



Dangerous Goods Safety Bulletin No. 0121

Hazards associated with the use of e-cigarette devices

Background

On 11 January 2021, the Department received a report of an incident at a mine site where an electronic cigarette (vape) battery spontaneously ignited in a worker's pocket while he was travelling in a utility with two other workers. The statements received with the report describe a combustion event not unlike fireworks going off and flying around the inside of the vehicle the workers were travelling in. The worker received severe burns to his leg.



Thermal and chemical burns from an exploding e-cigarette battery

This report is consistent with reports of other e-cigarette device spontaneous combustion events in the United States (US) and United Kingdom (UK), some of which have resulted in fatalities.

Also in January, an explosion in a parked car in a shopping centre carpark set off a destructive car fire that damaged seven cars in the vicinity. Police confirmed that an e-cigarette device was responsible for the explosion and resultant fire.

A recent study led by George Mason University estimated there were more than 2,000 visits to US emergency rooms from 2015 to 2017 for e-cigarette burns (thermal and chemical) and explosion-related injuries. The study report stated that the number is likely to be significantly higher as the study only considered emergency department presentations.

The vast majority of those injured were men who had e-cigarette batteries in their pockets when the batteries exploded. Some had keys or coins in their pocket which becomes a dangerous mix of metal and lithium-ion batteries, and increases the likelihood of a short circuit occurring. An overheated battery in a pocket can easily set clothes on fire, resulting in severe burns all over the body.

The linked video from NBC Nightly News shows e-cigarette devices exploding in pockets in several different scenarios – https://www.youtube.com/watch?v=XeKLMcM8_V0

Summary of hazard

The cause of the explosion is known as “thermal runaway”. Thermal runaway refers to the very rapid discharge of the battery which occurs when the battery overheats to dangerously high temperatures, resulting in inner fire and explosion, and chemical and thermal burns to the user.

Two thirds of the reported fire and explosion incidents analysed in a Federal Emergency Management Agency (FEMA) report in the US resulted in ignition of nearby contents such as clothing, soft furnishings and vehicle seats and, in eight per cent of those incidents, the fire was major involving significant portions of a building.

Available information and reports on similar occurrences from the US and UK focus almost exclusively on the injuries sustained by the individuals involved in each case. These are significant enough in themselves; however, the consequences of an e-cigarette battery explosion and fire in an underground mine or in the vicinity of an explosives magazine or fuel facility, are potentially catastrophic, as the explosion and fire in the shopping centre carpark demonstrates.

Contributory factors

The Health NSW fact sheet, Are electronic cigarettes and e-liquids safe? states that "the products available in Australia use a wide variety of parts and are sourced from many different manufacturers, including overseas manufacturers where safety and quality controls are unknown." This includes the quality and safety of the lithium-ion batteries used in e-cigarettes.

In their submission to the Australian Parliament Inquiry into the Use and Marketing of Electronic Cigarettes and Personal Vaporisers in Australia, the Australian Competition and Consumer Commission (ACCC) stated it was concerned about the potential safety risks from e-cigarette batteries:

E-cigarettes contain interchangeable parts, often including extra-low voltage lithium batteries. Failure of these parts has been linked to ignition of E-cigarettes, with a number of incidences of burns injuries reported overseas. Many have been linked to overcharging and overheating of batteries, causing the device to ignite or explode in close proximity to the user.

Actions required

It is strongly advised that all staff should be informed of this hazard.

Given the foreseeability of these occurrences and their potential consequences, the risks associated with carrying electronic cigarette devices (i.e. vaping equipment) on persons on site, particularly in potentially hazardous areas, should be reviewed and preventative and control measures developed and implemented.

Further information

- BMJ Journals, Electronic cigarette explosion and burn injuries, US Emergency Departments 2015-2017
<https://tobaccocontrol.bmj.com/content/28/4/472>
- CSIRO, E-cigarettes, smoking and health. A Literature Review Update (June 2018)
www.csiro.au/~media/BF/Files/E-cigarettes/E-cigarettes-Consolidated-Final-Report240618-pdf.pdf

- FEMA, Electronic Cigarette Fires and Explosions in the United States 2009-2016
www.usfa.fema.gov/downloads/pdf/publications/electronic_cigarettes.pdf
- Fire & Rescue NSW, E-cigarette fire risks and reported incidents
www.icao.int/safety/DangerousGoods/DGPWG15/DGPWG.15.IP.004.2.en.App.pdf
- NSW Health, Are electronic cigarettes and e-liquids safe?
www.health.nsw.gov.au/tobacco/Factsheets/e-cigs-are-they-safe.pdf
- Parliament of Australia, Electronic Cigarettes and Personal Vaporisers in Australia (March 2018)
www.aph.gov.au/Parliamentary_Business/Committees/House/Health_Aged_Care_and_Sport/ElectronicCigarettes/Report
- Tobacco in Australia: Facts and Issues (online resource)
www.tobaccoinaustralia.org.au/chapter-18-harm-reduction/indepth-18b-e-cigarettes/18b-4-safety

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22 February 2021