



Sellafield Ltd partners with the Virtual Engineering Centre (VEC) to commission its cutting-edge MIXED REALITY training tool

Working in collaboration with the Virtual Engineering Centre (VEC), digital impact centre, University of Liverpool, Sellafield have co-developed a unique mixed reality training simulator that precisely mimics the real-life working environment of Sellafield's newly commissioned nuclear waste removal crane.

This cutting-edge simulator will support Sellafield's specialist operators in their daily work through a comprehensive and staged level training programme in a fully immersive familiarisation environment.

The cost-reducing simulator is robust, easily accessible and improves process efficiency, productivity and the safety of workers operating in high hazard areas who carry out the retrieval task to make a positive environmental outcome.

THE INITIAL CHALLENGE

After hearing about the VEC innovation facility and the trusted advisory offering of their team, Sellafield approached the VEC with a challenge to understand how virtual reality (VR) could be used to communicate, inform and benefit the design process of

new facilities and installation of planned capital equipment, such as specialist cranes, still in the early design and development stages.

Sellafield were looking for a solution to help overcome their complex project challenges, whilst being committed to adopting an innovative framework of digital tools, processes and skills to its workforce with the aim of making Sellafield safer, sooner.

At Sellafield, innovation in safety is key. To do this, they are adopting new technologies into their processes, including the mixed reality crane simulator. This will ensure optimal process training to improve the accuracy of operations, increase productivity whilst reducing operator exposure and risk.

THE JOURNEY

Experts from the Virtual Engineering Centre (VEC) met with the Sellafield team at the VEC innovation facility at Sci Tech Daresbury. A simulator was quickly developed from existing Sellafield 3D design models containing information of the silo and crane. The VEC team integrated crane movements into the simulator, controlled from a chair with a built-in joystick identical to the real crane. The VR model replicated the real plant CCTV camera views and allowed the virtual cameras to be controlled exactly as they would be onsite.

Cross-functional teams from Sellafield's training, operations and specialist human factors were active in the co-development sessions. The team developed the training modules, including compliance and focus steps before finalising the crane training programme. The documented outcome was then used to familiarise and provide confidence to key Sellafield stakeholders,

including senior management, ONR (Office for Nuclear Regulation) and NDA (Nuclear Decommissioning Authority.)

THE SOLUTION

Using an exact replica of the crane's operator chair, control joystick and spatial working environment, together with selected digital tools, a precisely scaled immersive, mixed reality model of the crane and its operating waste-removal environment was created.

The crane training simulator provides a realistic environment for the operator, both visually and physically, including accurate manipulation and haptic feedback of all control systems. It mimics both the look and feel of the crane waste removal process and the environment in which the operator will be working and includes the potential challenges they may face within their day to day tasks. This allows operators to learn to 'drive' the nuclear waste retrieval crane before the full-scale training environment was available, ensuring greater levels of safety whilst increasing productivity.

THE BENEFITS

The realistic user experience of the training simulator builds operator confidence and has shortened the overall project delivery schedule. In the design phase, the operators could identify where visual aids would help them position the crane more precisely. These spatial and design features were added to the real plant during its construction. The operators fed back differences between the simulator and real plant to help improve the accuracy.

Being able to quickly identify and verify project needs, departmental functional requirements including key human factor aspects, enabled Sellafield to make quick and easy changes before the crane went into manufacture, reducing resources used such as time and money, ideal for projects with specific deadlines.

The simulator is now at such a level of sophistication that the project team have made the decision to use it as the primary tool for crane operator training. In the long term, this allows the full scale training rig to be 're-purposed' as a second operation retrieval system. This will save approximately £20M off the cost of future phases of the retrievals.

The simulator allows the operator to learn in a controlled environment and progress through various levels of training to reach the required skill level before completing each module.

The first time the real-life waste retrieval process using the crane was attempted, the operators completed the task of filling a waste container in just one day, a much shorter time than expected. The progressive training approach using the mixed reality simulator made this remarkable achievement possible. The operators at Sellafield are now able to undertake manoeuvres

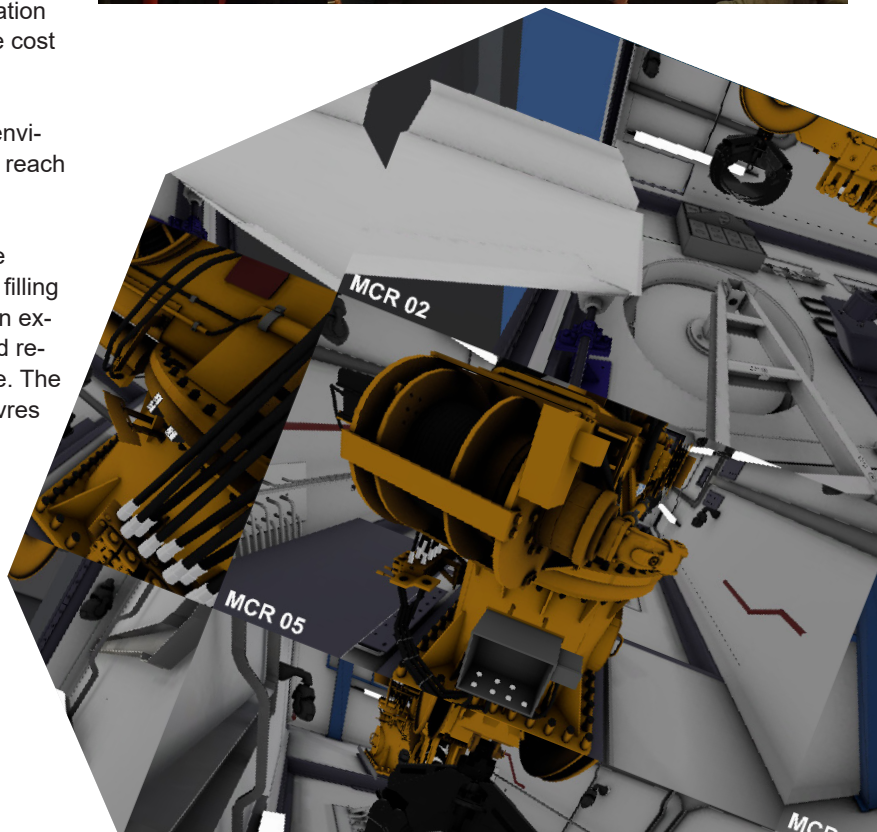
that require a high degree of accuracy and space perception, in the virtual world, before they advance to the real equipment and working environment.

With the crane being a completely new site installation, the simulator has allowed the Sellafield training and operations teams to try and test different approaches to training and assess, develop and implement the best training protocols and methodologies. Furthermore, the simulator has allowed Sellafield to train and upskill all of its operators on the new equipment before installation and potentially being placed in a hazardous environment. The training simulator is also used to familiarise operators who may have been off work for a period of time.

Advanced visualisation training systems have proven to be extremely cost-effective compared to traditional physical mock-up based rigs, particularly as the base digital information needed is now readily available - 3D digital design and other sources such as 3D laser scanning are widely used. There are clear environmental and safety benefits from testing and training in mixed reality rather than in physical space.



This project won highly commended at the NDA Safety & Technology Innovation awards 2019



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