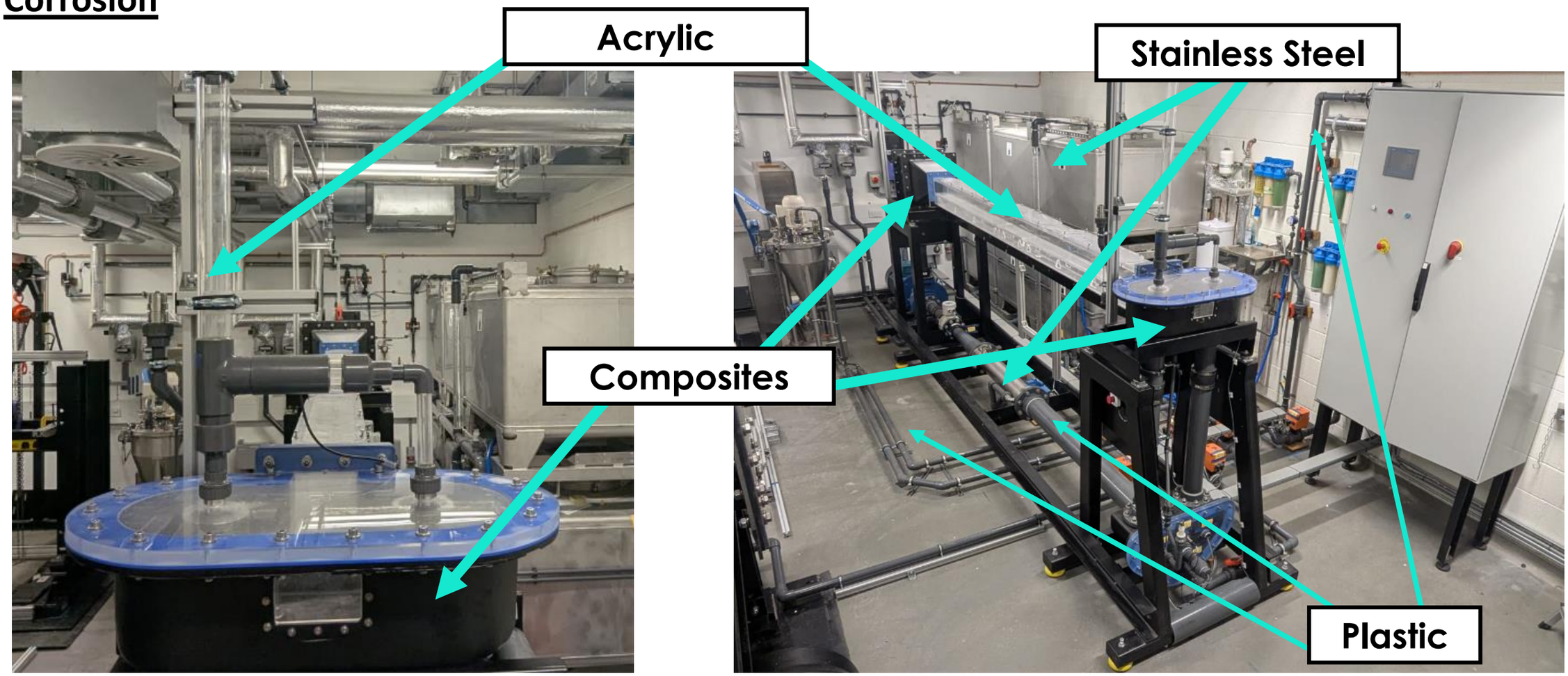
- **Challenges:**

  Temperature control:

  Contamination with oxygen

  <u>Corrosion</u>



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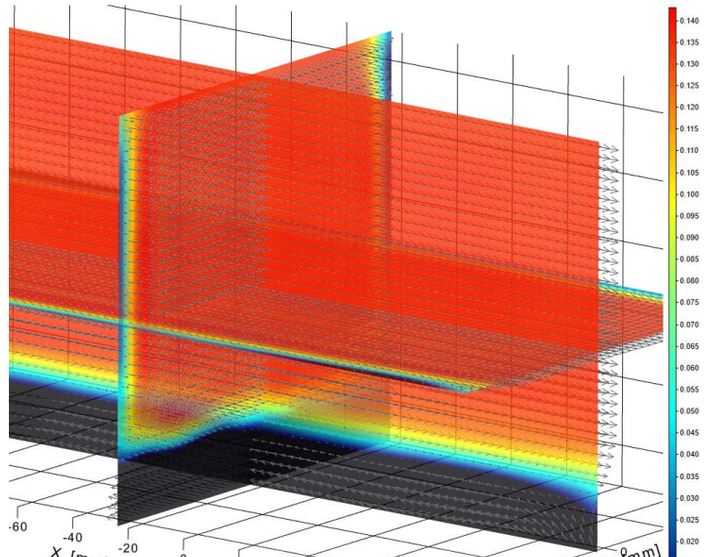
- **Characterisation:**

