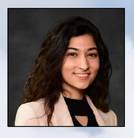
Sponsored by

CONTROLLED THERMAL RESOURCES

Simulation Software for Geothermal Power Plant


Kris Gaard


Marwa Abduljabbar


Nathan Gibfried


Travis Ryan


Joe Stephens

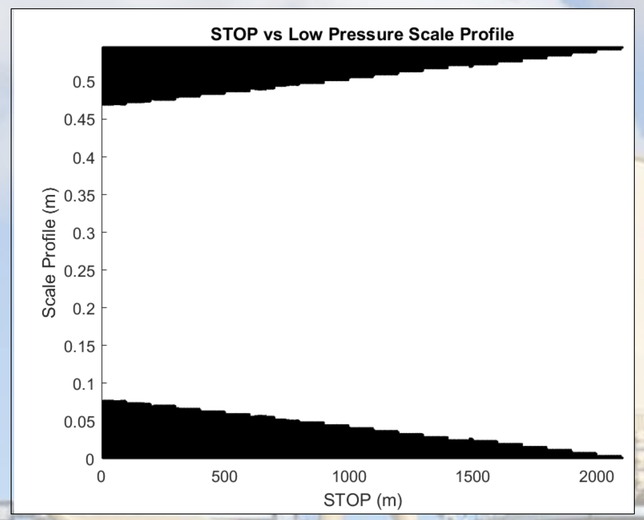
Project Overview

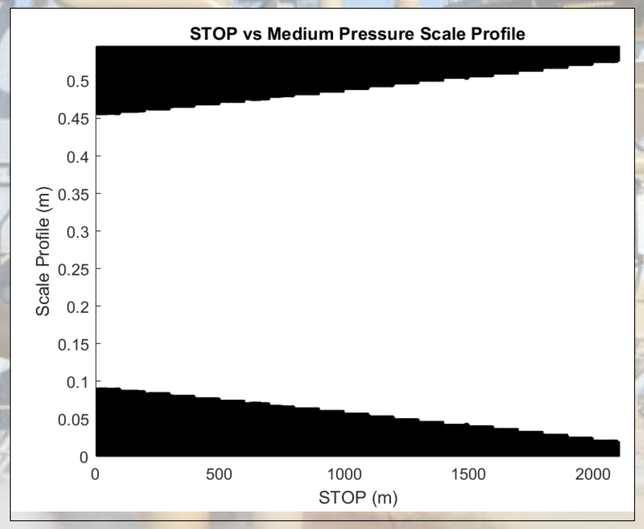
- The goal of this project was to optimize the efficiency of industrial geothermal pipelines in order to maximize profitability of the operation.
- A flexible simulation software was developed in MATLAB in order to accurately simulate the loss of thermal energy, pressure drop, and scale formation.
- A growth rate model was created to determine the critical cleanout frequency of the pipeline.
- A comprehensive financial analysis was conducted in order to compare the cost of a cement lined pipe to the cost of a non-scaling titanium pipe.

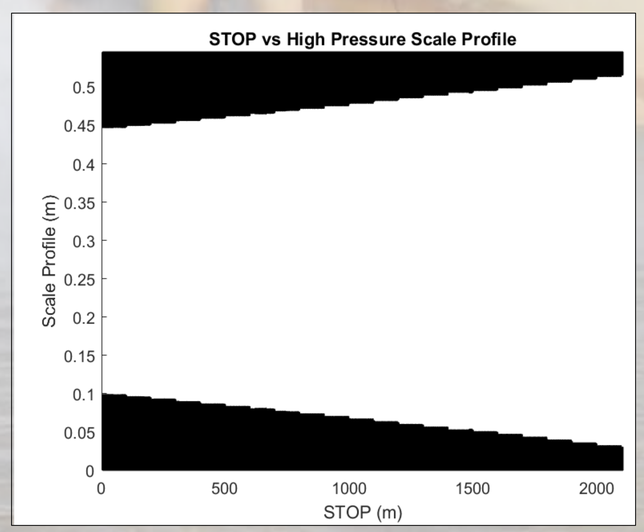
Scaling Deposition of the Current Pipeline

Methodology

- The MATLAB software can simulate any geothermal pipeline using inputs for a specific power plant such as geometry, pipeline materials and brine flow rate.
- The scale deposition and profile were matched to empirical pressure readings along the pipeline through iterative solutions.
- The operational costs of the cement lined pipe was calculated by using the pressure drop throughout the pipeline, pump work and industrial electricity cost.



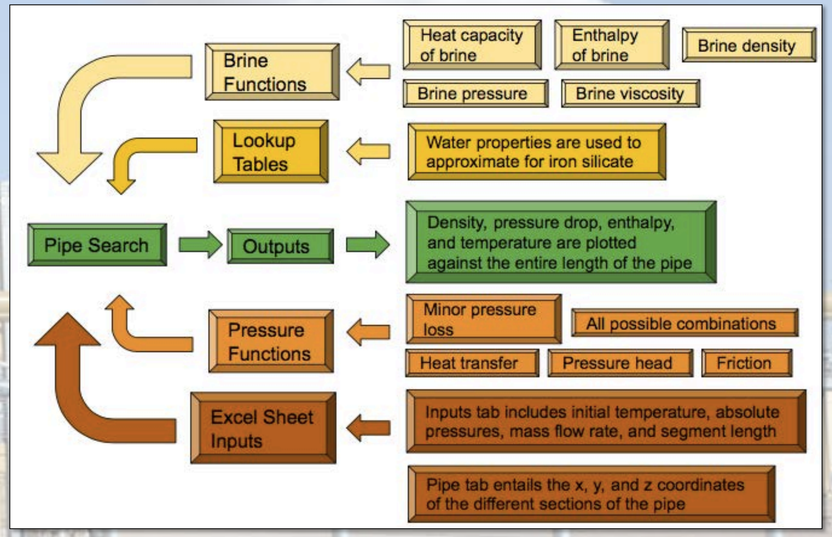


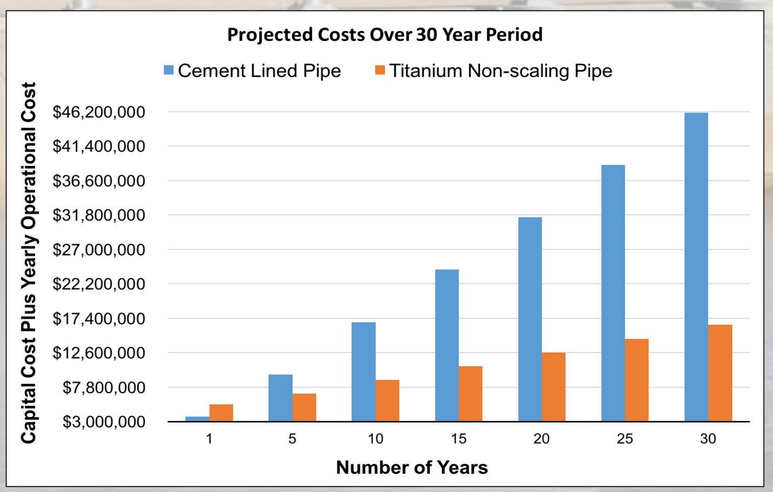


Conclusion

- Our growth rate model predicts a scale growth rate of ~8cm/year in a cement lined pipe.
- The optimal cleanout frequency was determined to be 500 days for the plant to operate at maximum efficiency.
- A titanium clad pipe has a payback period of 2.5 years and net savings of 29 Million USD in 30 years.

System Level Diagram





Fall 2020