Mining Vehicle Fires

If a mining vehicle falls victim to the ravages of fire, the cost of repair or replacement and the downtime while awaiting delivery of a replacement vehicle can have a serious impact on production schedules.
But dedicated systems are available to protect the vehicle and safeguard the operator.

Mining contributes significantly to Australia's gross domestic product and is responsible for the country's largest export revenue. Australia is the world's largest exporter of coal, iron ore, lead, diamonds, rutile, zinc and zirconium, the second largest exporter of gold and uranium, and the third largest exporter of aluminium.

By any measurement or international comparison, it is big business; of the world's developed countries, Australia is in the top 5 of Mining Countries in the world.

In addition to its importance in earning overseas dollars – coal is Australia's largest commodity export with annual coal exports worth more than $40 billion, predominantly to India, Japan, European Union, Republic of Korea and Taiwan

Australia has mining activity in all of its states and territories. Particularly significant areas today include the Goldfields, Peel and Pilbara regions of Western Australia, the Hunter Valley in New South Wales, the Bowen Basin in Queensland and Latrobe Valley in Victoria, along with various parts of the outback. Mining towns with such iconic names as Kalgoorlie, Mount Isa, Mount Morgan, Broken Hill and Coober Pedy are known across the world. Australia's high labour costs and world-class safety

standards, its distinctive geology, and the importance placed on mining research by successive governments and businesses has meant that the Australian mining sector is among the most technologically advanced to be found anywhere in the world.

The Mine Fire Challenge

The consequences of a fire in a mine – above or below ground – can be catastrophic, and the remoteness of the majority of mining operations in Australia makes regular fire risk assessment, fire prevention, fire protection, fire suppression and evacuation procedures critically important in terms of both life safety and asset protection. While, understandably, much of mine managements' attention is focused on below ground protection, utilising large-scale fixed engineered fire systems for the production-intensive mining operations, possibly less evident fire risks also have to be given the same level of diligent attention.

One important area that demands dedicated fire protection is the specialised plant, monster mineral-moving vehicles such as ore haulers, draglines, haul trucks, dozers and shovels on which mining and mineral extraction operations depend. Not only is this equipment extremely expensive to replace with a considerable delivery lead time – such equipment can often takes many months to replace – extensive downtime and business interruption, in the event of a fire there is also a very real life safety threat to the equipment operator. This machinery demands extraordinary, specialist protection to provide fire suppression for the equipment and a thermal barrier to protect and the operator's skin and clothing from heat, fire and flame.

Vehicle Fire Protection

The size of these machines means that, in many cases, if no fire detection / suppression system is installed the vehicle operator may not be aware of a fire until it is well advanced. Additionally, the precise nature of the fire hazard that these mineral moving vehicles present has to be carefully considered if the detection and suppression solution is to offer the maximum protection. Many operate virtually around the clock, 24 hours a day, seven days a week in what can only be described as an aggressive environment, generating considerable heat from the engine blocks, manifolds, turbochargers, and the vehicle's breaking systems. The vehicles also have to contend with high ambient temperatures, intense temperature variations in the engine compartment and near constant and substantial vibration.

In addition to the vehicle's fuel and the risk of fuel line ruptures, fire safety means taking into account any number of flammable liquids present throughout the engine compartment. These include hydraulic, brake, automatic transmission and power steering fluids, along with combustible accumulated grease on the engine block, for which frayed or damaged electrical wiring can easily provide the ignition source.

In fact, the Australian Standard, AS5062-2016 (Fire protection for mobile and transportable equipment) specifies that a risk assessment be undertaken in conjunction with stake holders, such as OEMs, mine management, operators, maintainers of the equipment and suppliers of fire suppression equipment to ensure that risks are identified for all facets of the machine and its environment.

Mining equipment is expensive and can often takes many months to replace. In the event of a fire there is also a very real life safety threat to the equipment operator.

Experience worldwide has shown that one of the most effective ways of dealing with this unique set of challenges is to use tested and Listed pre-engineered system such as the Amerex "VF" DCP system or the Ansul A-101 DCP vehicle fire suppression system.

The Amerex "VF" system is a specially-developed vehicle fire protection system that utilises linear or spot detection devices that alert a control module. This control module in turn alerts the vehicle operator that a fire has been detected and subsequently activates a fire suppression system. Heat from the fire activates the linear or spot detection devices that are located strategically throughout the "at risk" areas of the vehicle; the control module immediately sounds its integral alarm and, after a pre-set time delay period, the control module actuates the fire suppression system. The system can also be operated manually.

