



# Performance under pressure

a solution on how to fuel vehicles  
in a more efficient way

All over the world, people are trying to find ways to help reduce environmental impact. Hydrogen fuel is one potential solution, as it's completely free of emissions if it is produced from solar or wind energy. Linde Hydrogen FuelTech GmbH are increasing their capability to provide hydrogen fuel solutions, and approached VHT for a solution on how to fuel vehicles in a more efficient way.

Towns and cities all over the world are investing in greener public transport vehicles, whether that's through hybrid engines in buses or trains which run only on electricity. One solution which is often seen as the most promising in the long term is hydrogen

fueling, due to the absence of emissions by the rising availability of green energy.

There are already buses and trains available which run on either liquid or gaseous hydrogen, so the challenge is to make the transition easier.

Linde Hydrogen FuelTech offer fueling station solutions for these more environmentally friendly vehicles, and are investing in improving their offering significantly over the coming years. That includes being able to generate fuel at the station through solar energy, and being able to pump fuel into buses and trains quickly and efficiently. Here, they worked together with VHT to find an innovative solution.



## Fast fueling

An issue with fueling larger vehicles, like trains, is the fact that the pressure in the storage tank drops when fuel is transferred. This means the fueling process can take more time, which ultimately costs money as the vehicle is out of operation for longer. It can also mean that all fuel isn't being used, as some can remain in the tank. However, VHT has the solution.

VHT provides piston accumulators designed specially for use with hydrogen fuel. With these accumulators, compressors and other equipment, we can keep the hydrogen under constant pressure, regardless of how much is left in the tank. This means fuelling is significantly quicker, more efficient and more consistent.

VHT has years of expertise when it comes to traditional piston accumulators, working with oil and nitrogen, but Hydrogen in combination with high pressure presented some new challenges. With actuators that are working directly with hydrogen, there are a number of factors to consider, like surface smoothness, permeability, and sealing.

Hydrogen presents a unique challenge. Because it's the smallest molecule, it enters surfaces much quicker than other fluids and gases, which means VHT had to take a different approach with the materials and the design. No use of welds, for example, to avoid any

potential cracks, and different methods to cope with the high pressures involved.

## The fuel of the future

Finding the right technology now is vital for the future. Hydrogen fuel has the potential to help us to live in a more sustainable way if it can be implemented effectively. That's why solutions like this are so important, as they make the transition from traditional fuels to green fuels much easier.

Hydrogen fuel is not completely green yet, as the hydrogen is often a by-product of burning fossil fuels. However, it can also be produced from solar and wind energy, so the balance just needs to shift. Linde Hydrogen FuelTech can provide stations with on-site solar panels, which is an innovative approach to this particular challenge.

The key to the future of hydrogen fuel becoming widespread, aside from continued investment, is innovation. Innovations that work for the provider and the user, and that make the transition towards a greener future much smoother.

It's great to work with ambitious customers. The collaboration is great, and the results are fantastic. It's exciting to think that this is just the beginning.