Introduction
A bespoke heat exchanger (HEX) was designed, developed and tested - specifically for waste heat recovery applications. Counter-flow arrangement and radial-fins were incorporated to improve and enhance heat transfer.

Design and Development
The design was optimized with computational fluid dynamics analyses to achieve our target performance. Optimization for flow distribution

Prototype Manufacturing
The Radial-fin Heat Exchanger was manufactured and produced using Electrical Discharge Machining (EDM). The material used is predominantly stainless steel.

Experimental Testing and Setup
The Radial-fin HEX installed on a 6 cylinder 5.9L diesel engine and tested with an AC dynamometer available at UTM LOCARTIC.

Experimental Results

Comparison with Conventional Shell-and-Tube Heat Exchanger
Radial-fin HEX compared with 3 types of conventional shell-and-tube. (Result of conventional HEX obtained via ASPEN courtesy of J. M. Arreola)
- Conventional HEX 1 - Equivalent cross sectional area (flow area)
- Conventional HEX 2 - Equivalent heat transfer area (wetted area)
- Conventional HEX 3 - Equivalent size (diameter & length)

Conclusion
A Radial-fin Heat exchanger has been designed, developed and tested for waste heat recovery applications,
- Effectiveness ~ 75%
- Hot side back pressure < 10 kPa

- Compared to conventional shell-and-tube of equivalent wetted area Radial-fin HEX achieved better pressure loss and effectiveness with much smaller overall size - Almost 1/2 the diameter and 1/3 the length.
- Compared to conventional shell-and-tube of equivalent size Radial-fin HEX has more than 3x better effectiveness.

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