RUSSELL K MARCKS, P.E.

Professor Marcks is the HVAC&R lead Instructor at Sinclair and coordinates Thermodynamic, Fluids, and Analytical Tools courses for the MET program. He has taught for 30 years and has been the Dayton SAC for 25 years. He spends his summers sailing Lake Erie.

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FUNDING

ASHRAE Grant	$ 5,000
College Contribution	$ 400
Industry Donation	$ 3,000

PARTNERSHIPS

Habegger Corporation
Outdoor Unit Donation
Reduced cost on Indoor Unit
Emerson Climate Control
Variable Speed Compressor donation
Chapter Members on Advisory Board
Mentorship

DURATION

12 mo.: Design, Build but a perpetual commissioning project

DEVELOPMENT OF A GROUND SOURCE HEAT PUMP SIMULATOR

Sinclair Community College

OUR STORY

Naturally, we have air-to-air heat pumps in the lab. However, there was nothing to address geothermal systems. This project allows the simulation of a pond or river loop system allowing student to study operational parameters, to observe well field temperature drift, and of course, learn basic service and maintenance requirements. Using geothermal software, students also learn the fundamentals of well field design..

OUR PROJECT

This is a 5-ton system using off the shelf outdoor and indoor units controlled with a typical thermostat. The original compressor was replaced with a variable speed unit donated by Emerson Climate Control. Since this is a retrofit, compressor control is done manually via specialized software for the purpose. The 'well field' is simulated using two 200-gal vertical tanks hydraulically joined. The tanks are outfitted with two concentric copper coils. All four coils are pumped in parallel. Temperature sensors are installed at various depths in each tank as well as on the water loop condenser inlet and outlet. A pump on the closed water loop is driven by a VFD. Water flow through the tanks (to simulate low velocity river flow) is by gravity with flow to drain controlled by a simple two-way control valve. Water inlet to the tanks is handled by a simple float and solenoid valve. All flows are sensed. Two EasyIO controllers are used to handle all inputs and outputs as well as control logic for the waterside of the system.