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Data Modelling for Exhaust Gas Prediction.

ABSTRACT - Masterthesis

Global warming has become a startling issue in recent days and distinctively, automotive emissions are one of the primary contributors to this. Road transportation alone contributes to 12 of the total (European Commission 2010) $C0_2$ emission per annum in Europe. Adding to this, there are other hazardous emissions like NOx (Oxides of Nitrogen), CO (Carbon Monoxide), Hydrocarbons (HC) and Particulate Matter (PM) from an automotive exhaust. Over the years, stringent emission norms been posed by the Government. This has confronted the engine manufacturers and the component suppliers with a challenge to make their equipment more sophisticated and guarantee these requirements. One technique to ensure the compliance of these legislations is remote validation of ECU's. As a first step ahead in the direction of remote validation of exhaust gases from a diesel vehicle, the development of a simulation model for the diesel exhaust components is vital. The most familiar emission analyser used in the market is PEMS. The thesis aims to study various steady state and dynamic modelling techniques for developing a virtual emission analyser targeting diesel engines (Passenger cars), that will eventually substitute PEMS.

The emission quantities are a non-linear function of various engine parameters, which do not have standard empirical relations that can fit in for all operating conditions. Hence, the concept of data mining is chosen to determine the latent function between the engine variables and the tail-pipe emissions. The thesis considers the engine-out emissions, Diesel oxidation catalyst, NOx storage catalyst and Diesel Particulate Filter as a single system to be simulated. This is rather challenging since the catalyst and engine emissions are influenced by several ambient and operational conditions. The work targets on NOx, C02 and CO emissions under normal and regeneration modes of the catalyst.