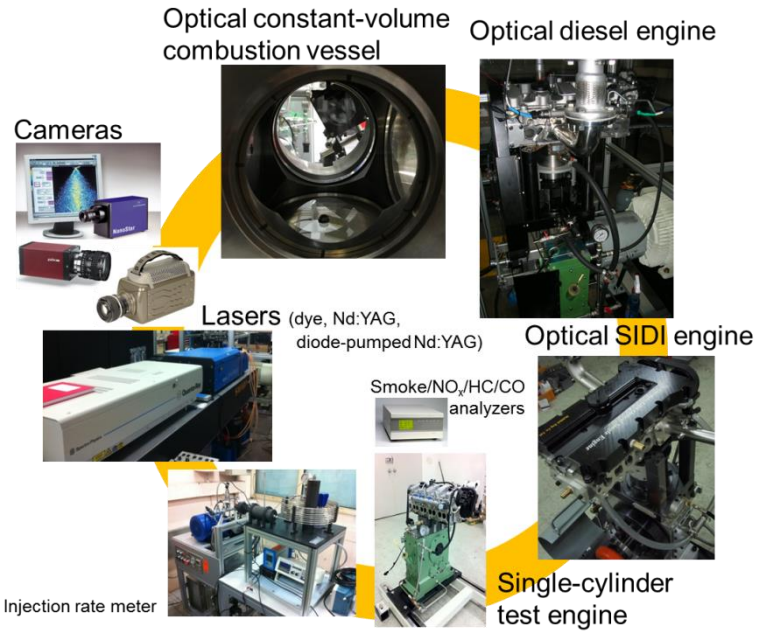
School of Mechanical and Manufacturing Engineering

Optical/laser-based imaging diagnostics and performance/emissions testing of combustion engines

The UNSW Engine Research Laboratory

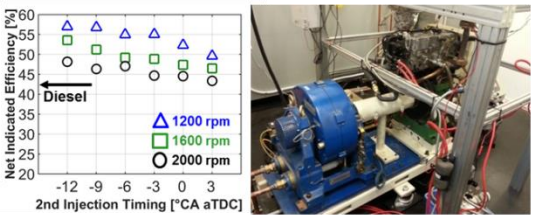
We experimentally investigate combustion engines with an emphasis on fuel injection, alternative fuels and advanced combustion regimes. We are specialists in optical/laser-based imaging diagnostics that are used to clarify fundamentals of mixing, reaction, and pollutants formation processes occurring inside the cylinder of the engine. We also conduct performance and emissions testing of combustion engines to optimise multiple operating parameters for efficiency improvement and emissions reduction.



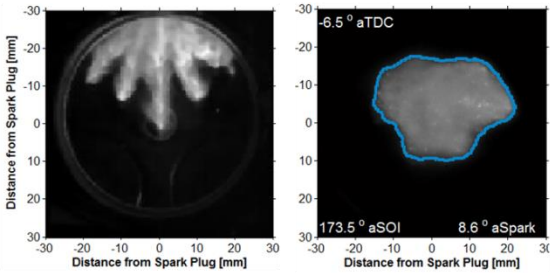
The laboratory is well equipped with state-of-the-art research equipment and facilities including two optical diesel engines, an optical SI engine, a high-pressure optical combustion vessel, various lasers and cameras, a single-cylinder performance test engine.

On the practical side, we have demonstrated capabilities in dual-fuel combustion of ethanol and diesel and innovative gasoline compression ignition engines achieving 50% higher efficiency. On the fundamental side, we have clarified ethanol/gasoline spray behaviour in both intake and in-cylinder conditions, diesel/biodiesel flame development, and in-flame soot particle structures.

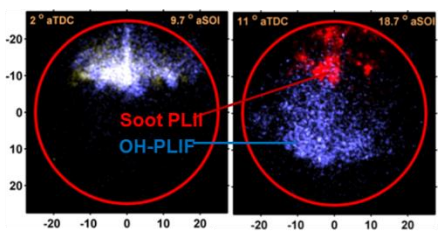
1. Performance tests of ethanol/gasoline compression ignition achieving 50% higher brake efficiency



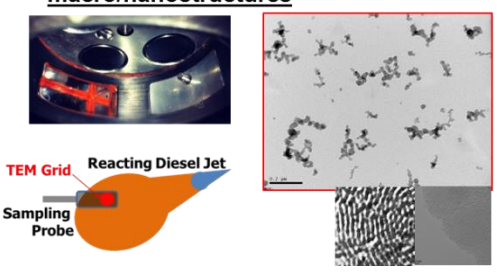
2. Ethanol/gasoline spray penetration and flame propagation study in an optical petrol engine



3. Jet-wall and jet-jet interactions (including wall *T*) in a light-duty optical diesel engine



4. In-flame soot particles sampling and morphology analysis for less harmful macro/nanostructures



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