ENVIRONMENTAL CODE OF PRACTICE

FOR THE

AUTOMOTIVE REPAIR INDUSTRY

FOREWARD

This environmental code of practice is intended to provide guidance to owners and operators of automotive repair industries as to the likely environmental impacts associated with the industry and the acceptable methods of control.

In some circumstances, alternative practices or equipment, other than those suggested in the code, may be equally effective in limiting the environmental impact.

The code is not intended to be regulatory, but advisory. It is definitely not intended to encroach on any other areas of legislative responsibility.

The Department of the Environment believes that if the code is honestly maintained by the industry, their operation will cause little, if any, adverse environmental effects. The code can be applied in a relaxed manner if the automotive repair premises are a reasonable distance form housing or other sensitive areas. Where there is an air, noise or water impact, the code would need to be diligently adhered to.

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1. Introduction

Motor vehicles play an integral role in the lives of Belizeans. While the costs to society in terms of air pollution from exhausts and from Chlorofluorocarbons (CFCs) in air-conditioners affecting the ozone layer have been well publicized, the potential environmental benefits and impacts from the vehicle repair industry have not.

The main environmental benefits of the vehicle repair industry include the saving of energy and resources. Each aspect of the vehicle repair industry has an important role. Rebuilding engines and transmissions and replacement of brake and clutch lining becomes necessary with normal wear. Radiator cores deteriorate over the years due to corrosion, oxidation of the fins and blockages, and, eventually, require replacement.

The energy and resources required to rebuild an engine or transmission, repair a radiator or air-conditioning unit are significantly less than would be required to replace the entire unit. The vehicle repair industry has a key role in the re-use and recycling of resources. Other benefits include returning fuel efficiency and pollution emissions to equal or better than the original "new" engine levels.

Aspects of the vehicle repair industry considered by this code include engine and transmission rebuilding, radiator, brake, clutch, and air conditioning repairs. Other codes of practice are being prepared for automotive spray-painting premises and service stations.

This code explains the potential for impacts on the environment from the automotive repair industry and provides guidelines describing how benefits can be achieved with minimal impact maintenance.

2. Brief description of the automotive repair process

2.1 Engine and transmission rebuilding

The engine and transmissions are dismantled and the components usually cleaned thoroughly before machining and re-working. Various cleaning systems are used involving detergents, caustic soda and solvents.

2.1.1 Removal of engine and transmission oil

The oil from engines and transmissions are drained from the components before disassembling. It is relatively simple to contain the oil for recycling or disposal.

2.1.2 Engine and transmission cleaning

Large quantities of cleaners are used, as they are continually being depleted and continually have to be made up to strength. The depleted cleaning solution, contaminated with oil, grease, heavy metals and dirt need to be treated and/or removed from the premises.

2.1.3 Spray cleaning

Kerosene:

One of the oldest cleaning methods in the automotive repair industry involves spraying the engine, usually with an air spray gun, and leaving the parts to soak for a few minutes. The parts are then sprayed with high-pressure water so that the dirt, oil, grease and kerosene become mixed with the water and flow to waste.

Unfortunately, some repairers still do this on the ground, drive- way or alongside or at the rear of their premises. The dirty, oily water usually runs into the ground or is washed in storm water drains.

Cleaning solutions:

Cleaning solutions in automobile repair work are usually emulsions, solvent or a combination of the two. The solution can be at room temperature or heated. The cleaning solutions soften the dirt and oily gums and either remove them completely or soften them sufficiently to allow them to be washed off with water.

Highly alkaline cleaners remove dirt and grease from iron parts easily, but will tend to dissolve parts made from aluminum. Hence, most cleaning solutions are only slightly alkaline and rely on a blend of solvents to remove the baked on deposits of gummy carbon and oil residues.

2.1.4 Tank-based cleaning

Solvent cleaners:

Most portable parts cleaners use a petroleum solvent drawn from a drum beneath the cleaning basin.

The dirt solvent is returned to the drum and filtered before re-use. When the solvent is too dirty for re-use, it is removed and recycled.

More aggressive solvents, such as perchlorethylene or solvents base on methylene chloride, cresylic acid or orthodichlorobenzene[1], will remove the heat-bonded deposits of carbon and gum, as well as paint, varnish and grease. These solvents act by penetrating the carbon, baked on dirt and gums to destroy their adhesion to the metal. They dissolve the gums and resinous binders that hold the carbon and dirt so that they float off and settle to the bottom of the tank. Some very hard deposits may require brushing with a wire brush.

