Robotic Grinding and Polishing Process Technology

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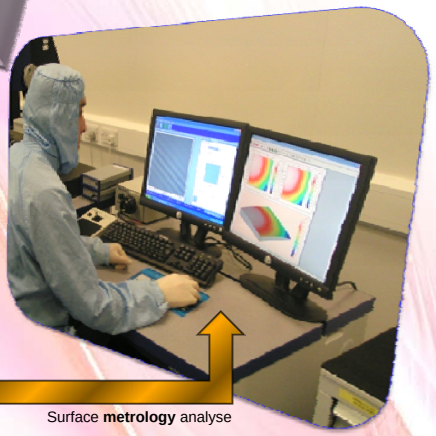
Inspiring tomorrow's professionals

Introduction Robotic abrasive finishing inclusive of both high grinding efficiency in material removal and excellent polishing quality in material surface is a new challenging technology to meet demands for today's and future front-end technology products. With the development of this technology, huge application areas are opened up especially in precision free-form component manufacturing, which is the key challenge in today's aerospace, energy and biomedicine industries. In the ongoing project, robotic grinding and polishing process is being developed to obtain simultaneous achievement of grinding and polishing process with efficiently high surface quality. For the purpose, the Centre for Precision Technologies facilities are going to be used to establish a new system regarding experimental needs, process monitoring, and surface metrology equipments.



Surface **metrology** analyse

Aim

- Development of a new generation abrasive finishing technology to simultaneously achieve high efficient materials removal as grinding and excellent surface quality as polishing by using 6 axis articulated robot and 7 axis CNC zeeko polishing machine.

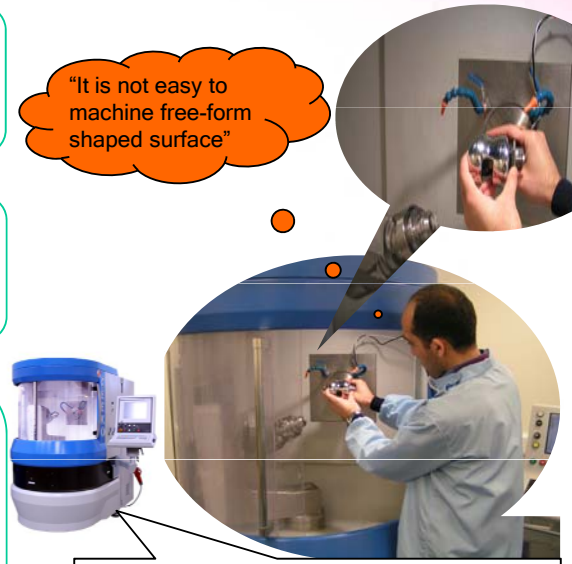
Objectives

- Establishment of the model of robotic abrasive finishing process
- Establishment of suitable sensing and metrological monitoring methods for the process.
- Experimental investigation to validate the model and optimise the new process.

Methodologies

- The nanomechanics will be applied to model the behaviour of material deformation and removal under nanometre scale.
- The abrasive processing will be optimised by varying process controllable parameters according to the theoretical model.
- Process monitoring and control strategy development. An adaptive monitoring and control strategy will be developed and demonstrated to potential industrial partners.
- Robotic grinding and finishing development. The online error probe methods will be developed by applying acoustic emission monitoring and optic scanning techniques. A robot error compensation and correction program will be developed based on an adaptive error correction strategy.

"It is not easy to machine free-form shaped surface"



The IRP200 is a 7 axis CNC optical polishing machine capable of producing ultra precise surfaces on a variety of optical materials and surface forms [2].

Benefits and applications [3]:

- Reduced direct labour expense
- Improved part quality
- Consistency of finish
- Predictable production & throughput
- Longer & predictable tooling/media life
- Ability to process wide product range
- Improved ergonomics
- Improved safety in manufacturing environment
- Reduced training expense
- Reduced work in process

Applications are where the increasing demands exist on ultra precision components with complex and free-form shapes especially in aerospace and biomedical applications.

References:

1. Han-yuen Tam, Osmand Chi-hang Lui, Alberet C.K. Mok, Robotic polishing of free-form surfaces using scanning paths, Journal of Materials Processing Technology 95 (1999) 191-200.
2. http://www.zeeko.co.uk
3. http://www.rimrockautomation.com/Applications/

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