Investigation on Capability of Reaming Process using Minimal Quantity Lubrication

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An investigation on reaming using minimal quantity lubrication (MQL) was carried out with the scope of documenting process capability using a metrological approach. Reaming tests were carried out on austenitic stainless steel, using HSS reamers with different cutting data and lubrication conditions. The reaming operations were compared with respect to a number of evaluation parameters, both hole quality (diameter, roundness, cylindricity and surface roughness) and cutting forces (reaming thrust and torque). Absolute average values as well as experimental standard deviations of the evaluation parameters were calculated, and uncertainty budgeting was performed for all measurands. Results show that reaming operations at lower cutting speed and feed produce low process scatter. The use of smaller depth of cut (i.e. smaller reamer diameter) resulted in larger reaming torque scatter than when a larger depth of cut was employed. The suitability of MQL for reaming was proven under the investigated process conditions, concerning both the quality of the machined holes, in terms of geometrical characteristics and surface finishing, and the process quality, with respect to reaming torque and thrust, along with their repeatability.