Master's degree programme in Energy Engineering

STUDENTS MEET INDUSTRY AND RESEARCH

Recent developments in design of large ground heat exchangers used with ground-source heat pump systems

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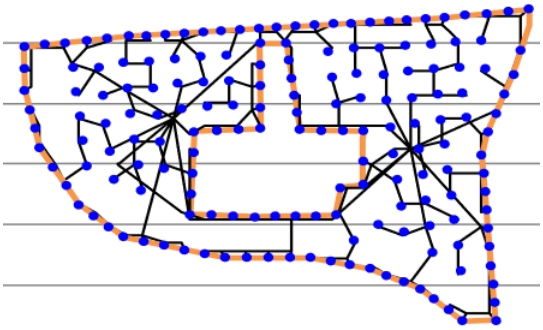
TIME: 16:30 – 18:30
LOCATION: M2 Room, DII

ABSTRACT:

Ground-source heat pump (GSHP) systems provide highly efficient heating and cooling of buildings. The first patent for a ground-source heat pump was issued in 1912, and a few systems were installed between the 1920s and the 1950s with limited success. The technology did not really take off until the energy crisis in the 1970s provided motivation and the development of heat-fused plastic pipe facilitated robust ground heat exchangers. In the 1970s, the market was mainly single-family homes. In the subsequent five decades, larger systems with hundreds and even thousands of vertical borehole ground heat exchangers (VBGHE) have become more and more common. However, design tools for such large systems have not kept pace with these developments.

Simulation-based design tools have been used since the late 1980s for designing ground heat exchangers (GHE) used with ground source heat pump (GSHP) systems. The ground heat exchanger simulations used in these tools rely on thermal response functions known as g-functions. Because of the significant computational burden in computing g-functions for even a single configuration, the design tools have relied on libraries of pre-computed g-functions for standard configurations as lines and rectangles. Standard configurations may be sub-optimal and will often fail to take full advantage of the available land for a specific building. This seminar will cover new developments in automatically selecting, sizing and optimizing both standard and irregular configurations. New developments allow creating, selecting and sizing irregular configurations where the available land area and "no-go" zones are described as irregular polygons.



BIOGRAPHY:

Jeffrey D. Spitler, PhD, PE

Jeffrey D. Spitler is Regents Professor of mechanical engineering at Oklahoma State University where he holds the OG&E Energy Technology Chair. He has more than 30 years of experience researching ground source heat pump systems, with the results from experimental, computational, and field research published in over 130 technical papers. He is a Fellow of ASHRAE and IBPSA, and currently serves as Editor-in-Chief of ASHRAE's research journal, Science and Technology for the Built Environment.