



PUBLIC HEALTH STATEMENT

Used Mineral-based Crankcase Oil

CAS#: 8002-05-9

Division of Toxicology

September 1997

This Public Health Statement is the summary chapter from the Toxicological Profile for Used Mineral-based Crankcase Oil. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This Statement was prepared to give you information about used mineral-based crankcase oil and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) identifies the most serious waste sites in the nation. sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. Used mineral-based crankcase oil has been found in at least 85 of 1,430 current or former NPL sites. However, the total number of NPL sites evaluated is not known. As more sites are evaluated, the number of sites at which used mineral-based crankcase oil is found may increase. This information is important because exposure to used mineral-based crankcase oil may cause harmful health effects and because these sites are potential or actual sources of human exposure to used mineral-based crankcase oil.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You can

be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking substances containing the substance or by skin contact with it.

If you are exposed to a substance such as used mineral-based crankcase oil, many factors will determine whether harmful health effects will occur and what the type and severity of those health effects will be. These factors include the dose (how much), the duration (how long), the route or pathway by which you are exposed (breathing, eating, drinking, or skin contact), the other chemicals to which you are exposed, and your individual characteristics such as age, gender, nutritional status, family traits, life-style, and state of health.

1.1 WHAT IS USED MINERAL-BASED CRANKCASE OIL?

Used mineral-based crankcase oil is another name for used motor oil or used engine oil. It is the brown-to-black, oily liquid removed from the engine of a motor vehicle when the oil is changed. Used mineral-based crankcase oil is similar to unused oil except that it contains additional chemicals that are produced or that build up in the oil when it is used as an engine lubricant. Used mineral-based crankcase oil has many of the characteristics of unused oil. It smells like unused oil and contains the chemicals found in unused oil. These include straight chain (aliphatic) hydrocarbons and aromatic or polycyclic aromatic hydrocarbons (PAHs), which are distilled from crude oil, and various additives that improve the performance of the oil in the engine. Aliphatic hydrocarbons are defined as molecules with carbon

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atoms in simple or branched chains. Aromatic hydrocarbons are compounds with unsaturated carbons in six-membered rings and with properties similar to benzene. PAHs are complex organic compounds containing three or more aromatic rings. In addition to the chemicals found in unused oil, used mineral-based crankcase oil contains chemicals that are formed when the oil is exposed to the high temperatures and pressures inside an engine as it runs. It also contains metals such as aluminum, chromium, copper, iron, lead, manganese, nickel, silicon, and tin, that come from engine parts as they wear down. In addition, used mineral-based crankcase oil contains small amounts of water, gasoline, antifreeze, and chemicals that come from gasoline when it burns inside the engine. The chemicals found in used mineral-based crankcase oil vary depending on the brand(s) and type of engine oil used, whether gasoline or diesel fuel was used, the mechanical condition of the engine that the oil came from, the various sources of used mineral-based crankcase oil (e.g., automobiles, airplanes, trains, ships, tractors, lawn mowers), and the number of miles driven between oil changes. Used mineral-based crankcase oil is not naturally found in the environment, but most of the chemicals found in the oil do occur naturally.

A large amount of used mineral-based crankcase oil is generated each year when motor oil is changed. It is usually discarded into the environment or recycled, but some other uses for it exist. Some industries mix used mineral-based crankcase oil with other oils to produce cutting oils or other lubricating oils. Used mineral-based crankcase oil can also be burned. It burns at about 300-400°C, depending on the mixture of chemicals in the used mineral-based crankcase oil. It has been used as a

fuel in oil burners in homes, as well as in industrial steam boilers, municipal incinerators, and rotary cement kilns. It is also used in producing asphalt. In the past, used mineral-based crankcase oil was also used on dirt roads to control dust. However, most states currently restrict this use.

1.2 WHAT HAPPENS TO USED MINERAL-BASED CRANKCASE OIL WHEN IT ENTERS THE ENVIRONMENT?

Some used mineral-based crankcase oil enters the air through the exhaust system during engine use. Used mineral-based crankcase oil may also enter the water or soil when it is disposed of improperly, for example, when it is poured into sewers or directly onto the ground. It may also enter the environment as a result of disposal in landfills, engine oil leaks, automobile or truck exhaust, and application onto rural roads for dust control. Some chemicals found in used mineral-based crankcase oil may be released into the air when it is used as a fuel in boilers, incinerators, and cement kilns. The movement in the environment of the chemicals found in used mineral-based crankcase oil depends on their individual properties. The hydrocarbon components of the oil generally stick to the soil surface and do not move through the soil. If oil is spilled, some hydrocarbons evaporate into the air very quickly, and others evaporate more slowly. Hydrocarbons that do not evaporate may stay in the soil for a long time because they do not dissolve in water and do not generally break down. Hydrocarbon components of the oil that enter surface water bind to small particles in the water. They eventually settle to the bottom where they can stay for many years. These hydrocarbons may build up in shellfish or other organisms. Some metals in

