CHIP MSDS COMPANION SHEET #7: VEHICLE MAINTENANCE

This summary sheet may be used to identify which classes of chemicals your product belongs to and what the product or its ingredients do. This information should assist you in comparing alternative products and identifying incomplete material safety data sheets. The health information below is intended for general information only. The effects of chemical ingestion are not included.

GASOLINE AND ADDITIVES:

Gasoline is a mixture of octanes and n-heptane. When an automobile engine under stress is accelerated too rapidly, it may produce a knocking sound. This indicates the engine has exceeded its ability to perform efficiently with the particular gasoline. In the down-stroke of the piston, a mixture of air and gasoline vapor and droplets is drawn from the carburetor into the cylinder. On the up-stroke, the mixture is compressed. The compression ratio is the ratio of the initial volume to the final volume. Knocking increases with increasing compression ratio. An engine develops more power and requires less fuel with increasing compression ratio so developing efficient high-compression engines is dependent upon the knocking tendencies of available gasolines. Fuels are compared by octane rating. Isooctane (2,2,4-trimethylpentane; octane rating = 100) detonates only at high compression. n-Heptane (octane rating = 0) is prone to knocking. Octane number is the percent of isooctane blended with n-heptane which produces a given set of knocking characteristics when it is tested in a standard one-cylinder engine operated under specific conditions.

Repeated or prolonged skin contact with gasoline causes dermatitis and can cause blistering. Inhalation causes depression of the central nervous system and can cause severe pneumonia-like symptoms. Some addiction to fumes has been noted. Brief inhalation of high concentrations can cause fatal pulmonary edema. Gasoline vapors can cause inflammation of the mucous membranes of the eyes.

Gasohol: 90% unleaded gasoline and 10% ethanol. Ethanol is the least toxic of the alcohols since the body breaks it down into carbon dioxide. Inhalation may cause headache; irritation of eyes, nose, and throat; and, if long continued, drowsiness, lassitude, loss of appetite, and inability to concentrate.

Any or all of the additives listed below may be present; many are multi-purpose.

❑ *Oxygenates:* to improve octane quality or extend gasoline volume. Such as methanol, ethanol, tertiary butyl alcohol, and methyl tertiary-butyl ether (see MSDS companion sheet on solvents).
❑ *Anti-knock additives:* to improve octane quality. These are lead alkyls such as tetraethyllead, tetramethyllead, or mixtures of these two (see supplementary information on lead), or methylcyclopentadienyl manganese tricarbonyl (MMT; banned by EPA). These also contain an identifying dye and organic halides. The organic halides, such as ethylene dibromide, scavenge the combustion products of the lead alkyls from the combustion chamber during the exhaust cycle and prevent lead deposits.

Ethylene dibromide is an animal positive carcinogen according to the International Agency for Research on Cancer. In animal experiments, it has been shown to be a teratogen, a carcinogen, a possible tumor-causing agent, and a cause of tissue outgrowths; it has also been implicated in worker sterility. It causes irritation and injury to skin and eyes, respiratory tract inflammation, anorexia and headache with recovery after discontinuance of exposure; weakness and rapid pulse; and cardiac failure leading to death.
❑ *Combustion deposit modifiers:* minimize surface ignition, rumble, preignition, and spark plug fouling These include organophosphorus compounds.
❑ *Metal deactivators:* deactivate copper ions which are powerful oxidation catalysts. Such as N,N-disalicylidene-1,2-propanediamine.
❑ *Rust inhibitors:* minimize rust formation in fuel systems and storage facilities. Includes organic acids, amine salts, and derivatives of phosphoric acid. A widely used type is based on dimerized linoleic acid.
❑ *Anti-stall additives:* such as glycol ethers (2-methoxyethanol, 2-ethoxyethanol). Inhalation and skin absorption have produced adverse reproductive effects in male and female experimental animals, including embryonic death, teratogenesis, growth retardation, testicular atrophy and sterility. In humans, irritation of eyes, nose, and throat; drowsiness, weakness, shaking; prolonged or repeated exposure causes personality changes and decreased mental ability.
❑ *Anti-carburetor icing additives:* freezing point depressants (act as antifreeze) such as alcohols and glycols, and surfactants (prevent adhesion between ice and metal surfaces) such as derivatives of carboxylic and phosphoric acids.
❑ *Detergents:* remove and/or minimize deposits in throttle of carburetor. Such as amines and derivatives of carboxylic and phosphoric acids having surface active properties; some are polymers.

