



The MTTRF has awarded UCD with a state-of-the-art 5-axis machining centre and powerful computer-aided manufacturing software. This has enabled us to set up a “learning factory” for education and research, and establish research collaborations with progressive companies and research institutes in Ireland and globally.

RESEARCH

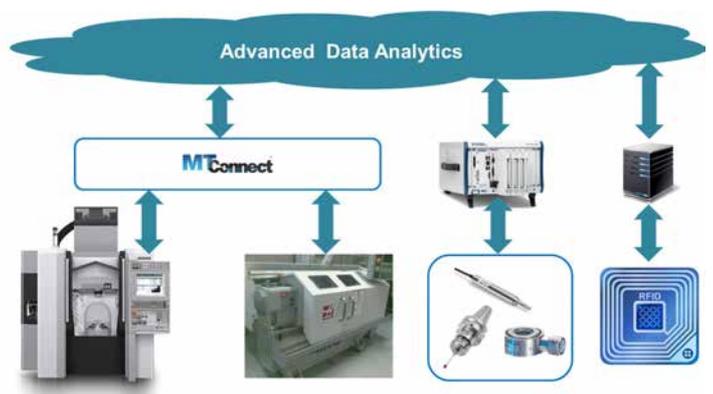
High Performance Cutting of Medical Device Materials

Components used in a total knee replacement such as “tibial tray” and “femoral head” are made completely in a Cobalt Chromium alloy; a high strength biomedical material with high wear resistance compared to alternatives.

The manufacture of these components involves multiple machining operations but milling, using multiple tool types, is the most common cutting operation and significantly accounts for component dimensional accuracy, surface quality and production costs. However, the mechanical and micro-structural properties of Cobalt Chromium alloys, for example the high yield and tensile strength, and the presence of hard carbides, would seem to correlate with low machinability. Moreover,

there are few publications on cutting of this class of medical grade alloy and hence there is significant scope for original research to understand the fundamental mechanisms in cutting and tool wear.

The objective of this research is to demonstrate the potential for significant cost savings by optimisation and innovation in tools, coatings and lubrication systems. The two-year project is due to finish in September 2016 but a “follow-on” project, titled “ Real-time tool wear analytics for medical device manufacturing” is due to commence in October 2016.



EDUCATION

Manufacturing Engineering I & II (I: Undergraduate course, II: Undergraduate/Graduate course)

Manufacturing Engineering I includes 5 laboratory sessions per student; one session involving a demonstration on the MTTRF equipment. There is also a separate three-hour CAD/CAM tutorial where each student develops a CAD/CAM solution for a simple problem and must then undertake a more difficult design assignment.

Manufacturing Engineering II comprises 36 lectures on Manufacturing Technology and 24 hours of "Case Studies". This year the syllabus was fundamentally changed to

introduce students to new concepts and technologies in Manufacturing Engineering. There has been an increased emphasis on Smart Manufacturing (Industry 4.0) as well as automation, digital technologies (data analytics, IOT) and Additive Manufacturing (3D Printing). These complimented many of the existing course areas such as Advanced CNC / 5-axis Machining.

In order to bring the individual course components more effectively together, a Learning Factory in Smart Precision Manufacturing has been established. The MTTRF equipment is the centerpiece for this initiative. All students within this course now received training in this Learning Factory, whose objective is to take the student through the manufacturing steps from part design to material selection, machining and final part inspection.



Gerald Byrne

Professor

School of Mechanical and Material Engineering
University College Dublin (Ireland)

Lab Website: http://www.ucd.ie/mecheng/ams/ams_people/byrne_gerald.html

MTTRF Awardee since 2011