1. INTRODUCTION

The necessity for cleaner technologies that reduce anthropogenic greenhouse gas emissions in the atmosphere by improving fuel economy, has made researchers and vehicle manufacturers focus their attention on more advanced engine concepts. This is the case of Gasoline Direct Injection (GDI) engines which can achieve a 20% reduction in both fuel consumption and carbon dioxide depletion. In the near future the majority of light petrol vehicles will be GDI.

1.1. GDI advantages

- Fuel consumption
- Carbon dioxide
- Power output
- Improved efficiency

1.2. GDI in the near future

![Graph showing penetration rate of new technologies to passenger cars, by Alternative](Image 2)

2. PARTICULATE MATTER

However, GDI engines are linked with higher levels of PM emitted, a toxic pollutant considered as carcinogenic by the International Agency of Research in Cancer. The effect of PM is size dependent, small particulates are emitted in larger numbers and can penetrate deeper in the human body. The European legislation, Euro6c which comes into force in September 2017, include a limit in PM number: $6 \times 10^{11}$ particulates/km.

High concentration of particulate matter and NOx are linked to plethora of respiratory health problems

- Air pollution: How strong is the link to cancer?

Tiny particles make air pollution the fourth leading cause of death worldwide

![Graph showing particulate matter](Image 3)

3. PM CONTROL

There are several ways to reduce/control PM. The optimisation of engine parameters such as the injection pressure or spark timing. Moreover, filters have been an effective ways to reduce PM in diesel cars. The same concept is now applied to petrol vehicles. Lastly, the use of alternative and renewable fuels, such as bioethanol, can palliate PM formation in the combustion chamber.

3.1. Optimising engine calibration

3.2. Aftertreatment systems

3.3. Alternative fuels

4. BHAM’s RESEARCH

Hydrogen combustion has been proven to reduce PM significantly. The physical properties of PM (morphology and microstructure) as well as soot oxidation patterns have been researched. Filter and lung deposition are strongly linked with those parameters. In addition, different gasoline particulate filters have been analysed.

4.1. Hydrogen combustion

![Graph showing particulate matter](Image 4)

4.2. PM characterisation

REFERENCES


ACKNOWLEDGEMENTS