

Numerical Analysis on the Effect of Abrasive Parameters on Wall Shear Stress and Jet Exit Kinetic Energy

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Abstract : Abrasive Water Jet (AWJ) machining is a relatively new nontraditional machine tool used in machining of fiber reinforced composite. The quality of machined surface depends on jet exit kinetic energy which depends on various operating and material parameters. In the present work the effect abrasive parameters such as its size, concentration and type on jet kinetic energy is investigated using computational fluid dynamics (CFD). In addition, the effect of these parameters on wall shear stress developed inside the nozzle is also investigated. It is found that for the same operating parameters, increase in the abrasive volume fraction (concentration) results in significant decrease in the wall shear stress as well as the jet exit kinetic energy. Increase in the abrasive particle size results in marginal decrease in the jet exit kinetic energy. Numerical simulation also indicates that garnet abrasives produce better jet exit kinetic energy than aluminium oxide and silicon carbide.

Keywords : abrasive water jet machining, jet kinetic energy, operating pressure, wall shear stress, Garnet abrasive

Conference Title : ICAME 2015 : International Conference on Automotive and Mechanical Engineering

Conference Location : New York, United States

Conference Dates : June 04-05, 2015