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OPTIMIZATION OF CUTTING INSERT GEOMETRY USING DEFORM-3D: NUMERICAL SIMULATION AND EXPERIMENTAL VALIDATION

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Abstract
In this research work an attempt has been made to minimize flank wear of uncoated carbide inserts while machining AISI 1045 steel by finite element analysis. Tool wear is the predominant factor that causes poor surface finish and is responsible for the dimensional accuracy of the machined surface. The quality of component produced decides the effectiveness and competitiveness of any manufacturing industry. In this analysis, the effect of tool geometries on performance measures of flank wear, surface roughness and cutting forces generated are evaluated. Three levels of cutting insert shape, relief angle and nose radius are chosen. Taguchi's Design of experiment (DOE) is used to design the experiments. For three parameters and three levels a suitable L_9 Orthogonal array is selected. Based on the designed experiment, simulation analysis is carried out using DEFORM-3D, a machining simulation and analysis software and the output quality characteristics are analysed by statistical techniques like Signal-to-Noise (S/N) ratio and Analysis of Variance (ANOVA). A validation finite element simulation is conducted with the obtained optimum tool geometry, which is also verified experimentally. It is observed that the performance of the determined tool geometry provides satisfactory results. 21 refs.
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Key Words: *Tool Geometry, Flank Wear, FE Analysis, S/N Ratio, ANOVA, DEFORM-3D*

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DESIGN OF MODERN HYDRAULIC TANK USING FLUID FLOW SIMULATION

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Abstract
Hydraulic power units are one of the most commonly used power sources in industry. The progress in recent years has offered high efficiency and reliable hydraulic components, yet the hydraulic tank design is often neglected part of the development.

The paper presents the development of industrial 400 litre hydraulic tank. In order to reduce oil swirling and improve stability of fluid flow, CFD simulations of oil flow inside hydraulic tank were made. Several variations of new hydraulic tank designs are compared with standard industrial tank. Furthermore, to achieve steady flow through the entire reservoir and reduce the phenomenon of oil swirling, newly-developed diffuser is used. Consequently a full scale hydraulic power unit was built according to obtained results. 11 refs.
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Key Words: *Hydraulic Tank, Fluid Flow, Simulation, Design*

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SEMI-DISCRETE EVENTS AND MODELS IN CATEGORICAL LANGUAGE

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Abstract
Some problems related to discrete event simulation and model validation are discussed. The validity of models with simultaneous events is discussed. The basic concepts of the theory of categories are recalled and applied to model construction process. The language of the theory of categories is used to treat some problems in modelling and simulation of discrete event, namely the ambiguity that may appear when simultaneous events occur. It is pointed out that the theory of categories may be useful as a unified language for model description. In particular, the categorical point of view can be useful while treating the model validity. Using this language we can get a high level of abstractions in model building. 14 refs.
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Key Words: *Discrete Events, Modelling and Simulation, Devs, Category Theory*

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MODELLING AND CONTROL OF TINNING LINE ENTRY SECTION USING NEURAL NETWORKS

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Abstract
The objective of this paper is the development of a mathematical model and the design of the control of the drives of a tinning line entry section, using artificial neural networks. The first part of the paper describes the mathematical models of the individual sections of the processing line: a decoiler and four traction rolls joined together by a steel strip creating a flexible linkage. The drive models have been supplemented by neural controllers in such a way as to satisfy the requirements specified for the individual drives and determined by the sheet metal tinning technology. The paper is concluded with a description of the whole model of the tinning line entry section together with the neural controllers and with an evaluation of the achieved simulation results. 16 refs.
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Key Words: *Control, Neural Network, Line Entry Section, Mathematical Model*