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Evaluation of the Vareb 10  
Gasoline-Water Emulsion

April 1974

Test and Evaluation Branch  
Emission Control Technology Division  
Environmental Protection Agency

## Background

The Test and Evaluation Branch of the Emission Control Technology Division is responsible for testing new approaches for exhaust emission control which have demonstrated the ability to reduce emissions from automobile engines. A water-gasoline emulsion manufactured by Vareb Associates, Inc., produced significant reductions in emissions from automobile engines in tests run at commercial test laboratories. To investigate the effect of the emulsion an evaluation was scheduled at the Ann Arbor EPA laboratory. The fuel tested by the EPA was the Vareb 10 emulsion, containing nominally 10% water.

## Vehicle Description

Two vehicles were used in the test program, a 1970 Chevrolet and a 1963 Ford.

The Chevrolet was equipped with a 350 CID engine and an automatic transmission. The Ford was equipped with a 289 CID engine and an automatic transmission.

## Test Program

All tests were run as directed in the 1975 Federal Test Procedure (FTP). Baseline tests were run on both cars using a standard test fuel. The vehicles were then preconditioned on the Vareb 10 to purge the fuel system of the baseline fuel.

The 1970 Chevrolet was run on the Vareb 10 in two configurations. In the first case, the car was run with a baseline idle CO of 0.1%. In the second case, the baseline idle CO was set at 6.0% to counter the lean air/fuel ratio that occurs when using the Vareb 10.

The 1963 Ford was run with a baseline idle CO of 0.8%. After being prepped on the Vareb 10, the idle CO was set to 2.2%.

## Test Results

The 1970 Chevrolet suffered severe driveability problems when running on the Vareb 10. This was apparently due to

the leaning of the air/fuel mixture which occurs when the Vareb fuel is used. The car ran so poorly that no meaningful emissions data could be generated.

The 1963 Ford ran on the Vareb fuel with no major driveability problems. The Vareb fuel produced a 39% HC reduction, a 55% CO reduction, a 24% NOx reduction and a 10% reduction in fuel economy (on a volume basis).

### Conclusions

It appears that applications of the Vareb 10 fuel would be limited to pre-controlled vehicles which are calibrated with a rich air/fuel ratio. Controlled vehicles, which initially run lean, would not benefit from the effect of leaning caused by the Vareb 10 fuel. Indications are that using the Vareb 10 in controlled vehicles would result in substantial increases in emissions.

Further testing needs to be done to investigate potential starting and driveability problems at sub-freezing temperatures.

Mass Emissions in  
grams/mile  
1975 Federal Test Procedure

1963 Ford

	<u>HC</u>	<u>CO</u>	<u>NOx</u>	<u>MPG</u>
Baseline	6.74	86.5	2.46	13.1
	6.57	80.6	3.36	13.7
AVERAGE	6.66	83.6	2.91	13.4
Fuel Test	4.08	37.5	2.20	12.0
% Change from baseline	-39%	-55%	-24%	-10%