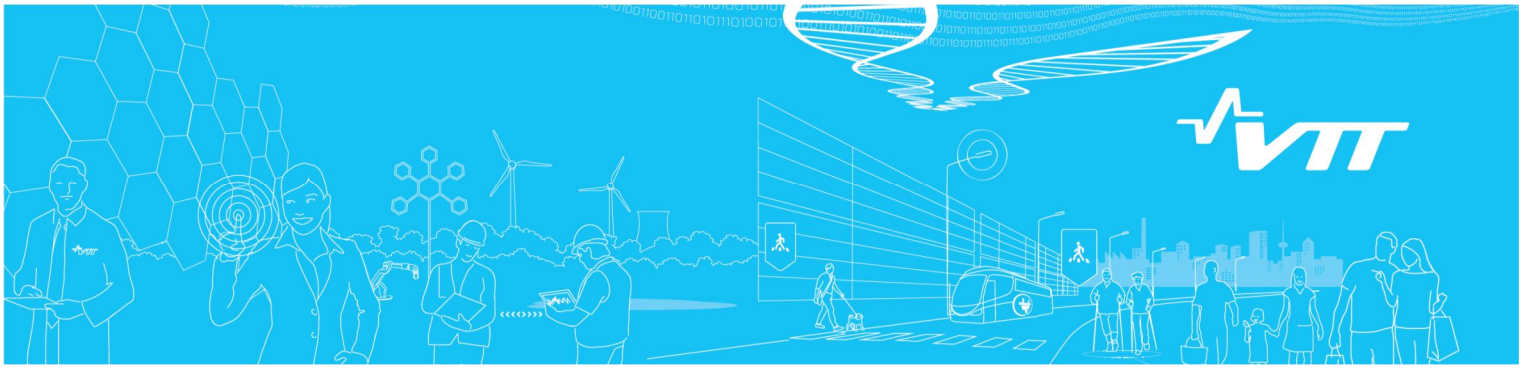

RESEARCH REPORT

VTT-R-05698-15

NH_3-sensor test in SCR aftertreatment unit

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Summary

In this study exhaust gas NH3 measurements were carried out with NH3 sensor in a SCR aftertreatment unit. The results were compared to Siemens LDS6 laser device and Gasmet DX4000 FTIR.

The results indicate that NH3-sensor is a promising technology for online monitoring of ammonia concentrations. The response time of the sensor is comparable to in-situ laser method. Also the sensitivity for small concentrations is good.

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Contents

1. Introduction

Exhaust gas NH3 measurements with NH3 sensor

Since SCR aftertreatment systems are widely used in power generation and transportation engine applications there have been an increasing need for online monitoring of NH_3 in exhaust gas. NH_3 is undesired compound in exhaust gas after the SCR unit thou it can appear when excess amount of urea is injected before the SCR unit. For monitoring and controlling the SCR system a reliable and accurate NH_3 sensor would be an ideal solution.

The goal of the measurements was to compare a commercially available ammonia sensor (Delphi) with other NH_3 measurements technics available at VTT's engine laboratory. Sensor was compared to Siemens LDS6 laser device and Gasmet DX4000 FTIR. Also condensing collection method was used in few measurement conditions.

2. Experimental

Measurements were performed with different ammonia levels, exhaust gas temperatures, flow rates and hydrocarbon concentrations. A lean-burn spark ignited natural gas engine with SCR catalyst and urea injection system was used for the measurements.

3. Results

Results indicate that the NH3-sensor is a promising technology for online monitoring of ammonia concentrations. Sensor response was linear compared to laser and FTIR though the concentration levels measured with sensor were obviously lower. The sensor is originally designed and calibrated for diesel applications and with re-calibration the sensor would most likely work more accurately in natural gas applications.

Since the sensor response was linear it could be easily corrected with simple $y = a \times x + b$ funtion to meet the results measure with other instruments. The response time of the sensor is comparable to in-situ laser method. Also the sensitivity for small concentrations is good.