

Investigation into Engine Emissions with modelling, and reducing Emissions using Water/Methanol Injection

Postgraduate Research Methods
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Research Aims

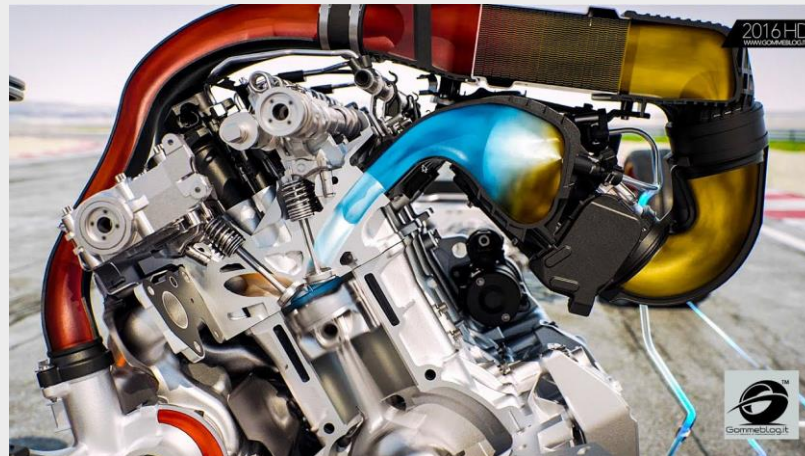
- Develop a combustion model using a Honda Internal Combustion Engine
- Validate the results of this model using an Engine Dynamometer and Gas analyser
- Investigate the benefits of using Water/Methanol Injection (WMI)



Bosch, 2009

Water Methanol Injection

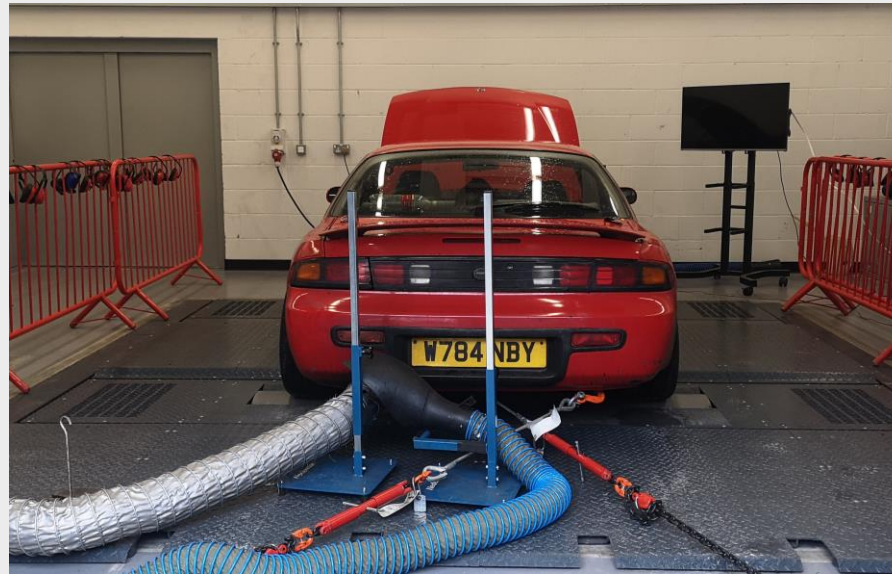
- Originated pre-WW2
- Featured on a limited number of production vehicles, most recently used on the BMW M4 GTS (2016)
- Can provide benefits such as lower fuel consumption, lower emissions & increased power



Autocar Magazine, 2017

Bachelors Research

- Calibrate WMI on a turbo-charged engine
- Tested on a Chassis Dynamometer
- Limited combustion analysis



Engine Dyno Testing

- A Honda engine will be tested on a dynamometer with comprehensive measurement devices
- Cylinder pressure will be recorded using a Spark Plug Pressure Transducer



Kistler, 2019

Combustion Model

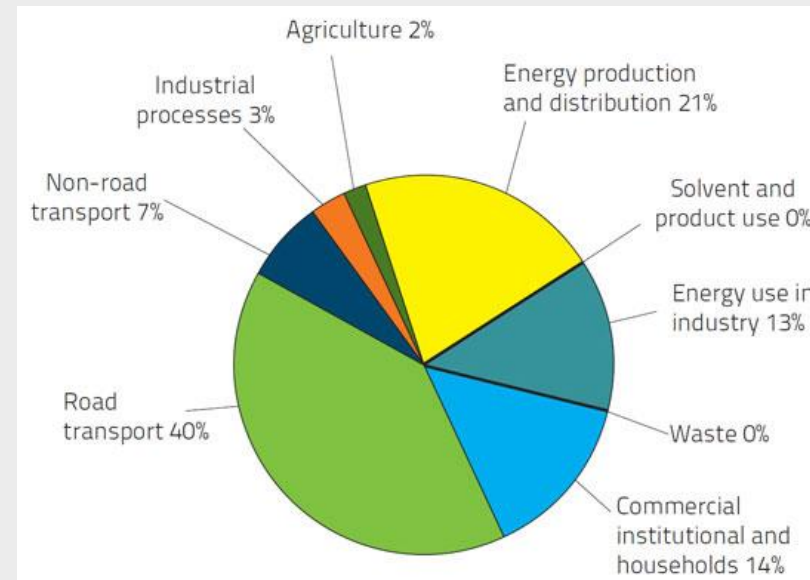
- A model will be developed using Excel and MATLAB
- Data from a pressure transducer will be used in order to calculate
 - Flame Speed
 - Burned, unburned, and average temperatures
 - NO_x emissions
 - The effect of methanol on flame speed

Combustion Model

- The effect of WMI will be modelled and then validated
- Modelling combustion accurately can allow manufacturers to accurately predict engine performance and emissions, with less need for dyno and on road testing

NO_x Emissions

- Road transport attributes to 40% of total NO_x emissions
- High NO_x levels can lead to smog, acid rain, and ground level Ozone, which contributes to health problems such as respiratory conditions.



Icopal-Noxite, 2015

NO_x Emissions

- NO_x levels have become increasingly important since the “Diesel-gate” scandal in 2015
- Cheat devices were used in order to provide false readings for emissions testing



The Guardian, 2019

Why is this topic Master's suitable?

- Vehicle Emissions, particularly NO_x, are relevant in today's world.
- WMI is not widely researched and could provide benefits to the Automotive Industry
- No mainstream combustion analysis software advertises the ability to simulate WMI

What could
this research
achieve?

- Lower Vehicle Emissions due to accurate modelling and WMI
- Develop an increased understanding of the impact of WMI on combustion
- Reduce costs in development for manufacturers

References

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