Optimized automatic selection of turning cutting tools conditions based on data from manufacturer Sandvik Coromant

Oussama Jaider
Professor, Depart. of Mechan. Engineering
FSTT,University of Abdelmalek Essaadi,
Tangier, Morocco
angus_oussama@hotmail.com

Abdelilah Elmesbahi
Professor, Depart. of Mechan. Engineering
FSTT,University of Abdelmalek Essaadi,
Tangier, Morocco
elmesbahi_abdeilah@hotmail.com

Ahmed Rechia
Professor, Depart. of Mechan. Engineering
FSTT,University of Abdelmalek Essaadi,
Tangier, Morocco
rechia@hotmail.com

Summary

Selection of a proper cutting tool plays a significant role in achieving consistent quality and in controlling the overall cost of manufacturing. The present paper describes an approach to build of a computer interface support for automatic and optimized selection of cutting tools conditions for automated machinability assessment of manufacturing features for turning. Data-tools were collected from recent Machining Handbook of world's leading manufacturer of tools Sandvik Coromant. This application works conjointly with a feature automatic recognition system for rotational part. Examples are given to show how this approaches, systematically, lead to an optimum cutting-tool for a specific machined part.

Keywords: CAD/CAM, CAPP, Manufacturing Feature Recognition, Automatic cutting-tool selection for turning.

1. Introduction

Process planning is an activity that consists in selecting the necessary processes, tools, appropriate parameters and operation sequencing to manufacture a part. The traditional way to solve process-planning problems is to leave it to the manufacturing experts that translate the global geometry of the part into a group of machining features well adapted to a defined machining process, relying on their own experience. This manual approach is time consuming and, usually, not consistent as the quality of the process plan depends on the planners' experience [1, 2]. Disadvantages of manual approaches led to development of automated approaches that aimed to reduce the probability of errors and inconsistencies. Computer Aided Manufacturing Process Planning is one of the most important advances in the area of manufacturing engineering which plays a critical role, linking Design and Manufacture. CAPP determines automatically the use of available resources, including machines, cutting inserts, holders, appropriate machining parameters such as cutting speed, feed rate, depth of cut, and generates automatic sequences of operations and instructions to convert a row material into a required product with good surface finish [3]. The production cost of a manufacturing component depends upon cost of workpiece material, tooling cost, and recurring expenses. Thus, it is clear that the only scope to reduce the overall cost of a workpiece is to focus on the tooling cost and machining time. Selecting an optimum insert, optimum cutting conditions, and optimum sequences affect directly the workpiece cost [1]. More than one hundred CAPP systems have been reported in the literature. However, the link between CAD and CAPP systems is still not integrated as desired [4]. On one hand, the data of the neutral files such as STEP, IGES generated by CAD systems consist of geometric and topological information, these data cannot be used for direct application to process planning since CAPP systems require part form feature information, not geometric and topological information, CAD is usually geometry-based, whilst CAPP/CAM are feature-based and domain-dependent, which results in unsatisfactory practical implementation, or a common weakness of CAPP systems [5]. On the other hand, Geometrical and

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