

EVALUATION OF ECCONO-NEEDLES

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## Background

Canco Incorporated of San Rafael, California, requested that the Test and Evaluation Branch conduct a program to determine the emission control potential of Econo-Needles. The company representative presented test data which they had obtained from a reputable laboratory showing significant reductions in hydrocarbon and carbon monoxide emissions. This data was generated using a group of vehicles operated and tested at 5000 feet above sea level where baseline CO levels are much higher than at sea level.

## Device

Econo-Needles replace the stock idle mixture screws from a vehicle's carburetor. The replacement screws are available in six sizes covering a significant proportion of vehicles currently being operated in the United States.

Econo-Needles are hollow allowing air to bleed through them with the intended effect of leaning air/fuel ratio. Installation instructions supplied with the device call for screwing the Econo-Needles in until they are seated and then backing off one-half a turn. The use of a garage-type combustion analyzer, while not specified in the instructions, enables more precise settings of lean idle mixture.

## Test Program

Three vehicles from the EPA test fleet were selected for installation of Econo-Needles:

1962 Chevrolet Biscayne	283 CID
1963 Ford Galaxie	289 CID
1970 Plymouth Valiant	225 CID

All three vehicles were equipped with automatic transmissions.

The Valiant and the Galaxie were subjected to three test configurations. After baseline testing at "best idle" setting, Econo-Needles were installed according to the installation instructions and the cars were again tested. Subsequently, the idle CO was set at a minimum level with Econo-Needles and the two vehicles were retested. The Biscayne was tested in only the baseline and lean-set Econo-Needles configurations.

All testing was performed in accordance with the November 10, 1970, Federal Register. This document details the standard Federal Emission Test Procedure for 1972 model year vehicles. Fuel consumption was quantitatively evaluated during the testing.

Test Results

The test results for the three vehicles are presented in the Appendix of this report. These results are summarized below:

Summary of Emission Results  
% Reduction from Baseline

	<u>1962 Chevrolet</u>		<u>1963 Ford</u>		<u>1970 Plymouth</u>	
	Normal	set/Lean idle	Normal	set/Lean idle	Normal	set/Lean idle
HC	---	7%	7%	2%*	5%*	0%
CO	---	30%	10%	5%	19%*	33%
CO <sub>2</sub>	---	9%*	2%*	0%	3%	1%*
NOx	---	14%*	18%*	5%*	4%	2%*

\*Increase

Fuel consumption calculations for the three vehicles indicated the following results:

Fuel Consumption/Change from Baseline

	<u>1962 Chevrolet</u>		<u>1963 Ford</u>		<u>1970 Plymouth</u>	
	Normal	set/Lean idle	Normal	set/Lean idle	Normal	set/Lean idle
	---	4%**	1%***	1%***	0%	4%***

\*\*Penalty

\*\*\*Benefit

Conclusions

With careful combustion analyzer setting of Econo-Needles hydrocarbon and carbon monoxide levels can be reduced in the vehicles tested. Oxides of nitrogen tend to increase. Similar reductions of HC and CO might be achieved by resetting the standard idle mixture screws.

Fuel consumption results were mixed and therefore no conclusions as to the effectiveness of Econo-Needles on fuel economy can be made.

1972 Federal Test Procedure  
 All Results in Grams Per Mile  
 All Results in Grams Per Mile

1962 Chevrolet-283 CID

Date	HC	CO	CO <sub>2</sub>	NOx
Baseline				
3-17-72	5.30	54.5	515.8	3.8
3-16-72	6.3	67.9	532.7	3.9
3-15-72	6.1	47.2	525.9	4.1
Average	5.9	42.4	524.8	3.9

Eccono-Needles (low idle CO)

4-6-72	5.4	19.8	540.9	4.5
4-10-72	5.4	36.2	585.5	4.8
4-8-72	5.6	28.4	541.6	*
4-7-72	*	34.26	609.9	4.1
Average	5.5	29.6	569.5	4.5

% Reduction from Baseline  
 from Baseline 7% 30% 9% increase 14% increase  
 from Baseline

Baseline fuel consumption 14.7  
 Eccono-Needles fuel consumption 14.1 mpg  
 Eccono-Needles fuel consumption

\*Error in sampling

\*Error in sampling

1972 Federal Test Procedure  
All Results in Grams Per Mile

1963 Ford-289 CID

<u>Date</u>	<u>HC</u>	<u>CO</u>	<u>CO<sub>2</sub></u>	<u>NOx</u>
Baseline				
2-2-72	8.9	116.1	508.1	4.1
2-3-72	7.3	124.2	522.5	4.0
2-4-72	8.0	119.7	529.1	3.9
2-5-72	7.4	105.9	523.4	4.2
2-28-72	9.2	130.5	519.6	4.0
Average	8.2	119.3	520.5	4.0

Eccono-Needles (followed recommended installation)

2-29-72	7.1	104.6	537.7	4.4
3-1-72	8.0	111.8	528.3	4.3
3-2-72	7.5	103.7	523.8	5.0
3-3-72	7.8	102.3	535.3	5.0
Average	7.6	106.9	531.3	4.7

% Reduction from Baseline	7%	10%	2% increase	18% increase
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Eccono-Needles (lean idle CO)

3-17-72	8.3	112.7	498.5	3.7
3-22-72	8.5	113.0	546.5	4.6
Average	8.4	112.9	522.5	4.2

% Reduction from Baseline	2% increase	5%	0%	5% increase
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Baseline fuel consumption	12.3 mpg
Eccono (normal set) fuel consumption	12.4 mpg
Eccono (lean idle) fuel consumption	12.4 mpg

1972 Federal Test Procedure  
All Results in Grams Per Mile

1970 Valiant-225 CID

<u>Date</u>	<u>HC</u>	<u>CO</u>	<u>CO<sub>2</sub></u>	<u>NOx</u>
Baseline				
2-2-72	2.3	44.7	407.9	4.8
2-4-72	1.9	37.0	418.7	3.7
2-5-72	2.0	33.1	425.7	5.3
2-23-72	2.4	41.0	392.3	4.9
2-25-72	1.9	36.5	407.9	5.3
2-26-72	2.1	36.1	397.9	5.1
2-28-72	2.3	48.6	403.8	5.4
Average	2.1	39.6	407.7	4.9

Eccono Needles (followed recommended installation)

2-29-72	2.5	62.9	384.8	4.4
3-1-72	1.9	31.8	404.1	4.7
3-3-72	2.2	47.2	398.3	4.9
Average	2.2	47.3	395.7	4.7

% Reduction  
from Baseline    5% increase    19% increase    3%    4%

Eccono Needles (lean idle CO)

3-17-72	2.3	28.7	394.5	4.8
3-21-72	2.3	29.7	422.2	4.7
3-22-72	1.9	24.2	419.3	4.9
3-23-72	1.8	23.3	407.8	5.4
Average	2.1	26.5	411.0	5.0

% Reduction  
from Baseline    0%    33%    1% increase    2% increase

Baseline fuel consumption	18.5 mpg
Eccono (normal set) fuel consumption	18.5 mpg
Eccono (lean idle) fuel consumption	19.2 mpg