Advanced Reconfigurable Modular Fixture Design for Casing Family

Engine casing is an important aerospace part which requires high accuracy of machining during its manufacturing. Rolls-Royce plc. uses several dedicated fixtures to support the complicated component for different machining operations and for different parts of the casing family. Therefore, a large number of fixtures are required for the machining of the casings, leading to many problems, such as storage, maintenance, long leading-time and high cost etc. An innovative modular fixture that is capable of holding a few casings for multi-machining operations is highly demanded and is developed. Using the casing fixture as case study, the concept of modular fixture can be extended for general thin-walled cylindrical components.

Aims and Objectives

- To design a reconfigurable modular fixturing system for supporting the casing family.
- To design a fixture that holds the thin-walled component rigidly for milling and drilling operations.
- To manufacture and test the modular fixturing system.
- To integrate sensor technology for fixture fault diagnosis and process monitoring.
- To explore the concept of the modular fixture for holding general thin-walled components

Methodology

- CAD/CAM modelling
- Finite element analyses of static deformation and vibration
- Intelligent technology
- Hydraulic & pneumatic control
- Experimental evaluation
- Practical consideration

Notable achievements

- Extensive finite element analysis (FEA) has been conducted to assist the fixture design;
- Fixture has been designed and manufactured;
- Intelligent technology has been integrated with the fixture;
- Fixture has been validated and the FEA has been experimentally verified;
- To be delivered to Rolls-Royce plc. on production line.
- Three patents are applied by Rolls Royce

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