



Investigation Into Water Methanol Injection

Morgan Kirkham-Jones

Supervisor; Malcolm McDonald

School of Engineering

MEng Automotive Engineering



Water/Methanol Injection has its origins in WWII where it was used to aid planes in take off and combat situations (Jane, 1989).



The vehicle and it's WMI was tested (purely for academic purposes) at Oulton Park in 2019

Introduction

The aim of this project was to examine the impact of a water methanol injection (WMI) process in a modern forced induction engine. Over 130 test runs using a chassis dynamometer have been completed for this project.

Modern engines are becoming increasingly down-sized and with higher boost levels. This leads to higher cylinder temperatures and pressures, increasing the propensity to knock. Instead of over-fuelling or retarding ignition timing, WMI may be a solution to this (Khatri, 2019).

By reducing temperatures and increasing octane levels, WMI reduces the knock propensity. This means WMI can allow further advanced timing and increased boost levels without causing knock (Pauer, T, 2016)

The table below shows the increase in ignition timing possible without causing knock depending on what injection method

Injection = Test=	No WMI	WMI CM3	
	Standard	100% Meth	50/50
Degrees SA Until Knock	4	7	8



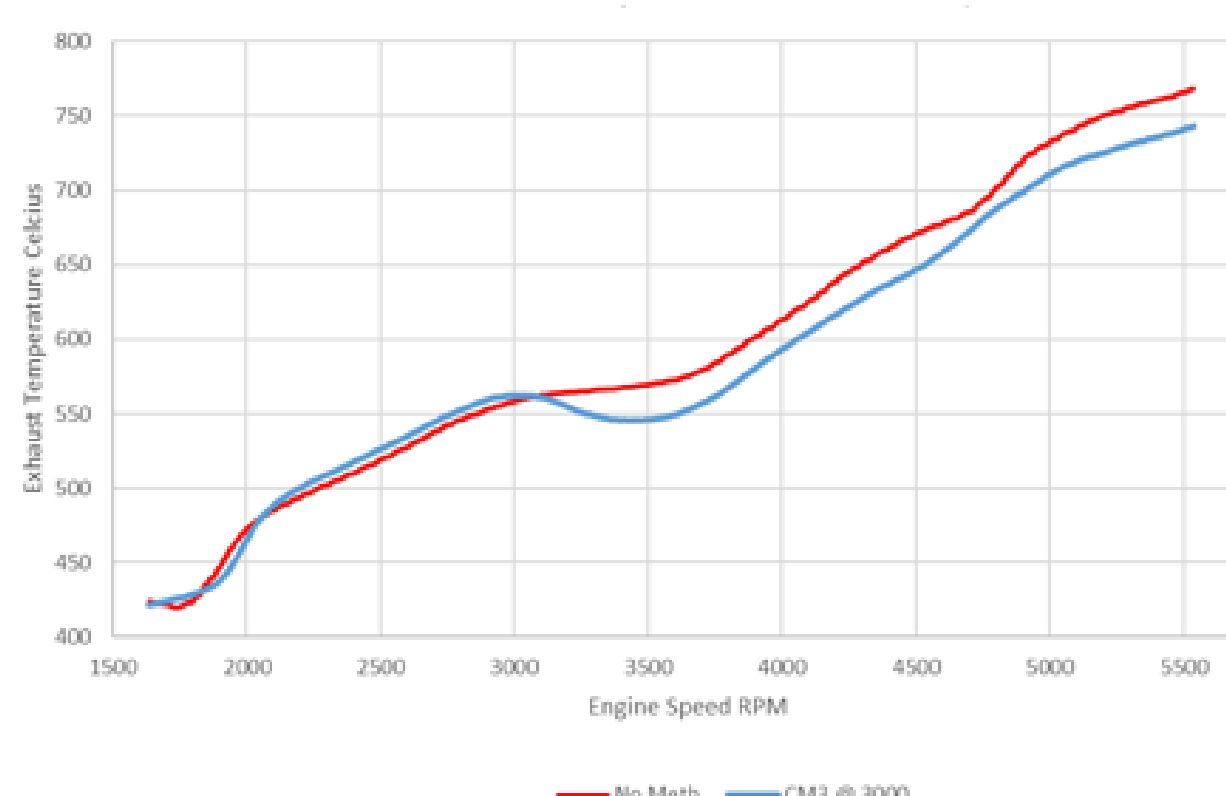
Photo showing the Injection system

Targets

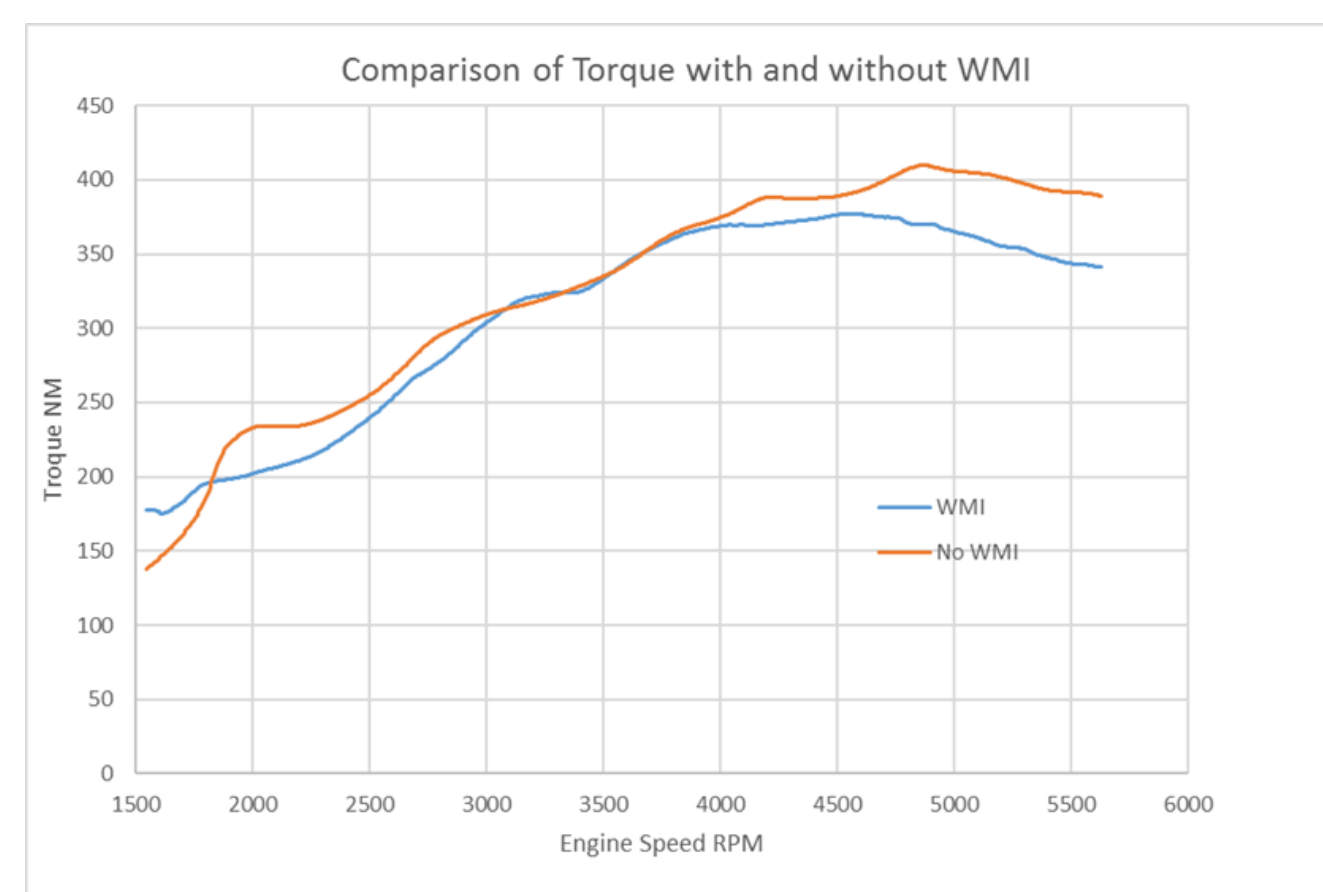
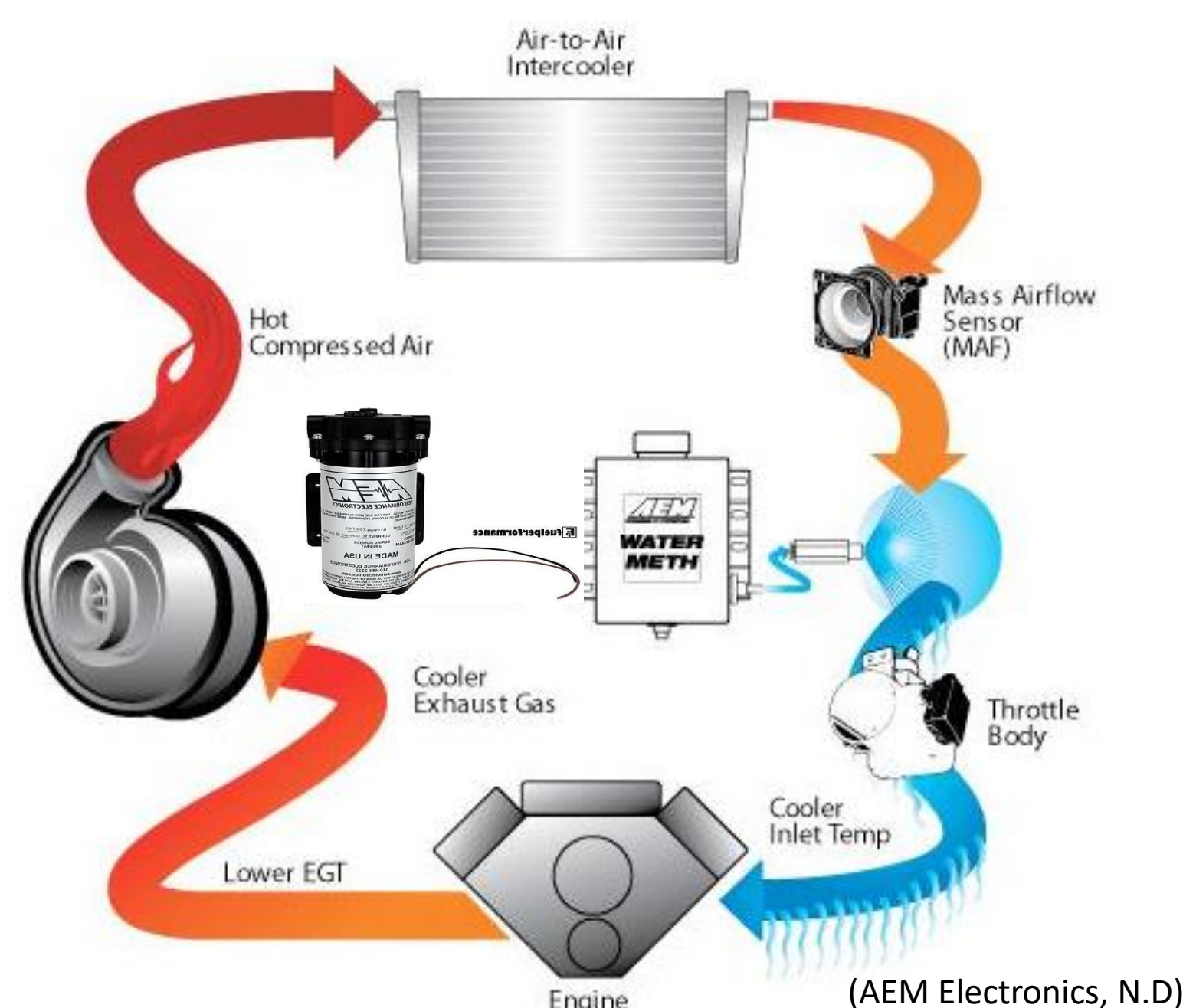
- Install a water/methanol injection system to the engine.
- Examine the effectiveness of the water/methanol using a chassis dynamometer.

