

Gas detection system tackles refrigerant leaks

International company Murco has launched a new generation of gas detection equipment, to complement its comprehensive range of gas leak detection equipment. Robust and reliable, these gas alarm systems are now used in thousands of refrigeration and air-conditioning installations worldwide.

Refrigerant detectors are the front line instruments in the industry's response to challenging and comprehensive requirements. The Murco sensor transmitter range includes catalytic, semiconductor, electro-chemical, and infrared models to detect gas leaks in an area, room, zone, airspace or airflow.

The Murco MGD system has one-, two-, four- and six-channel monitors with remote sensors and a choice of one or two levels of detection. All have visual and audible alarms and relays for control or remote reporting. All Murco units incorporate constant power and system fault monitoring as standard.

Available for all refrigerants and most other problem gases, the units are being used extensively in machinery room applications to ensure compliance with international conventions and regulations.

Murco has developed systems that are distributed worldwide and allow full compliance with all relevant standards, including SANS 10147, ISO 5149, EC Regulation 2037/2000 and EN378, and the US standards ANSI/ASHRAE 15, as well as meeting most insurance, work safety, mining code and best-practice requirements.

The danger of refrigerant leaks "A high proportion of South African mining companies and refrigeration contractors are taking little or no action to minimise refrigerant leaks in refrigeration installations and, therefore, they do not comply with prevailing standards.

"Of greater concern are the potential dangers to the occupants, the facilities, and the environment," asserts Murco MD Dr Lorcan Maher.

Mine ventilation and cooling practices have evolved greatly in the past decades as the refrigeration infrastructure acquired greater importance in the light of deeper and more complex mines. Refrigeration is crucial to the growth of the mining industry as underground chambers go down to 3 000 m below the surface and temperatures reach 50 °C and higher.

Better practices are encouraged by the introduction of health and safety standards, the need to increase the productivity of the workforce and the need to improve efficiencies and reduce costs.

A crucial innovation in the industry was the introduction of high-performance and advanced control systems that enabled operators to have a comprehensive understanding of the mine's conditions, even in remote areas, improving their safety operations.

However, there has been little action in the monitoring of refrigerant leaks. Maher says the reasons for widespread inaction cannot be the lack of awareness because the hazards are widely understood and documented while all refrigeration engineers, insurance inspectors and assessors are aware of the need for regulatory compliance.

"Unfortunately, in matters of safety it is often a fact that money speaks louder than formal regulation. So, perhaps, it will take a high-profile lawsuit by an injured worker or the family of a dead one – or the dismissal of a large insurance claim because of failure to take proper precautions – to change the mindset of management in the South African mining industry." He points out that refrigerant leak detection systems are quite expensive and that the cost of leak detectors can easily be recovered through savings in reduced refrigerant loss.

Deaths as a result of refrigerant leaks are not exceptional. Ammonia, for example, a highly corrosive, toxic and explosive refrigerant, is used in many chiller installations throughout South Africa.

Lighter than air, leaking ammonia can accumulate in the head-spaces of enclosed areas. Other refrigerants, such as R22, are heavier than air, and if operators are unaware of a leak, it can accumulate over time in any enclosed area.

Since many refrigerants are odourless and colourless, the displacement of oxygen goes unnoticed and workers can lose consciousness quickly. In rarer cases, the refrigerant can react with intense heat or open flame to produce the deadly phosgene gas.

Another aspect of refrigerant leaks is the high impact on the cooling efficiency of a system. Research shows that a refrigeration system experiencing a typical leak of 15% can experience a drop in capacity of 45%, resulting in a 100% increase in the energy consumption. Moreover, refrigerant leaks have a double negative impact on the environment, owing to the release of refrigerants (greenhouse effect), and the additional carbon emissions

resulting from the generation of additional power to run the inefficient system.

Standards and regulations requiring refrigerant leak detection Pressure is mounting regarding environmental regulations: "It can hardly be compared to serious safety issues, but the fact is that there is increasing concern about the contribution made by leaking refrigerants to ozone depletion and global warming. Invariably the key point of these standards is all-embracing and applies to all refrigeration and air-conditioning installations in all circumstances," says Maher.

"Most standards state unambiguously that at all times, care should be taken to lessen the discharge of refrigerant into the atmosphere," he notes.

The seriousness of leaking systems was of comparatively little concern to the industry until recently. Most plant operators found it easier to top up leaking systems with refrigerant rather than find leaks and operate tight systems. Historically, some 70% of refrigerant has been used simply for topping up leaks.

This began to change with the Montreal Protocol in 1987, which formalised a response to the damage being caused to the ozone layer by ozone-depleting substances. With the subsequent international phase-out programme for CFCs and HCFCs, the replacement cost of refrigerant leaks started to become a source of concern.

Stationary refrigerant monitors The International Standards Organisation (ISO) 5149: 1993(E) was the response to the Montreal Protocol and updated the previous standard and incorporated the requirement to use leak detectors.

It applies in all member countries of the ISO in Europe, the US, and includes major Asian countries, such as China, Japan, Korea, Singapore, India, and Pakistan. A number of countries worldwide, including the US, Netherlands, and South Africa, responded to the protocol by introducing their own supplementary regulations or standards, requiring the installation of fixed refrigerant monitors in refrigeration and air-conditioning machinery rooms based on the ISO 5149 standard. In South Africa, the National Standards 10147 (SABS0147) code of practice on refrigeration systems is the relevant standard. This requires the installation of fixed refrigerant leak detectors with special requirements for ammonia.

In most countries there is a volume of safety legislation covering occupational exposure that requires that workers not be exposed to harmful gases, including refrigerants, above the recommended limits.

Refrigerant monitors would demonstrate compliance and lessen this risk.



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