

MineARC's ChemSAFE Safe Havens: the gold standard

MechChem Africa speaks to Alex Farquhar of MineARC Systems, a world leader in controlled environments and safety technologies for underground mining, tunnelling, chemical processing and biotechnology industries.



Alex Farquhar (left), Global Petrochemical and Disaster Relief BDM for MineARC systems, installing a ChemSAFE refuge chamber for Castrol in Merak, Indonesia.

MineARC Systems was founded as a specialist in the design, manufacture and supply of safety chambers for underground mining. "Refuge chambers are the backbone of our company and this success has expanded into the tunnelling construction field. Both industries are exposed to the risk of fire and underground smoke, which can quickly contaminate the respirable atmosphere.

"We design safety shelters that can be located underground at emergency muster locations so people can get into them quickly and remain protected for the duration of any life-threatening incident," says Alex Farquhar, the global business development manager for the company's ChemSAFE emergency shelter solutions.

Today, under the ChemSAFE brand, the company develops surface-based solutions for the oil and gas and chemical industries to serve a similar purpose. "These are designed to protect against releases such as chlorine, ammonia, hydrogen fluoride, hydrogen sulphide and other chemicals that can be lethal or cause permanent damage," Farquhar explains.

"What differentiates ChemSAFE from other safety shelter providers is, while most shelters try to filter and purify the air, we create a totally sealed environment with its own atmosphere. We manage this by scrubbing out the CO₂ produced when people breathe inside the chamber, and replacing depleted oxygen to maintain a breathable atmosphere for all those being sheltered," he continues.

Competing systems, he suggests, attempt

to dilute the contaminated air and expel gases using compressed air, while controlling the leak rate. "We seal the shelter, apply a positive pressure and then manage the atmosphere inside totally independently of what is happening outside," he adds.

Most ChemSAFE shelters are designed for 12 hours or less of safe refuge based on specific site requirements. At-risk facilities such as fertilizer manufacturers or ammonia plants will usually have prepared incident response scenarios, which typically require between 30 minutes to six hours of protection against a gas release, based on the estimated time for the released volume to dissipate.

"When I talk to industry groups dealing with major hazard facilities, one of the first questions is 'What kind of scenario can a

ChemSAFE withstand'. We have solutions that can go well above industry standards with respect to blast resistance and chemical protection – in almost any application. We are confident in saying that our chambers will offer the protection required, regardless of the client's response scenario," Farquhar says.

Custom-built to suit the facility's needs, typical above-ground ChemSAFE refuge shelters are blast-rated for 5 psi overpressure, which is equivalent to a windspeed of over 160 mph that will completely destroy areas of a city. "We also have blast protection options of up to 12 psi if needed, which is the highest I have ever seen in any risk assessment.

"By offering such high levels of protection on the chemical side, we are attracting a lot of interest from companies handling ammonia, along with those dealing with sour gases such as H₂S," he adds.

Farquhar suggests that the use of a safety shelter above ground is often considered counterintuitive to the traditional safety response. "When an alarm goes off at the workplace, people are conditioned to follow the safest route out of the building and to assemble at an outside muster point. Going into a sealed chamber usually feels wrong.

"In a chemical emergency, however, outside is not safe. We offer chambers for between 20 and 60 people, but 30 is a more manageable number to enable people to get in as quickly as possible; generally within a few minutes. We also have an expandable modular shelter design that can be expanded



A ChemSAFE refuge chamber create a totally sealed environment with its own atmosphere.

or contracted quickly to match the changing numbers of onsite people needing protection," he says.

Farquhar cites an example from India, where an emergency procedure dictates that 150 people are required to enter a safe environment within two minutes of a release. "We had to design dual rapid entry airlocks rather than having a door system; enabling large numbers of people to enter quickly and efficiently without contaminating the inner refuge," he explains.

Turning attention towards the transition to decarbonising the energy landscape, he says that Australia and South Africa have excellent wind and solar resources and a lot of companies see this as an ideal opportunity to invest in green hydrogen and green ammonia.

"I was recently called in to speak with a group looking to use ammonia for its maritime decarbonisation programme. There are a lot of companies getting involved in these gases for the first time and they are looking for advice on how best to handle the associated risks," he explains.

Hydrogen has a low density, so for transportation purposes, ammonia (NH₃) is more easily handled. While it can be used directly as a fuel, hydrogen can also be stripped out of the ammonia for direct use. "All the technologies involved have started to gain traction with developers and investors," Farquhar tells MechChem Africa.

"We see this as a new and important area of development. It is very challenging, though. Ammonia is likely to be used as a fuel for heavy logistics, the rail and shipping networks, for example. Road based transport would probably use hydrogen directly, supported by a new and innovative refuelling infrastructure," he predicts.

A customised ChemSAFE shelter has already been supplied to a port facility tasked with ammonia transfer from vessels. The ChemSAFE chamber sits on wheels on the wharf so it can be strategically positioned close to the ship being unloaded. This ensures the dock workers can get into a sheltered atmosphere quickly should the ammonia breach containment.

Hydrogen, he notes, which is much lighter than air, tends to dissipate quickly when released and is only a blast hazard if ignited after mixing with oxygen. This will happen if the mixing occurs while the hydrogen is contained. Also dangerous, though, is the secondary fire or blast hazard: when a flame produced where a hydrogen leaks into the air ignites another area of the plant, for example.

Farquhar goes on to say that while users tend to have some safety systems in place, the companies around them often feel vulnerable. "Increasingly, we are hearing from people who do not actually own the chemical, but are

seeking advice on how to deal with over-the-fence hazards," he notes.

"In Indonesia, for example, we have a customer alongside a chemical plant that stores and uses highly toxic chemicals. I know how serious their hazards can be, and it makes me feel much more comfortable knowing that this company now has access to our shelters," he tells MechChem Africa.

"There is a well-known saying: 'If you think safety is expensive, wait until you have an

accident!' These days, not only are business owners accountable for the people injured or killed, but if any lack of diligence is uncovered, their license to operate is likely to be withdrawn. Accidents are also particularly damaging with respect to public perception, so the effects of any major accident can be felt for a long time," he warns.

"The MineARC and ChemSAFE range can protect against all of these risks," he concludes. □



ChemSAFE chambers are surface-based solutions for the oil and gas and chemical industries, designed to protect against releases such as chlorine, ammonia, hydrogen fluoride, hydrogen sulphide and other chemicals that can be lethal or cause permanent damage.



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