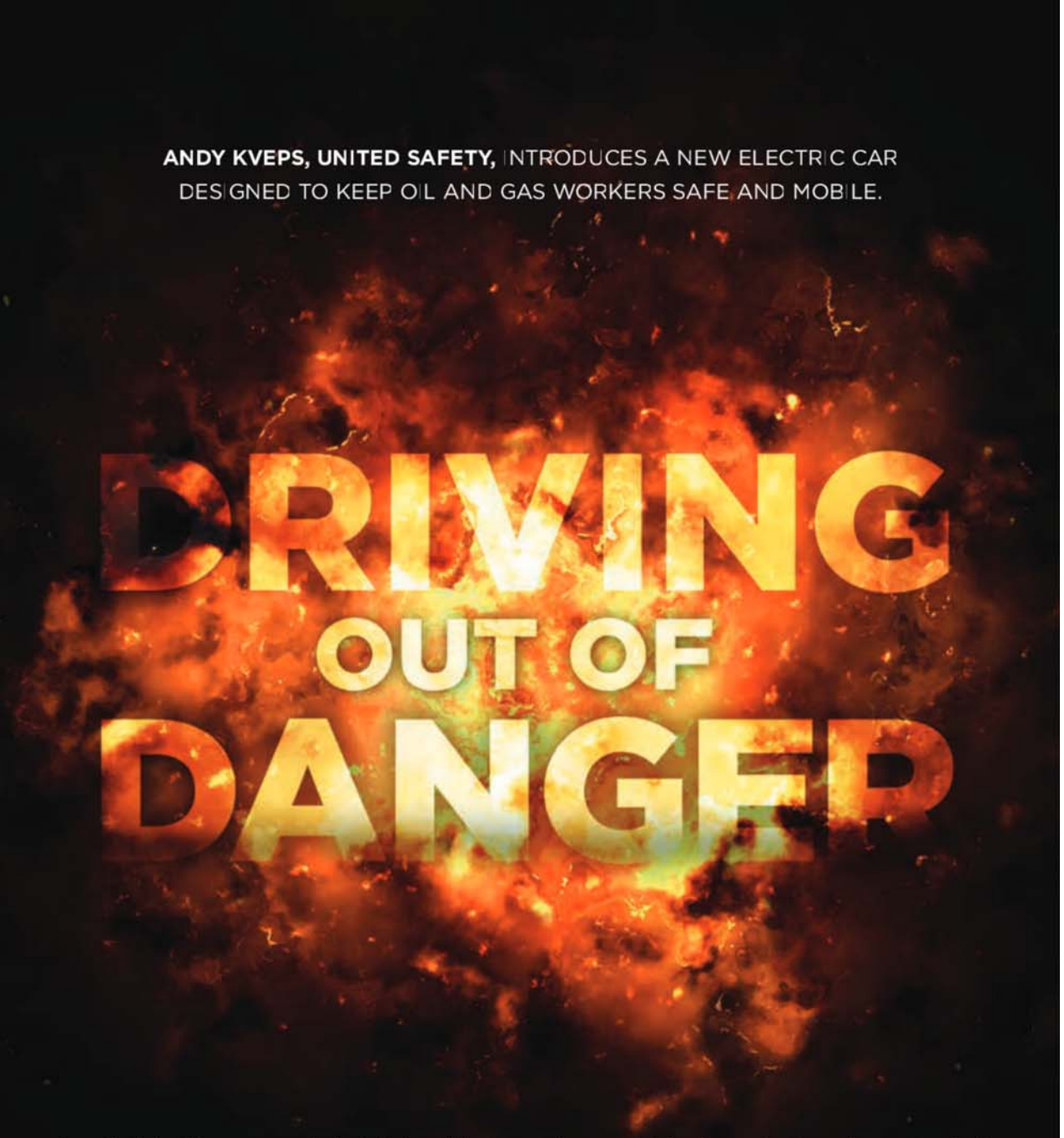
ANDY KVEPS, UNITED SAFETY, INTRODUCES A NEW ELECTRIC CAR DESIGNED TO KEEP OIL AND GAS WORKERS SAFE AND MOBILE.



