

# CLEAN RESOURCES

## CLEAN TECHNOLOGY

RENEWABLE AND ALTERNATIVE ENERGY - ELECTRICITY GENERATION

## FUNDING DETAILS

### High-Strength Coating-Based Waste Heat Utilization Heat Exchangers for Energy Recovery in the Natural Resources Industry of Alberta

The use of flaring in the oil and gas sector is recognized as a necessary safety measure, but it results in greenhouse gases (GHG) and excessive heat being released. If the heat could be successfully and efficiently captured, it could be used to generate power for oil and gas operations and reduce GHG emissions.

To meet this challenge, Dr. McDonald's and Dr. Chandra's team at the Universities of Alberta and Toronto are focused on developing new thermal coatings and manufacturing processes to improve the efficiency of heat exchangers. The new heat exchanger structure and coatings have high surface area to volume ratios which increases the flow of hot gases through the structure to enhance heat collection while resisting the detrimental effects of high-temperature corrosion. This new heat exchanger will be lab tested and then field tested within an Organic Rankine Cycle to demonstrate more efficient electricity generation.



**RECIPIENT:**  
University of  
Alberta / André  
McDonald



**PARTNERS:**  
Imperial Oil  
University of  
Toronto



**TOTAL BUDGET:**  
\$321,000



**AI FUNDING:**  
\$96,000



**PROJECT DATES:**  
OCT 2018 –  
SEP 2022



**PROJECT TRL:**  
Start: 4  
End: 7

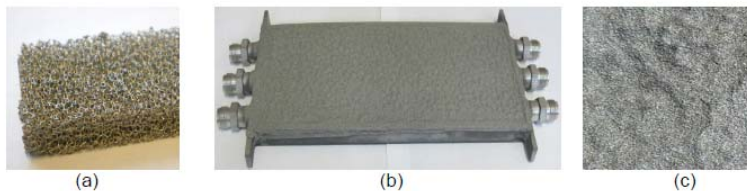


Fig. 1: (a) Metal foam core; (b) Metal foam heat exchanger; and (c) Plasma-sprayed coating skin

## APPLICATION

This technology is targeted at oil and gas producers who use flaring within their operation. Heat exchangers with a thermal-sprayed coating are being developed to serve as a waste to value-added technology by converting waste heat energy to high-quality electrical power.



### PROJECT GOALS

- Develop a thermal-sprayed coating-based heat exchanger;
- Increase energy transfer from waste heat gases with a modified heat exchanger; and
- Integrate the heat exchanger into a Rankine cycle engine to produce electricity from waste heat energy.

### BENEFITS TO ALBERTA

- Contribute directly to growing Alberta’s green economy and improving oil sands energy efficiency.
- Contribute to mitigating environmental pollution and the adverse impact of energy use and industry processes on the climate, all while ensuring industry profitability or enabling it to increase.
- Diversify the economy by developing materials and process to more efficiently convert waste heat energy from flares to a value-added commodity such as clean electricity.
- Attract and retain students, collaborators, and partners to Alberta.
- Engage with stakeholders external to Alberta to support importation and exportation of expertise for the benefit of Alberta.



2 Publications



2 Students Trained



1 Project Job



2 Future Jobs



1 New Product/Service



5.5 kT/yr Future GHGs Reduced

## CURRENT STATUS

### MAY 2022

Due to the COVID-19 pandemic, the focus of testing and simulations was around lab-scale activity, rather than in-field testing with our industry partner and the university facilities. The research team developed an ingenious way to simulate field testing in a lab environment and used existing research facilities at the UofA to complete the testing. The team is still working to complete field testing later in 2022.