http://www.nonoise.org/groups/cqs/cqs.htm provides health and noise facts.

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PRELIMINARY RESEARCH PAPER 13-98

THE USE OF METHANOL IN LEAF BLOWERS POWERED WITH TWO CYCLE ENGINES

It has been reported that yard maintenance workers are using methanol in gas powered leaf blowers as a means of circumventing the ban in Los Angeles on the use of gas powered leaf blowers within 500 feet of residences. The results ot the research done to date is summarized as follows.

While methanol has the advantage of reducing the risk of fire and explosion damage to those using it as an alternative fuel and it will reduce harmful engine emissions in engines designed for its use, the fumes from the use of it as well as the engine emissions can be injurious in particular to children. It also is damaging to the ozone layer, and to leaf blower engines not designed for it. It is not legal to use methanol as a fuel in gas powered leaf blowers under the Los Angeles ordinance, banning their use notwithstanding the ruling of a Municipal Court Judge. Moreover, methanol cannot be used in a gasoline powered leaf blower sold since 1995 in California because the use violates air quality regulations.

ANALYSIS

1.Methanol.

Methanol is the simplest alcohol, containing one carbon atom. It is a colorless, tasteless liquid with a very faint odor and is classified as a solvent. Although it is known as wood alcohol because it can be made from wood, most methanol is better known as Methyl Alcohol (CH3OH) and it is typically manufactured by steam reforming natural gas by catalytically combining CO with hydrogen in a 1:2 ratio under high temperature and pressure.

2.Legality of use of methanol in gas powered leaf blowers.

There are two issues involving the legality of using methanol in gas powered leaf blowers under the ordinance banning the use of gas powered leaf blowers. Gas is defined in Webster's Third International Dictionary as a vapor or gaseous mixture.

Whether gasoline, methanol, ethanol, or alcohol is used as a fuel in the internal combustion engines used on leaf blowers, it is the vapors of these fuels which burn in

the engine, not the liquids. Internal combustion engines use a mixture of air and vapors from the fuel which is burned in the cylinder. The discussion of internal combustion engines in the Encyclopedia Britannica describes gas engines as using "a flame-ignited explosive mixture of vaporized spirits of turpentine and air" and it states kerosene was also used in early engines. The discussion describes an internal combustion engine as "one in which energy is directly translated into mechanical power by causing an explosion to take place behind a piston."

The explosive mixture is created through carburetion in which the liquid fuel "issues from a nozzle in a very fine stream and, mingling with the air, is broken up into a spray." This ‘atomization’ results in vaporization of the fuel into a gaseous form which is sucked into the combustion chamber of the engine cylinder where it is ignited and explodes.

Therefore, it must be concluded that all liquid fuels including methanol and ethanol are covered by the definition in the ordinance of "gas powered".

The second issue is, does the use of methanol as a substitute fuel for gasoline in gas poered leaf blowers violate any environmental regulations. The answer is affirmative if methanol is used in any leaf blower which has been certified by the California Air Resources Board since 1995. Use of methanol in gas powered leaf blowers sold in California before 1995 is not a violation.

3.Harmful effects of the use of methanol.

While touted by the Environmental Protection Agency as a substitute fuel for gasoline, environmental health researchers are concerned about the toxicity of methanol. In a study done by the University of Rochester on the neurobehavioral toxicology of methanol, it was concluded that ". . . solvents such as methanol, endocrine disruptors such as the PCBs, and drugs such as cocaine are potent nervous system poisons whose capacity to inflict damage to the developing brain greatly exceeds their capacity to induce damage in the adult brain. Because the (expression?) of this damage may remain silent until ____, aging in a parallel theme."

the Rochester Study concluded: "Widespread distribution of methanol, however, also means that accidents and high-level exposures are inevitable. In these instances, infants and children are the subpopulations at greatest risk for enduring effects."

According to the EPA’s Office of Air Quality Planning and Standards Hazardous Air Pollutants Fact Sheets, methanol is a hazardous substance. The Fact Sheets summarize the effects of methanol onhuman health of substances as follows:

> "Acute (short-term) exposure of humans to methanol by inhalation or ingestion may result in visual disturbances, such as blurred or dimness of vision, leading to blindness. Neurological damage, specifically permanent motor dysfunction, may also result. chronic (long-term) inhalation or oral exposure to methanol may result in conjunctivitis, headach, giddiness, insomnia, gastric disturbances,

visual disturbances, and blindness in humans."

4.Damage to engines.

The use of methanol in engines not designed to burn methanol can be very damaging to the engines. The warranty on a gasoline powered leaf blower will be voided by the manufacturer if methanol is used in the engine.

The damage done by methanol to such an engine occurs in two ways. First, the engine block and other components are made of carbon steel. When ethanol, which is alcohol, is used, a residue of water forms on the metal surfaces and this water is corrosive. It forms under the oil lubricating cylinder walls.

