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Case Report

Two death cases originating from supplementary heater in the cabins of parked trucks ☆

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ABSTRACT

A supplementary heater can be mounted in trucks or other transportation vehicles and used to heat the air in the cabin independent of the engine of the vehicle. This apparatus works with diesel fuel or gasoline. Combustion products burning in the pre-combustion chamber heat the fins of the engine. The air passing through the fins is heated and is transferred into the cabin. The malfunction of such an apparatus may be the cause of carbon monoxide (CO) poisoning or fire. In this study, we report two cases in which drivers died while asleep in the cabins of parked trucks. In the first case, a 43-year-old man died because of CO poisoning originating from a broken supplementary heater. In the second case, a 48-year-old man died owing to a fire that resulted from the burning of upholstery cloths in the truck cabin, and which was caused by a supplementary heater set at very high temperatures. In both cases, it was determined by a technical expert that the CO poisoning in the first case and the fire in the second case were caused by the supplementary heater in the trucks. It is emphasized in this article that the supplementary heater in the truck might be the cause of mortal CO poisoning as well as be responsible for fires in the cabins of the trucks. It aims to highlight that a detailed investigation of supplementary heaters at the death scene is required for such death cases in the trucks.

1. Introduction

Carbon monoxide (CO) is a colorless and odorless gas, and is lighter than air. It is an incomplete combustion product of hydrocarbons. About 600 accidental deaths due to CO poisoning are reported every year in the United States. CO usually causes accidental deaths, because it is pure and odorless. However, if there are other gases in the medium, the odor of these gases can be detected.[1–4]

Vehicle emissions in industrial countries account for about 50–60% of total emissions; the other categories of CO emissions are other fuel combustion sources, such as steam boilers, industrial processes and solid waste disposal. Exposure to additional CO can be detrimental to human health, and exposure to higher concentrations can result in death. The health effects of CO are largely the result of the formation of carboxyhaemoglobin (COHb), but, in addition to its reaction with haemoglobin, CO combines with myoglobin, cytochromes and metalloenzymes such as cytochrome *c* oxidase and cytochrome P-450.[5]

A car with a catalytic converter that emits less than 0.5% CO during the mandatory inspections can emit substantially more CO under special circumstances. When the car is running in a small garage, the oxygen level in the intake air will decrease owing to the exhaust-gas mixing with the surrounding air. During normal variations in the oxygen level, the Electronic Control Unit of the car ensures that complete combustion occurs, as this is a prerequisite for the function of the catalytic converter. At a certain critical point, the oxygen level will be so low that the Electronic Control Unit can no longer maintain complete combustion, thus disabling the catalytic converter. As a result, a considerable amount of CO will be emitted.[6,7]

CO can also affect drivers of a moving vehicle, usually owing to a defective exhaust system that allows gas to percolate through the floor or engine bulkhead into the interior. Rarely, a strong following wind can blow the external exhaust-gas through the open doors of a van or truck. Another cause is a leak in the heat exchanger in vehicles that use a direct air supply from around the exhaust manifold to provide passenger heating.[4]

In this study, two different cases of drivers who died while sleeping in the cabins of the parked trucks are presented.

2. Case reports

Case 1: The 43-year old male truck driver was found dead in the cabin of a parked truck in an open area (Fig. 1). A dense smell of

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Fig. 1. Case 1 was found dead in the cabin.

Fig. 2. Supplementary heater of the truck (case 1).

Fig. 3. Supplementary heater was adjusted to 2.5/4 (case 1).

diesel fuel was detected in the cabin. The supplementary heater has been adjusted to 2.5°/4° for the purpose of giving hot air flowing into the cabin (Figs. 2 and 3). However, cold air was given into the cabin because the supplementary heater was broken. The body of the driver was facedown on the bunk bed. According to witness statements, the driver was waiting for loading in the truck garage and he had attempted to repair the broken supplementary heater the day before.

Fig. 4. Case 2 was found dead and burned.

Cherry-red lividity, congestion and cyanosis of the face were reported after external examination.

The internal examination showed the organs were bright pink in color, and hyperemia and congestion, and petechial hemorrhages on the lungs were detected. Bright pink liquid owing to lung oedema in the trachea and main bronchial lumen was observed. 62.8% COHb was reported by toxicological analysis of blood.

Case 2: A 48-year old male truck driver was found dead due to a fire in a truck parked in an open area of the truck garage (Fig. 4). The fire was started by burning of upholstery cloths and burnable parts of the truck and was caused by operating a supplementary heater at very high temperatures. It was also determined that the supplementary heater in the truck had been installed subsequently under the driver's seat (Figs. 5 and 6). The driver's seat and the one next to it were folded up towards the front of the truck and the body was found lying on the left side on the lower bunk bed, at the back of the cabin.

The external examination showed that the clothes on the corpse were partly burned, and the lividity was cherry-red in color on unburned parts of the skin. There were second- and third-degree burns, which were getting worse to carbonization on some areas of the right side of the corpse.

Internal examination showed hyperemia and light-red color in all internal organs; oedema in the cerebrum; soot and carbon particles were in the mouth cavity, trachea and the main bronchus;

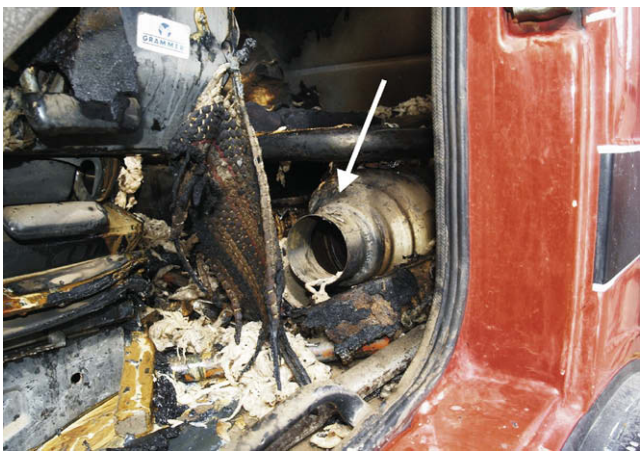

Fig. 5. Subsequently installed supplementary heater (case 2).