

# Case Study - eSupercharger for Range Extender Engine

With MAHLE Powertrain Ltd

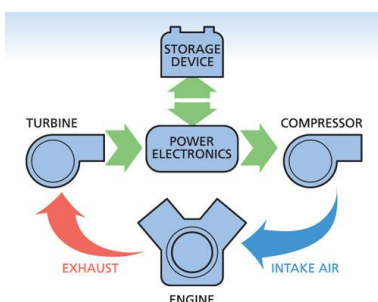


## Aeristech Ltd

Aeristech leads the world in breakthrough engine turbocharging technology. Aeristech has “game changing” proprietary patent technology using ultra high speed motors. The heart of the solution is our ability to control and use the world’s fastest rotating and accelerating permanent magnet motors to provide substantial power on demand, eliminating perceived turbo lag....even from rest.



Our Full Electric Turbocharger Technology (FETT) reflects the culmination of significant investment following intensive research & development by some of the world’s most capable electrical engineers and scientists. Aeristech has solved one of the auto industry’s key issues: how to reduce CO<sub>2</sub> emissions, enable engine downsizing and improve driving performance whilst managing cost and weight.



## Project Overview

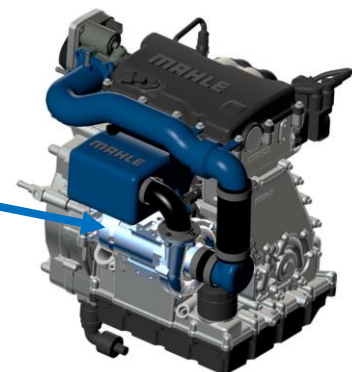
The primary objective of this collaborative project with MAHLE Powertrain was to demonstrate the novel concept of integrating Aeristech’s electric supercharger (eSupercharger) to increase the power output of MAHLE’s Range Extender (REx) engine from 30 kW to 50 kW to broaden the scope of Range Extended Electric Vehicle (REEV) applications for the REx engine.

Implementing Aeristech’s eSupercharger technology to achieve this power upgrade from 30 kW to 50 kW required minimal changes to the base engine design, and therefore enables MAHLE Powertrain to offer an optional power upgrade for larger / heavier vehicle applications.

The project received a grant support from the Niche Vehicle Network (NVN) as part of the 2013 NV CR&D competition for funding.



Aeristech 10 kW eSupercharger



## Project Scope

A four month project to demonstrate this concept at proof-of-concept level including the following activities:

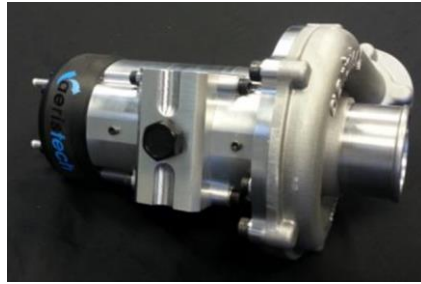
- Design modifications of Aeristech’s eSupercharger for the specific REx engine application including:
  - Greased bearings (no external lubrication loop for bearings)
  - High voltage control/power electronics (EV application)
- Manufacture, assembly and test of modified eSupercharger
- Integration (hardware and software) to MAHLE’s REx engine
- Validate concept through engine dyno test programme



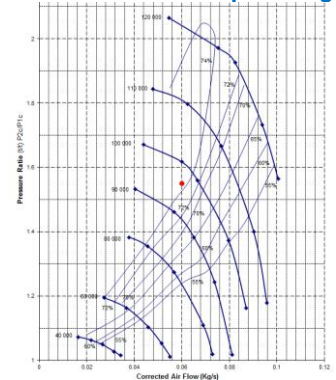
Aeristech's technology leadership was recognised by the Energy Institute, when in 2012 it named Aeristech winner of the prestigious Energy Institute Technology Award.



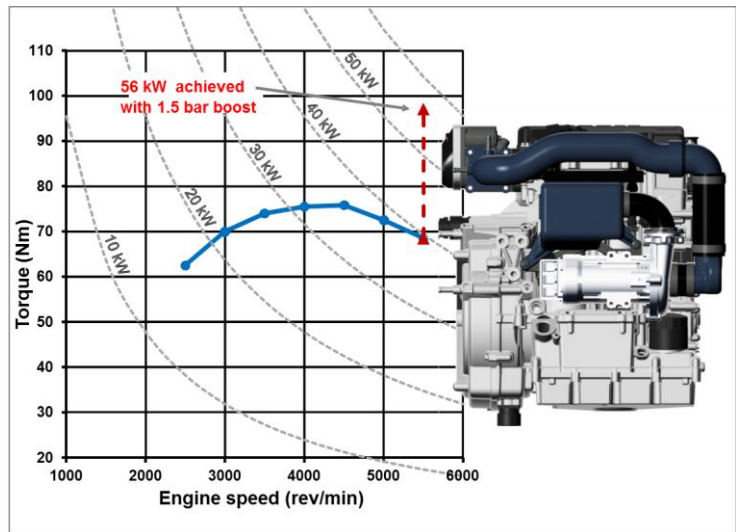
In 2010 Aeristech was declared Regional Winner and UK finalist of the Shell Springboard Award for new green technologies.



**Aeristech 10 kW eSupercharger**



**Testing Results**



- ➔ Initial testing achieved **56 kW at 5500 rev/min** with 1.5 bar boost
- ➔ Net power of 51 kW (eSupercharger power requirement of 4.5 kW non-optimized)

**Project Conclusions**

Validated the concept for eSupercharger as an efficient means of increasing power output with minimal changes to the base engine.

Aeristech eSupercharger as a single stage boosting device enables:

- ➔ Higher power output (c. 40%) for MAHLE's REX engine
- ➔ Broader range of application (larger / heavier vehicles)
- ➔ Maximising production volume with a common base architecture.



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