A Link Standalone ECU has been used to allow control over many vehicle parameters, such as fuelling, ignition timing and boost control.

The Injection system can deliver 270 or 440cc/min into the intake plenum of the vehicle



This graph shows the impact WMI has on exhaust temperature. WMI starts at 3200 RPM

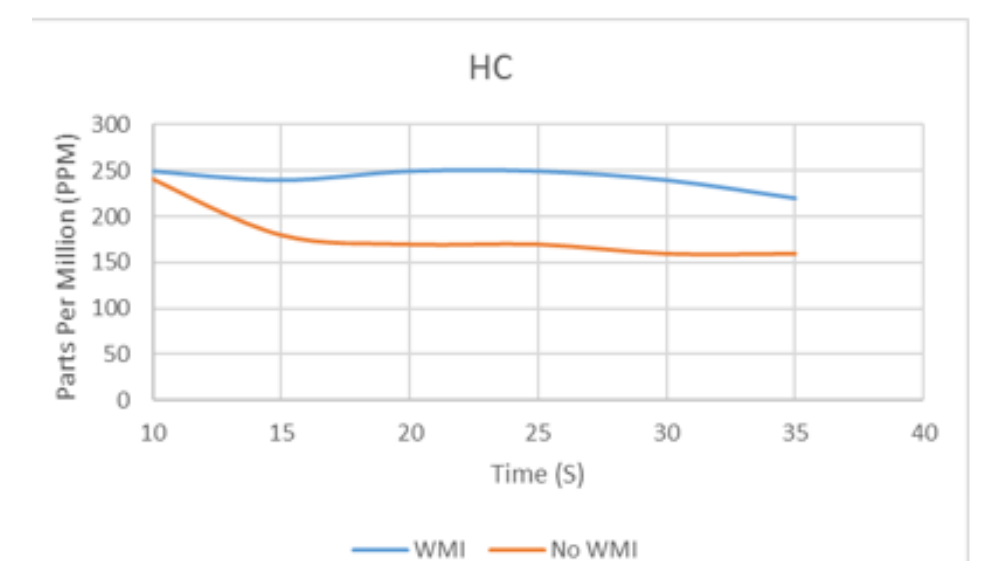


Graph showing a reduction in torque when using a Water Methanol system

If fuelling is not changed, injecting too much water/methanol can lead to a reduction in power and an increase in hydro-carbon emissions. Over-fuelling in this way can stop fuel burning by exceeding the flammable point. Removing fuel and running closer to stoichiometric can give the most power and highest reduction in emissions (Berni, 2015).

The report concludes that;

- WMI allows for spark advance towards MBT timing
- Lowers intake and exhaust temperatures
- Can result in an increase in Hydro-carbon emissions and a loss of power



Data showing an increase in HC emissions with WMI

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