State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-163
Relating to Exemptions under Section 27156
of the Vehicle Code

AIRSENSORS, INC.
MODEL NO. N-8A-HD ELECTRONIC
FUEL INJECTION SYSTEM

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Airsensors Model No. N-8A-HD electronic fuel injection system manufactured by Airsensors, Inc. has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1986 and older Chevrolet/GMC 454 CID heavy-duty gasoline engines.

The following modifications to the original equipment emissions control system are permitted:

1) The carburetor bowl vent hose is disconnected from the carbon canister and that port on the carbon canister must be plugged.

2) The original air cleaner and heated air intake are replaced with the Airsensors air cleaner.

3) The vacuum hose routing is changed as specified in the device installation instructions.

4) The automatic choke system is removed with the original equipment carburetor.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE AIRSENSORS MODEL NO. N-8A-HD ELECTRONIC FUEL INJECTION SYSTEM.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

> "43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 9th day of May, 1986.

K. D. Drachand, Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

# EVALUATION OF THE AIRSENSORS MODEL NO. N-8A-HD ELECTRONIC FUEL INJECTION SYSTEM FOR USE ON 1986 AND OLDER CHEVROLET/GMC 454 CID HEAVY-DUTY ENGINES FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE CALIFORNIA ADMINISTRATIVE CODE

May, 1986

# EVALUATION OF THE AIRSENSORS MODEL NO. N-8A-HD ELECTRONIC FUEL INJECTION SYSTEM FOR USE ON 1986 AND OLDER CHEVROLET/GMC 454 CID HEAVY-DUTY ENGINES FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE CALIFORNIA ADMINISTRATIVE CODE

by

Mobile Source Division
State of California
AIR RESOURCES BOARD
9528 Telstar Avenue
El Monte, CA 91731

(This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.)

## SUMMARY

Airsensors, Inc., of Seattle, Washington has applied for exemption of their electronically controlled fuel injection system Model No. N-8A-HD for use on 1986 and older Chevrolet/GMC 454 CID heavy-duty engines.

Exhaust emissions test data show no significant increases in emissions when the N-8A-HD fuel injection system is installed on the engines described above.

The applicant has submitted all the required information and based on the submitted emission data the staff recommends that the exemption be granted as requested.

# CONTENTS


| | Page Number |
|---|---|
| SUMMARY | i |
| CONTENTS | ii |
| I. INTRODUCTION | 1 |
| II. CONCLUSIONS | 1 |
| III. RECOMMENDATIONS | 1 |
| IV. DEVICE DESCRIPTION | 1 |
| V. DEVICE EVALUATION | 2 |
| VI. DISCUSSION | 4 |
| APPENDIX | |
| Airsensors Technical Manual | A-1 |
| 9-Mode Simulation Test Program | A-2 |
| Turbocharger Test Program | A-3 |
| Original Test Data | A-4A, A-4B |
| Prototype Identification Label | A-5 |
| Advertising Material | A-6 |

State of California
AIR RESOURCES BOARD

# EVALUATION OF THE AIRSENSORS MODEL NO. N-8A-HD ELECTRONIC FUEL INJECTION SYSTEM FOR USE ON 1986 AND OLDER CHEVROLET/GMC 454 CID HEAVY-DUTY ENGINES FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13 OF THE CALIFORNIA ADMINISTRATIVE CODE

## I. INTRODUCTION

Airsensors, Inc., of Seattle, Washington, 98188, has applied for an exemption for their electronically controlled fuel injection sytem Model No. N-8A-HD for use on 1986 and older Chevrolet/GMC 454 CID heavy-duty engines originally equipped with a Rochester 4-barrel carburetor. The system measures the mass air flow, engine temperature, engine speed and engine timing to electronically compute and control the injected fuel flow to maintain pre-determined air-fuel ratios depending on the engine load.

## II. CONCLUSION

The applicant has submitted all the required information and based on the submitted exhaust emissions test data, the staff concludes that the replacement of the original equipment carburetor with the Airsensors model No. N-8A-HD electronic fuel injection system will not adversely affect emissions.

## III. RECOMMENDATION

The staff recommends that the exemption be granted as requested and that Executive Order No. D-163 be issued.

## IV. DEVICE DESCRIPTION

The Airsensors model No. N-8A-HD electronic fuel injection system consists of a four-injector throttle body, which replaces the original

equipment manufacture (OEM) carburetor, a high-pressure fuel pump, fuel filters, a fuel pressure regulator, a new air filter, a mass air flow sensor, an engine temperature sensor, engine timing sensors, a fast-idle air-bleed and a system computer which controls the injectors flow rate based on the signals it receives from the various sensors.

