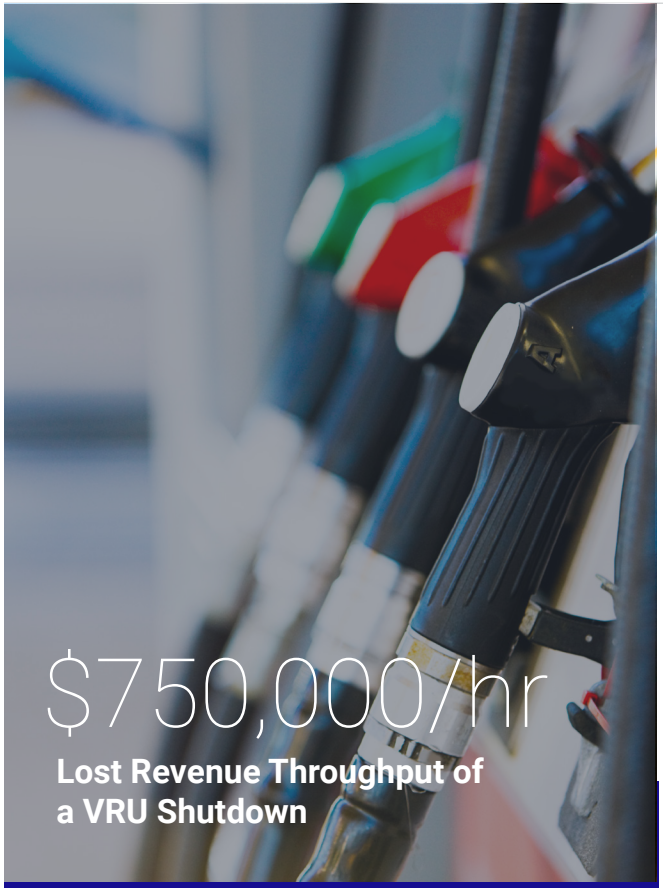
CASE STUDY



Building on prior VR training success, a Fortune 500 petroleum refiner asked XALTER to develop virtual VRU training.

VRU Training

Challenge

Downstream operations in the United States include the distribution of refined fuels from dozens of terminals across the country to thousands of retail gas stations. The gasoline is blended with special additives based on the specific requirements of each customer, location and applicable regulations and then loaded into a fleet of specialized tanker trucks for distribution. While the process itself is not highly complex, the equipment used is – and that means precision is required for safe and accurate fuel loads.

Every terminal that loads gasoline is required to have a vapor recovery unit (VRU) to capture gas and vapors that the trucks return with from offloading at a station. The VRU converts the vapor back into sellable gasoline and helps reduce greenhouse gas emissions. In order for a terminal to be functioning and loading gasoline, at least one VRU must be online at a time, or the terminal will eventually be shut down. Some places allow for flaming the vapors as a last resort, but this is typically no longer accepted.

The impact of turning off a VRU or shutting down a terminal impacts up to 16 trucks per hour that cannot fill up with gasoline, resulting in potential revunue loss of up to $750,000 per hour. In short, an MRO error that causes a shutdown could delay millions of dollars in revenue throughput per day.

Building on its successful XR training relationship, the downstream petroleum refiner approached XALTER in early 2020 to develop VR training for their Vapor Recovery Unit built by John Zink Hamworthy Combustion (part of Koch Industries).

An MRO error that causes a shut down could literally cost millions of dollars per day.

Solution

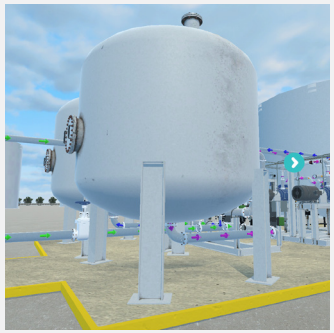
The VRU built by XALTER is a fully functioning simulator of a real wet-VRU used by the downstream petroleum refiner.

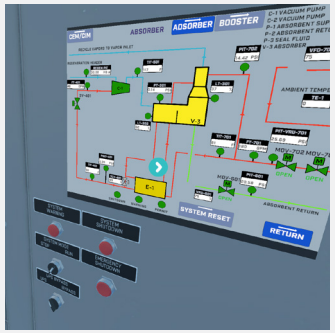
Simulation Capability

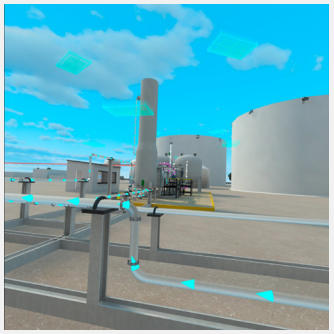
The VRU has all the major components of the real VRU, including working valves, motors, electrical, and a functioning Operator Interface Panel (OIP). Temperature and pressure gauges in the field report data to the OIP so users can monitor what's happening. A breaker room connected to the VRU controls all major electrical systems and pumps, and allows for shutdown of various components. These shutdowns affect the flow/temperature/ pressure of the VRU and that is reflected both in the OIP and in the visualized vapor flows.

