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13th September 2018

Chief Compliance Officer
New South Wales Resources Regulator
New South Wales Department of Planning and Environment

Re: **Preventing fires on mobile plant – Discussion paper August 2018**

Dear Sir/Madam,

The Construction and Mining Equipment Industry Group of Australia (CMEIG) has reviewed the New South Wales Resources Regulator's discussion paper (dated August 6th 2018), titled Preventing Fires on Mobile Plant[1].

In brief:

- CMEIG supports the Resources Regulator's efforts to continue dialogue on the topic of preventing fires on mobile plant. We also encourage the Resources Regulator to create a forum to collectively discuss this important topic in greater detail, such that the complexity of this topic can be given due consideration

- CMEIG has significant practicability concerns about a broad-brush approach to fire-resistant fluids and/or surface temperature control on all mobile plant operating in New South Wales mines. We also highlight the risk in taking such an approach, of proposing controls that involve inherent trade-offs, and may in themselves create additional hazards without addressing the root cause of fires on mobile plant

- CMEIG believes it may be pragmatic to normalise, and then analyse each fire incident, establishing the root cause on a case-by-case basis. Such analysis should consider the role of inspection, operation and maintenance practices, operator and maintainer training and experience, as well as the role of machine modifications.

We look forward to engaging further with the Resources Regulator. In the interim, we respectfully offer the following commentary for consideration.

Analysis of fire incident data

CMEIG notes the reference to an average of 6.2 fire events per month reported between September 2014 and May 2017, in comparison to the stated data collected between 2001-2008 showing an average of 3.1 fires reported per month. To the extent the Resources Regulator has not already done so, we suggest that it would be prudent to consider this apparent increase in light of the following potential contributing factors:

- resource industry activity and cumulative active field population of mobile plant between 2001-2008, and between 2014-2017 (i.e. whether a higher field population and mining more tonnes may contribute to higher average fires reported per month)

- any differences in the approach to data collection and reporting between the two afore-mentioned time-frames

[1] Preventing Fires on Mobile Plant Discussion paper August 2018, New South Wales Resources Regulator https://www.resourcesandgeoscience.nsw.gov.au/miners-and-explorers/safety-and-health/topics/fires-on-mobile-plant

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- field population of types of machines relative to number of fires reported on each machine type (i.e. testing whether there are certain mobile plant types or applications or environments resulting in higher relative, and absolute fire incidence – this may then allow a more pragmatic, solution-oriented approach)

- age (and operating hours) of machines at the time of fire incident (i.e. understanding the role of an ageing fleet, extending service life in lieu of replacing dated machine fleets, and the role of extended maintenance intervals in the New South Wales mining downturn between 2014 and 2017).

CMEIG respectfully suggests that analysis of fire incident data should additionally consider:

- specific machine types and models represented in the fire incident data available to the regulator, and more importantly, in respect of which the equipment manufacturer may have (or can work) on case-by-case solutions

- analysis of the root cause of each fire event i.e. the role of potential contributing factors including:

    - inspection, operational, maintenance and 'housekeeping' practices inconsistent with those recommended by the original equipment manufacturer

    - contribution of machine modifications or configuration changes to that which was originally supplied or recommended by the original equipment manufacturer.

Fire suppression systems

While CMEIG acknowledges the Resources Regulator's previously stated position that mobile plant fire suppression systems are focused on minimising consequences of fires, rather than preventing fire occurrence, we urge that fire suppression systems continue to be considered an important part of the suite of controls to minimise risk of injury due to fires on mobile plant. We note fire suppression systems are relatively simple to implement in comparison to the proposals from the Resources Regulator, and query whether their effectiveness has contributed positively to current health and safety outcomes in the fire events observed by the Resources Regulator.

Surface temperature control

CMEIG notes the Resources Regulator's reference to surface temperature control. We understand this is referring to designing mobile plant engine systems with additional cooling capacity to control surface temperatures, including through the use of water cooled exhaust systems.

