

# TACKLE TRIALS WITH TRAINING





**Philipp von Breitenbuch and Feras Alhothali, Linde Engineering, Germany,** explain how the brain drain and the COVID-19 pandemic are shining the spotlight on the possibilities of virtual reality training, especially in the LNG and NGL industry.

**T**he outbreak of COVID-19 has dramatically accelerated the need for remote and virtual training. Suddenly, companies across almost all branches of trade and industry are moving education and capability-building to an online-only setting as social distancing regulations and travel restrictions make in-person classroom or group-based training sessions difficult, if not impossible. The need to adapt rapidly from presence-based learning to the virtual world presents many companies and training providers with new challenges. However, it

also provides a host of new opportunities, including cost efficiencies and a lower carbon footprint thanks to the elimination of travel, and the possibility to bring rich, immersive online learning experiences to remote locations in real time.

Fortunately for some companies, they were already poised to take advantage of the remote learning trend even before the safety and hygiene concerns of COVID-19 took hold. Linde Engineering is one such company. For several years now, the company has been developing





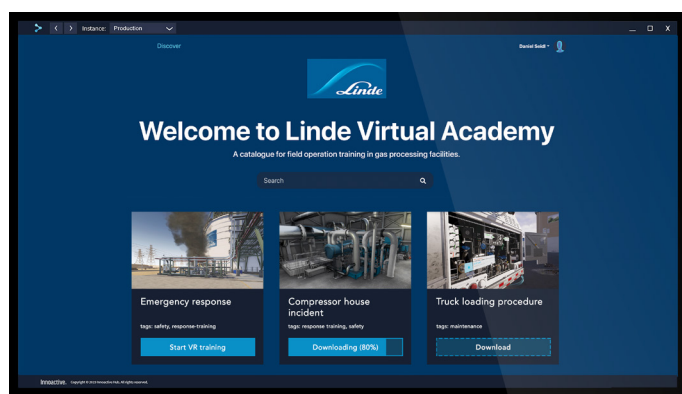
virtual reality (VR) training modules aimed at increasing safety and efficiency in gas processing plants such as those deployed in the oil and gas industry.

## Tackling the brain drain

COVID-19 is not the only force of change accentuating the need for training in the oil and gas industry. Shifting demographics, for instance, are having a particularly strong impact on this sector in Western countries. Experts predict a large and growing gap in terms of both available workers and skillsets in oil and gas. It is expected that around 50% of experienced employees will retire from their current jobs within the next five to seven years. It is assumed that only 50% of these retirees will be replaced, which means a smaller, inexperienced workforce will be challenged to compensate for the gradual brain drain.

Looking beyond the importance of experience in maximising operational efficiency, the loss of knowledge and experience can – far more importantly – translate into serious safety risks. A 2017 Salford University study revealed that, on average, 70% of all accidents are caused by human error. Training and proactive skill-building is the most effective strategy to mitigate the rising risk of failures and safety incidents in the coming years. Given the limited scope and reach of live training in existing plants, due often to the fact that many critical scenarios are difficult or dangerous to simulate, VR is emerging as the most effective way to build safety-critical capabilities. Following in the footsteps of other industries such as the airline business, which has been training pilots in simulators for decades, oil and gas companies are now increasingly looking to VR as a way to bring an immersive, real-life training experience to up-and-coming plant operatives.

The effectiveness of VR training is undisputed. Studies have shown that VR training is 15 times more effective than traditional classroom training thanks to the interactive, realistic learning environment. It is particularly appealing to those who prefer a blended learning experience or are quickly overwhelmed by technical jargon in a static classroom setting. This is because VR is amazingly close to real life. Virtually exposed to an emergency scenario, participants in a training situation react as they would in the real world, even registering an increase in heart rate.



**Figure 1.** Users of the Linde Virtual Academy are up and running in three simple steps – subscribe, download, train.

## Dynamic VR offering

To help close the skill gap in oil and gas and capitalise on the effectiveness of VR training, Linde's aftersales LINDE PLANTSERV® offers an extensive program of online training modules aimed at operational excellence and best practice in safety. The Linde Virtual Academy is a large and ever-expanding library of VR modules dedicated to individual safety-critical procedures and operational procedures. By digitally transforming the way Linde delivers information, it provides operators with a safe environment in which to train for high-risk scenarios, learn how to safely respond in an emergency, practice regular field operation procedures, and execute maintenance interventions. It is a powerful and flexible platform to support staff qualification and build the necessary skills before even starting up a new plant.

