NOx Reduction in Engines using a Turbo-Expander

Jordan Brace, Professor John Allport

School of Computing and Engineering, University of Huddersfield, Queensgate, Huddersfield, West Yorkshire, HD1 3DH

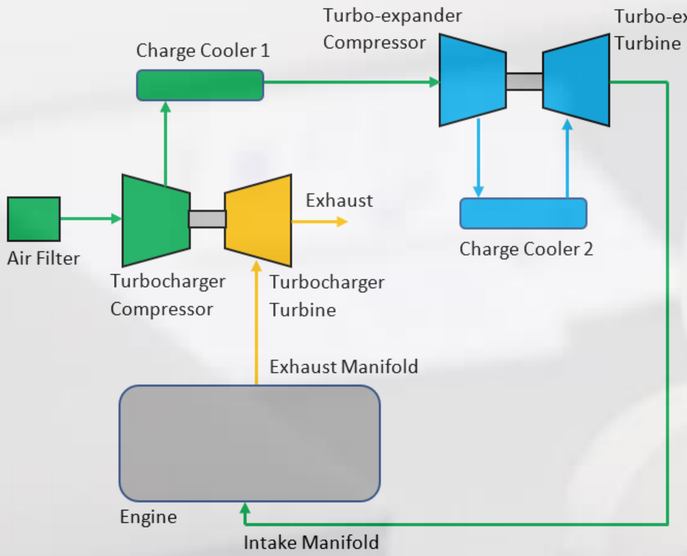
University of HUDDERSFIELD
Inspiring global professionals

AIM

- To investigate the effect an Air Cycle Technology (ACT) Turbo-Expander has on NOx emissions in a diesel engine.

Theory

- The ACT Turbo-Expander is to control air intake temperature of an engine to reduce emissions from the exhaust.

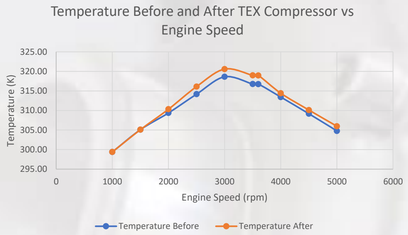


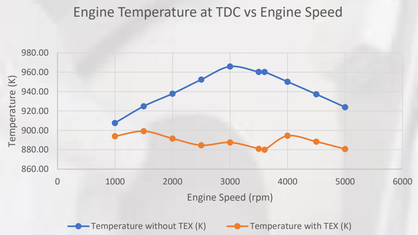
Resilience & Recovery

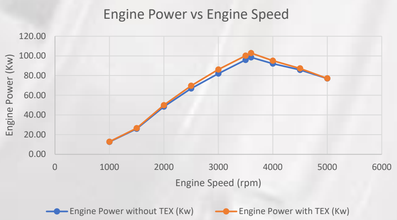
- This research is linked to resilience of the design of the engine, which is now seen as an unclean source of transportation, the turbo-expander will allow this image to be reversed and the public perception of the engine be recovered so it can be used in a clean manner.

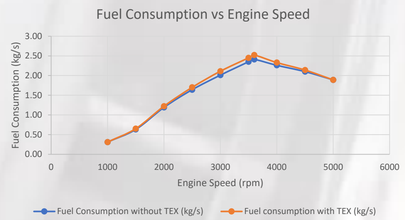
Hand Calculations

- The engine has been broken down into parts and basic principles used to calculate changes to air as it flows through the engine. This has all been used to create a spreadsheet which can be used to collect data of engine parameters and graph the results.







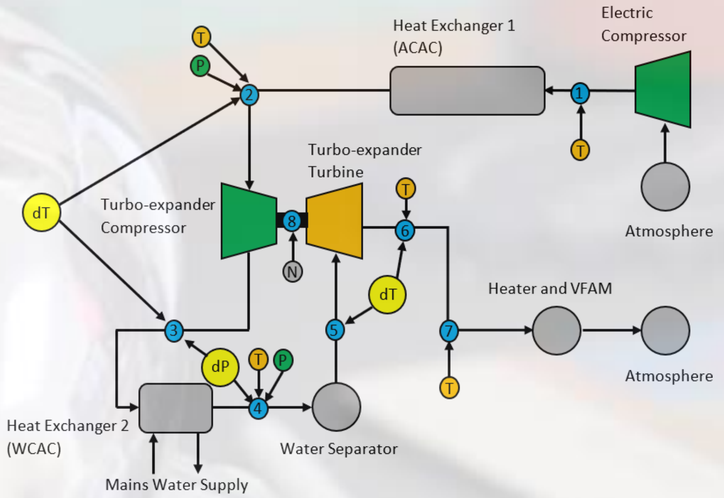


Discussion

- The graphs show how the temperature is reduced across the turbo-expander, leading to a reduction in temperature that enters the engine.
- The other key factor is that engine power and fuel consumption are relatively unaffected due to the air density remaining similar.

Next Steps

- In order to validate that the turbo-expander a test rig has been constructed which will allow the air parameters to be monitored before and after the turbo-expander.



- Once the turbo-expander operational range is understood from the test rig it can be fitted to the test engine, a Ford 1.5 ltr diesel engine. This will allow the behaviour of the turbo-expander to be verified against the hand calculations and the data from the test rig.