DRIVING OUT OF DANGER

The Flocken Elektrowagen, considered to be the first real electric car in the world, appeared in 1888 with a potential to compete with the gasoline-powered vehicle introduced by Karl Benz. Unfortunately, high costs, low speed and short battery life stalled development. In contrast, advances in internal combustion technology, the growing petroleum infrastructure and mass production paved the way for gasoline vehicles to dominate the market.

Fast-track to the 1980s where the petroleum and chemical industries have expanded, but were plagued by a number of serious major incidents involving fires, explosions or releases of toxic substances. The death and injury of a large number of people inside or outside the plant, and the extensive property and environmental damage pushed the industry to identify areas that were 'Immediately Dangerous to Life and Health' (IDLH), regulate equipment and limit the work allowed in these areas.

Innovations lead to more innovations

Today, electric vehicles have resurfaced in the market. Powered by improved drive and battery technology, they have found their niche market in areas such as the logistics and travel and tourism industries. The application of explosion-proof technology in electric vehicles signified a new era of innovation specifically targeted at the petrochemical and oil and gas industries handling toxic and flammable materials.

Figure 1. *Driving the industry to safety. The Air Qruise™ Electro-Ex is an ATEX-certified explosion-proof vehicle equipped with a breathing air system that allows workers to drive safely through explosive and toxic environments.*

Follow the duct tape to innovation

An innovation can often be implemented in areas where there is a significant use of 'duct tape' or stop-gap measures to solve a challenge. This was the case for the protection of personnel travelling through toxic atmospheres. Typical workaround solutions involved simply walking rather than travelling in a vehicle. Carrying bulky breathing equipment could impair the driver's ability to control the vehicle. Traditional methods such as these are often seen as inefficient and cumbersome and impede a person's ability to work efficiently and safely.

Recently, a technology has been developed to increase personal safety while travelling through toxic areas. The Air Qruise™ technology, the industry's first vehicle gas protection system (VGPS) works by integrating breathing air systems into the overall shape and form of a vehicle. The technology was designed in such a way that it does not interfere with any of the vehicle functions or impede the vehicle operator in performing the duties of the driver. This allows the driver and passengers of the vehicle to be fully protected while operating the vehicle. The VGPS can be adapted to just about any vehicle; car, truck, bus, helicopter, plane, boat, etc.

However, the introduction of explosion-proof technology on its own revealed another challenge. When using a vehicle that is equipped to travel through explosive atmospheres, it is likely that the vehicle's occupants would be subjected to a toxic environment. Thus, the development of the explosion-proof vehicle solved the challenge of protecting assets and people from an explosion, but created a gap where the vehicle's occupants could be subjected to toxic environments.

Almost explosive – very toxic

Techniques for ensuring personal safety can be derived from an awareness of the IDLH environment and the ability to understand where a worker exists in relationship to the IDLH space and how they may interact with it. Regulatory bodies in the US, Canada, UK and Europe require a certain level of competence for people working in IDLH areas. Only people who have undergone training and obtained the appropriate certificates and special permits can enter IDLH areas.

When working in explosive environments with a hydrogen sulphide (H_2S) or sour gas component, it is important to understand when the environment becomes toxic and when it becomes explosive. Hydrogen sulfide is a colourless, highly flammable and explosive gas. Personnel may readily identify its strong odour, which is characteristic of the smell of rotten eggs. However, the odour is not a reliable indicator of the presence of H_2S and may not provide adequate warning of hazardous levels, as at higher concentrations the gas disrupts the olfactory senses. The Occupational Safety and Health Administration (OSHA) established a 10 ppm level as the maximum allowable limit during an 8 hour shift. At an exposure level of 700 ppm and above, death can result if the victim is not promptly rescued.

In a sour gas plant, the percentage of hydrogen sulfide in the feed gas can vary between 5% and 45%. Natural gas or methane has a lower explosive limit of 5% or 50 000 ppm. For example purposes if one were to choose a 20% sour gas plant, this would result in a toxic gas concentration of approximately 10 000 ppm. Even an atmosphere containing a level of natural gas that is not explosive could still present an extremely toxic environment. Clearly, designing a vehicle to provide explosion-proof capabilities solved only part of the problem.

Not your dad's electric car

The recently launched Electro-Ex employs the same Air Qruise technology on an electric vehicle to provide maximum safety in IDLH atmospheres. The combination of explosion-proof mobility with breathing air delivery and gas monitoring systems allow personnel to work safely and transit through hazardous environments.

