عنوان مقاله:

Effect of Surface Roughness on Vortex Length and Efficiency of Gas-oil Cyclones through CFD Modelling

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نویسندگان:

Seyed Masoud Vahedi - *M.S. Student, Department of Mechanical Engineering, Semnan University, Semnan, Iran*

Farzad Parvaz - *PhD. Candidate, Department of Mechanical Engineering, Najafabad Branch, Islamic Azad University, Isfahan, Iran*

Mohsen Khandan Bakavoli - *M.S. Student, Department of Mechanical Engineering, Semnan University, Semnan, Iran*

Mohammad Kamali - *M.S. Student, Department of Mechanical Engineering, Najafabad Branch, Islamic Azad University, Isfahan, Iran*

خلاصه مقاله:

Separation of suspended droplets in a fluid flow has been a great concern for scientists and technologists. In the current study, the effect of the surface roughness on flow field and the performance of a gas-oil cyclone is studied numerically. The droplets and the turbulent airflow inside the cyclone are considered to be the discrete and continuous phases respectively. The Reynolds stress model (RSM) is employed to simulate the complex, yet strongly anisotropic, flow inside the cyclone while the Eulerian-Lagrangian approach is selected to track droplet motion. The results are compared to experimental studies; according to the results, the tangential and axial velocities, pressure drop, and Euler number decrease when the surface roughness increases. Moreover, the cyclone efficiency drops when the vortex length decreases as a result of a rise in surface roughness. The differences between the numerical and experimental results become significant at higher flow rates. By calculating the impact energy of droplets and imposing the film-wall condition on the walls, splash does not occur.

کلمات کلیدی:

Roughness, Reynolds Stress Tensor, Eulerian-Lagrangian, Oil-Gas Cyclone, Two-phase flow