

EVALUATION OF THE LANDRUM
RETROFIT SYSTEM

April 1972

Henry L. Gompf
Test and Evaluation Branch
Environmental Protection Agency

Background

Mr. Porter Landrum of Birmingham, Alabama, supplied the Test and Evaluation Branch with test data indicating significant reduction in hydrocarbon and carbon monoxide on a vehicle equipped with his retrofit system. Based on this preliminary testing, a confirmatory evaluation was conducted in the EPA laboratory at Ann Arbor.

Device Tested

The Landrum system employs the replacement of stock idle mixture screws with hollow bleed-type screws. These screws are transversely drilled near the ends to allow gasoline to enter mixing with air. The air supplied to the screws is preheated by means of a vacuum actuated cylindrical resistance heater. For this test the stock idle screws were removed from a 1971 Ford, 351 CID engine with automatic transmission. Mr. Landrum's screws were installed with the associated heating element. No idle mixture adjustment was necessary as the Landrum screws are seated solidly in the carburetor.

Test Program

Testing of the vehicle, both baseline and device equipped was done in accordance with the November 10, 1970, and July 2, 1971, Federal Register. These documents describe the 1972 and 1975 Federal Test Procedures, respectively. In addition, fuel consumption has been calculated from the exhaust emissions for each test.

Test Results

The test data is presented in the Appendix of this report. As indicated the Landrum system appears to reduce hydrocarbon by 10% and carbon monoxide by 15%. A 7% fuel consumption penalty is associated with the system. It should be noted that the baseline vehicle, in this case, was set at a lean idle of .25% CO. This was roughly the same idle CO level as obtained with the Landrum device installed.

Conclusions

While the reductions obtained appear small, this was partially due to careful adjustment of the baseline vehicle to a lean idle setting. The setting for the Landrum system required merely the seating of the special idle screws. No doubt the effective reduction of carbon monoxide would have been appreciably higher if the test vehicle had been adjusted to normal maintenance levels of carbon monoxide.

Due to the use of small passages in the idle screw concern is expressed over deposit plugging. This tendency could result in rough idle, stalling, or misfire. Durability testing would be required to quantitatively evaluate this condition.

APPENDIX

1975 Federal Emission Test
All Emission Results in Grams Per Mile

| <u>Date</u> | <u>HC</u> | <u>CO</u> | <u>CO₂</u> | <u>NOx</u> | <u>Fuel MPG</u> |
|----------------|-------------|-------------|-----------------------|-------------|---------------------|
| Baseline | | | | | |
| 4-17-72 | 2.81 | 13.9 | 644.1 | 5.35 | 12.9 |
| 4-18-72 | 2.44 | 11.0 | 651.4 | 5.42 | 12.9 |
| Average | <u>2.63</u> | <u>12.5</u> | <u>647.8</u> | <u>5.39</u> | <u>12.9</u> |
| Landrum System | | | | | |
| 4-4-72 | 2.46 | 12.0 | 690.4 | 6.10 | 12.0 |
| 4-5-72 | 2.28 | 11.0 | 732.3 | 5.05 | 11.5 |
| 4-6-72 | 2.42 | 10.2 | 724.9 | 5.23 | 11.6 |
| 4-7-72 | 2.29 | 9.3 | 690.7 | 5.27 | 12.4 |
| Average | <u>2.36</u> | <u>10.6</u> | <u>709.6</u> | <u>5.41</u> | <u>11.9</u> |
| % Reduction | | | | | |
| from Baseline | 10% | 15% | 10% increase | 0% | 7% penalty |

1972 Federal Emission Test
All Results in Grams Per Mile

| <u>Date</u> | <u>HC</u> | <u>CO</u> | <u>CO₂</u> | <u>NOx</u> |
|------------------------------|-------------|-------------|-----------------------|-------------|
| Baseline | | | | |
| 4-17-72 | 3.25 | 24.4 | 677.9 | 5.37 |
| 4-18-72 | 2.68 | 19.2 | 678.7 | 5.27 |
| Average | <u>2.97</u> | <u>21.8</u> | <u>678.3</u> | <u>5.32</u> |
| Landrum System | | | | |
| 4-4-72 | 2.96 | 21.0 | 720.0 | 6.13 |
| 4-5-72 | 2.61 | 19.8 | 760.0 | 4.97 |
| 4-6-72 | 2.61 | 16.6 | 776.9 | 5.10 |
| 4-7-72 | 2.51 | 15.9 | 710.1 | 5.12 |
| Average | <u>2.67</u> | <u>18.3</u> | <u>741.8</u> | <u>5.33</u> |
| % Reduction from Baseline | 10% | 16% | 9% increase | 0% |