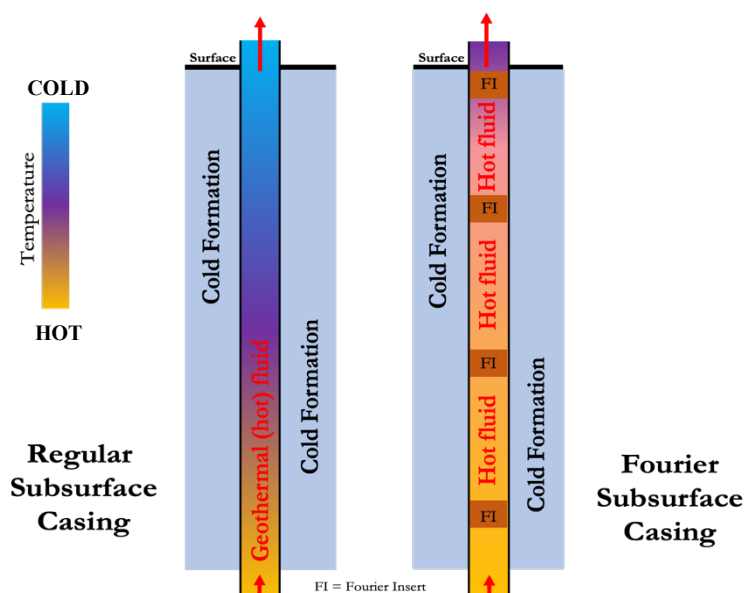


Fourier Casing: A New Technology to Reduce Heat Loss in Geothermal Processes

Geothermal energy represents an opportunity for low emissions energy generation and for Alberta's oil and gas sector to reduce GHG emissions. Recent studies by Alberta Innovates and COSIA identified fluid flow drag and heat losses as two key barriers to efficient geothermal power production, particularly from lower temperature geothermal resources which are common in Alberta. Fourier Casing technology is a short, targeted, wall-shaped device which can be inserted at selected locations into geothermal subsurface pipes to reduce fluid flow drag and heat losses. This Project will advance Fourier Casing design optimization to optimize fluid flow and mixing for heat recovery.



RECIPIENT:
UofA / Dr. Arman
Hemmati



TOTAL BUDGET:
\$531,000



PROJECT DATES:
FEB 2023 –
MAR 2026



PARTNERS:
NSERC
Imperial Oil
GEES Inc.



AI FUNDING:
\$195,000



PROJECT TRL:
Start: 5
End: 7

APPLICATION

The Fourier Casing development project is targeting geothermal energy production applications, to increase energy output from operations which recover heat by the flow of fluids through the subsurface heat resource to energy generation operations. This technology may also increase heat recovery used in oil and gas production operations, and other industrial processes to recover waste heat from piped fluids.



ALBERTA INNOVATES

CLEAN ENERGY

CLEAN TECHNOLOGY

RENEWABLE AND ALTERNATIVE ENERGY – ELECTRICITY GENERATION

PROJECT GOALS

Building on previous computer simulations to complete proof-of-concept analysis, this Project will achieve the following:

- Bench-scale Fourier Casing design and implementation optimization,
- Address knowledge gaps relating to flow-induced stress/vibration and optimal material properties,
- Develop an efficient bench-scale manufacturing process at 70-75% of market cost,
- Completion and operation of a test bench scale prototype,
- Final Fourier Casing design for fabrication and installation of a field test prototype, and
- Patent registration.

Project success will lead to design and fabrication of a working prototype for field tests in collaboration with industry partners.

BENEFITS TO ALBERTA

- Enhance the economics of high to moderate temperature geothermal resources, co-production in active oil and gas operations, stand-alone geothermal facilities in Alberta.
- Support Alberta's oil and gas and electricity sectors in advancing towards their net zero emissions targets.
- Create new economic activity in Alberta from the manufacturing, marketing and sale of Fourier Casing equipment in Canada and globally for use in geothermal and industrial operations.
- Enhance Alberta's reputation as a leader in clean technology innovation, contribution to low emissions energy production and a low emission future for Canada.



4 Publications



7 Students
Trained



1 Patent



2 Project Jobs



11-100 Future
Jobs



1 New
Product/Service



<10,000 t/yr Project
GHGs Reduced



10-100 kt/yr Future
GHGs Reduced

CURRENT STATUS

JUN 2025

Design-based simulations are complete and total drag reduction is being assessed for the inserts.

Multiple conference and journal publications are accepted or submitted.

We have also identified the effect of multiple insert placement on their performance.

Next, we are completing several high-resolution simulations to better understand the process/physics of the flow manipulation to assist in finalizing the final design for prototype development.