

# DIESEL COMBUSTION CONTROL WITH DIGITAL RATE SHAPING



## Background

Fuel efficiency and combustion emissions are always in need of improvements. Available SAE papers and reports indicate an improved efficiency by using "Digital Rate Shaping".

## Objectives

- By running injector pump bench and single-cylinder firing injection patterns and fuel injection settings with DRS (Digital Rate Shaping) that improves fuel efficiency, emissions and combustion noise.
- Define needed HW requirements such as needed separation time, flow rate, injection shot precision and robustness.
- Define needed SW functionality to handle proposed injection pattern and DRS.

## Activities

- Test plan preparation for injector test bench and perform testing including reference. Result evaluation.
- Test plan preparation including DoE for single-cylinder and perform testing including reference. Result evaluation and creation of combustion model.
- Test proposed calibrations in multi-cylinder if possible (optional).
- Final report with description of how to most efficiently balance the calibration to achieve lowest engine out emissions including CO<sub>2</sub> and combustion noise through model based calibration.

## Miscellaneous

- Preferred background: experience from engines or control systems.
- Aiming for students studying MPAUT or MPSYS at Chalmers
- Examiner: Lucien Koopmans, Department of Mechanics and Maritime Sciences / Division of Combustion and Propulsion Systems
- Volvo Cars contact: Johan Zackrisson, Diesel Combustion Control, [johan.zackrisson@volvocars.com](mailto:johan.zackrisson@volvocars.com)

