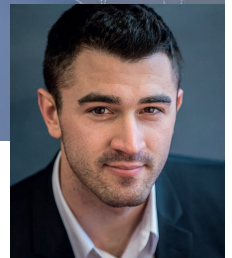




# VIRTUAL REALITY TRAINING FOR INDUSTRIAL FIREFIGHTING



**Parable**  
learn by immersion

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There is a frenzy of movement on deck as another loud explosion erupts from behind you, accelerating a raging chemical fire at the liquid bulk terminal. The clock is ticking and you need to extinguish the fire now. A walkie-talkie blares in your left hand with updates from the land-side fire department, while your right hand opens a valve manifold as you shout to another crew member. The lid comes flying off its hinges from the pressure and strikes you in the leg. It's all over.

You remove the head-mounted display and take a deep breath. The instructor says you failed to pass the training, but then again, everyone does their first time in Virtual Reality (VR).

Your assessment pops up on your mobile phone; below average communication with crew members, failure to remember correct procedures, failure to check pressure levels before opening the valves, inability to tie moment to moment decisions with the big picture.

Luckily, the training will repeat next week, and this time you will be mentally ready.

## TRAINING FIREFIGHTING CREW

This story may seem decades away, but the future of fully immersive and interactive training in VR for incident response is closer than many people think. In fact, the Port of Rotterdam is making this future a reality today. Thanks to our experiences during PortXL, a Rotterdam-based accelerator program, we were able to connect with the Port of Rotterdam and learn more about Industrial Firefighting Pools (IBPs) and their challenges.

The Port of Rotterdam in 2006 initiated the IBP program together with partners such as Dutch environmental agency DCMR, public firefighting and safety bodies like Gezamenlijke Brandweer, Brandweer Rotterdam, Veiligheidsregio Rotterdam-Rijnmond, Deltaliq, and a number of private companies in the port. This joint effort allows parties to combine resources and knowledge to reduce service costs, improve safety outcomes and cut costs for port related companies storing and handling flammable liquid bulk.

Although the probability of a fire incident is extremely low, IBP routinely trains its crew to be ready to respond at any moment and at

any location within the port of Rotterdam. The current training approach is, in many ways, as immersive as possible. It is hands-on, on the vessel, with the actual equipment. However, this approach has several limitations: it is time-consuming, resource intensive, costly and difficult to schedule around the crew's work rotations.

In practice, this means IBP training needs to be scheduled months in advance. The crew also never get the opportunity to train with an actual fire incident. When the training takes place, it is on the comfort of a patrol vessel where stress, time pressure, communication and the backdrop of a raging chemical fire are not part of the training equation.

Now for the first time interactive VR training is helping the Port of Rotterdam train IBP more frequently and more cost-effectively while including missing elements such as stress, time pressure, communication and the setting of a virtual fire incident. The goal is not to replace traditional hands-on training, but to compliment and create a well-rounded training experience.

IBP training encompasses a number of different activities, which can be broken down into five sequential categories of

actions. For the past several months Parable worked with the Port of Rotterdam on a proof of concept for VR training in "Step 5: Connecting and Operating". This training focuses on procedural knowledge and safety with the equipment onboard the vessel. Our joint approach was to start small and test the technical feasibility and commercial viability, while gathering participant feedback, before developing other sections.

**PROJECT DEVELOPMENT PROCESS**

Before we began any kind of technical development in VR, my team and I needed to step into the world of IBP and into the shoes of its fellow crew members to fully understand the training and the processes. We conducted short interviews and observational research onboard the vessel to document how the crew preformed the training to establish a baseline on the exact set of procedures. This felt experience also gave a understanding of the weight of objects, material composition, textures, and sounds necessary for making a realistic virtual experience.

Developing VR training programs is, in essence, a challenge of translating elements of the real-world into the virtual world in such a way that they appear and feel indistinguishable from the real-world. We employed a number of techniques to make this translation successful. Photos, procedural videos and even technical drawings provided much of the information on size, scale, colour, texture and lighting.

