

# A Hydrodynamic Model of a Common Rail Injector with Fuel Leakage Prediction

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# Abstract

- A hydrodynamic model of a Common Rail injector by Bosch has been developed in the simulation tool GT-Fuel v.2017 by Gamma Technologies
- The mathematical model corresponds to the setup of the Common Rail injector and high pressure circuit of the Common Rail injection system as installed on a test bench in the FIE Lab VTP Roztoky.
- Due to the changes in the main components of the simulation environment GT-Fuel, the model was developed from scratch
- The model features the following main components:
  - 1D or 0D hydrodynamic models of all the main hydraulic parts of the CR injector
  - Mechanical models of the injector moving parts (needle, control piston, etc.)
  - Simplified model of the solenoid-actuated control valve
  - Hydraulic models for fuel leakage through needle and control valve guide including the prediction of the clearance between deforming solid parts based on the instantaneous acting pressure.
  - Basic models of the high-pressure lines, rail and high-pressure pump
- A basic validation of the hydrodynamic model predictions has been done using the experimental data on the rate-of-injection profile measured in FIE Lab VTP Roztoky



# Informace

- **Kontaktní osoba:** Ing. Marcel Diviš, Ph.D., Marcel.Divis@fs.cvut.cz
- **Soubor:** CR\_injector\_2017\_001.gtm
- **Podrobný popis:** Diviš, M.: A Hydrodynamic Model of a Common Rail Injector with Fuel Leakage Prediction. Technická zpráva Z17-35, ČVUT v Praze, 2017
- **Technické parametry:** Model pro běh vyžaduje programové prostředí GT-Suite, Gamma Technologies včetně komponenty GT-Fuel verze v.2017. Model je kompatibilní s operačními systémy Windows a Linux.
- **Ekonomické parametry:** Model umožňuje matematické simulace funkce vysokotlakého čerpadla Common Rail a dalších komponent vstřikovacího zařízení, což může ve výsledku vést k redukci nákladů na experimentální ověřování a optimalizaci funkce vstřikovacího zařízení.
- **Příklady užití modelu:**
  - Diviš, M.: A Hydrodynamic Model of a Common Rail Injector with Fuel Leakage Prediction. Technická zpráva Z17-35, ČVUT v Praze, 2017



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