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used mineral-based crankcase oil dissolve in water and move through the soil easily and may be found in surface water and groundwater. Groundwater flows slowly underground and then drains into surface waters such as marshes and lakes. Most metals found in used mineral-based crankcase oil stay in the environment for a long time. Thus, metals from used oils can build up in plants, animals, soil, sediments, and non-flowing surface water.

1.3 HOW MIGHT I BE EXPOSED TO USED MINERAL-BASED CRANKCASE OIL?

You are most likely to be exposed to used mineral-based crankcase oil when you change the engine oil in your car. A small amount of the chemicals in exhaust fumes comes from used mineral-based crankcase oil. Therefore, you may be exposed to used mineral-based crankcase oil when you breathe in exhaust fumes. You may also be exposed to used mineral-based crankcase oil when it is used to control dust on rural roads. The waste crankcase oil used for road oiling comes from service stations or fleet shops. It is mixed with industrial oils which contain polychlorinated biphenyls (PCBs), chlorodibenzo dioxins (CDDs), and chlorodibenzo furans (CDFs) which are bad for your health. You may be exposed to these compounds when you breathe in these compounds as wind-blown dust. However, most states currently either prohibit or restrict its use for that purpose. Most people are exposed to very low levels of used mineral-based crankcase oil. People who live or work in the vicinity of an active or inactive recycling facility that recycles used mineral-based crankcase oil may either breathe fumes found near the facility or come in contact with contaminated soil, sludge, or

sediment. People who work or live in or near buildings where used mineral-based crankcase oil is burned for heating fuel may breathe high levels of metal particles and PAHs.

People who live near landfills can also be exposed to used mineral-based crankcase oil. A common practice of people who change the oil in their own vehicles (or do-it-yourselfers) is to dump it together with other household wastes, which usually end up in landfills. The waste oil can then enter the environment and may contaminate crops, farm animals, or fish and shellfish. If you eat the contaminated food, you may be exposed to the hydrocarbons and heavy metals present in the waste oil. You may also be exposed to used mineral-based crankcase oil by accidental spills during transport. However, since very small amounts are transported, the environmental impact of spilled used oil is limited.

There is very little information on the levels of chemicals in the environment resulting from releases of used mineral-based crankcase oil. Used mineral-based crankcase oil is a source of hydrocarbons in storm runoff from bridges, rivers, streams, and deep as well as surface sediments. However, in several studies, used mineral-based crankcase oil may be only one of many sources of the environmental contamination. Such studies have shown increased levels of various components of used mineral-based crankcase oil in dust, surface water, storm runoff, and roadside soil in industrial, commercial, and residential areas and near highways. Heavy metals, possibly from used crankcase oil sources and from motor vehicle exhausts, have been found in the soil near extensively traveled roads and highways. Surface

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water samples taken from ponds at an NPL site that was a recycling facility for used mineral-based crankcase oil and other used petroleum products were found to contain chromium, lead, and xylene, respectively.

1.4 HOW CAN USED MINERAL-BASED CRANKCASE OIL ENTER AND LEAVE MY BODY?

Used mineral-based crankcase oil is a mixture of several different chemicals. Whether the chemicals in used mineral-based crankcase oil are taken up, stored in, or excreted by the body after exposure depends on the individual properties of the chemicals in the oil. Studies of cattle that swallowed used mineral-based crankcase oil showed that lead and other metals in the oil are absorbed and distributed to various tissues, such as the liver and kidneys. Studies in mice showed that the PAHs that build up in used mineral-based crankcase oil are absorbed when used mineral-based crankcase oil is applied to the skin. A study in rats showed that used mineral-based crankcase oil that is swallowed is eliminated in the feces. Medicinal-grade mineral oil is also eliminated rapidly from the body in the feces. Thus, it is likely that the chemicals that are in both medicinal-grade mineral oil and used mineral-based crankcase oil are eliminated rapidly in the feces, but we do not know the timeframe for elimination from the body of other chemicals found in used mineral-based crankcase oil. We also do not know whether other routes of elimination exist. Additional information on the movement of the individual chemicals into, through, and from the body can be found in the toxicological profiles for those chemicals.