**INTUITIVE INTERACTIONS**

The visual appearance of the environment is only part of what creates an immersive training environment. We know from research and experience that interaction is a key ingredient in tricking the brain that VR feels like reality. This is because well-designed interactions create a feedback loop in the brain known as perception-action-coupling, which is an important contributor to the feeling of agency and therefore the user's level of perceived immersion.

We designed these interactions through a visual programming language where we can layout the cause / effect outcomes of each user interactions. To us, we see a web of different functions and features which instruct the VR application, for example, on how to visualise the rotation of a valve as it is being unscrewed. For the user, they simply see the tool they apply to the valve as it opens. The goal is to make this interaction as fluid and intuitive as possible for the user so that their VR training experience feels identical to the one they have in reality.

**PUTTING VR TRAINING TO THE TEST**

We put VR training to the test in August, 2017 by conducting a user test with the trainers and crew of the Port of Rotterdam. Both the trainers and the crew saw the value of VR for IBP training. The major point of criticism was that the port wanted VR to cover more than procedural training to include the remaining four steps of the IBP process. The port wanted to know how soon the project could be completed and implemented.

While we are still several months away from implementing the full training in practice, the feedback we have received has reassured us that we are on the right track and are indeed offering a training tool that is innovative and adds value to their processes.

Early estimates show significant cost-savings for IBP using VR training, however we still need to see if these numbers remain true in practice once the training is implemented and in use full-time. For now, VR cannot replace the learning value of training with the actual equipment, but it can certainly compliment traditional training by making training more flexible, more frequent and more cost-effective.

**BROADER TRAINING CHALLENGES**

While the challenge of the Port of Rotterdam and its partners in IBP is unique to their industrial fire fighting program, other companies face similar training challenges.

Many offshore companies deal with technically complex, dangerous and expensive equipment and operational procedures. When the risk is high, many of these companies look for the most immersive training possible to train the exact set of procedures.

Many of these companies spend millions on custom simulation rooms where they have total control over the training material to lower operational risk. The common conception is that high operational risk means high training costs.

This makes perfect sense considering experiential learning is one of the most effective ways to prepare people for on the job challenges and how to operate under stress.

VR is exciting because it offers a more cost-effective method for training that is just as immersive as high end simulation rooms, but at a fraction of the cost because it does not require expensive hardware and maintenance costs.

The future of training will only get more and more immersive as VR hardware improves, computational power increases and adoption rate becomes more wide spread.

This will drive down prices and make this technology available to more and

more companies in the port sector and beyond.

At the moment, many companies feel like they are taking an innovative leap when they commit to VR training programs, but in a few years from now this will become the new normal for training. If a technology push is not the persuading factor, then business case and cost savings will certain take its place.

Commercial gains aside, VR training has one inherent element that distinguishes itself from all its predecessors- the element of fun.

People genuinely enjoy being transported to a virtual world where they have nearly unlimited freedom to experiment, fail, succeed, learn and play. This fun factor is, and will continue to be, a key ingredient in effective behavioural change. People want to change, but they do not want to be changed. I am confident, that if training is fun and engaging, people will not only own the change they inevitably need to make, they may just do it with a smile.

**ABOUT THE AUTHOR**

Sam Ryan moved to The Netherlands in 2014 to pursue a Masters' degree at Delft University. There he connected with several like-minded individuals passionate about VR and education. Together they founded Parable. Parable has worked on commercial VR training projects and was an entrant to the PortXL accelerator programme, which gave the company much wider access to the port-related and offshore companies. PortXL assisted Parable in its focus on the industrial equipment training market.

**ABOUT THE ORGANISATION**

At Parable we believe people learn best by doing, which is why it creates immersive, interactive training experiences using Virtual Reality (VR). Our mission is to help companies train with industrial equipment. The custom-made training solutions we offer gives workers an unprecedented advantage to learn and train by interacting with technically complex and dangerous industrial equipment in the safety of VR, the same way they would on the job. This approach is designed to save our clients time and money, reduce workplace incidents, and increase worker efficiency and proficiency with industrial equipment.

**ENQUIRIES**

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