Methylene chloride or ortho-dichlorobenzene is normally used on small components or on aluminum parts, which cannot be treated with caustic. Methylene chloride is used cold and without agitation, whereas ortho-dichlorobenzene products can be agitated and heated to 60^0C.

Most of these solvents are hazardous in the workplace unless stored and handled correctly. Perchlorethylene is a category three work safe substance. Contact the Department of Occupational Health, Safety and Welfare of Western Australia for more information.

Some solvents contain ozone-depleting substances such as carbon tetrachloride and methyl chloroform.

Such solvents are highly volatile or have a low boiling point, and to reduce evaporation, a water seal is usually maintained over the solvent to reduce evaporation.

As parts are removed from the tank, they pass through the water seal, which helps wash off and recover the solvent clinging to the parts.

Emulsion type cleaners:

Usually the emulsion cleaner consists of a liquid soap/detergent in water. The parts are submerged in the solution for one to four hours, where they soak in the solution until clean. Emulsion type cleaners have little effect on the carbonized deposits found on the piston and connecting rods. Usually the tank is cold, but heating speeds up the cleaning process. On removal, the parts are suspended in a wire tray over a tank and flushed with a pressure stream of water.

2.1.5 Vapour bath

Another cleaning method employs heat to vaporize the solvent. A typical system consists of a heat tank to contain the solvent, with a rack to hold the parts to be cleaned suspended above the solvent, so that the parts are suspended in the vapour. The solvent is maintained at boiling point, so that the lower temperature of the parts causes the vapour to condense on the parts and dissolves the gums and grease and allows the grime to run back into the liquid tank below.

Some systems have a pump and spray so that the parts can be sprayed to wash off any remaining particles of dirt.

2.1.6 Cleaning before assembly

Before reassembling, the components are all cleaned again to remove any metal particles, lapping compound or machine coolants. Chemical cleaners are used; usually alkaline and detergent mixtures. High-pressure air may be used to dry components or remove fine residue.

Soluble oil type machine coolants usually contain between five and 15 per cent oil concentration and contain emulsifiers, which make separation of the oil from wastewater extremely difficult. Biocides are usually added to machine coolant to prevent bacterial build-up and to extend the life of the machine coolant.

Grinding and other specialty fluids have a limited life and are periodically replaced. These oils can also easily be contained for disposal.

2.2 Radiator repairing

The replacement of the core involves heating the old radiator to melt the solder and remove the top and bottom tanks from the core. A new core is then re-soldered to the top and bottom tanks.

The engine cooling water, usually with added chemicals for corrosion inhibition, has historically been released to a drain or sewer before the radiator is removed from the vehicle. However, when released to storm water drains, cooling water has the potential to cause pollution. The Department of the Environment does not allow this waste to be discharged to sewer. Modern practice is, therefore, to contain and store radiator coolants on-site for the transport by a licensed waste carrier to a disposal site.

2.2.1 Acid bath

An acid bath is maintained for immersing the top and bottom tanks for removing scale and deposits before soldering the new core to them.

2.2.2 Radiator water additives

Ethylene and propylene glycol are the cooling water at a concentration of between 35 and 50 per cent and will protect against freezing to -17.7^{0}C. The glycol derivatives are initially non-corrosive, are non-flammable and have a low evaporation rate and are effective heat exchange agents.

However, coolants can become corrosive as the coolant, buffers and corrosion inhibitors in the coolant break down and lose their effectiveness, or react with leaking exhaust gases, metals from the engine block or other foreign substances introduced into the tap water. Most manufacturers recommend changing the coolant at 12 to 24 month intervals because of this deterioration.

2.2.3 Corrosion inhibitors

Corrosion inhibitors are chemicals added to the cooling water to stop the anodic reaction, slow the cathodic reaction or both.

Table 1: **<u>Chemicals used to stop anodic and cathodic reactions.</u>**

Anodic	*chromate* *orthophosphate* *nitrite* *silicate*
Principally cathodic	*polyphosphate* *zinc*
Both anodic and cathodic	*organic filming* *amines* *phosphonates*

2.3 Brake and clutch relining

To date, brake and clutch linings have been manufactured from asbestos fibers mixed with filler materials in phenolic resins. It is planned to phase out the use of asbestos fibres by 1997.