Imperial College London

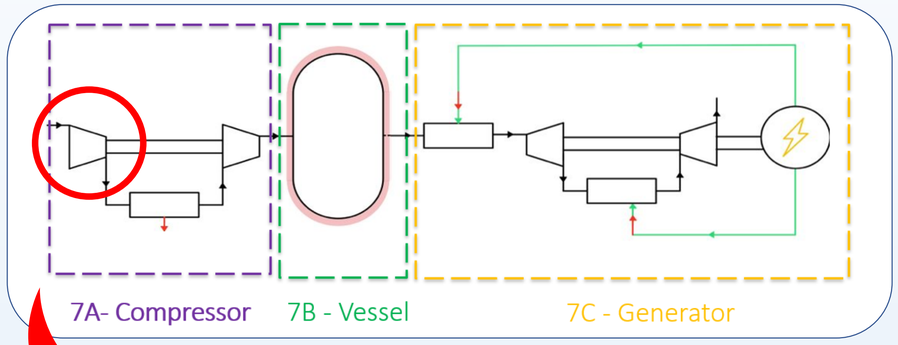
# Air Compressor

## Compressed Air Energy Storage (CAES) System

Group 7A: Calum Mackay, Hafiz Amri, Ryan Ho, Yixuan Fu

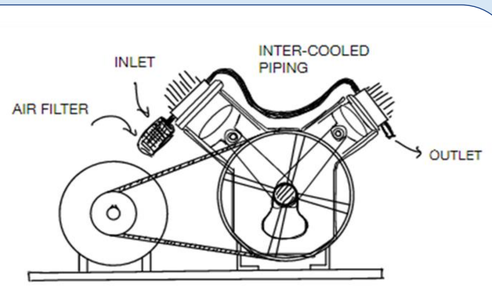
## Overview

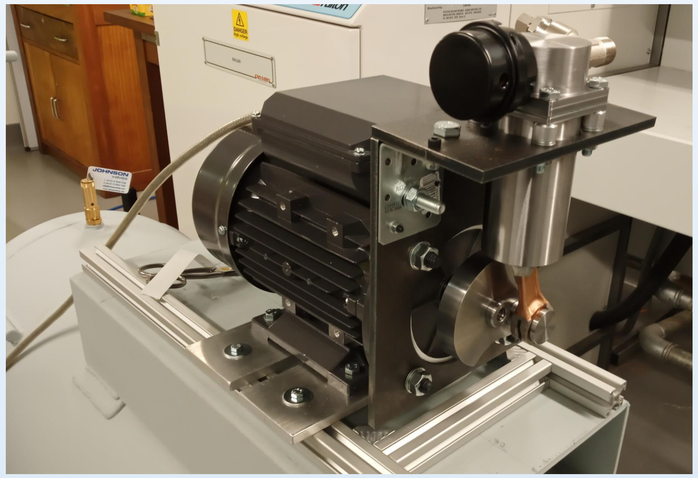
- Small-scale CAES system as back-up in data centre
- Design, make and test 1st stage of a 2-stage reciprocating air compressor as a characteristic proof-of-concept




## Technical Specifications

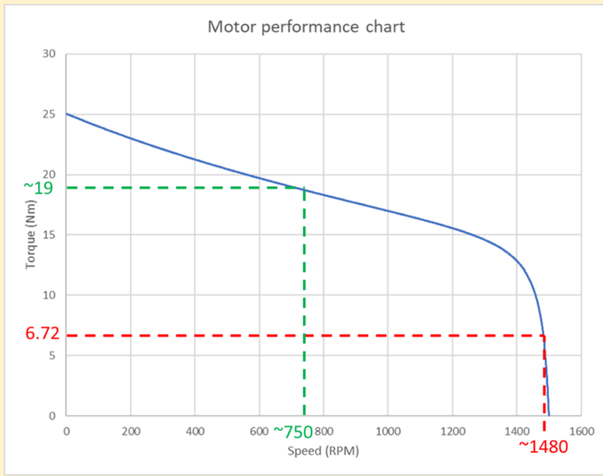
| Full Scale | Proof-of-Concept |
|---|---|
| Charging time: 40 to 50 minutes | |
| Mass Flow Rate: 5 g/s | |
| Reciprocating | |
| Belt Drive | Direct Drive |
| 16 Bars | 4 Bars |
| 2-stage | 1-stage |
| Vessel: 500 L | Vessel: 300 L |
| | 1500 RPM |
| | Input: 1.5 kW |



## Test 1: Steady-State Motor

- Measured with tachometer reading of crankshaft rotation
- Motor speed at 750 RPM instead of expected 1420 RPM
- Attributed to high torque and excessive vibrations




## Test 2: Intercooling

*Intercooling set-up with hot air gun and anemometer on opposite ends of pipe; readings obtained from thermocouple at inlet and outlet*

- Derived heat transfer capabilities of proposed finned pipe intercooling system
- Steady heated air from hot air gun
- Average overall heat transfer coefficient calculated to be 0.297 W/m$^2$·K ⇒ Inaccurate
- Estimated results using heat gun flowrates
- Results inconclusive; further testing required