THE FACTS EMISSION OF PROCESS GENERATED CARCINOGENS FROM COMBUSTION

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ROADMAP ON CARCINOGENS

Most hazardous substances are labelled and identified, but there are also carcinogens created as a by-product during a work process, so called process-generated carcinogens (PGCs). As PGCs are usually not labelled and not referred to in Safety Data Sheets, these PGCs need special attention in OSH practice because millions of worker's in Europe are daily exposed to PGCs. One of the processes that emits PGCs is combustion. Combustion is the reaction between a fuel and oxidant accompanied by the release of heat. During combustion, new chemical substances are created from the fuel and oxidizer, which creates exhaust fumes. In occupational settings, carcinogenic (and other hazardous) substances are emitted upon combustion and form a hazard to workers. Examples of work situations in which exposure to carcinogenic substances from combustion occur are welding (welding fumes) or inhalation of diesel exhaust fumes.

Which activities lead to emission?

Fumes are formed when a metal or other material is heated and its vapours condense into very fine particles into the air. These fumes may be released upon welding, smelting, heating, burning, soldering, and curing of material. An operating engine emits carbon and many other chemical elements which contain carcinogenic substances, yet exposure may still take place when the engine is off in spaces with no or little ventilation.

Where risks occur

Combustion processes take place in a wide variety of industries like metal processing, construction, shipyards, and transportation industries. Exposure to engine exhaust takes place in occupations such as mechanics in bus garages and truck terminals, truck drivers, firefighters, construction workers, forklift operators, people working with fixed power sources like compressors, generators, workers loading and unloading ships or airplanes, oil and gas workers and toll-booth workers.

How many workers are exposed?

It is estimated that 3.6 million workers in Europe are exposed to diesel engine exhaust. Furthermore, millions of workers in Europe are exposed to fumes that contain carcinogenic metals such as lead, beryllium, cadmium and nickel. Exposure to chromium VI takes place upon welding stainless steel, nonferrous alloys, chromate coatings and some welding consumables. The exposure number to chromium VI is estimated at 900,000 workers in Europe. Welding of (metal) coatings and residues may also lead to the exhaust of toxic vapors, such as cadmium plating and plastic coatings.

Factors that influence exposure

Factors that influence workers' exposure to combustion fumes are the type of the process, the composition of the material that is being combusted, the location (area or confined space), the type of ventilation controls (mechanical or local) and the work practices.

Health effects

The source of the material being combusted determines the fume type and hence the health effect. Substances that increase cancer risk are chromium (lung); higher risk for cancer are suspected for nickel (lung, nasal), cadmium (lung, kidney, prostate), lead (lung, stomach, and urinary-bladder), beryllium (lung). For detailed information about health effects for specific carcinogenic metals and materials, please go to the factsheets for individual substances on the website of Roadmap on Carcinogens: Diesel emission and Welding fumes.

SOLUTIONS AND GOOD PRACTICES? WWW.ROADMAPONCARCINOGENS.EU/COMBUSTION

What to do?

Combustion fumes are usually not considered to be hazardous for human health, so extra attention should be paid to awareness of these substances and measures to mitigate the exposure. Like for any other chemical substance, one must perform a risk assessment on combustion fume (e.g. diesel emission or welding fume) exposure of employees. Ask for instance the following questions: are fumes being released into enclosed working areas? Are measures taken to reduce exposure? Do workers report irritated eyes or lungs?

The best solution is to minimize the fume as close as possible to the source by re-designing the work and reconsidering the techniques and materials used, for instance an extracted welding torch. If that does not work, the emission should be controlled in the close vicinity of the source, for example by using local exhaust ventilation systems. A variety of good fume extraction tools is present at www.dustfreeworking.tno.nl. Good practices and solutions are available on the website of Roadmap on Carcinogens.

Respiratory protective equipment, designed to protect the wearer from inhaling harmful dusts, fumes, vapours or gases, should only be used as a last resort.