1.5 HOW CAN USED MINERAL-BASED CRANKCASE OIL AFFECT MY HEALTH?

The health effects of exposure to used mineral-based crankcase oil vary depending on the properties of the chemicals found in the oil. Each brand of oil contains slightly different mixtures of oils and additives. Also, the characteristics of the engine in which the oil is used affect its final composition. Thus, effects experienced after exposure to one batch of used mineral-based crankcase oil may not be the same after exposure to another batch. Mechanics and other auto workers who are exposed to used mineral-based crankcase oil from a large number of motor vehicles have experienced effects on the skin (rashes), blood (anemia), and nervous system (headaches and tremors). However, these workers are also exposed to a large number of other chemicals in the workplace. Exposures to some of these other substances are known to cause rashes, anemia, headaches, and tremors. Therefore, it is possible that the effects the workers experienced may have been caused by chemicals from sources other than used mineral-based crankcase oil.

Volunteers who breathed mists of used mineral-based crankcase oil for a few minutes had slightly irritated noses and throats, and the mists were irritating to the eyes of some people. Animals that ate large amounts of used mineral-based crankcase oil developed diarrhea. Thus, people who swallow used mineral-based crankcase oil may also have diarrhea. Some cows that ate used oil containing metals such as molybdenum and lead in contaminated pastures experienced harmful effects

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on the blood, such as anemia, and on the nervous system, such as tremors. Some of the cows died. There is a possibility that anemia and tremors may occur in people exposed to used mineral-based crankcase oil. Used mineral-based crankcase oil was only slightly irritating to the skin of rabbits, guinea pigs, and mice. We do not know if exposure to used mineral-based crankcase oil affects the reproductive ability of men or women or whether it causes birth defects.

Long-term exposure of the skin to used mineral-based crankcase oil causes skin cancer in mice. PAHs in the oil have been identified as the cancer-causing agents because some PAHs are known to cause cancer and because the carcinogenicity of various batches of the used oil increased with increasing amounts of PAHs in the oil. The Department of Health and Human Services, the International Agency for Research on Cancer (IARC), and EPA have not classified used mineral-based crankcase oil with regard to its carcinogenicity in people.

The health effects of many of the individual chemicals found in used mineral-based crankcase oil (PAHs, lead, zinc, cadmium, copper, chromium, nickel, barium, boron, manganese, tin, and aluminum) are discussed in the toxicological profiles for those chemicals.

1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO USED MINERAL-BASED CRANKCASE OIL?

Used mineral-based crankcase oil is a mixture of a large number of chemicals. Its composition depends

on the brand of oil and the characteristics of the engine in which it was used. Therefore, no one medical test will show if you have been exposed to used mineral-based crankcase oil. However, there are methods for determining if you have been exposed to some of the chemicals in used mineral-based crankcase oil. These include testing for the presence of metals such as lead or molybdenum in your blood, or testing for deoxyribonucleic acid (DNA) adducts (chemical addition products) with PAHs in your skin cells. These tests are not part of routine medical examinations. However, your doctor can collect blood or tissue samples and send them to most university medical centers or medical laboratories for analysis. It should be noted that molybdenum and PAHs are common environmental contaminants and elevated levels of these materials may be the result of exposures to materials not associated with used mineral-based crankcase oil. Also, testing for exposure to specific chemicals in the oil cannot be used to find out exactly how much used mineral-based crankcase oil you have been exposed to. However, the testing is very useful because the amounts of individual chemicals identified can be used to determine the health effects that you may experience. Health professionals with expertise in occupational medicine or industrial hygiene should be able to identify chemicals that may have been in the oil and recommend tests for those chemicals. Some of the tests for specific chemicals provide information about previous exposure levels and about whether harmful health effects may occur. For more information on the tests available for specific chemical components of used mineral-based crankcase oil, please refer to the toxicological profiles for those chemicals.

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1.7 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

Regulations for used mineral-based crankcase oil are still being created and revised. Thus, federal guidelines or standards for inhalation, drinking water, food, or dermal exposure to used mineral-based crankcase oil are not yet available. However, the EPA and most states have developed regulations regarding disposal of used oil, its recycling, spraying used oil onto road surfaces for dust control, or burning it as a fuel.

1.8 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333

Information line and technical assistance:

Phone: 888-422-8737
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

To order toxicological profiles, contact:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800-553-6847 or 703-605-6000

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological profile for used mineral-based crankcase oil. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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