

# Project report

## Project 1B – TSFS09

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September 18, 2025

### 1 Examination requirements

The objective of this project is to select, parametrize and validate models of each of the components of the engine. To pass, all models shall be addressed and the solutions (validations) properly described in your report. The project report should include:

- Briefly comment on the validation figures. Discuss the correlation with measurement data. Is your model accurate?
- After validation of models, all estimated parameters in different sub-models must be presented in a table.

### 2 Assignments

Select, parametrize and validate all necessary sub-models for the VEP-engine. For your convenience, they are listed in separate headings below.

All sub-models must be validated. Validation of a model means showing that the model and the data are consistent by comparing the output from the models (static or simulated) to the data from the measurements.

Identify the inputs, outputs and parameters for all sub-models. Adapt the model parameters for the constituent sub-models to the measurement data and show how well the model and measurement data agree. Describe how the validation has been performed for each sub-model and the parameter values you use.

In this section, the models developed in the previous chapter are compared against the measurement data. A template for the fuel injector is provided. Follow the style of this example for the rest of the models.

## 2.1 Fuel Injector

Parameter(s) value:  $c_{fi} = 0.0169$ ,  $t_0 = 6.5098 \times 10^{-4}$

Validation:

Injected fuel ( $m_{fi}$ ) and the injector opening times ( $t_{inj}$ ) were measured and available signals for a least squares fit using the backslash operator in Matlab. The validation of the fuel injector model is shown in Figure 1. As seen in the figure, the injector model performs well over the whole operating region.

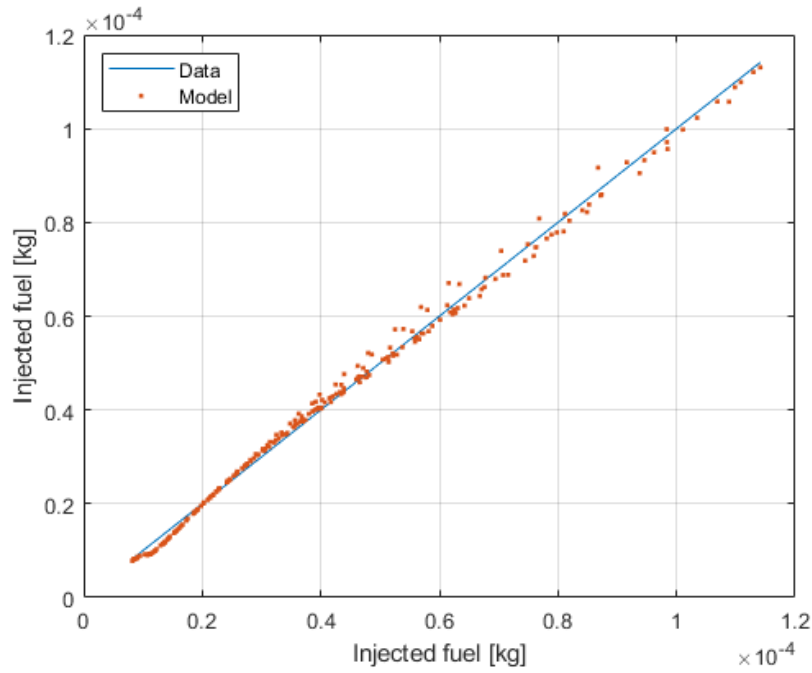


Figure 1: A validation plot of the injector model.

## 2.2 Throttle Flow

Parameter(s) value:

Validation:

## 2.3 Cylinder: Volumetric Efficiency

Parameter(s) value:

Validation:

## 2.4 Cylinder: Engine Temperature

Parameter(s) value:

Validation:

## 2.5 Cylinder: Torque

Parameter(s) value:

Validation:

## 2.6 Exhaust Flow

Parameter(s) value:

Validation:

## 2.7 Step Response: Throttle

Parameter(s) value:  $\tau_{th} = ???$ .

Validation:

## 2.8 Step Response: Lambda

Parameter(s) value:

Validation:

# 3 Table of Parameters

All estimated parameters in the different engine sub-models are summarized in table 1.

Table 1: Estimated parameters in engine sub-models. *Number of empty rows in front of each component is randomly selected and should not be inferred as number of parameters.*

Component	Parameter	Value
Fuel Injector	.	...
	.	...
Throttle Flow	.	...
	.	...
Volumetric Efficiency	(choose two/three parameters)	...
	.	...
Engine Temperature	.	...
	.	...
Torque	.	...
	.	...
Exhaust Flow	.	...
	.	...
Step Response: Throttle	.	...
	.	...
Step Response: Lambda	.	...
	.	...