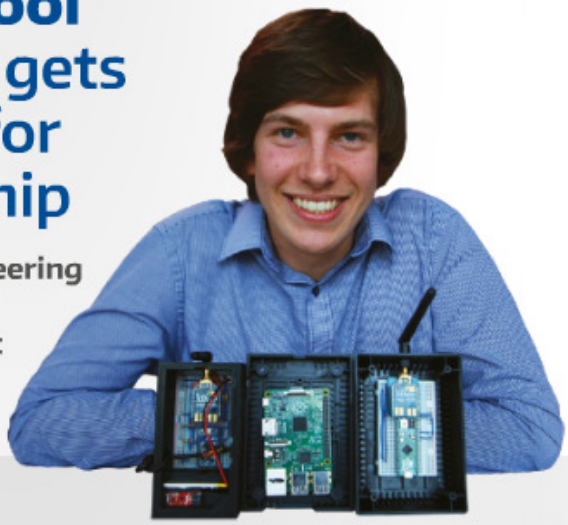
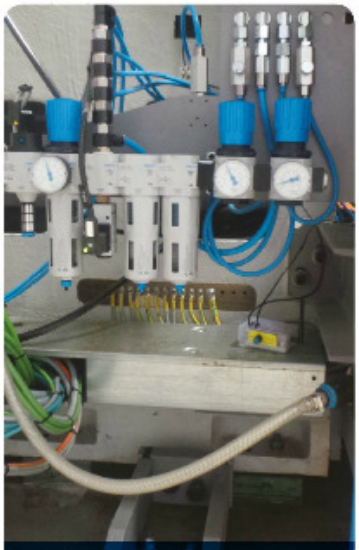
Low cost machine tool monitoring project gets the chemistry right for engineering leadership

An initiative that aims to develop engineering leaders of the future has led to a young chemical engineer developing a low cost way of monitoring the temperature of different parts of a machine tool.



Robin Hartley is studying Chemical Engineering at the University of Sheffield and has been working on the project at the AMRC as part of the Sheffield Engineering Leadership Academy (SELA) programme, run by the University of Sheffield.

Participants attend professional skills workshops, hear talks by influential engineering leaders and take part in two large, year-long group projects that run alongside their academic studies.



Hardware for Robin's wireless sensor unit in situ at the AMRC Factory of the Future shop floor

Robin secured his placement at the AMRC after hearing an SELA talk by a senior Rolls-Royce engineer about leadership and his role within the AMRC.

"At the end of this workshop, I was keen to follow up the opportunity and was lucky enough to find myself being interviewed the very next morning for a 10 week summer placement within the Process Technology Group (PTG) at the AMRC," said Robin.

Robin's placement is with PTG's Process Monitoring and Control operation, which studies measurement, computation and autonomous control within advanced manufacturing processes.

"My project is to design and develop the software and the hardware for a wireless sensor network which can provide a drop in solution for monitoring the temperature of multiple machine tools on the shop floor of the AMRC's Factory of the Future," he explains.

"My system uses the popular Arduino and Raspberry Pi platforms alongside inexpensive ZigBee radios which together provide a compact and low cost solution for wireless data acquisition."

Two of Robin's wireless units have recently been installed on CNC machine tools as a proof of concept system.

Each unit has multiple temperature sensors which record data from different locations such as the main spindle motor housing, the machine bed, the coolant fluid tank and the ambient workshop temperature.

Robin's system could be further developed to work with a range of Arduino-compatible sensors allowing a range of different parameters to be wirelessly monitored and recorded. This data could then be used to help identify anomalies and improve manufacturing processes to ensure machines always work at optimum conditions.

Robin said: "As a Chemical Engineering student, I have found this placement very rewarding as it has enabled me to expand my knowledge of programming, wireless communication, electronics and process monitoring in a multidisciplinary engineering environment.

"This has been a great opportunity to apply my engineering skills in a new context, whilst taking on the responsibility for developing, delivering and presenting my project against a number of design criteria; on time and within budget."

AMRC project manager Simon Hogg, who has been supervising Robin's placement, said: "Robin has been working alongside our own engineers and has managed to adapt his skill set to allow us to progress wireless data collection.

"We have adapted the scope of his project dynamically during his placement to fit it to the needs of multiple internal customers including manufacturing engineers and IT managers."