EATS modelling towards zero emissions

1. Background

The environmental and health problems associated with local emissions from vehicle transportation is becoming more evident and thus more urgent to resolve than ever.

The system design of the Exhaust Aftertreatment System (EATS) is a result of many conflicting objectives and the geometry poses many challenges for modelling. This project aims at developing generic methods and models that can be used in industry for any specific EATS design.

2. Project description

In this project, a generic EATS, simplified, but capturing all relevant features of a production EATS will be manufactured. Detailed measurements in combination with 3D-simulations will characterize different transient phenomena. This will enable an engineering model (sets of 1D-models) of the simplified EATS.

Project objectives

1 To experimentally verify “difficult” conditions for high performance during cold-start and other transients. To characterize these conditions in terms of spatially resolved temperatures, residence times and concentrations.

2 To develop an engineering model that can couple spatial resolution (“simplified CFD”) with standard 1D-catalytic models.

3 Results

A PhD student has been recruited and will start in May 2019. To prepare for the experimental methodology, a MSc thesis project in presently on-going. A first version of the simplified EATS has been manufactures, see Figure 1

Figure 1 A simplified EATS with an inert monolith canned in a “reactor” with a deviating flow and potential thermal gradients.

In order to estimate the optimal positioning of a few thermocouples, a CFD model was developed see Figure 2.

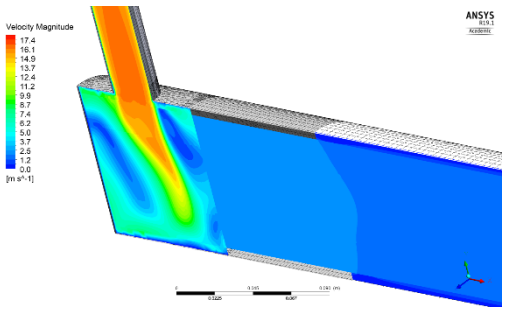

Figure 2 The temperature field in the EATS steady state operation.

By applying model-based Design of Experiments (DoE), an optimal selection of positions will be achieved for further experimentation.

4 Conclusions and outlook

The project is already getting useful results. The project will continue to combine modelling and experiments in an iterative approach to reach the project objectives.