Research article

Machining fixture assembly/disassembly in RFID environment

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Abstract

Purpose – The purpose of this paper is to present a novel approach for identification of machining fixtures, and their elements in an assembly/disassembly process.

Design/methodology/approach – Radio frequency identification (RFID) technology is applied to identification of physical machining fixtures and their basic elements.

Findings – Based on comprehensive testing in industrial conditions it was established by this research that the use of RFID technology contributes to significant reduction of assembly/disassembly time of machining fixtures.

Practical implications – Practical applicability of RFID technology is emphasized and demonstrated in the paper. The suggested system is proven superior in comparison with conventional methods for identification of fixtures/fixture elements which qualifies it for real industrial application.

Originality/value – To the best of authors' knowledge there are no previous reports of successful application of RFID technology on identification of fixtures/fixture elements.

Keywords Radio frequency identification, Assembly, Metal working industry

Paper type Technical paper

Introduction

One of the most critical features of a modern manufacturing system is the ability to design and produce lots of high-quality products in the shortest possible time. Rapid launching of a novel product which beats the competition to the market represents a key factor in providing larger market share, and higher profit margins. All this requires development of flexible, agile manufacturing which is capable of rapid adjustment to novel manufacturing programs (Herakovic, 2007). Owing to stringent market demands and intensive development of science, equipment, and novel technologies, the level and trend of further development of machining processes in the metal cutting industry depend on numerous factors. The factors which most influence quality of machining process are: type of blank, machining technology, operations, sub-operations, machine tools, cutting tools, fixtures, measuring devices, etc. In order to bring the machining process to a higher level, all these elements must be optimized.

Within a number of factors which influence output effects of manufacturing process, machining fixtures play prominent role. Novel fixture design solutions consist of two inseparable entities: fixture design process, and fixture assembly/disassembly process. The process of fixture design requires selection of fixture elements in order to allow generation of engineering documentation (2D and 3D fixture drawings, bill of materials, etc.). In the course of fixture assembly process, fixture elements are selected and then integrated into a single functional unit. Fixture disassembly process is the opposite of fixture assembly (Marcincin, 2003). Feasibility is achieved when a maximum number of elements, which are used in one fixture, can be used in another, after disassembly. After use, fixtures are returned into assembly/disassembly work unit, disassembled, and stored away according to their applicability into predefined places. Newly required fixtures are assembled from elements of disassembled fixtures. In this way, the "circular process" provides rational usage of fixture elements.

In the so far research in the field of fixture design, various approaches have been used. Generally, several fields of research have been present in this area. Majority of them refer to development of fixture design systems and development of methodologies for fixture design optimization. Various techniques have been used for optimization of fixture

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