

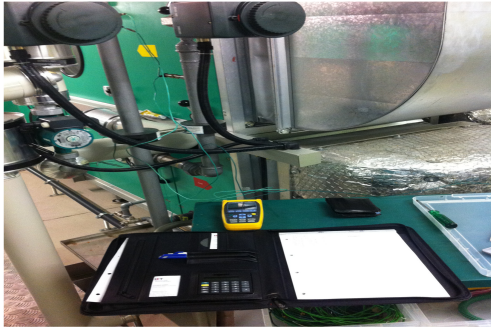


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The behaviour of real heat exchangers in HVAC applications close to saturation

Approaches to calculate the saturation of heat exchangers



Monoblock at the HSR in Rapperswil where the supply air for the offices is cooled or heated.

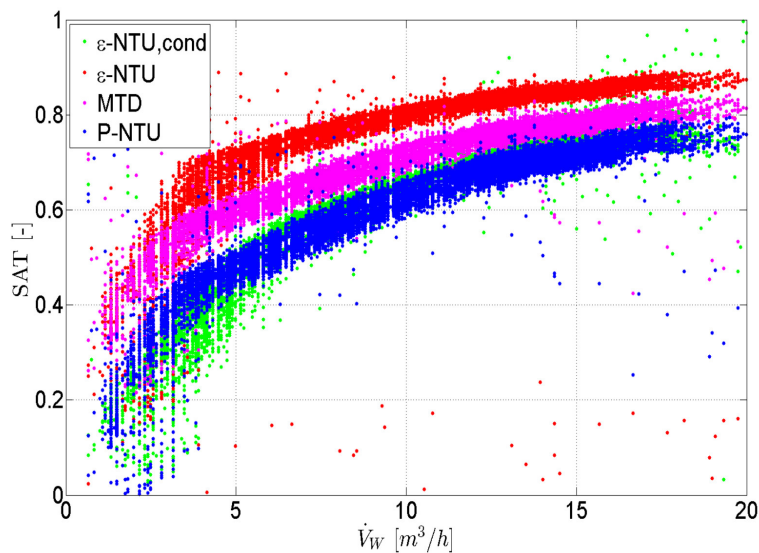
Introduction: Belimo Automation AG develops components for HVAC applications that are used in facilities all over the world. These components are getting more and more connected to each other combining them in a system of intelligent devices. Different sensors are connected and their data is evaluated in an electronic unit which then controls actuators with the calculations done within the device itself. This opens up new ways to optimize complex systems in the energy management of buildings. The Belimo Energy Valve has been developed based on this idea. It measures flow data in heat exchangers used in air conditioning systems. The device evaluates this data and compares it to the energy demand in the building. With this information it controls the supply of the cooling water flowing through the heat exchanger.

Proceeding: The performance of heat exchangers depends on the design and the flow conditions in the device. Depending on these conditions the maximum transferable heat is limited for a specific heat exchanger. The goal of the research done is to find a way to describe the performance of such a device by comparing the effective with the maximum possible heat transfer that can be achieved. This parameter is defined as the saturation of a heat exchanger. This should be done with the least information possible and it should be easily implemented in a device like the Belimo Energy Valve.



The Belimo Energy Valve controls the supply of cooling water for the air conditioning heat exchanger.

Result: As a result of this research, four different approaches to calculate the saturation of a heat exchanger have been developed. They have been compared to each other by analyzing measurements done on air conditioning systems working in real conditions. One approach could be found that matches best the requirements.



Results for different saturation calculations in function of the water flow rate.