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EVALUATION OF MACHINING-INDUCED CHATTER AND PART QUALITY IN TIAL ALLOYS TURNING PROCESSES BY MEANS OF HARMONICS ANALYSIS

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Titanium alloys have been reported as potential materials for aeronautical and automotive applications due to their interesting mechanical properties, combined with their low density. The manufacturing processes developed for these alloys require finishing machining operations to improve the surface quality of the parts and to meet the desired geometrical tolerances. Nevertheless, titanium aluminides exhibit extremely low machinability in comparison to traditional titanium alloys. The combination of the low thermal diffusivity of these materials and the high chemical affinity and friction coefficient with the cutting tools accelerate tool wear phenomena and lead to a deterioration of the part surface quality. Moreover, the mechanical properties of titanium aluminides contribute to increase the cutting forces which generates tool repulsion resulting in undesirable vibration or chatter phenomena. In this paper, the machining suitability of the turning process of Ti48Al2Cr2Nb titanium aluminide has been evaluated based on the analysis of chatter phenomena and the inspection of the surface roughness and roundness tolerance of the machined part. Experimental turning tests have been carried out by varying the main parameters of the process, cutting speed, feed rate and depth of cut, with the objective of determining the best cutting combination. For this purpose, a harmonic analysis methodology of the roundness profile based on the application of the discrete Fourier transform (DFT) has been employed. This technique has made it possible to isolate the vibration-induced machining effects from the lower frequency defects generated by part bending and to relate them to the surface quality and geometrical accuracy of the machined part.

Keywords: Roundness Tolerance, Titanium Aluminides Machininc, Harmonics Analysis, Chatter Phenomena

CHARACTERISATION OF THE PERFORMANCE OF A STRUCTURED LIGHT DIGITISING SENSOR BY USING DIFFERENT MATERIALS AND SURFACE FINISHES

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The advantages of non-contact digitising systems over contact systems are undeniable. They allow capturing more information per unit of time with less accessibility problems and without alter the digitised surface. Although many of these systems have been developed with the aim of replacing contact systems in metrological verification tasks, generalist techniques such as photogrammetry, structured light, etc., have been developed over the years for digitising archaeological remains, works of art or living biological systems, among others. As is the case for non-contact measurement-oriented systems, for these generalist systems there are still difficulties in positioning them along a metrological traceability chain if they are required for any kind of measurement. This is due to the lack of specific standards, as well as the strong influence of the optical properties of the digitised surface on the quality of the results obtained. It is therefore necessary to develop calibration procedures and characterisation work to analyse this influence. The aim of this work is to characterise the metrological performance of one of these generalists structured light devices, Einscan-SP by Shining 3D, in the digitising of different calibration spheres made of different materials (WC, Al2O3, ZrO2, etc.) with different surface finishes (shot-blasted, polished, coated). As quality indicators, the number of points captured, the quality of the point cloud as well as the dimensional and geometrical deviation from the results obtained with a high-performance contact measurement system shall be used. Apart from the raw data, the influence of applying filtering to the captured clouds is analysed. The results of this work allow recommendations to be made regarding the material and finish of the spheres to be used, as well as the filtering to be applied, if necessary, in order to assess the metrological performance of this type of equipment.

Keywords: Structured Light, Characterisation, Material, Surface Finish

METROLOGICAL ASSESSMENT OF MICRO-TEXTURED EDM ELECTRODES BY ELECTROFORMING.

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Surface engineering makes use of functional and aesthetic textures to meet different needs in the development of new products, with high-value enriched features. At present, the use of additive manufacturing is bringing many advantages in its integration into advanced hybrid manufacturing processes. The direct application of textures on 3D models is a viable, fast and sustainable solution in many of these technologies by reducing the consumption of resources in materials and energy, of the additional processes that have been commonly applied in these applications.

One of the processes that allows texturization of materials with great hardness is sinker electro discharge machining. This process, although slow, allows to obtain textures in small dimensions with very high precision, difficult to achieve by conventional processes. However, one of the aspects that make it a slow and expensive process is the manufacture of electrodes, especially those with complex geometries.

Therefore, work is being done to solve this aspect, combining the additive technology of stereolithography by mask (MSLA) and the electroforming process to generate micro-textured copper electrodes with some structured and bioinspired textures. The model parts are generated with the textures in MSLA, which are then metallized on the functional surfaces before being introduced into the electrolytic bath to generate the electroforms with the appropriate thickness. This work presents the results of the metrological assessment from the CAD modeling to the electroeroded part, including the generated model part and the electrode made from it. This work is being developed in the Integrated and Advanced Manufacturing research group of the University of Las Palmas de Gran Canaria and in collaboration with the Engineering and Materials and Manufacturing Technology research group of the University of Cadiz.

Keywords: Metrological Assessment, Micro-Texturing, Sinker Electro Discharge Machining, Additive Manufacturing

OPTIMIZING THE SUPPLY CHAIN OF INTENSIVE CARE UNIT BLOOD CULTURE SAMPLES TO CLINICAL MICROBIOLOGY LABORATORY USING LEAN SIX SIGMA

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This paper targets the application of Lean Six Sigma (LSS) framework to microbiological diagnosis processes performed in a clinical microbiology laboratory of a tertiary level Spanish hospital. The increase in clinical samples and diagnostic requests during the COVID-19 pandemic led many microbiology laboratories to optimize their processes. Blood culture samples are one of the most critical cultures because a blood infection may endanger the individual's life. Not only the speed and quality of the diagnosis is important, but also the efficiency in the sample's supply chain to the laboratory and its preservation conditions. To this end, the supply circuits of blood culture samples to the microbiology laboratory play a major role in the process, being the samples from intensive care units (ICUs) among the most critical.

The work presents the analysis and optimization of the ordering and supply process of blood culture samples from an intensive care unit to a microbiology laboratory using LSS methodology and tools. The process starts with the blood culture's order generation from the intensive care unit specialist and ends with the final reception of the blood culture sample in the pre-analytical area of the microbiology laboratory.

The project is structured considering DMAIC problem-solving methodology. Main lean tools used for the supply process analysis and optimization were Gemba Walk, Value Stream Analysis (VSA) and mistake proofing. After project results validation with