

Investigation of Beam Defocusing Impact in Millisecond Laser Drilling for Variable Operational Currents

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Abstract : Owing to its exceptional performance and precision, laser drilling is being widely used in modern manufacturing industries. This experimental study mainly addressed the defocusing of laser beam along with different operational currents. The performance has been evaluated in terms of tapering phenomena, entrance and exit diameters etc. The operational currents have direct influence on laser power which ultimately affected the shape of the drilled hole. Different operational currents in low, medium and high ranges are used for laser drilling of 18CrNi8. Experiment results have depicted that there is an increase in entrance diameter with an increase in defocusing distance. However, the exit diameter first decreases and then increases with respect to increasing defocusing length. The evolution of drilled hole from tapered to straight hole has been explained with defocusing at different levels. The optimum parametric combinations for attaining perfect shape of drilled hole is proposed along with lower heat treatment effects for higher process efficiency.

Keywords : millisecond laser, defocusing beam, operational current, keyhole profile, recast layer

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