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**Renishaw supports winning engineering project**

Global engineering company Renishaw has worked with sixth form students from Howell’s School, Cardiff as part of its Engineering Education Scheme Wales (EESW) Sixth Form Project. The project forms part of a competition where school students devise solutions to real-life industrial problems to improve their science, technology, engineering and maths (STEM) skills.

At the South Wales Big Bang Fair, one team from Howell’s School was named among a group of overall winners. It will now go on to represent the region at the UK national competition at the NEC, Birmingham, in 2019.

**Background**

Howell’s is a leading independent school in Llandaff, Cardiff, for girls aged three to 18 and boys aged 16 to 18. The school entered two teams of year 12 students into the EESW competition. The aim was to encourage its sixth form students to consider studying engineering courses in further or higher education.

During the competition, sixth form teams are partnered with local companies who present them with a project brief. The students then work with engineers from their partner company to develop project ideas, produce a prototype and manufacture a product. At the local regional Big Bang Fair, schools showcase and present their projects, which are judged in different categories.

**Challenge**

According to Engineering UK, the UK requires 124,000 engineers and technicians each year. However, there is an estimated shortfall of between 37,000 to 59,000 in meeting annual demand for roles requiring level 3+ skills, and a graduate level shortage of at least 22,000 per year.

“STEM engagement and outreach activities can open doors for young people,” explained Simon Biggs, Education Outreach Officer at Renishaw. “Outreach gives young people experience of real-life engineering applications and knowledge of where a career in engineering can take them. Outreach can get young people excited by STEM, encouraging them to take the subjects at GCSE and A Level and go on to pursue an engineering apprenticeship or degree.”

The EESW competition brings together local businesses with schools across the UK to get young people engaged in STEM activities and build bridges between industry and education. From October to April, the students solve the problem set by their industry partner, working with engineers and scientists to do so.

The two teams from Howell’s worked with engineers from Renishaw, who set the challenge of building a measurement device to accurately measure encoder rings. Renishaw offers a range of rotary encoders, each having different encoder ring diameters. As the specifications for diameters are very tight, it can be difficult to distinguish between the types just by looking at it.

The students were challenged to design a system to quickly check the diameter and confirm they have selected the correct ring. The system must be quick, easy to use and capable of identifying and displaying the ring diameter to an accuracy of 500 µm (0.5 mm). This is a project for which Renishaw was the ideal partner because it specialises in measurement and motion control.

**Solution**

From October 2017, both teams from Howell’s worked with Renishaw to develop their projects. First, the students met with Erik Danielson, a Senior Production Engineer and STEM Ambassador at Renishaw, who explained the brief and gave some background information on Renishaw. The teams then visited Renishaw to learn more about its products and processes and were introduced to its workshop facilities.

The teams were also introduced to Simon Biggs, Education Outreach Officer at Renishaw, as well as the engineers who would be assisting the teams for the rest of the project. This was Graduate Engineer Simon Cowell and Production Technician Ben Wallace for team one and Production Technician Stephen Pickles for team two.

The teams began by researching, developing and modelling their ideas for the measurement of ring diameters. In November, the students returned to Renishaw where they received consultation and advice on their work. In December, the teams began work on a prototype model, gaining an insight into the computer code required to successfully complete the project.

“As part of the project, Renishaw ran workshops to develop the students’ coding abilities, an area where they had limited experience,” said Dr Andrew Ford, Head of Physics at Howell’s School. “Due to the proximity between Renishaw and Howell’s, the students were able to arrange additional meetings and workshops to improve their electronics. This was vital to the project, which relied on programming capabilities to produce a digital display.”

The students were then able to manufacture their designs using workshop machines and soldering equipment.

**Results**

Team one’s product was a conveyor belt system, which the encoder ring could be placed on. Using a hand crank, the belt moved, allowing the rings to move through the path of an infrared light dependent resistor (LDR). When interrupted, the beam read the encoder ring. Using bespoke software designed by the students, the reading was converted into a diameter reading with an accuracy of ± 0.1 mm.

The second team used a Renishaw read-head to measure the diameter. Using the read-head, students were able to convert pulses into a distance using code. The model included datum points on its base to ensure the rings did not move.

At the South Wales Big Bang Fair, held at Parc Y Scarlets, Llanelli, in April 2018, 75 teams from across the region displayed the results of their projects. Students submitted a written report in advance and also made a presentation to a panel of engineers, assisted by engineers from Renishaw.

“The teams were able to confidently answer challenging questions from the judging panel,” explained Ford. “The judges were impressed with both teams, who each received three award nominations from a field of over 100 teams.”

Team one was nominated for Best Working Model or Prototype, Best Application of Engineering and Technology and Best Written Report. Team two was nominated for Best Application of Science, Most Effective Presentation of the Solution and Best Working Model or Prototype.

At the awards, team one was awarded Best Working Model or Prototype, awarded £50 each and £250 for the school. The team was also selected alongside two other schools as overall winners and will go forward as the South Wales regional representatives to the national competition at the NEC in 2019. All of the students received a Gold Crest Award for their participation.

“Working with Renishaw has developed the students’ understanding and problem solving,” added Ford. “The engineers acted as excellent role models and related well to the students, who valued and respected their guidance and support.

“The teams now appreciate the costs and practical concerns that engineers face,” added Ford. “They have gained an understanding of the exciting, innovative environment engineering is and how planning and progress are vital in achieving their goals.”

“Both prototype projects require refinement before they are fully functioning parts. However, both teams were able to produce designs that met the original brief to a high standard. Renishaw will continue to support Howell’s School at the national competition, so that the team can perfect their designs and hopefully, be crowned national champions,” concluded Biggs.

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Notes to editors

UK-based Renishaw is a world leading engineering technologies company, supplying products used for applications as diverse as jet engine and wind turbine manufacture, through to dentistry and brain surgery. It has over 4,500 employees located in the 35 countries where it has wholly owned subsidiary operations.

For the year ended June 2017 Renishaw recorded sales of £536.8 million of which 95% was due to exports. The company’s largest markets are China, the USA, Japan and Germany.

Throughout its history Renishaw has made a significant commitment to research and development, with historically between 14 and 18% of annual sales invested in R&D and engineering. The majority of this R&D and manufacturing of the company’s products is carried out in the UK.

The Company’s success has been recognised with numerous international awards, including eighteen Queen’s Awards recognising achievements in technology, export and innovation.

Further information at [www.renishaw.com](http://www.renishaw.com)