

13. Heat Exchanger Testbed – Quiescent Conditions

Purpose: This setup is used to test the performance of heat exchangers during condensation and frosting. The heat exchangers are tested in ambient conditions (25°C and 30-50% relative humidity) with or without forced convection. We use a DSLR to visualize the frost formation mechanisms on the fins of the heat exchanger. The adjustable frame used to hold the heat exchangers is mounted on an accurate mass scale. Expelled condensate is collected in a custom-made pan which may be isolated from the mass measurements. Thermocouples are used to measure the cooling fluid inlet and outlet temperatures, air inlet and outlet temperatures, and fin surface temperatures.

- Imaging: DSLR camera (Pentax K-50), Infrared imaging camera (FLIR A655sc).
- Data Acquisition: National Instruments NI-USB 6310.
- Temperature measurements: 6 K-type thermocouples calibrated to 0.1°C.
- Ambient measurements: Ambient temperature and humidity are measured using an Omega HX93b hygrometer.
- Flowmeter: Omega FMG 92 electromagnetic flowmeter.
- Mass scale: Ohaus ranger 7000 with data transfer capability to the computer.
- Anemometer: Omega HHC261 handheld anemometer.
- Chiller: Thermo Scientific Merlin M150 circulating 50% ethylene glycol mixture. Temperature range (-20°C to 30°C).

