

## EXPERIMENTAL INVESTIGATIONS AND METHODOLOGY OF MAKING ENERGY BALANCE OF THREE-WAY EXHAUST GASES CATALYTIC REACTOR

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*The paper presents selected experimental results for three-way exhaust gases catalytic reactor. Particular attention is paid to the difference in exhaust gases temperature measured at the catalyst inflow and outflow and the conversion of exhaust gases basic components. The energy balance proposed for the reactor takes into account the calculations of the effects of thermal reactions taking place in it. It is indicated that difference in temperatures of exhaust gases flowing through catalyst could be applied as a diagnostic signal.*

Key words: energy balance, catalytic reactor

### 1. Introduction

All over the world, fighting air pollution is regarded as one of the top priorities in environmental protection. Adopted regulations enforce solutions leading to the reduction in air pollution. Ever increasing number of vehicles causes larger fuel consumption on a global scale, which in turn, results in higher emission of toxic compounds into the atmosphere.

The major compounds contaminating the atmosphere, emitted by engines, are: carbon monoxide CO, nitrogen oxides NO<sub>x</sub>, hydrocarbons CH and also aldehydes RCHO and other chemical compound harmful to the environment.

Ensuring that limits for the emission values of the poisonous components of exhaust gases are kept low in accordance with the regulations in force, we have to rely on additional devices neutralising exhaust gases outside the engine. Catalytic purification of exhaust gases turns out to be the best means of reducing the above-mentioned contaminants. Three-way catalysts (TWC), used at present, neutralise three major toxic components of exhaust gases simultaneously.

Long lasting service and extreme operating conditions as well as occasional use of poor quality fuels causes the reactor degradation, which leads to vehicles increased adverse effect on the environment. It is therefore important to be able to evaluate the reactor performance and diagnose its technical state. The methods for diagnosing catalytic reactors can be divided into three groups:

- methods where sensors detect toxic compounds concentration (direct detection of reactor efficiency),
- methods where sensors detect oxygen concentration (detection of oxygen storage space losses),
- methods where there are temperature sensors (detection of the amount of heat released).

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