Optimal lot sizing with CNC machines

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Abstract

An algorithm is presented for determining the optimal machining parameters for each of a set operations required to produce a product in the economic lot sizing context using a CNC Machine Tool. The cost components considered are: (1) inventory carrying cost, (2) cost of machine and operator time, (3) the cost of tools consumed and (4) the set up cost for producing each lot. The optimizing criterion is minimum total cost comprising the above components on a unit time basis. It is shown that the optimal machining parameters could be outside what is considered the efficiency range in traditional machining economics.

Keywords and phrases : Machining economics, inventory, optimization, CNC Machines.

Introduction

A number of articles have appeared in the literature dealing with the selection of optimal machining parameters to machine a component for various criteria [1, 2, 3, 7, 8, 14, 15]. The most commonly used criteria have been minimum cost, maximum production rate, and maximum profit rate. Ramaswamy and Lambert [12] also included in-process inventory cost and penalty cost for due date violations in the total cost model for single pass turning operation. Koulamas [6] has developed a queuing model with the service station subject to breakdown while it is busy, to determine the optimal batch size in a machining economics context. He also considered stochastic tool lives. Kee [5] has developed optimization strategies for selecting optimum cutting conditions for constrained multi-pass rough operations on CNC and conventional lathes using maximum production rate as the criterion. Ramaswamy [11] has analyzed the the