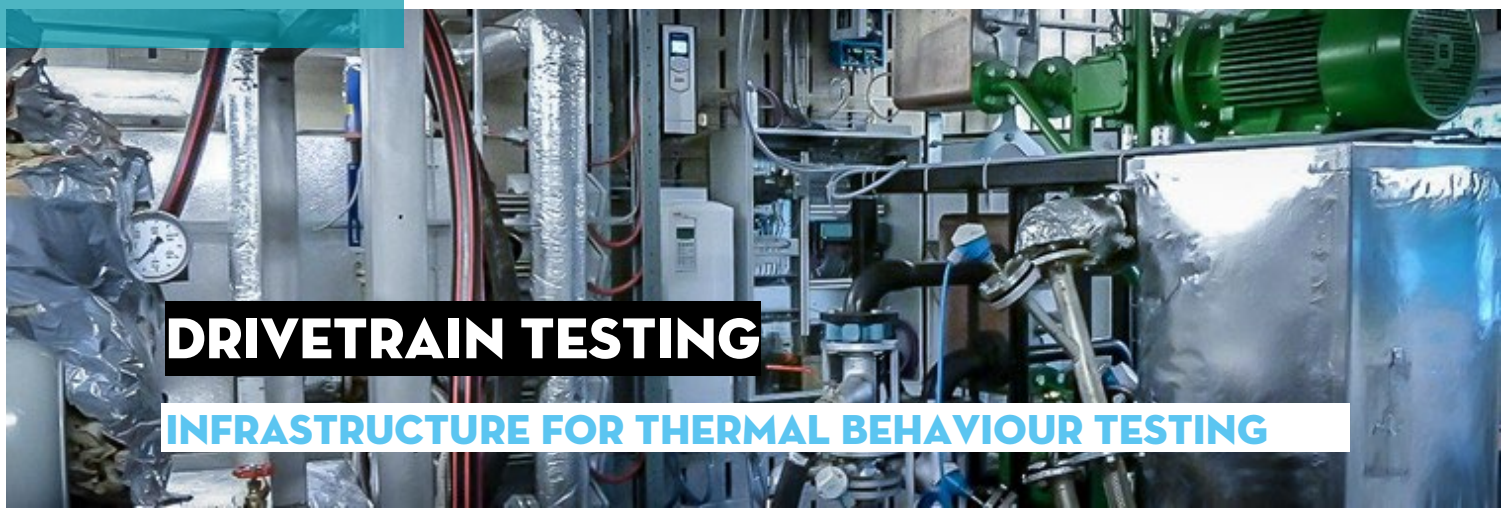


DRIVETRAIN TESTING

INFRASTRUCTURE FOR THERMAL BEHAVIOUR TESTING

Location: FlandersMake@UGent

DESCRIPTION

At the FlandersMake@UGent research lab Applied Thermodynamics and Heat Transfer (ATHT) lab, we focus both on state-of-the-art fundamental research and industrial services. ATHT focuses on systems and machines where thermal energy transfer is the main energy transfer mode. The aim is to develop more energy efficient systems through experimental and numerical research, as such contributing to the EU Green Deal by offering technical solutions and science-based expertise. Test infrastructure is available for thermal characterization and performance studies of different types of fluids, drivetrain and building materials, testing of your newly developed heat exchanger or even testing of entire heat pump/HVAC systems and ORC systems.

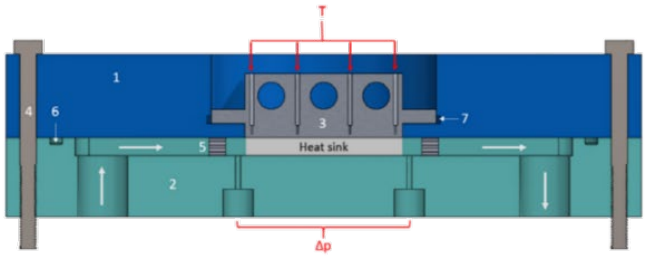
Performance evaluation of heat exchangers with gas and fluids

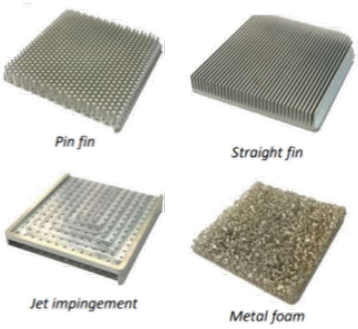
Dedicated setups to evaluate the heat transfer of heat exchangers, cooling plates and heat pipes:

- A wind tunnel for heat transfer and pressure drop measurements
- A water tunnel for flow visualization experiments
- A test setup for performance evaluation of water-glycol or oil cooled heat sinks

In the air-to-air heat exchanger test-rig we are able to measure the performance of heat exchangers. This can either be done with constant heat flux boundary conditions and one airflow to measure the heat transfer capabilities of one side, for example for a new fin design. Another possibility is to use two air streams to measure the performance of the heat exchanger under test.

