Optimisation of Paint Removal Operation Using Waterjet Cleaning Process

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Abstract The need of cleaning automotive paint without secondary pollution has recently become a major concern globally. The waterjet technology has extended its application to include surface treatment, machining, cleaning and cutting of materials. Plain waterjet is frequently used for cleaning since its offers environmentally friendly concept which results near zero pollution to the surroundings. This research aims to analyse and optimise the use of multiple passes in waterjet cleaning process for removal of automotive paint using response surface method (RSM). The effect of surface roughness (R_a) and its topography were analysed. RSM, analysis of variance (ANOVA), fractional factorial at two levels were utilized to optimize the plain waterjet process parameters for effective cleaning of paint. It was found that the lateral feed and pressure were the most significant control factors in influencing the cleaning performance criteria. Mathematical model was developed using linear regression analysis to predict the surface roughness in terms of cleaning parameters of plain waterjet process. The model had successfully predicted the R_a of the plain waterjet cleaned automotive parts within the limit of this study. The recommended optimal parametric combinations for better R_a were found to be waterjet pressure of 34.0 MPa, traverse rate of 500 mm/min, standoff distance of 10 mm, number of passes of 1 and lateral feed of 0.6 mm.

Keywords Waterjet cleaning · Paint removal · Multiple jet passes · Surface roughness · RSM

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Recent Trends in Manufacturing and Materials Towards Industry 4.0,
Lecture Notes in Mechanical Engineering,
https://doi.org/10.1007/978-981-15-9505-9_43