The suppressant agent storage cylinders are pressurised using nitrogen (N) expellant gas cartridges. Specially developed dry chemical extinguishing agent is expelled from the storage cylinders via a network of distribution hoses leading to the per-identified fire prone areas. Discharge nozzles direct the suppression agent.

Another option is the foam fire suppression systems that are used extensively throughout Australia and Asia. These systems are available in both engineered and pre-engineered designs. Pre-engineered systems use pre-set parameters for the distribution of pipework and nozzles. Engineered systems such as the IFES Fire Systems offering use a calculated approach using a sophisticated software and risk assessment process. There are two types of foam used AFFF (Aqueous Film Forming Foams) and F3 (Fluorene Free Foam) foam provides cooling of hot components and reduces the chance of re-ignition and is able to cover fuel spills that may occur under the vehicle. Options have been designed to allow various levels of protection, from fully automatic detection and suppression systems with full engine shut down and cab monitoring, to simple suppression-only systems with manual actuation.

Other benefits of the system include flexible siphon tubes for horizontal cylinder mounting, reinforced extra strong brackets with the smallest possible space demand, and larger capacity cylinders with higher flow valves.

Ensuring Operator Safety

Fires in off-highway vehicles such as mineral moving vehicles can quickly engulf the engine compartment and either threaten directly the life of the vehicle operator or cut off his or her escape route as the flames spread via the wheel arches or ignited fuel spillage.

To overcome this high-risk challenge, many now consider it essential to install a solution that provides direct personal protection for the operator, providing life-enabling time to escape and protected egress route options.

Such a system is Delta Fire Australasia's Firebane TES system, designed to increase the level of operator safety and reduce fire damage to off-road vehicles that operate in and around molten metals. It uses a liquid fire extinguishing agent that emulsifies and cools heated materials more quickly than water or ordinary foam, and has already become widely adopted in the steel industry where it is used for protecting smelting-operation pot carriers that transport superheated materials.

To overcome the risk of injury or death of the vehicle operator, many companies now consider it essential to install a solution that provides direct personal protection for the operator.

The system is designed to disperse the suppression agent throughout the cabin area, spraying the vehicle operator from above and below. This reduces the heat and smoke in the cabin area as well as minimising the prospect of injury should the emergency necessitate the operator having to exit the vehicle. The liquid fire suppression agent knocks down the flame, reduces smoke, eliminates heat and cools superheated objects and surfaces. Objects wetted with the agent will not support combustion and are protected from heat and flame. Most significantly, the agent is non-corrosive, non-staining and is safe when sprayed directly onto the vehicle operator.

An “escape component” is part of the solution, incorporating an escape hood and exit path spray. The escape hood withstands temperatures of up to 1000 °C for a short period of time to enable the vehicle’s operator to safety exit when in close proximity to excessive heat or flames. The exit path suppression agent spray is designed to provide a “corridor” to allow the operator to exit the vehicle. In addition to providing operator safety, this system can also be used to provide fire suppression for engine compartments and areas susceptible to damage from radiant heat. A tyre spray component option can be installed that will wet the rubber tyres of the vehicle, extending tyre life by reducing the damage caused by charring and flame contact.

The Cost Equation

With heavy mining plant easily topping the million dollar mark, the cost of fitting effective fire detection and suppression to new equipment or retro-fitting it to existing plant is miniscule. Certainly, the risk of fire is not high, but the consequences are significant. It can surely be only a matter of a few hours downtime following a fire before the cost of lost production exceeds the fire detection and suppression installation cost. Add to this the cost of potential litigation if the vehicle operator is injured or killed and the equation loses all comparison.

About Delta Fire

Delta Fire are Australia's leading specialist in the provision of high hazard fire protection and equipment. Our commercial and industrial fire protection product range includes almost every aspect of fire retardants and suppression from portable fire extinguishers to specialised fire safety solutions.

Clients include numerous airlines, fire and rescue organisations and Australia's top commercial and industrial organisations. Some blue-chip clients we work with are Virgin Blue, Qantas, Thiess Construction, Shell, Fremantle Ports, BP Petroleum, Neumann Petroleum, and Royal Vopak. We also provide fixed and mobile fire-fighting systems and suppression agents that provide around-theclock protection in high-hazard petrochemical environments.

As a national fire safety organisation with operations in Brisbane, Sydney and Melbourne and authorised distributors in South Australia and Perth we provide a consistently high level of service across Australia.

Delta Fire Australasia specialises in the design, installation and servicing of commercial and industrial fire-suppression systems. To find out more about the range of foam hanger protection solutions **contact Delta Fire.**

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