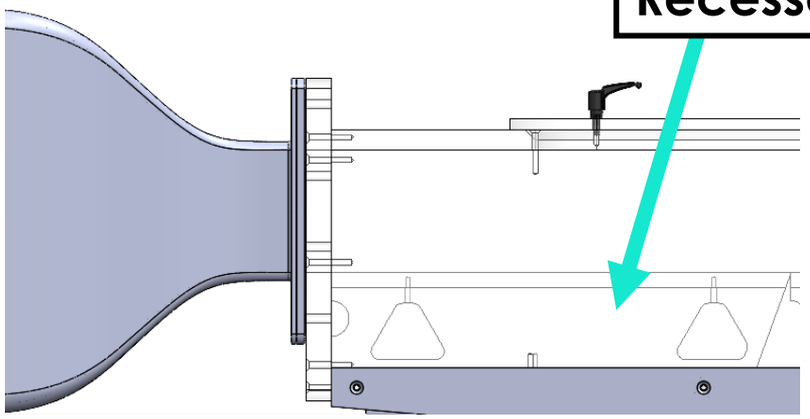
  Flow speed range: 0.1 – 2.0 m/s;

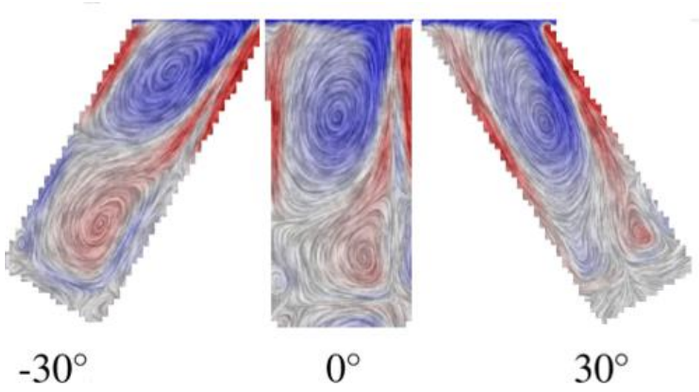
- **Cavity Flow**

  2D cavity models varying the angle;

  Preliminary tests with water;