Previous electric cars were hampered by poor performance in speed, range and payload. With the technological advances made in the last few years, this VGPS has 100 km driving range with a top speed of 35 kph. The vehicle houses a 14.4 kWh power pack that is maintenance-free and performs well in wide temperature extremes. When completely drained, the vehicle can be charged in 12 hours and can be topped up to full capacity in two hours when half depleted. The power pack can also be changed out with a fresh one in around five minutes.

For use as an emergency response vehicle, the combination of technologies will open the door to new thinking. For instance, at present, standard rescue operations on large sites that have a potentially toxic atmosphere are limited to 30 minutes due to a limited portable air supply. The Electro-Ex carries 400 ft^3 of air as a standard, providing enough breathing air for two persons for two hours. Rapid deployment bags contain a set of breathing masks for the driver and passenger supported by an air storage system with visual and audible gauges. For emergency response situations, the vehicle can carry 10 man-hours of breathing air or more.

Productivity up, fatigue down

Driven by demand, oil and gas companies are aggressively pursuing drilling operations in complex wells for additional resources. The industry also continues to build and expand facilities that produce and refine product from fields containing high concentrations of H_2S. Facility managers often find themselves awake at night thinking of ways to protect personnel as they travel through these areas.

Most protection surrounding toxic environments in the industry revolves around a person on foot. The VGPS comes with a beefy payload of 1000 kg and a towing capacity of 3000 kg. This makes the vehicle a legitimate workhorse, designed for petrochemical industry personnel to move through a toxic

environment quickly. Allowing operators to travel rapidly through potentially toxic and explosive atmospheres and transition from the vehicle to the place of work increases both the efficiency and safety of the workers by reducing exposure times.

Reducing foot travel also decreases fatigue. In larger plants where there are significant distances to traverse, an explosion-proof vehicle proves to be a smart solution. The VGPS can transport equipment for daily operations and maintenance, carry plant operators and supervisors for routine inspections or move field personnel or medical responders to remote work sites. Facility managers will benefit directly from cost savings through reduced travel time and operator fatigue.

Compliance to standards

Across the globe, there are three recognised certifying bodies that have set the standards for explosion-proof, intrinsically safe equipment. The European Union uses ATEX, North America refers to UL standards and IECEx is recognised internationally. These certifying bodies issue standards and directives that provide guidance for manufacturers of equipment and protective systems for use in potentially explosive atmospheres.

For the purposes of certification, facilities are divided into zones or divisions based on the likelihood of a potentially explosive atmosphere being present. The Air Qruise Electro-Ex has ATEX 94/9/EC for Category 2G (Zone 1), which meets standards suitable for atmospheres containing gas and where an explosive mixture is likely to occur in normal operation. In Canada, where this VGPS was designed, ATEX and IECEx certifications are often recognised and accepted. The vehicle was launched in the Middle East, which also recognises ATEX standards. If the need arises, the vehicle can be certified under UL and IECEx.

Innovation is about asking the probing questions

The cross-pollination of tried and tested technologies from other industries often leads to very successful innovations. The introduction of explosion-proof vehicles is a demonstration of the benefits of merging proven techniques and technologies across industries. As explosion-proof vehicles become more common, users will begin to ask the question, “This vehicle is built to protect hard assets, but what is being done to protect the vehicle’s occupants?”

Successful protection of workers from toxic environments requires systems designs that are simple and bullet-proof. By listening to and working together with plant operators, regulatory bodies, field workers and oilfield service companies, innovations can be developed to protect people in these increasingly challenging environments.

The road ahead

The VGPS is now being tested at one of the largest sour gas field developments in the Middle East, with a 23% H_2S component. Periodic drills have been conducted to simulate an H_2S release, and the vehicle occupants conduct safety evacuation exercises. The vehicle has proven to be a robust system capable of adapting to the extreme temperature swings and unique challenges found in the Middle East.

The industry has been quick and enthusiastic to adopt its benefits and value. With much-valued user input and feedback, the VGPS is already being transformed and modified for applications within the oil and gas industry and others. It is only the beginning of the road for highly mobile IDLH protection systems.