The Linde Virtual Academy reflects the experience Linde has gained whilst engineering over 4000 industrial plants worldwide and operating over 1000 of its own plants. Consequently, the standardised, simulated plant environments cover 90 - 95% of all plant scenarios in real life. This means that participants can easily apply the lessons learned to their own plant.

In addition, the Academy dynamically channels insights gained by customers from live operations into new and expanded modules. This interactive content development process enables oil and gas companies to share their particular experience and lessons learned in managing and responding to hazards with the rest of the industry. Ultimately, all oil and gas companies have a common interest in raising safety standards across the industry and Linde Virtual Academy speaks to that willingness to share information.

## Ready, steady, go

The Linde Virtual Academy has been designed for ease of use. It is modelled on common media streaming platforms, which means all users need is a VR headset and a laptop. In three simple steps – subscribe, download, train – users have instant, on-demand access to all the modules covered under their subscription agreement. This allows operators to complete their training when it suits them – at a time and place of their choice. Furthermore, any number of operators can work on the same modules in parallel. A continuous feedback loop lets trainees track and evaluate their progress and see which modules they have successfully completed.

## Tailored to the needs of the LNG industry

Rounding out various industry-wide generic modules, the dynamically expanding Linde Virtual Academy includes training scenarios specific to the LNG and NGL industry.

Typical scenarios include the following:

### Filling of submerged pumps

- Trainees learn how to cool down the pump step by step with intermediate temperature and level checks, while aligning their actions with the control room. This always involves manual field operation and, if carried out incorrectly (too fast, for example), can result in pump damage, high repair costs, and

possibly even downtime while waiting for a new pump to be delivered.

## Reacting to a fire in the machine house

- Trainees learn to understand the hazards associated with combustion of hydrocarbons and how to react safely in emergency situations such as this. Training in a safe environment is particularly beneficial in dangerous scenarios where it would be difficult and expensive to simulate the incident.

## Depressurising and inerting a column

- Before a vessel can be handed over to the maintenance team, it needs to be depressurised and subsequently purged. Trainees learn how to achieve this correctly in this module and thus contribute to a smooth, risk-free process flow.

## Troubleshooting a stuck valve

- Sometimes a valve can get stuck with a loss of instrument air supply. This is a common failure situation and the troubleshooting measures can be easily practiced in the virtual world. Here, trainees are drilled on this failure situation and how to respond safely.

## Valve change-over

- Even routine, simple operational procedures can present a safety risk if not executed properly. Changing over safety valves is a typical example. Operatives must unblock one valve before blocking-in the other one. Incorrect blocking-in of valves immediately results in a high safety risk, and so this module gives operatives a chance to practice this over and over.

Other typical LNG and NGL training applications include draining vessels to the flare system and unclogging filters – where practice can increase maintenance efficiency and help avoid inadvertent malfunctions.

## Success stories in the making

For some time now, VR has been gaining traction as a valuable and flexible training tool, especially given the remote location of many LNG and NGL plants. The need for remote, on-demand training has become all the more pressing in times of social distancing and travel restrictions.

VR training gives workers the chance to practice routine maintenance and operating procedures and – even more importantly – critical and unforeseen scenarios in a safe yet realistic environment. Operatives can learn from their mistakes without having to worry about safety or fire risks, unwelcome costs, and potential plant downtime. Not only does VR training thus contribute to safety and operational excellence in complex and potentially dangerous working environments, it also enables plant operators to get ahead and prepare now for the staff and skills gaps expected in the next five to seven years.



**Figure 2.** All the user needs for the virtual training is a VR headset and a laptop.

Linde Virtual Academy is an example of how VR technology can be successfully rolled out to increase training efficiency in the oil and gas industry. Already deployed across Africa, Europe, and North America, this technology is increasingly resonating among customers – as demonstrated by a growing number of large scale reference projects. For example, Linde Engineering is setting up a VR training centre for a remote, world-class LNG plant currently under construction. This will allow the customer to get its 100+ operators up to speed before the remote plant even comes on stream. Looking ahead, Linde anticipates that VR will enjoy rapidly growing popularity in the oil and gas industry over the coming years. **LNG**