TNO

Evaluating CH4 emission performance of OEM versus retrofitted CNG vehicles

B. Geluk
Automotive Powertrains
PTC

TNO | Knowledge for business

Introduction

A THC equivalent is proposed for the total hydrocarbon emissions limit value for natural gas vehicles.

The following equation is used to calculate the THC equivalent for natural gas vehicles:

$THC_e = K \cdot MHC + NMHC$ where:

$$K = \frac{1-\eta_M}{1-\eta_G}$$ where:

η_M = is methane conversion efficiency of a Methane Optimized Catalyst

η_G = is methane conversion efficiency of a Gasoline Optimized Catalyst

Test programme

To determine the CH_4 conversion efficiency of a methane optimized catalyst and CH4 conversion efficiency of a petrol optimized catalyst a measurement program was started at TNO.

Four vehicles were selected and prepared for the measurement program. One OEM CNG vehicle, two retrofitted CNG vehicles and one OEM petrol vehicle.

All emission tests were NEDC cycles driven on a chassis dyno.

The fuel used for the measurements was reference fuel. For the tests with petrol, reference petrol was used. For the tests with CNG, G20 was used.

CH_4 emissions were measured both upstream and downstream of the catalyst

Vehicles

Vehicle #1
OEM CNG vehicle
2008 Opel Zafira 1.6 CNG monofuel (odometer 10816)

Vehicle #2
Retrofitted CNG vehicle
2007 Peugeot 207 1.4 (odometer 61954)

Vehicle #3
Retrofitted CNG vehicle
2005 Toyota Yaris 1.3 16V VVT-I 5-drs (odometer 92617)

Vehicle #4
OEM petrol vehicle
2007 Opel Zafira 1.6 (odometer 46778)