PhD thesis project
Project carried out in collaboration with a public research center

DEVELOPMENT OF INNOVATIVE COATING TECHNOLOGY "ESSC: ELECTRO STATIC SOLID LUBRICANT COATING" TO PRODUCE HIGH PERFORMANCE COATED TOOLS

Related Research Field

Mechanical Engineering (Manufacturing Technology): Machining of materials has received substantial attention due to the increasing use of machining processes in various industrial applications. This treatment identifies the major problem areas and relates observed performance to fundamentals of physics, chemistry, materials.

Description

In many machining operations, coated cutting tools are used to improve machining process performance. But, with the advancement of hard materials, there is a need to look into the advanced coated cutting tool material to withstand the high temperature generation in order to reduce tool wear. In this research work, the feasibility of a **novel approach** for developing a new generation of cutting tool coating technique namely **ESSC** (Electro Static Solid lubricant Coating) will be explored. This approach is based on an innovative **solid lubricant coating** of nano-sized particulates with a science based new methodology for specific hard machining. The investigators propose to explore if the new **electro static based coating** method will work to determine if such coated tools can compete commercially. If successful, this approach may provide an economical way to synthesize protective coatings on cutting tools, **far less expensive than traditional chemical or physical vapour deposition**. Such high-performance cutting tools reduce frequency of tool replacement and improve productivity.
Accurate prediction and thus reliable simulation of machining performance can only be achieved if and only if the behavior of work material is properly accounted for. Because metal cutting involves a great deal of plastic deformation of the work material, great strains, fracture; as a result, high process temperatures, the modeling of work material behavior present significant difficulties. As a result, the known attempts of such modeling were not successful as they concern with only one or very few facets of material behavior in machining. The proposed project aims to develop and apply new breakthrough models of material behavior in machining based upon the application of major ideas of physics of strength and facture control. Once developed these models will be used for simulation of practical machining operation to increase their efficiency, improve reliability of the machined parts and optimize machining operations and cutting tool design.

Salary

35200 euro per year

Contact

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