❑ *Dispersants:* remove and/or minimize deposits in carburetor, intake manifold and ports, and intake valves. Such as polymeric materials containing amines or other functional groups; these may be used combined with synthetic polymers or special oils.
❑ *Demulsifiers:* minimize emulsion formation. These are generally complex mixtures of surfactants.
❑ *Dyes:* oil-soluble solid and liquid dyes for various identification purposes (see below under aviation fuels).

DIESEL FUEL AND ADDITIVES:

Diesel fuel is a mixture of cetane (n-hexadecane) and 1-methylnaphthalene. The ignition quality is expressed in terms of the cetane number, which refers to a mixture of cetane (value = 100) and 1-methylnaphthalene (value = 0). Most automotive diesel engines require a fuel of cetane number greater than 45.

Diesel fuel may contain some of all of the following additives:

❑ *Ignition quality improvers:* to raise the cetane number an promote faster starts and less white smoke. Includes alkyl nitrates
❑ *Oxidation inhibitors:* to minimize oxidation and gum and precipitate formation and improve storage life. Incluces alkyl amines and amine-containing complex materials.
❑ *Biocides:* to inhibit the growth of bacteria and fungi which feed on hydrocarbons and help prevent filter-clogging caused by these organisms. Examples are boron compounds, quaternary amine compounds, or ethers of ethylene glycol. The glycol ethers (such as 2-methoxyethanol and 2-ethoxyethanol or ethyl cellosolve) by inhalation or skin absorption have produced adverse reproductive effects in male and female experimental animals, including embryonic death, teratogenesis, growth retardation, testicular atrophy and sterility. In humans, irritation of eyes, nose, and throat; Can be absorbed by skin; causes drowsiness, weakness, shaking, prolonged or repeated exposure causes personality changes and decreased mental ability. Ethylene glycol mono ethyl ether affects brain, blood, and kidneys; causes personality changes. Less toxic than ethylene glycol monomethyl ether or ethylene glycol monobutyl ether.
❑ *Rust preventives:* To minimize rust formation in fuel systems and storage facilities. Such as organic acids and amine salts; a widely used type is based on dimerized linoleic acid.
❑ *Metal deactivator:* to deactivate copper ions which are powerful oxidation catalysts. Such as N,N'-disalicylidene-1,2-propane diamine.
Pour Point Depresssants:: to improve low-temperature fluidity properties by modifying the wax crystal growth, structure, and/or agglomeration. (Waxes are present in the original petroleum

Workers exposed to high concentrations of automotive emissions may experience elevated levels of blood carboxyhemoglobin and lead. USDHHS-NIOSH recommends that whole diesel exhaust be regarded as a potential occupational carcinogen based upon results of animal studies. Increased rates of lung cancer have been associated with occupational exposoured to diesel engine emissions. Workers exposed to diesel exhaust have exhibited eye irritation and decreased lung function; the lung function loss is reversible.

Vehicle exhaust from gasoline or diesel engines may contain:

❑ *Carbon monoxide:* a teratogen in animal experiments; affects human central nervous system. Inhalation causes asphyxiation since carbon monoxide combines with hemoglobin in blood, preventing it from carrying oxygen and thus depriving the tissues of oxygen. Recovery from brief exposures is possible by inhaling fresh air. Repeated exposure to low concentrations have been found to produce hearing disturbances, contraction of field of vision, and heart irregularities.

❑ *Lead aldehyde:* organic lead compounds are carcinogens of the lungs and are possible tumor causing agents. Lead is a cumulative poison, so prolonged exposure can produce industrial lead poisoning. Affects central system: mile cases of short duration show headache, dizziness, insomnia; more sever exposures show stupor, coma, and death.

❑ *Nitrogen oxides and Sulfur oxides:* Nitric oxide and nitrogen dioxide irritating to skin, eyes, and mucous membranes; deadly poison; inhalation affects lungs and respiratory system; reaction with moisture in lungs forms nitric and nitrous acids/sulfurous and sulfur acids which damage lung tissue.

