

# Performance of Ground Loops in Direct Geothermal Energy Applications

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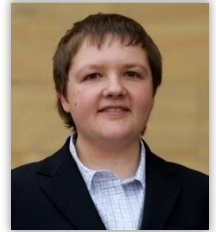
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**Abstract:** A ground source heat pump (GSHP) system is technology that transforms renewable geothermal energy from shallow depths into heating and cooling energy for buildings. This technology has great potential to considerably decrease buildings' greenhouse gas emissions as well as reduce the overall cost of heating and air-conditioning. The most expensive components of GSHP systems are ground heat exchangers (GHEs). They are also the least researched elements of the systems, so optimisation of GHE parameters is important for reduction of total costs of the systems and overall promotion of the technology among potential users.

## Introduction

Applications of direct geothermal energy utilises a sustainable geothermal source of heat and coolth instead of traditional sources which can help to significantly reduce cost for air-conditioning of buildings and substantially cut greenhouse gas emissions from them.

Application of direct-use geothermal energy is growing worldwide. However, even though the number of direct geothermal installations in Australia is increasing, there are few published examples of monitoring and research into these systems in Australia.

## Research Question

Among all components of typical direct geothermal energy systems the ground heat exchangers are the least studied and thus requires further research into it.

This research aims to answer the following question:

*"How variation of design parameters influences performance of GHEs in direct geothermal energy applications?"*

## Research Objectives

- To understand how different geological materials affect performance of GHEs
- To monitor real life performance of GHEs and to understand how changes in operating conditions influence performance of GHEs
- To consider the application of risk-based assessment in the design of GHEs
- To make recommendations for the reliability based design of GHEs in Victorian climate and geological conditions

## Experimental Works

The installation for the two full scale experiments has begun. The first experimental data are expected to be available for the analysis in the middle of next year.



**Bio21 Science Sub-School Project.**

Installation of vertical geothermal loops (April, 2013)



**New Development in Monbulk.**

Pile reinforcement cages fitted with instrumented geothermal loops (February, 2013)