We emphasise that the design of complex machine systems requires consideration of a multitude of requirements such as safety, serviceability, maintainability, reliability, energy demands, and ultimately end user acceptance – the design process inherently involves the difficult task of balancing these various considerations. As such, we suggest due consideration be given to the following:

- mobile plant design and development is often an iteration to designs previously proven in use over an extended period of time (including from a safety critical control system (i.e. brakes, steering etc) perspective). Development activity typically limits content change in successive iterations to ensure safe, reliable products. Significant changes such as the proposed surface temperature control may compromise this approach, potentially introducing new and/or unforeseen risks

- mobile plant component selection is based on compatibility and suitability for the intended use. Please note that while we acknowledge the Resources Regulator's assertion that marine configurations of some engines used on mobile plant exist, we suggest that the following factors need to be considered:

    - some manufacturers of mobile plant are also engine and component manufacturers. In other cases, the manufacturers of a specific mobile plant may be an integrator relying on third-party suppliers of engines, powertrains, cooling systems and other components, all optimised to work together. Further, not all suppliers of components provide marine engine configurations

    - in many cases where marine configuration engines are available, they are typically not retrofittable for the engine models and engine configurations used on mobile plant in the mining environment. By way of example, marine engines differ in engine and turbocharger configurations, as well as in their ability to be integrated into mobile plant chassis and powertrains

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  - many marine configuration engines (particularly larger marine engines) are designed to be reliant on a captive body of water for cooling i.e. raw, cool water from the body of water on which the marine vessel is traversing, is either pumped through the marine engine block and expelled through the exhaust, or circulated through a heat exchanger and expelled from the vessel. The absence of a large body of cool water or the difficulty of rejecting heat to an external body of water may make the use of specially designed marine engines impracticable for mobile mining machines

- cooling systems on typical mobile plant in the mining environment are balanced to manage the temperature contribution of a number of fluid powered systems – hydraulic implements, brakes, steering, engine and other circuit cooling requirements to name a few. Scavenging the energy demands of these systems and still providing the required level of heat rejection raises the following issues:

  - including heat rejection from exhaust systems on mobile plant where thermal energy is currently dissipated to the environment through convection and radiation, would require significant cooling package size increases to heat exchangers and engine radiators

  - including the afore-mentioned heat rejection may require a larger engine package. This has carry-over effects to the design of the entire machine. By way of example, a larger engine package to provide surface temperature control will itself need further cooling, and constitutes greater space-claim and weight penalty to the machine structure, while producing lower performance in an overall larger machine dimension. Furthermore, where poor inspection and maintenance practices are a contributor to fires, the additional complexity and maintenance burden introduced in this example, and the potential for leakage of the increased volumes of circulating coolant, may actually increase the likelihood of a fire

- we note the engine and machine research and development, testing and validation likely required for surface temperature control may share similarities with activities undertaken by various manufacturers of mobile plant to achieve USA Environmental Protection Agency Tier 4 Nonroad Diesel Engine Emissions Levels

  - the afore-mentioned has collectively been a multi-billion-dollar investment for CMEIG members, involving extensive redesign of mobile plant. We also note that the technologies available to achieve lower engine emissions levels can require and/or result in higher surface temperatures. We therefore suggest that any efforts to address surface temperature controls at a regulatory level in New South Wales would require consultation with the New South Wales Environmental Protection Authority (currently proposing USA Tier 4 Nonroad Diesel Engine Emissions Levels in New South Wales surface coal mines) to ensure consistency of approach

  - the level of complexity and focused design (noting as mentioned previously, that this design focus would require trade-offs in various other aspects) would ideally need to be supported not just by the New South Wales Resources Regulator, but the broader Australian, and global earthmoving machinery markets. Where this is not supported globally, consideration should be given to the potential resulting costs impacts on that market

- we also note certain regions within New South Wales, including parts of the Hunter Valley have strict noise control requirements. Achieving these requirements typically requires extensive use of sound control methods and sound suppression material. Cooling systems (and in particular cooling fans) are commonly a significant contributor to noise emissions and the significant addition of heat rejection to cool exhaust components may be contrary to the strict noise control requirements. Sound suppression methods and material also have the potential to raise mobile plant under-hood surface temperatures, contrary to the Resource Regulator's stated objective.

Comparing underground coal mobile plant with other mobile plant

CMEIG notes the Resources Regulator's reference to the relatively low incidence of fires on mobile plant in the underground coal environment relative to all other mines. As noted by the Resources Regulator, diesel mobile plant for underground coal mines demonstrate certain characteristics including surface temperature control, and use of a number of explosion protection techniques. We note that these characteristics are primarily aimed at the potentially catastrophic risk profile due to ignition of specific coal types, rather than the lower risk profiles inherent in other mobile plant applications.