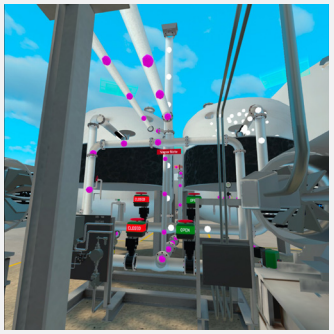
Using different materials, refinery employees can visualize the vapor flows inside of the VRU for incoming vapors, scrubbed airs, glycol systems, and gasoline. Altering different valves and motor operator valves (MOVs) will adjust these flows and users are instantly able to see the impact. All hand-turn and gate valves are fully functional, and several motor controlled valves can be either shut down by the OIP, breakers, or by hand turning as an override -- just like using a real VRU. All of these various active learning scenarios are designed to not only simulate real-world situations for hard skills training, but also build critical-thinking, resiliency, reasoning and problem-solving skills.

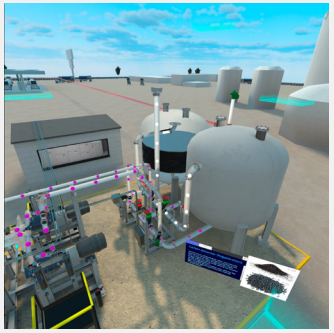
VR Training Experiences

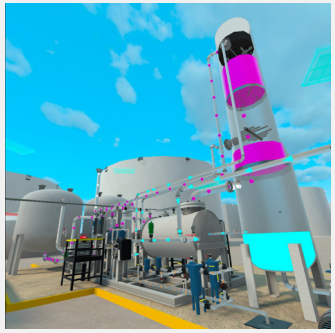


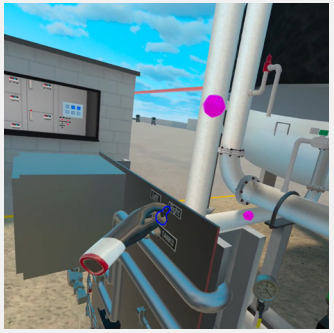












Secure Multi-player Collaboration

The entire system was built with a secure and private multiplayer server for the downstream petroleum refiner that runs behind their firewall to allow for scalability and running multiple sessions with multiple rooms and multiple users per room. Up to 50 trainees can join a single room without any performance degradation. Conceivably, upping the performance of the servers would scale this number indefinitely.

User trainees can log into the VRU, assign themselves a custom room, and invite others to train and work with them. Anything they do, move, manipulate, or change in the environment is updated for all parties, so everyone has a live view of the VRU and how it's being manipulated. Voice Chat is leveraged to allow users to talk to each other in real time, giving a real sense of "being there" in the same space with collaborators.

Lookout platforms are artificially placed around the VRU, which allow users to get different perspectives of the system, how it flows, and how it behaves that they can't normally get standing on the ground in real life. Actual 3D sound captured at a real VRU adds more immersive audio experience so that trainees know when they are too close to a pump or separator.

Combining the sandbox experience with full multiplayer capability has created an interesting immersive learning tool as instructors are able to guide students into the VRU to discuss concepts, show examples of functionality, and use it for a variety of other tasks as a teaching aide.

Custom Scenarios

In addition to the sandbox experience, we built 14 different MRO scenarios into the VRU that sound specific alarms and teach the user how to fix common VRU shutdown problems.

As an alarm sounds, users must check the OIP to notice the alarm. They are then asked a series of questions based on what they can observe from the VRU and OIP. Based on their assessment, they are then told instructions for fixing the problem and resolving the alarm.

These custom scenarios include a variety of issues, like low levels in separators, pumps malfunctioning, tanks not switching between adsorption and absorption, temperature issues, and pressure problems in different lines.

Because of how the system and sandbox environment is built, more scenarios can be built on top of the existing system to allow for developing a range of critical-thinking, resiliency, reasoning and problem-solving skills.

Flexible Multi-device Use

The VR training content was designed to reflect the various user environments in which the refinery's staff would need to be trained. For that reason, we architected the training and simulation content to be accessible via both VR headsets and PC devices.

Up to 50

trainees can join a single room without any performance degradation

Results

The downstream petroleum refiner is in final VRU testing as of Q4 2021 in preparation for deployment and data capture in 2022.

Initial observations include several instances of up to 30 trainees joining the VRU virtual environment to review various instructions and trainers report high levels of engagement, strong feedback from users, and a variety of unique use cases as a collaboration and communication tool.

XALTER develops virtual, augmented and mixed reality solutions that are delivered though the proprietary XALTER platform. The company has revolutionized the use of 3D modeling and simulation in training and operations support and offers measurable ROI, enhanced safety, content retention and environmental impact metrics.

Now customers can deploy multi-user and multi-platform programs anywhere in the world, gather data and derive valuable insights about their business. Scenario planning, user tracking and subsequent analytics facilitates data visualization on sophisticated dashboards that showcase business intelligence. The program benefits learners, trainers and the client company.

XALTER engineers and training professionals harness the latest research and training technology to provide clients highly individualized solutions. The platform engages learners in immersive VR/AR/MR custom training environments tailored to specific industry sectors and ensures effective knowledge acquisition and skills mastery.

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