Introduction
This work was undertaken in collaboration with United Biscuits in an attempt to fuel their distribution fleet on straight (unprocessed) used cooking oil as a replacement to fossil derived diesel fuel. Used Cooking Oil fuel was supplied by Olleco Co. This work follows from a comprehensive life cycle analysis undertaken at the University of Leeds concluding transesterification processing of cooking oils to biodiesel constitutes 57% of total CO$_2$ emissions of used cooking oil derived biodiesel use.

We have investigated the effect of straight used cooking oil on fuel injector deposit formation in Euro VI Heavy Goods Vehicles.

Methodology
2 x Fuel Injectors removed from HGV after 6 months running on SUCO

Injectors disassembled

Injectors cleaned with toluene and acetone

SEM and EDX analysis

Deposit samples taken from injectors

Samples analysed by FTIR

EDX – Energy Dispersive X-ray Spectroscopy

The deposits are mainly carbon based however there are large amounts of sodium and zinc present particularly at the tip of the injector.

FTIR – Fourier Transform Infrared Spectroscopy

FTIR confirms the presence of sodium carboxylate and zinc oxide salts in the deposit. This indicates deposit formation due to metal contamination in the fuel.

FTIR validates EDX findings by highlighting the presence of carboxylate salts and metal oxides in deposits.

Further processing of fuel is strongly recommended. This will reduce the amount of trace metals present in the fuel (particularly Na and Zn).

Conclusions
• We propose that the thick layer of shaft deposit is the most likely cause of poor driveability.
• EDX indicates Na and Zn play a key role in injector deposit formation.
• FTIR indicates Na and Zn play a key role in injector deposit formation.

Contact Us
Christian Michelbach: pmcam@leeds.ac.uk
Nicola Wood: pmnjw@leeds.ac.uk
Dr. Hu Li: fuehli@leeds.ac.uk

EPSRC Centre for Doctoral Training in Bioenergy
Energy Building
University of Leeds
LS2 9JT, UK