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We suggest the following considerations are relevant:

- we query whether the lower incidence of fires on diesel engine mobile plant in underground coal mines is contributed to by:
    - a lower duty cycle for these machines (i.e. whether these machines are operated continuously over a typical shift or as support equipment, in comparison to other non-coal mobile plant that are primary production machines)
    - a lower population of these machines relative to other mobile plant resulting in lower incidence of fires
    - acceptance of lower performance and lower reliability for these machines in comparison to other mobile plant
    - relatively strict adherence in underground coal applications by end users, to original equipment manufacturer inspection and maintenance instructions due to the afore-mentioned explosion risk profile in underground coal mines

- expanding on what has been outlined previously, we note the different approach to diesel engine emissions and noise control requirements applicable to the underground coal environment

- we also note the relative simplicity and smaller size of diesel mobile plant in underground coal, including the use of simple, lower power engine packages versus those used in other mining applications. By way of example, we note that underground coal mobile plant engine power is typically around 250 hp or less. In comparison, underground non-coal machines can be upwards of 700 hp and surface mining machines can be upwards of 4000 hp. We suggest the cooling system sizing and heat rejection requirement for the latter two examples would be substantially greater than that which applies to the underground coal mobile plant example. We also note it is a common market expectation for the non-coal machines to sustain >85% typical availability rates.

Fire-resistant fluids

CMEIG suggests that consideration of the possible adoption of fire-resistant fluids should take the following into account:

- the relative cost of using these fluids in comparison to mineral oil. The discussion paper estimates the cost can be three to five times that of mineral oil. We suggest the overall cost and complexity of their use may increase further when considering the following:
    - availability of these fluids in the bulk quantities required for broad adoption by end users
    - fluid storage and management, particularly where different machine makes and models require incompatible fire-resistant fluid types

- the limited market interest to-date, to support their broad adoption on new machines/designs. There is limited knowledge of the impact of these fluids on seals, pumps, filters and other hydraulic system components, and the potential impact on safety related hydraulic systems such as brakes and steering. We suggest fire-resistant fluid usage may involve trade-offs in terms of:
    - fluid operating temperature range limitations (in some cases, operating temperature is limited to <60°C)
    - fluid operating life limitations (in some cases, as low as 5-20% of the lifetime of mineral oil)
    - need for frequent top-up to compensate for evaporative losses for some water-based fluids
    - need for frequent hydraulic system maintenance and filtration (i.e. some fire-resistant fluids demonstrate high levels of detergency)
    - accelerated wear of hydraulic systems components and in particular, Aluminium, rubber and plastic components (in some cases, this can result in a 50% reduction in component life)
    - hydraulic system performance reduction in comparison to mineral oils
    - different operating pressure requirements, and potential aeration and cavitation issues

- complexities in providing a unique solution for the New South Wales resources market:
    - retuning machine hydraulic systems to run fire-resistant fluids for one market relative to the willingness of other markets to adopt a similar approach

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  - potential environmental impact and cost of purging mineral oil from those machines destined for the New South Wales Resources industry
  - managing the supply chain for fluid power components, to separate and purge mineral oil from hydraulic system components where these components are normally supplied ‘wet’ with mineral oil

- potential carcinogenic and health-related considerations in handling certain fire-resistant fluids

- not all fluids have fire-resistant substitutes (e.g. diesel, transmission oils, final drive and gear oils, engine oils, coolant etc.)

- fire-resistant hydraulic fluids still burn under certain conditions e.g. when in the form of an oil spray, or in the case of water-based fluids, when the water content evaporates

- not all fires are caused by fluids (e.g. electrical fires, tire fires)

- where maintenance and inspection issues are an underlying cause of fire, fire-resistant fluids may not (or perhaps only partially) address the issue. In conjunction with the afore-mentioned issues, the proposed approach may prove limited in effectiveness, and potentially even counterproductive.

Summary

In closing, the approach proposed in the Resources Regulator’s discussion paper poses difficulties and concerns for reasons such as identified in this response. Instead, CMEIG suggests that a more targeted approach should be pursued. To that end, we would be pleased to engage in further discussions with the Resources Regulator and other concerned parties (i.e. machine users) to collectively review industry data in detail, discuss potential contributing factors, and then consider what additional measures, if any, could be implemented (or may already be implemented, or in the process of being implemented) to help further address those contributing factors.

We appreciate the Resources Regulator’s consideration of this response and look forward to the opportunity to engage further.

Sincerely,

David Birrell
CEO – CMEIG