



Hitachi access virtual expertise for unique product testing

Hitachi Rail is a global provider of rail solutions, priding themselves on offering a world-class service. Home to 11 manufacturing sites across 27 countries, Hitachi Rail strive to use the latest in technology, to remain competitive and deliver the highest quality service to their customers across the world.

CHALLENGE

Hitachi Rail in London, Kasado in Japan and their client ScotRail, wanted to explore how digital tools could help in the development of a virtual prototype of their new driver's cabin, eliminating design issues before costly manufacturing took place. The design would be based upon a train travelling between Glasgow and Edinburgh, Scotland.

The simulation needed to represent the cabin as realistically as possible for the Hitachi team to test against their needs and specific requirements, removing space for error. Details to be considered during the development included ergonomic assessments, the control panel positioning, washout and glare on the instrument panel and reading light positioning, to ensure drivers sight was clear and unbroken.

SOLUTION

The Virtual Engineering Centre worked closely with the Hitachi Team, listening to their concerns and needs to ensure the solution was bespoke and solved their industry challenges.

The end simulation allowed the Hitachi team to sit in the real driver's seat and interact with a range of virtual components including window wipers, light levels, roller blinds for window glare protection, an accelerator, sounding a horn, display screens and distance markers.

The driver's movements were accurately tracked in the virtual environment and a real-world control panel and operator/driver seat were physically aligned to ensure accurate immersion and spatial awareness, enabling the user to collect valuable data and information on the virtual prototype.

To create a realistic simulation, the driver sightlines were assessed by tracking the drivers x,y,z head position and rotation, when sat on the calibrated physical train seat. Virtual reality was used to simulate the reading light brightness and beam direction positioning. In addition to the immersive VR simulation the VEC partnered with Optis, a local SME. Together the teams accurately rendered glare and screen washout at different times of the day with a clear Scottish sky when travelling East to West and West to East. A 360 degree raytraced model was created using Optis' 'THEIA', a physically correct real-time rendering software.

BENEFITS

This simulation allowed the user to immersively experience everything that the cabin driver would be able to, ensuring testing and validation could be processed with confidence, avoiding costly mistakes in the design process. This included replacing a window which allowed the driver to see specific visual markers, the drivers identified this as an essential requirement to allow them to precisely halt the train in the optimum position at Edinburgh train station, enabling convenient access for customers, entering the train from the station platform.

Close communication with the Hitachi team meant the data was regularly updated, often with daily updates by designers in Japan which lead to 'round the clock' process at times. The virtual testing allowed Hitachi to streamline testing as the model itself only took six months to create and develop whilst the whole project was delivered over nine months.

Interactivity with pre-defined components enabled Hitachi Rail and ScotRail drivers to ergonomically test and modify critical elements through many variables. A full range of 'line of sight' tests were also carried out including the 'travel' of the windscreen wipers. Following the assessments these were re-positioned in a way to maximise visibility by widening the space between the park and end position. The positioning of a second driver's seat was also assessed and modified through testing of their visibility of the speedometer, which they need to always have clear and easy access to in case of an emergency. VR proved to be extremely valuable in this case as it allowed the second driver to feel the physical strain on the body due to the ergonomic reach required.