The computer uses the mass air flow meter signal to provide the correct quantity of fuel to maintain a proper air-fuel ratio. The computer uses a tachometer signal to control the frequency of the injection and an inductive pick-up to time the four injectors to match the firing order of the engine. The computer uses the signal from the temperature sensor to provide additional fuel flow during cold engine operation and the air-bleed to provide a fast idle, to prevent stalling, during cold engine operation.

Should the air flow signal be lost due to a malfunction, the computer has a "drive-home" mode which causes the fuel flow to be proportional to engine speed only. This will prevent roadside stranding of the vehicle and occupants.

The Airsensors model N-8A-HD system will be sold on a installed basis by qualified and trained installers using the technical information supplied with each kit (see Appendix 1).

## V. DEVICE EVALUATION

In order to demonstrate compliance with the requirements for the exemption the applicant was required to perform back-to-back 9-mode heavy-duty engine dynomometer tests or a similar chassis dynomometer test using the "Test Program for Simulating 9 Mode Heavy-Duty Engine Dynamometer Testing on a Chassis Dynomometer for Comparative Exhaust

Emissions" (see Appendix 2). Prior to receiving the Air Resources Board's (ARB) test instruction letter requiring the 9 Mode testing the applicant had assumed that the "Test Program for Add-On Turbocharger kits for Heavy-Duty Engines" (see Appendix 3) would be acceptable and therefore performed comparative emissions tests using a 1985 Fleetwood motor home equipped with a Chevrolet/GMC 454 CID heavy-duty gasoline engine. After receiving the ARB letter requiring the 9 Mode testing the applicant attempted to find a laboratory capable of performing either the engine dynomometer test or the chassis dynomemeter test. The closest independent emission laboratory capable of performing either test is Southwest Research Institute in San Antonio, Texas. Because of the distance involved and the financial burden it would impose on the applicant, the ARB decided to perform the 9 Mode tests at the Haagen-Smit Laboratory on the heavy-duty chassis dynomometer.

The testing was scheduled for February 26, 1986, however at this time the heavy-duty chassis dynometer was not functioning properly, so the testing was postponed until March 6, 1986. The testing was again postponed until March 13, 1986, because the dynamometer was used for emissions testing of other ARB priority programs. On March 14, 1986, the planned ARB testing was cancelled and it was decided to base the evaluation on the applicants data only (see Appendix 4). The results of these tests are summarized in Table 1.

Table 1
Exhaust Emissions
Airsensors N-8A-HD Electronic
Fuel Injection for GMC Heavy Duty
454 CID Gasoline Engines

Test vehicle: 1985 Fleetwood Motor Home

| MODE | HC (ppm) | CO(%) | NOx (ppm) |
|---|---|---|---|
| Baseline Idle | 10 | 1.05 | 60 |
| Device Idle | 10 | 1.00 | 50 |
| Percent Change | 0% | - 5% | -16% |
| Baseline 20 mph | 5 | 0.41 | 250 |
| Device 20 mph | 5 | 0.40 | 200 |
| Percent Change | 0% | - 2% | -20% |
| Baseline 30 mph | 5 | 0.33 | 480 |
| Device 30 mph | 2 | 0.18 | 460 |
| Percent Change | -60% | -45% | -4% |
| Baseline 40 mph | 15 | 0.20 | 340 |
| Device 40 mph | 0 | 0.23 | 220 |
| Percent Change | -100% | +15% | -35% |
| Baseline 50 mph | 15 | 0.18 | 780 |
| Device 50 mph | 0 | 0.15 | 900 |
| Percent Change | -100% | -17% | +15% |
| Baseline 55 mph | 15 | 0.15 | 850 |
| Device 55 mph | 0 | 0.05 | 700 |
| Percent Change | -100% | -67% | -18% |

## VI. DISCUSSION

The applicant's submitted data show no increase in hydrocarbon emissions and no significant increases in carbon monoxide or nitrogen oxide emissions from the test vehicle. The system is complete and when installed on the 1986 and older Chevrolet/GMC Heavy-duty 454 CID engines it replaces the OEM carburetor with the following modifications to the OEM emission control system:

1) The carburetor bowl vent hose is disconnected from the carbon canister and that port on the carbon canister must be plugged.

2) The original air cleaner and heated air intake are replaced with the Airsensors air cleaner.

3) The vacuum hose routing is changed as specified in the device installation instructions.

4) The automatic choke system is removed with the original equipment carburetor.

The facsimile of the underhood system identification label was submitted and displays all the required information (see Appendix 5).

Airsensors intends to market this system through qualified service facilities on an installed basis. Installers will be trained by Airsensors to assure proper installation of the system. A typical advertisement used for the marketing of this system is included in Appendix 6. Airsensors has fulfilled the requirements for this exemption.