

LAB RESULTS SHOW

ETHANOL BLENDS REDUCE SNOWMOBILE EMISSIONS

By Howard Haines

Montana Department of Environmental Quality

There are concerns being raised about the effects of snowmobile engine emissions on public health and the environment in sensitive areas such as Yellowstone National Park (YNP).

The majority of winter visitors to Yellowstone use snowmobiles powered by two-stroke engines. Current design of these two-stroke engines emits 25-30% percent of the fuel and lubrication oil unburned. These engines are tuned to run rich for better throttle response and cold starts. The rich fuel mixture also produces more carbon monoxide, unburned hydrocarbons and smoke.

To address these concerns, the Montana Department of Environmental Quality (DEQ), in cooperation with the International Snowmobile Manufacturers Association (ISMA), the U.S. Department of Energy, the Wyoming Energy Office, the National Park Service and others developed a two-part program in 1995 to evaluate potential emission benefits of using biomass-based fuels and lubricants in snowmobile engines.

Previous studies showed that oxygenated fuels, including ethanol blends, reduce carbon monoxide by about 20% on average in newer, fuel-injected automotive engines, with a greater reduction in older, carbureted cars. Missoula, Montana, has climate conditions similar to those in West Yellowstone. Missoula has reduced carbon monoxide by 24.3% on average since 1993 through the use of oxygenated fuels and by 29-60% during daylight hours on days with stagnant air (when the wind velocity was less than one mile per hour). Missoula uses a fuel with 2.7% oxygen (almost 8% ethanol). The ethanol is splash-blended with regular or premium gasoline, increasing octane over standard and premium grades.

However, there were no data for oxygenated fuel used in snowmobile engines. With the data from the earlier investigations and experience from similar locations, DEQ theorized that the use of oxygenated fuels would reduce carbon monoxide generated by transportation vehicles in West Yellowstone, Yellowstone National Park, and throughout the greater Yellowstone region.

To check this assumption, laboratory testing of snowmobile engines was conducted in May and June, 1997, to verify that ethanol-blended fuels would reduce carbon monoxide. Test engines supplied by the ISMA included an air-cooled, 488cc, carbureted Polaris engine and a water-cooled, 440cc Arctco engine. Fuels tested include a reference gasoline (Indolene), gasohol (10% ethanol), and an aliphatic gasoline. The aliphatic gasoline contains virtually no aromatics, olefins, oxygenates, or sulfur, and is used in other countries to reduce toxic emissions. Lubricants evaluated include two biodegradable (biomass-based lubricants), a high polyisobutylene (PIB) lubricant shown to reduce particulates in other engines, and a conventional, petroleum-based lubricant.

Laboratory emissions tests were conducted on snowmobile engines using an industry-approved test cycle developed from field use data--the first of its kind for these engines. The purpose of the tests was to determine how emissions could be effected by the use of ag-based products such as gasohol and biodegradable lube oils. The test data showed that ethanol-blended gasoline produced 16% fewer hydrocarbons, 9% less carbon monoxide, and 24% less particulate matter than gasoline. Oxides of nitrogen (NOX) are naturally low from two-stroke engines. The results are preliminary because the data from tests on the second engine are still being compiled, and the chemical analyses are not yet complete.

Please call (406-444-6773) or email [Howard Haines](#), Montana Department of Environmental Quality, if you have any questions or would like a summary of the report when it is available later this year.