

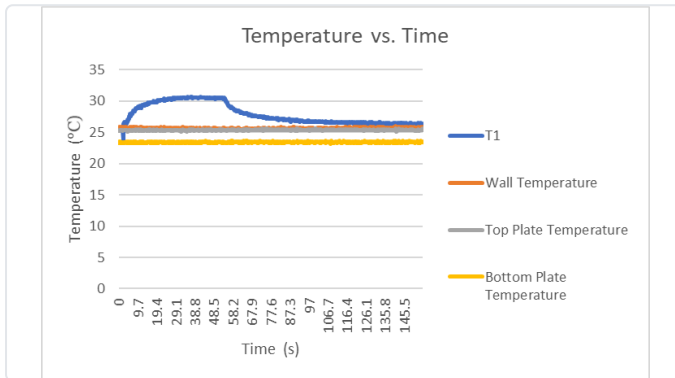
Experimental Thermodynamics Lab Series

University of Toronto, MIE210 (Thermodynamics) · Group lab series, 2022

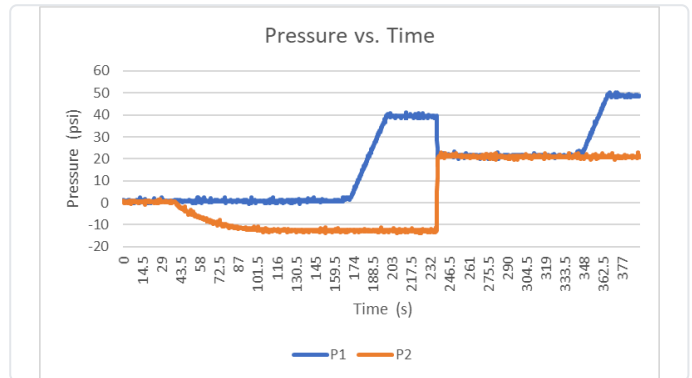
Experiment and analysis

Three instrumented labs validating gas-law, energy-balance, and transient-system theory on a two-tank rig.

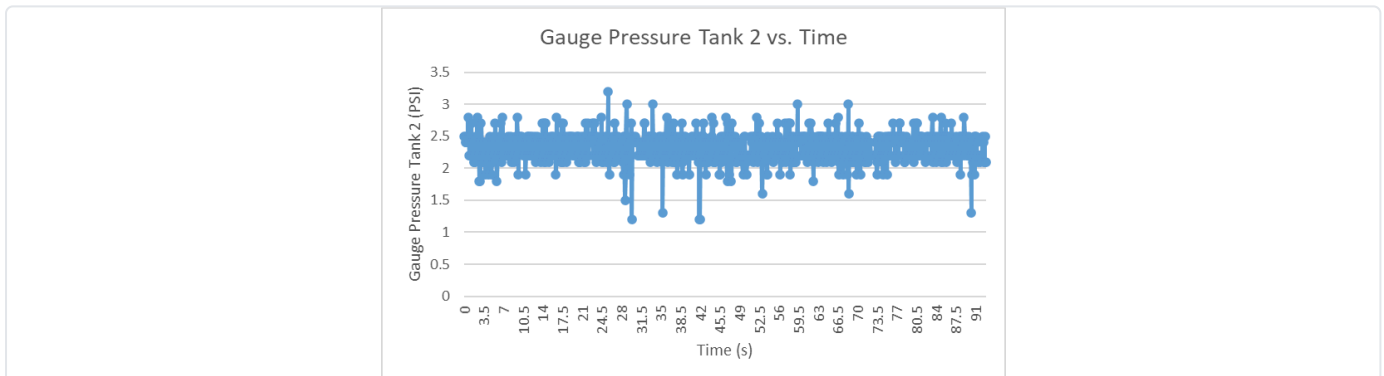
A three-lab sequence on a two-tank pressurized-air rig. The first lab showed the path-independence of state properties and applied the ideal gas law to find an unknown volume; the second applied the first law of thermodynamics with PID-controlled heaters and pump-and-fan similarity; the third analyzed mass transfer, throttling, and heat loss in open and transient systems. Measured time-series were compared against theory throughout.



Multi-thermocouple temperature versus time under PID heating (first law).



Two-tank pressure transient through valve expansion (open and transient systems).



Tank pressure versus time (ideal gas law).

Method

Pressure, temperature, and mass-flow data were acquired over time on a two-tank rig with solenoid and needle valves, then reduced with ideal-gas and energy-balance calculations and compared to predicted behaviour.

SELECTED REFERENCES

- Y. Cengel, M. Boles, Thermodynamics: An Engineering Approach (course text).
- Conservation of mass and energy for open systems, standard control-volume formulation.

Engineering portfolio brief. Course and team project; contribution as noted above.