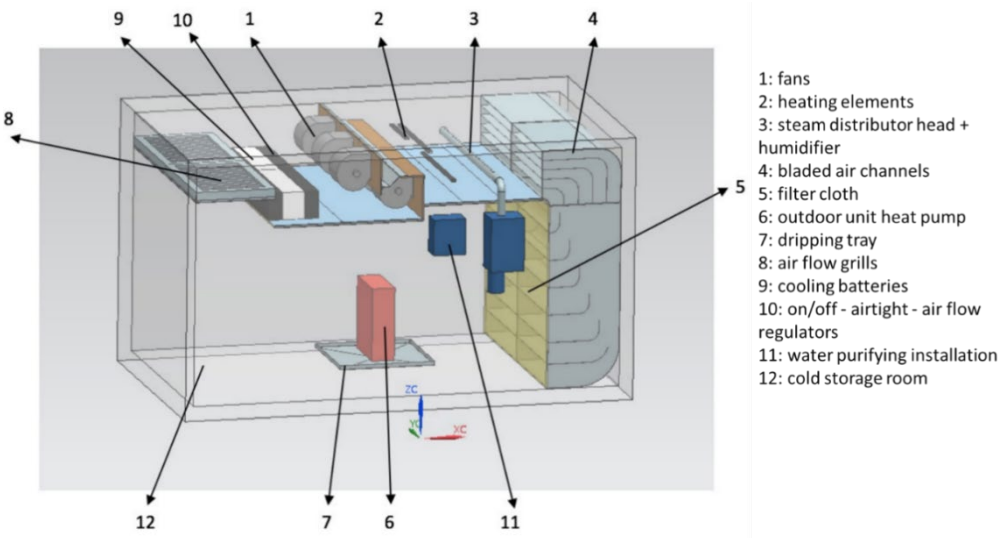
The heat sink test setup measures the pressure drop and the heat flux for a controlled flow rate of a water-glycol or oil coolant.





Testing of heat pumps and other HVAC equipment (EN 14511)

At our lab, we have a climate chamber available for testing the performance, efficiency and reliability of heat pumps and other HVAC equipment in a controlled environment. This test cell is designed according to the EN 14511 standards and is fitted with various components such as cooling batteries, fans, heaters, and humidifiers to comply with the EN14511 standard. The test conditions, testing methods, calculation methods, performance measurements and quality control are standardized as specified in EN 14511.



Measurement of thermal conductivity of building materials using the guarded hot plate method and parallel hotwire method (ISO8302, NBN B62-201 and NBN B62-202)

The guarded hot plate method is a steady-state measurement method that determines the thermal conductivity of a material by 'sandwiching' it between two plates, by measuring on the one hand the temperature difference between the two plates and on the other hand the electrical power to the heated plate.

Organic Rankine Cycles (ORCs) high-temperature heat pump testing

The fully instrumented test facility is equipped to test ORC system drivetrains (Organic Ranking Cycle) and high-temperature heat pumps with 300kW heating and 250kW cooling capacities. These test facilities are also used to test the performance of medium-large scale phase change materials (PCM) energy storage units.

ORC system specs

- Electric thermal oil heater
- 0-250kWth, max T 350°C
- Water-glycol cooling loop (air cooled) cond T ambient to ca. 120°C
- 11 kWe nominal electric power
- Thermal imaging camera
- Flue gas analyzer

Flow calorimeter for measuring fluid thermal properties

The flow calorimeter is used to measure the isobaric specific heat capacities of different fluids.

OUR OFFER

We offer services on our test rigs for:

- Performance evaluation of heat exchangers, cooling plates and heat pipes;
- Testing of heat pumps and other HVAC equipment (EN 14511);
- Thermal conductivity measurements of building materials using the guarded hot plate and hot wire methods (ISO8302, NBN B62-201 and NBN B62-202);
- Performance evaluation of Organic Rankine Cycle (ORC) systems, including their components;
- Measuring fluid thermal properties (isobaric specific heat capacity) using the flow calorimeter.