[1] MESH TYPE ANALYSIS FOR SIMULATING CAVITATION PHENOMENA IN INJECTION NOZZLE: THEORETICAL AND NUMERICAL ANALYSIS

Blaž Vajda, Zoran Žunič, Breda Kegl, *University of Maribor, Faculty of mechnical engineering, Engine research Laboratory, Maribor, Slovenia*

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Abstract

The evaporation of diesel fuel in the injection nozzle significantly influences the injection characteristics and spray formation process. In present paper the influence of different type of mesh and density of mesh on the cavitation phenomena is analyzed. The theoretical backgrounds of cavitation occurrence presented in the first part of the paper are followed by the numerical analyses of two-phase flow (liquid and gas phase) and single phase flow. The numerical analysis is made for two different type of fluid diesel (D2) in biodiesel (B100) using computation fluid dynamic (CFD) program FIRE. Numerical analysis also includes different type and density of meshes and their influence on results. The two-phase flow is analyzed using the two-equation approach, where all conservation equations are solved for every phase. The results are compared for different meshes and different types of fluid (D2 and B100). The result show how important is the structure of used mesh and its density.

Key words: two-phase flow, cavitation, injector nozzle, CFD, nodalisation analysis.

ANALIZA TIPA MREŽE U SVRHU SIMULACIJE POJAVE KAVITACIJE U MLAZNICI BRIZGAČA: TEORETSKA I NUMERIČKA ANALIZA

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Rezime: Isparavanje dizel goriva u mlaznici brizgača značajno utiče na karakteristike ubrizgavanja i proces formiranja mlaza. U ovom radu se analizira uticaj različitih tipova i gustina mreža na proces stvaranja kavitacije. Prikazane su osnove nastanka kavitacije, navedene u prvom delu rada, potom sledi numerička analiza dvofaznog (tečnost i gas) i jednofaznog protoka. Numerička analiza se odnosi na dva različita fluida, dizel gorivo (D2) i biodizel (B100) koristeći kompjuterski CFD program FIRE. Numerička analiza takođe uključuje različite tipove i gustine mreže i njihov uticaj na rezultat. Dvofazni protok smo analizirali koristeći pristup sa dve jednačine u kojima se jednačine održavanja rešavaju za svaku fazu. Upoređivali smo razultate za različite tipove mreže i gustine goriva (D2 i B100). Rezultati ukazuju na značaj strukutre mreža i njihove gustine.

Ključne reči: dvofazni protok, kavitacija, mlaznica brizgača, CFD, analiza mreže.

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