❑ *Smoke and other hydrocarbons produced by incomplete combustion of fuel:* Includeing ethylene, formaldehyde, methane, benzene, phanel, 1,3-butadiene, acrolein, and polynucleararomatic hydrocarbon (several are carcinogens) as well as particulate with absorbed contaminents. Aldehydes are highly irritating to eyes and mucous membranes of the respiratory tract; they are perceptible by eye and nasal irritation at>1ppm; all the aldehydes possess anesthetic properties. "Tars" produced by gasoline engine exhaust have caused cancer in animal experiments.

FLUIDS, CHEMICALS, AND EXPOSURES INVOLVED IN VEHICLE MAINTENCE

❑ *Anti-freeze:*

Methanol: irritant to skin, eyes, mucous membranes; narcotic; toxic to nervous system, especially the eyes causing atrophy of optic nerve and leading to blurring of vision, photophobia, irritation

of mucous membranes of the eyes, and eventually eye lesions and blindness. It is slowly eliminated from body, so repeated daily exposures can build up in body to cause illness. Oxidized by body to formaldehyde and formic acid which are both toxic. Causes headache, gastrointestinal disturbances, dizziness, feeling of intoxication, coma. Skin may become dry and cracked due to solvent action of methanol. Dangerous fire hazard.
Ethylene glycol: irritant to skin, eyes and mucous membranes; very toxic in particulate form upon inhalation.

❑ *Windshield washer solvent:* methanol (see above).

❑ *Batteries:*
Sulfuric acid: extremely irritating, corrosive, and toxic to tissue. Contact with the body results in rapid tissue destruction and severe, painful burns. Repeated contact with dilute solutions can cause dermatitis. Repeated or prolonged inhalation of mist can cause inflammation of upper respiratory tract leading to chronic bronchitis. Workers exposed to low concentrations of vapor gradually lose sensitivity to irritation.

❑ *Lead:* see supplementary information on lead.

❑ *Asbestos exposure during servicing of brake and clutch assemblies:* workers inhaling brake drum dust have developed lung tumors; (see supplementary information on asbestos). Brake lining composition includes: asbestos, resins and polymers, oxides and pigments, metals, and carbon, graphite, etc. Normal braking conditions tend to destroy asbestos and produce drum dust containing amorphous magnesium silicate which is nonfibrous. Severe ("panic") braking conditions produce high temperatures which cause decomposition of the brake lining binder and the release of free asbestos fibers.

Sources of exposure to the garage mechanic and automobile repairman include (1) debris of brake or clutch lining wear when housing is cleaned using a high pressure air hose, (2) use of autobody filler, and (3) dust disseminated during mixing and application of undercoating materials which have contained the fiber in previous years. Short term asbestos concentrations during brake maintenance work can be high. Measurable concentrations of asbestos can persist in the workplace for as long as 15 minutes after in air blowing as far as 75 feet away. Therefore, a generally, low-level background contamination of asbestos can exist throughout a garage where brake repair is conducted. In past years asbestos was used as a reinforcing agent in plaster autobody fillers used for dent patching. Extensive dust exposure was common as the material was sanded smooth. Most persons previously exposed should be aware of their asbestos exposure.

❑ *Brake fluid and additives:* glycol ethers (2-methoxyethanol, 2-ethoxyethanol) are anti-icing additives. (see above)

❑ *Lubricating oils:* may contain residuals of phenol (highly toxic, rapidly absorbed through skin), furfural (2-furaldehyde, highly

toxic in humans via inhalation but of low volatility, highly irritation to eyes, skin and mucous membranes; poisonous to central nervous system), n-methyl pyrrolidone (n-methyl pyrolidinone, low toxicity via skin), methyl-ethyl ketone (2-butanone, strong irritant; affects peripheral and central nervous system; a teratogen in animal experiments), or propane (affects central nervous system at high concentrations; an asphyxiant) used for extraction of substances present in the crude stock which could adversely affect engine performance.