Methanol also causes the engine seals to deteriorate because they are made to withstand the chemical effects of petroleum products but will not withstand the use of alcohol based fuels.

Consequently, it is necessary to use corrosion resistant metals such as stainless steel if methanol is used as a fuel source. One alternative is to use metals with a high chrome content and special oils but even with the use of these materials, corrosion will still occur although the rate of corrosion may be reduced to an acceptable rate. Seals have to be replaced with seals that are alcohol resistant.

Complicating the problem is the type of methanol used. There are three mixes of methanol commonly sold as motor fuel. The most common fuel available is M85 (85% methanol, 15% gasoline) which is generally used in motor vehicles. The second is M50 (50% methanol, 50% gasoline), and M100, sometimes referred to as M1, which is 100% alcohol.

Conversion of existing gas powered leaf blowers to methanol to avoid engine damage is not possible unless the leaf blower is rebuilt, which is very expensive.

5.Air Pollution Impacts.

The use of methanol as an alternative fuel theoretically significantly reduces engine emissions. However, testing by the National Renewable Energy Laboratory of the use of methanol fuels in vehicles built to use methanol have not produced the reductions in engine emissions that is promised for methanol. While the use of methanol does reduce hydrocarbon and carbon monoxide in small amounts, it increases the amount of NOx emissions, which are a particular component of smog and particularly damaging to the ozone layer.

Despite extensive research, to our knowledge no such tests have been made concerning the use of methanol as an alternative fuel in two-cycle engines, which power gas powered leaf blowers. In a two-stroke engine, the fuel is a mixture of gasoline and oil. Although leaf blowers will run on a mixture of methanol and oil, the type of engine emissions has not been determined by a government certified laboratory.

Adding to the problem of using methanol in gas powered leaf blowers is that the air/fuel ratios set on the carburetor must be adjusted for the fuel to burn properly. OEM carburetors on gas powered leaf blowers are not designed to modify the air/fuel ratio. Examination of some of the gas powered leaf blowers that have been converted for use of methanol show "Rube Goldberg" type modifications which, while they modify the air/fuel ratios, may significantly increase the air pollutants generated by the engines.

There are efforts to produce conversion kits, but EPA test results for conversion kits for other alterntiv fuels have had disappointing results. It appears that to ensure that gas powered leaf blowers can effectively reduce damaging engine emissions using methanol, it will be necessary for them to be designed and manufactured for that purpose.

Experimental designs have shown that by reducing the engine speeds and with leaf blowers especially built to use methanol, there is a promise that such machines will be less noisy and meet the State mandated 50% decrease in harmful engine emissions by 1990. However, the availability of such machines on the market is at least two years away. Moreover, the new machines still will emit the same amount of harmful engine emissions in one hour as do 15 automobiles in the same amount of time.

thus, the use of methanol as a substitute fuel in gas powered leaf blowers which have been converted and have not been certified by the California Air Resources Board as compliant with emissions standards could potentially increase the amount of harmful air pollutants, particularly the amount of methanol in the air around buildings where children are located.

Another complication is the availability of methanol fuel to users of gas powered leaf blowers. Methanol is not sold at most service stations and the type sold is the M85 type, which is most damaging to engines, and contains 15% gasoline. For that reason, experimental leaf blowers are designed to run using a mixture of pure alcohol and a special oil. That creates a problem that based on availability, the proper fuels will not be used.

Additionally, methanol as a solvent, introduces organic emissions into the atmosphere that not only cause a gradual change of climate, but they also affect the growth and decay of plants and the health of animals. In other words, methanol contributes to the "green house" effect.

There is another pollution related impact in using methanol or ethanol as fuels in gas powered leaf blowers, and that is the exhaust fumes are so noxious that they are nauseating to persons smelling them. Since the exhaust fumes often enter any structure nearby which has open windows or doors, they are a nuisance to persons who smell the exhaust fumes while inside a nearby structure.

CONCLUSION

The use of methanol as a substitute fuel in order to evade the ban on gas powered leaf blowers in Los Angeles violates the ban, and, at best, will not reduce significantly

harmful air pollutants. The use of methanol has the potential of increasing the amount of hazardous air pollutants. It does nothing to reduce the noise or the amount of fugitive and toxic dust generated by gas powered leaf blowers, now will it reduce the abuses of the use of gas powered leaf blowers in the "mow, blow, and go" operations of yard maintenance workers who blow much of debris and dust onto neighbor's property and/or into the street where it is left to be stirred up by passing vehicles, or into storm drains.

Submitted by the Research Committee, August 9, 1998.

Addition May, 2001;

"Formaldehyde emissions and emissions from the gasoline fraction of M85 (85 percent methanol, 15 percent gasoline) would contribute significantly to ozone formation. The use of M85 [in vehicles] would increase formaldehyde emissions (55 mg/mile vs 15/18 mg/mile). . ."