WorldCargo news

Tackling mobile plant fires

Approved factory-fitted or retrofitted fire suppression systems are readily available, from companies such as Dafo, for heavy handling equipment

Burnt-out wrecks of equipment parked up awaiting an insurance assessor or an occupational safety officer to inspect them remain an all too familiar sight in port terminals.

Insurance industry figures indicate that 50% of all fires on mobile plant are due to poor maintenance. The main cause of fire is fuel, hydraulic fluid, lubricants or built-up flammable deposits leaking on to hot surfaces.

One vehicle fire suppression specialist, Sweden-based Dafo Vehicle Fire Protection, currently has OEM references for more than 100,000 materials handling machines. The Dafo Vehicle system is fitted to all big lift trucks built by Hyster Europe in Nijmegen and is the standard offer for Kalmar heavy lift trucks built in Poland and China, as well as Kalmar straddle carriers. Complete kits are shipped from Dafo Vehicle and the OEMs' fitters are trained to install them. Other key OEM customers include Volvo, Konecranes and Terex.

In addition, the company has thousands of retrofit applications. Dafo Vehicle's approved distributors retrofit heavy-duty plant, including mobile port equipment of different brands all over the world on a regular basis. "Our installers and service personnel are trained in accordance with Dafo Vehicle's high standards, which guarantees minimal disruption for the operators," said marketing manager Fredrik Rosén.

Prior to installation, the installer conducts an onsite fire risk assessment in order to identify potential fire hazards. Based on this, the severity and probability will be assessed, and the final design of the system will be completed.

In one notable recent retrofit, all mobile equipment at DP World London Gateway, including its fleet of Kalmar hybrid shuttle carriers, has been retrofitted by Dafo Vehicle's exclusive UK distribution and installation partner, Dafo UK & Ireland/Fire Shield Systems. For machines such as straddle carriers, where the driver is particularly exposed, Dafo Vehicle always recommends an extra manual actuator in the operator cabin, to back up the automatic actuator.

Key elements

In essence, the Dafo Vehicle system comprises four integrated components:

- A linear heat detector wire.
- Optical and acoustic alarms.
- The suppression agent (housed in a non-pressurised tank).
- The control unit.

The components work together in a coordinated, fast and efficient way to suppress fires. The detector wire is triggered when the temperature reaches 180 degC.

This may seem a high trigger point, especially if there is a fire in very cold ambient temperatures, but experience shows that it prevents false alarms, particularly as engine compartment temperatures are much higher these days, to maximise fuel efficiency.

Rosén said that Dafo Vehicle was one of the first companies in the world to develop integrated fire-fighting solutions for vehicles, as far back as 1976, and it has worked continually to make its systems more reliable as well as more sustainable and innovative.

Over the years, it has attained vast experience and knowledge from end-user installations, and

Dafo Vehicle's marketing manager, Fredrik Rosén

these have been used as the basis for eliminating false alarms and false releases.

Dafo Vehicle's suppression agent is 'Forrex', a trade-marked, proprietary blend of surfactants, liquid and dry chemicals specially developed to suppress fires in IC engines. Forrex offers outstanding flame knockdown and protection against reignition as it 'sticks' to the sprayed surfaces.

As soon as the alarm is triggered, the agent is released through a nitrogen gas actuator into steel pipe lines and then sprayed through nozzles on to the turbo charger, catalytic converter, pumps, fuel lines, generators, transmission belts, filters, hydraulic package, and so on.

The activation temperature of the linear detector wire in the Ansul Checkfire 110 vehicle fire suppression system from US-based Tyco Fire Products is, like the Dafo Vehicle system, 180 degC (356 degF). The operating principles are very similar. When fire is detected, the control module sends an electrical signal to release the gas from the expellant gas cartridge to pressurise and release the fire suppressant.

Apart from general fire and H&S legislation, Rosén makes the point that, nowadays, port authorities often require fire suppression systems to be fitted on heavy-duty plant in order to reduce downtime and secure business continuity.

Operations do not have to be shut down while the port or civil fire brigade is called out. The fire is put out so quickly that the risk to life is minimised, smoke pollution is also drastically reduced and, in many cases, once the fire is out, the machine can 'limp' to the workshop without having to be towed in.

According to Rosén, port authorities often then make reference to commonly used standards for fire protection. A good example is Australian Standard AS 5062:2016 - *fire protection for mobile and transportable mobile equipment*. This is an international third-party certification specifically for heavy-duty mobile equipment, instead of recognising specific fire suppression systems. Dafo Vehicle has a Certificate of Approval based on AS 5062.

In many cases, it is a prerequisite to install a fire suppression system on heavy-duty mobile plant in order to get insurance. Insurers may offer a reduced premium if a fire suppression system is installed, dependent on the required service being conducted at the prescribed intervals.

Electrical fires

As well as 'hydraulic fires', electrical cabinets are a well-known source of fire as they generate sufficient energy ignition and provide the combustible material to spread the fire. To combat electrical fires, Dafo Vehicle's PFK system combines fire suppression abilities with environmental sustainability.

The PFK system agent, FK-5-1-12 (Novec), is pressurised in the agent tank with nitrogen. FK-5-1-12 is a colourless and odourless gas that suppresses fires through cooling and suffocation. The agent leaves no residue, requires no clean-up and is non-conductive and non-corrosive. FK-5-1-12 agent quickly evaporates without harming any valuable assets, the company said.

Industry and public transport bodies are, increasingly, looking to renewable fuels, but knowledge about associated fire risks remains limited. Consequences connected to risks of lithium-ion batteries in case of a malfunction may imply serious outcomes, for example, if the driver is affected by gas emissions or by fire/explosion. Short circuiting, overcharging, high temperatures, mechanical damage and overheating might cause thermal runaway and the release of a flammable electrolyte, which makes fire extinguishing very difficult.

Hyster EC mast truck with Dafo Vehicle's fire suppression system

EV/hybrid protection

Dafo Vehicle has launched a fire protection system for electric and hybrid vehicles that is activated before a fire in a battery occurs. The solution has been developed for buses, but will also be available for other heavy electric vehicles now entering the port environment.

Dafo Vehicle won an Innovation Label award at Busworld Europe 2019, in recognition of its 'Li-IonFire' research project, which is co-funded by the EU under its Horizon 2020 Framework Programme for Research and Innovation. Li-IonFire, a registered trademark, investigated how to deal with fire hazards of lithium-ion batteries in vehicles to reducing the risks and consequences of a thermal incident in heavy commercial HEVs and EVs.

Risk management

Dafo Vehicle has also introduced DafoCLOUD, a cloud-based risk management system to provide a full overview of the life cycle of its fire detection and suppression system (FDSS). DafoCLOUD provides access to the full history and genealogy of subsystems of the FDSS, and the complete information is seamlessly accessible and updatable by relevant stakeholders. DafoCLOUD is the basis for reducing and controlling the total cost of ownership while maximising safety. ❑