The base fluids used to manufacture lubricating oils may be derived from petroleum, plant or animal oils, synthesized, or mixtures of any or all of these. Synthetic base fluids include chlorofluorocarbon polymers, fluoroesters, fluoroethers, phosphate esters of isopropyl phenol and cresylic acids, polyphenyl ethers (such as meta bis (m-phenoxyphenyl) Benzene), silicate esters (such as disiloxane derivatives), and silicones.

Additives:

Engine protectors: anti-wear agents, extreme pressure agents, anti-rust agents, corrosion inhibitors, detergents, dispersants, and friction modifiers.

❑ *Modifiers:* pour point depressants (prevent condensation of waxes), seal swell agents, viscosity index improvers (which extend the upper temperature limit at which an oil will still provide satisfactory lubrication).

Base stock protectors: anti-form agents, antioxidants, and metal deactivators.

❑ *Greases:* Solid or semisolid gels prepared by adding hydrocarbon-soluble metal soaps or salts or higher fatty acids (such as calcium stearate, lithium stearate, aluminum naphthenate) to mineral oils. The soap content varies from < 1%to 30%. Calcium soaps of rosin acids are used in greases. Greases also contain some water as a stabilizer.

WELDING FUMES

Welding in confined spaces may cause oxygen deficiency or buildup of explosive or toxic gases. *See supplementary information on welding.* Welding of painted surfaces can produce toxic fumes containing lead or cadmium; cadmium is very hazardous due to severe and possibly fatal lung irritation without warning signs; chronic exposure causes emphysema and kidney damage. Cadmium is also used in some stainless steel welding rods. Welding of metal surfaces contaminated with oily stock, paint resins, or chlorinated solvents can produce fumes containing formaldehyde, lead, carbon monoxide, hydrogen chloride, or phosgene.

Welding fumes may contain iron oxide and oxides and fluorides of manganese, potassium, sodium, calcium, and silicon.

Fluoride fumes cause respiratory tract irritation with chills, fever, shortness of breath, and cough; repeated exposure causes buildup that can lead to bone changes. Iron oxide fumes produce benign pneumoconiosis called siderosis.

Argon welding produces ozone (irritating gas; headaches, chest pain and dry throat; acute exposures can cause pulmonary edema) and nitrogen dioxide (deadly poison; inhalation affects lungs and respiratory system).

Ultraviolet and infrared radiation from arc welding, especially UV, causes skin burning but without producing tanning and is especially painful to the eyes.

Zinc fumes from galvanized metal can cause metal fume fever.

DEGREASING OF METAL PARTS: (see MSDS companion sheet: General Maintenance)

EPOXY PLASTIC FILLERS AND EPOXY PAINTS

Epoxy is a polymer formed by reaction of epichlorohydrin (1-chloro-2,3-epoxypropane) with bisphenol A (diphenylol propane), resorcinol, hydroquinone, glycols, or glycerol. The diglycidyl ethers with their epoxide groups are also used as reaction components or reactive diluents. Epoxies are cured with polyamines, polyamides, polysulfides, urea- and phenol-formaldehyde, acids or acid anhydrides, or boron trifluoride.

Epichlorohydrin is an animal positive carcinogen by International Agency for Research on Cancer and a possible tumor causing agent; it has caused tissue outgrowths in animal experiments. In exposed workers, it has caused increased respiratory cancer deaths, chromosome abnormalities in white blood cells, at least temporary sterility, damage to kidneys in chronic exposure, and damage to liver, respiratory tract, and skin. It causes transient burning of eyes and nasal passages, cough, chest congestion, headache, nausea, vomiting; skin exposure causes burning sensation, redness, swelling, itching, blisters, skin erosion, and enlarged lymph nodes. Uncured resins and hardener are extremely damaging to the eyes.

The glycidyl ethers may be capable of producing testicular atrophy and hemopoietic (blood-forming organ) abnormalities. in animal experiments.

The possible allergic response, dermatitis, primary irritation and skin sensitization experienced upon exposure to epoxy paint or coating productsz may be probably be due to the amine hardeners

or to the epoxide intermediates. The cured resin is relatively nontoxic unless an excess of hardener (used to speed up the curing process) is unreacted; then the d;ust from finishing operations may contain sufficient uncombined hardener to irritate the skin.

PAINTS AND THINNERS: (see NYSDOH Chemical Fact Sheet: Painters)

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