

A review on Advanced Manufacturing Processes

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Abstract:

Researchers have explored a number of approaches to combine different manufacturing processes with the similar objectives of improving surface integrity, increasing material removal rate, reducing tool wear, reducing production time and extending application areas. This paper aims to give overview of modern manufacturing processes that are currently under use/research in the manufacturing arena. This review paper starts with the classification of current manufacturing processes based on processes being defined as additive, subtractive, transformative, joining and dividing. Definitions of hybrid processes from other researchers in the literature are then introduced. Finally, this paper attempts to propose possible definitions of Advanced Manufacturing Processes along with the classification, followed by discussions, developments, limitations and future research needs.

Key words: High Speed Machining, Machining, Grinding, Micro Electro Chemical Machining, Forming, Turning, Sintering, CNC, process integration, process capability, hybrid manufacturing processes, transformative processes

I. INTRODUCTION

Currently, manufacturing companies have to compete in a more and more global market. This global competition has resulted in the development of new materials, processes and products. The most important aspect of these is the advanced design and manufacturing concepts involved in their production. The necessity to use newer materials for different applications and control of their dimensional accuracies has led to evolution of modern manufacturing methods or processes. This paper reviews some of the modern manufacturing methods which are used currently / under research and their applications. This would help in deciding whether these processes are a viable alternative to what are currently under practice.

II. MANUFACTURING PROCESSES

Manufacturing transforms bulk material into finished products. This process of transformation can be done by putting material together, by moving material from one region to another and subtracting unwanted material [1].

A. *Advancements in Conventional Machining Processes: High Speed Machining*

Developments in ultra-hard cutting tool materials, together with improved machine tool spindle and drive systems, have led to the ability to machine at much higher cutting speeds than previously possible. High speed machining allows high material removal rates while maintaining relatively low feeds.

B. *Hard Machining*

Hard machining is a machining process carried out on "hard" materials (where "hard" is defined as having hardness greater than 45Rc). The process is intended to replace or limit traditional grinding operations that are expensive, environmentally unfriendly, and inflexible.