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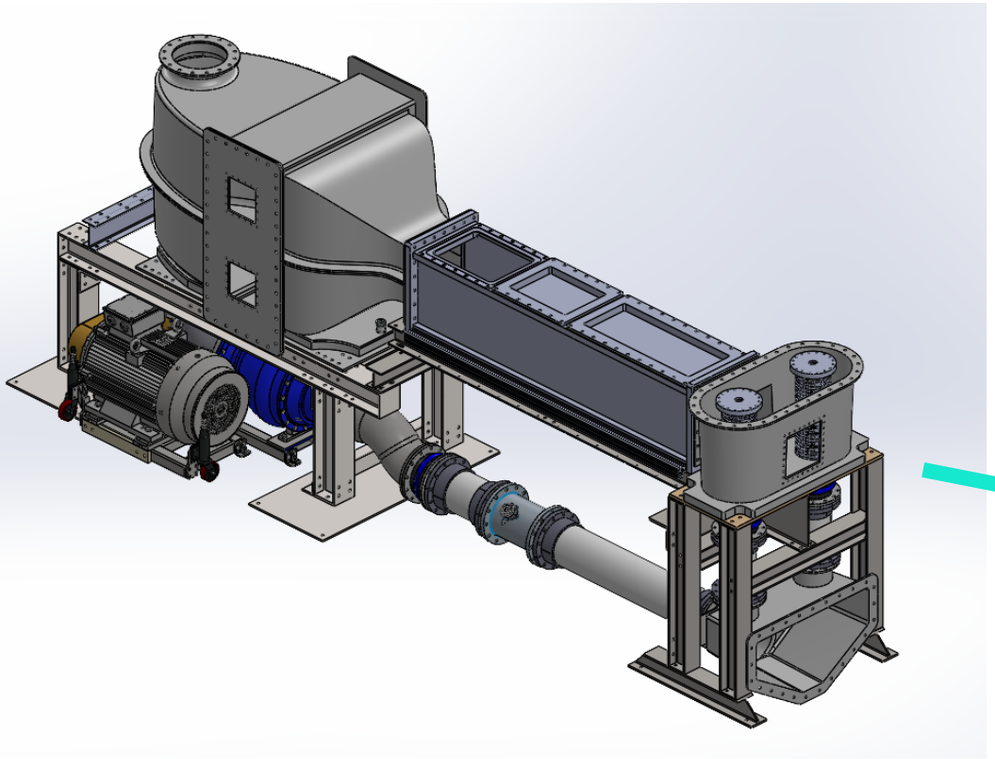
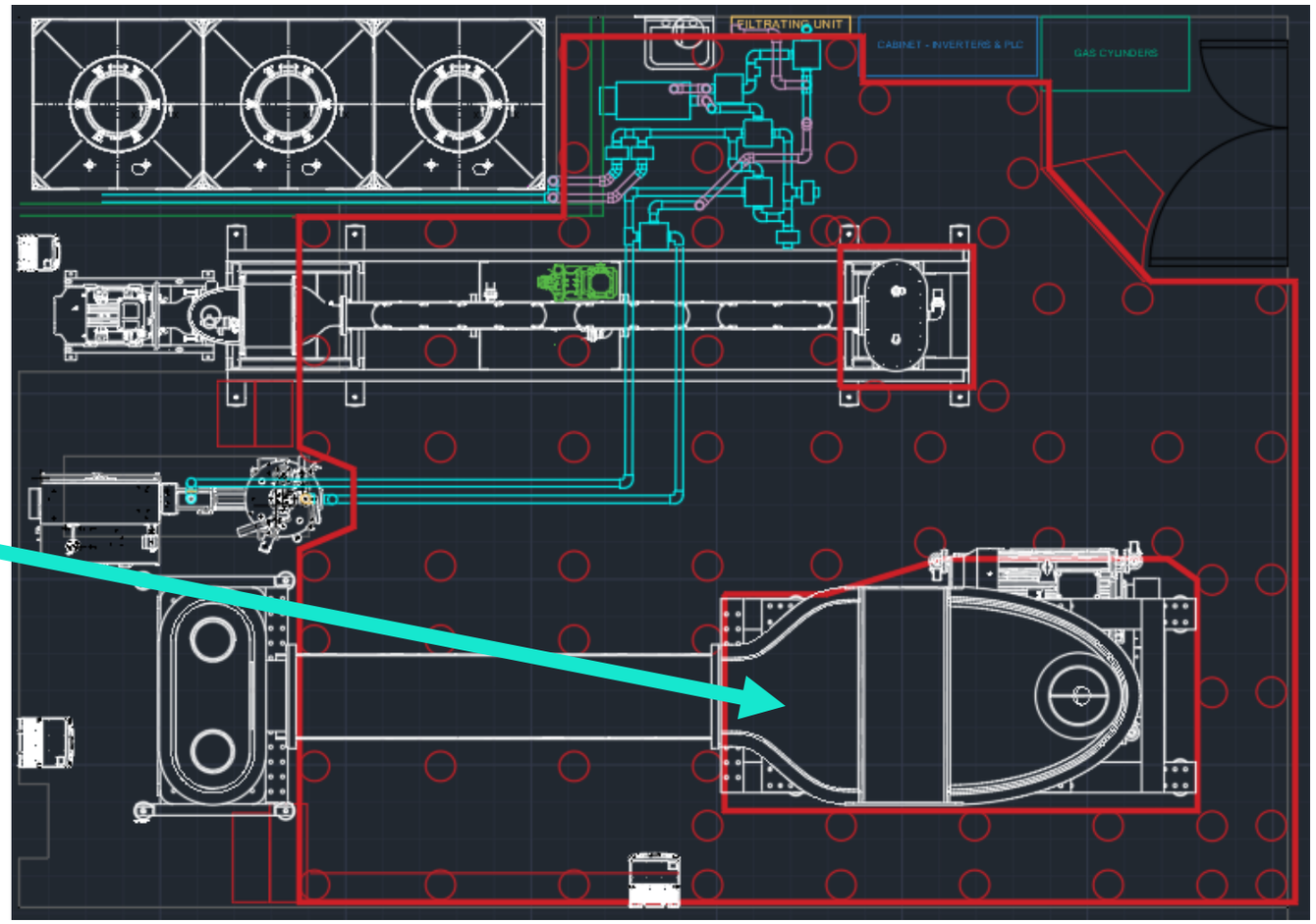
- **Next steps…**

Characterising the secondary flow loop with NaI;

Developing and commissioning the primary flow loop;





Thank you!

Acknowledgements: