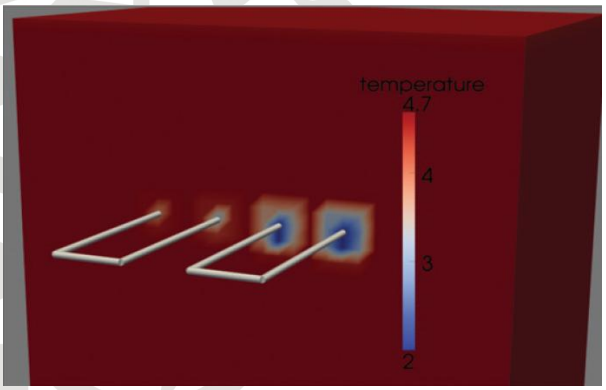

IN THE LOOP: IMPROVING GROUND LOOP HEAT EXCHANGERS

James Craig, Simon Haslam, Richard Simms, David Broderecht

There is enormous untapped potential in the fact the soil stays roughly the same temperature year round. Horizontal ground loop heat exchangers (GLHEs) have been taking advantage of this for decades to heat and cool homes. In winter, pipes that run in a horizontal loop through the ground absorb heat and transfer it to a heat pump inside the house. In the summer, the system works in reverse. The challenge is to make them both cost effective and space-efficient.

Because we currently don't know a lot about heat transfer mechanisms underground, GLHEs are overdesigned to compensate for that uncertainty. The more we know, the more efficient and more affordable we can make these systems.

That's why a team headed by James Craig is collecting data from a household system that has been specifically designed with multiple loop configurations for easy monitoring. The researchers are also tracking power and temperature data from the heat pump inside the house, along with outdoor temperatures.

Craig and his students have also developed a specialized 3D computer model that simulates the complex interactions between various loop configurations and soil conditions. Based on the extended finite element method, it can simulate the effects of different configurations and conditions more efficiently than standard heat transfer models.

By combining the results of real-life data with computer simulations, the UW investigators can develop more efficient GLHE designs, shrinking the amount of land required and bringing these systems within the financial reach of more Canadian households.

Partners: NextEnergy, Ontario Centres of Excellence