Extended Abstract

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Specific effects of worker on surface integrity of final product

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Abstract:

Requirements of product precision in chain supply in automotive industry are usually on extreme high level. Usually, there is focus on the fields of process control, productivity, capability, reliability and repeatability of all the preparatory and manufacturing steps. But there is sometimes one area, which is in the background, protection of parts before sweat aggressiveness. In this project, you can find out analysis of experiment with influence of surface behavior of non-ferrous part by the sweat of the worker or operator. Research team had opportunity to observe and analyze influence of different level of sweat aggressiveness during controlled time-period to find out correlation between supply time, sweat and protection of high precision part for automotive industry. This paper primarily investigates productivity dependent surface integrity characteristics with keen focus on role of machining environments in machining of Inconel 718. Further a model has been proposed and developed for better understanding of sustainability in machining. For this high-speed turning of Inconel 718 at varying material removal rate (MRR) levels depicting productivity rates has been carried out under dry, flood coolant and water vapor machining environments, and then the resultant surface integrity is investigated in terms of surface roughness, surface damage and residual stresses. Later sustainability assessment has been also carried out using the developed model. The results show that good surface finish and residual stresses in compressive regime can be well ensured in high-speed machining range with low MRR under water vapor machining environment, while the same being feasible at high MRR under dry cutting. However, the sustainability assessment gives highest product sustainability index of 82.92% at medium MRR under water vapor machining environment which emphasizes this to be a suggested favorable condition considering both, better surface integrity as well as sustainable cleaner machining alternative. Thus use of water vapor as coolant and lubricant in machining seems to be an eco-friendly machining technique and hence a better green manufacturing technology. This paper presents an overview of the past research on Surface Integrity (SI) studies in the context of machined components from a range of work materials including stainless steels, Ni and Ti alloys, hardened steels for dies and molds, bearings and automotive applications. Typical surface alterations such as phase transformations, micro hardness and residual stress are discussed and correlated with the functional performance of the machined products. A summary of past and current modelling efforts is then presented along with projections for developing predictive models for SI and means for enhancing product sustainability in terms of its functional performance. While the world is moving towards achieving sustainable development goals for responsible production and consumption, there is a need for metrics deployment for lower practical levels. From a manufacturing perspective, definitions of sustainability indicators are required for industrial processes and operations. These metrics encourage the evaluation of manufactured parts and whether they meet the quality requirements in both a qualitative and quantitative way. The present contribution proposes a framework for defining a structured set of metrics customizable for operations in different manufacturing technologies. In order to validate the proposal, an experimental data analysis of turning operations was completed and the surface integrity was defined as the control feature. The selected material was AISI 1018 and the main process parameters were controlled in order to identify their influence—not only in the final mechanical quality of the part, but also in the sustainability indicators. To achieve this goal, a set of experiments was performed wherein some of the fundamental machining parameter values were fixed, while other key parameters were modified. The results obtained helped to determine the criteria for predicting the quality of the turning operation when the effects are not readily evident in visual or dimensional inspections, as well as in evaluating the environmental impact that guarantees optimal part manufacturing.

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