

## CASE STUDY: DTE HOLDINGS LTD

### THE BRIEF

DTE Holdings North West Ltd (DTE) is a crane and lifting equipment specialist manufacturer and service company, based in Cheshire, North West England. They are a market leader in the region and utilise over thirty years of experience in the manufacturing, servicing and maintenance of mechanical handling equipment, including factory cranes, jib cranes, wire rope and chain hoists. DTE provides service packages from the design and planning stage through to the development, building and maintenance of lifting solutions for various scales and working environments.

DTE developed a crane operation protection system (COPs) that aims to enhance existing lift procedures and increase personal safety levels, implementing hook laser alignment, load recognition, slinger handset control, high-quality video cameras and motion detection. Their COPs have been integrated and tested in the overhead cranes installed at Jaguar Land Rover. Building on the success of COPs version 1, DTE is looking into developing COP v2 which would improve the accuracy of the human detection function. The current COP v1 system has two cameras with a bird's eye view, directly on top of the lifting equipment. This led to pixilation when lifting the loads and causes several false positives, which affect the detecting performance.

DTE would also like to explore ways of adding machinery monitoring via the Internet of Things (IoT) to their overhead crane systems, which is currently relying on human inspection and is performed manually. This would not only cause unplanned downtime affecting production and generate a high cost of repair whilst also posing risks to workers. A prediction-based feature is DTE's other aspiration that the system will not only monitor the condition and performance of the equipment but also predict when the equipment will break down, thus the stakeholders can strategically schedule maintenance without incurring much downtime of the machines.

### THE APPROACH

DTE requires C&W 4.0's support to target their challenges in the field of software development, sensor deployment and IoT solutions for human detection and machinery monitoring. The support from C&W4.0 will help DTE to reduce shopfloor downtime, and increase productivity and efficiency.

The CW4.0 team at Liverpool John Moores University (LJMU) met with DTE to understand their existing technologies and challenges and then engaged with the academic knowledge base at LJMU including academics from both School of Computer Science and Mathematics and the School of Engineering.

Through several meetings and site visits, the C&W4.0 team and LJMU academics helped DTE to clarify their challenges and broke them down into practical phases and steps. A student engagement session was organised by the CW4.0 team where DTE was able to present their challenges and engage with the L7 MSc student cohort at LJMU.

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As a result, four L7 MSc students were selected to address the DTE's challenges in the following areas:

COPs v2 human detection improvement:

- Apply machine learning technologies to the existing overhead imaging system and design an algorithm to weed out all false positive conditions in the workshop.

Overhead crane prediction-based maintenance:

- Design and implement an algorithm and API to work with training data captured from various sensors to predict the downtime of the assets involved
- Design an engineering system structure to work with training data as phase I to predict downtime of the crane

Sensor and IoT monitoring of the overhead crane:

- Carry out the feasibility research on appropriate sensors and technologies that can be used to monitor crane wheel and wire rope conditions in real-time. A suitable IoT interface to monitor and display the measurement is also desirable to complete the system

## THE BENEFITS

Academic solutions were developed under CW4.0's supporting scope and were made available to DTE, including the algorithm codes and testing prototypes. The CW4.0 support helped DTE to prove the concept and the feasibility, and therefore increased DTE's confidence to invest in R&D on their crane safety system.

Built on these 1st phase developments with CW4.0, a 'Digital Trident Crane Safety System' was proposed by DTE, which would be a completely novel and up-to-date smart system for improving crane safety in a hazardous work environment, converting market needs to reality-based solutions.

The CW4.0 team worked with DTE and will continue to support them with further development of the system including funding applications. DTE forecasts that the proposed system would lead to a 40% increase in turnover and the creation of 6 jobs by the end of their next three-year growth cycle.