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POSSIBLE CAUSES OF FIRES IN ELECTRIC VEHICLES AND FIRE EXTINGUISHING RULES

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Annotation: Fires in electric vehicles (EVs) can be caused by battery malfunctions, thermal runaway, manufacturing defects, overcharging, accidents, or poor maintenance. Lithium-ion batteries, commonly used in EVs, pose specific fire risks due to their high energy density. Once ignited, these fires are intense and difficult to extinguish. Fire extinguishing rules emphasize using large amounts of water or special Class D extinguishers, isolating the vehicle, and ensuring thermal management.

Key Words: EV fires, battery, thermal runaway, lithium-ion, overcharging, extinguishing, re-ignition, safety.

Around the world, the market share of electrically powered vehicles increases consistently every year. Along with this growth, the fire safety of electric vehicles is becoming increasingly important. According to research conducted by the National Highway Traffic Safety Administration (NHTSA) in the USA, the risk of car fires and lithium-ion battery explosions is slightly less and poses less danger compared to traditional internal combustion engine models.

Every year, information comes from many countries about accidents related to fires or explosions in electric vehicles. The popularity of such news is related to the fact that incidents and fires involving internal combustion engines have long become a normal occurrence and have not attracted public attention. However, numerous studies show that the risk associated with lithium-ion battery models is very high, as battery damage can lead to a self-destructing chain reaction, though the risk level of electrolytes is lower than gasoline or diesel fuel, and much lower than hydrogen fuel in hybrid modifications.

The most common causes of fires in electric transportation are accidents and collisions, which have a negative and catastrophic impact on the battery. A severe collision can lead to "thermal runaway," which is a catastrophic and irreversible rise in battery temperature to critical limits. Additionally, catastrophic outcomes and short circuits in the vehicle's electrical network can lead to coolant leaking from the battery, and water entering the vehicle's electrical network. I will introduce the rules for extinguishing fires that occur in electric vehicles. Typically, a fire originating in a lithium-ion type battery in a vehicle does not occur immediately but happens after some time, which gives the driver and passengers time to exit the cabin. At the same time, fighting fire and high temperatures is very difficult; the difference between a fuel fire and a fire in an electric vehicle is that ordinary dust or gas type firefighting tools are ineffective. Moreover, when extinguishing electric vehicles, there is a risk of electric shock from high voltage systems.

The first thing a vehicle user should do is exit the vehicle covered in fire or smoke and call rescuers via emergency phone. If conditions allow, you can use foam firefighting equipment from a safe distance while adhering to all precautions. The primary task in the initial stages of

firefighting is to disconnect the high voltage cable either using an emergency connector or mechanically.

Tesla Corporation's official website, the world's most popular light electric vehicle manufacturer, indicates that the battery extinguishing process can last up to twenty-four hours. Furthermore, after the fire has been extinguished, the vehicle should be monitored for 2-3 hours as a fire may reoccur. The manufacturer recommends using a large amount of water for this, along with the possible formation of "electric arcs" accompanied by significant sparking. Because an electric discharge in the vehicle body is possible, the use of protective gloves is recommended.

In conclusion, using electric vehicles safely not only protects our health but also reduces environmental, ecological, and financial damages. The growing use of electric vehicles nowadays leads to fewer cases of burns or deaths.

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