Simulation and investigation of effective parameters on low-carbon steel laser welding process using fluent software

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Abstract
In this paper, laser beam welding of a rectangular piece of steel was simulated using Fluent software. Physical properties of analytical field was constant and its changes with temperature was ignored. In the present work, effect of tool speed and laser power on temperature distribution of workpiece surface and different depths in the plane of symmetry and also maximum of temperature and depth of penetration were investigated. Using a macro code, geometry generation and meshing of the analytical field by helping required geometric parameters were provided for software. Moreover, laser radiation power was exerted by writing an UDF in the fluent software. In this case, it was assumed that the workpiece is stationary and gaussian thermal source model defined in UDF moves with the intended speed. Results show that at a constant power, maximum temperature of the workpiece decreases with increasing heat source speed, moreover, in this case, gradient of temperature in front of the workpiece and behind of it, increases and decreases respectively. It is found that the temperature in the depth of the workpiece increases with increasing the power.

Keywords: Simulation, Laser welding process, CFD, Moving source, Finite element volume, Low carbon steel.