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SELECTED PAPERS FROM
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ICOM'08

Editors

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Pin type reconfigurable Clamping ability evaluation for Setup-Free Technology

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ABSTRACT

Setup-free machining process has been conducted in the previous research of the principal researcher for machining six surfaces of block-like components. By using specially designed equipment, six surfaces of a block like component can be machined in single process without setup preparation. This paper describes the utilization of a pin type reconfigurable clamping integrated with setup free attachment in order to increase the part geometry could be clamped. The pin type fixture is attached for locating and clamping of an irregular shaped workpiece during manufacturing processes. Performance of the improved attachment is analyzed by means of computer simulation and machining experiments. Boolean operation of CAD Solid model is the tool to calculate the clamping area between pin-end and workpiece. Optimum pin configuration respect to the part geometry is determined by performing clamping evaluation process.

1. INTRODUCTION

The ultimate goal of challenges for the factory automation of low repetitive manufacturing will be to realize automated manufacturing of products in shortened product life cycle and increasing requirement for quality and reliability.

Typical application may be fabrication of various fixtures and prototypes. Flexible Manufacturing Systems (FMS) is a viable solution in which machining equipments are operated around the clock, with attendance by workers during small part of the operation hour. The reason is that substantial preparation for fixture and others necessary for each machining process.

Fixturing system can be categorized into two dedicated modular and pin-type system. A pin-type fixturing system can be used for locating and clamping a workpiece of irregular shape during manufacturing process. Most of the fixture systems only design for considering the machining process in one process. Certain part geometry needs more than one setup to complete machining process. No fixture available for machining all surface of the small part components without setting and performing the machining in one process.

Fixture has been considered as one of main problem to improve flexibility, productivity and part quality. Many fixtures system, modular contact or pin type has been investigated during several years[2]. Most of the fixture system only considers the machining the part in one setup. No fixture available for machining all surfaces of the part component without changing the setup. When whole surfaces of the part are necessary to be machined, two or more process should be considered by changing and resetting part orientation.

A solution to this problem has been proposed in previous articles in which block like components are machined without using a fixture [3]. The article introduced a method for machining all six faces of a block like part in one process.

2. SETUP-FREE MACHINING ATACHMENT

Setup-Free attachment has been proposed as the system to machine block like components are machined without using a fixture. Several block like parts can be machined from a long round bar material in one process. Prototype of the attachment, as shown in Fig. 1, is mounted on the table of