

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-171-1  
Relating to Exemptions under Section 27156  
of the Vehicle Code

ADVANCED TURBO SYSTEMS  
TURBOCHARGER KIT MODEL NO. ATS 6.9L FOR INSTALLATION ON 1983-1987  
FORD HEAVY-DUTY VEHICLES EQUIPPED WITH A 6.9 LITER  
NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE

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 add-on turbocharger kit Model No. ATS 6.9L manufactured by Advanced Turbo Systems, Inc., 5919 South 350 West, Murray, Utah 84107, using an AiResearch turbocharger Model No. T04B with an A/R ratio of 0.96 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 1983 through 1987 model-year Ford Motor Company heavy-duty vehicles equipped with a 6.9 liter Navistar International heavy-duty diesel engine.

Modifications to the OEM emission-related parts due to the installation of the turbocharger kit include replacement of the air cleaner assembly and replacement of the OEM exhaust system with a 3" diameter exhaust system and replacement of the OEM crankcase depression regulator with parts included in the ATS kit.

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 ADVANCED TURBO SYSTEMS TURBOCHARGER KIT MODEL NO. ATS 6.9 L FOR INSTALLATION ON 1983-1987 FORD HEAVY-DUTY VEHICLES EQUIPPED WITH A 6.9 LITER NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE.

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.

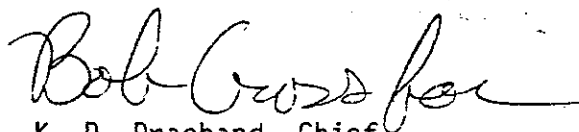
Section 43644 of the Health and Safety Code provides as follows:

"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.

Executive Order D-171, dated November 14, 1986, is superseded and of no further force and effect.

Executed at El Monte, California, this 17th day of December, 1987.

  
K. D. Drachand, Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

EVALUATION OF THE ADVANCED TURBO SYSTEMS ADD-ON TURBOCHARGER KIT  
MODEL NO. ATS 6.9L FOR INSTALLATION ON 1983-1987 FORD MOTOR COMPANY  
HEAVY-DUTY VEHICLES EQUIPPED WITH A 6.9 LITER NAVISTAR  
INTERNATIONAL HEAVY-DUTY DIESEL ENGINE

December, 1987

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INTERNATIONAL HEAVY-DUTY DIESEL ENGINE

by

Mobile Source Division

State of California  
AIR RESOURCES BOARD  
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(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

Advanced Turbo Systems (ATS) has requested a modification of their exemption (Executive Order D-171) from the prohibitions of Vehicle Code Section 27156 for their add-on turbocharger kit Model No. ATS 6.9L designed for 1983-1987 Ford Motor Company heavy-duty vehicles equipped with a 6.9 liter Navistar International heavy-duty diesel engine. The requested modification includes the removal of the original equipment manufacturer (OEM) crankcase depression regulator.

The ATS turborcharger kit requires the removal of the OEM crankcase depression regulator to facilitate installation of the turbocharger. Although part of the original kit, this provision was overlooked in Executive Order D-171. The crankcase ventilation function is then accomplished by venting the drivers side valve cover to the turbocharger compressor inlet with hose and fittings included in the kit. This modification to the crankcase ventilation system was made to the test vehicle as part of the turbocharger kit installation prior to the device tests. The test results show that the installation of the ATS turbocharger and the modification to the crankcase ventilation system does not have an adverse effect on the exhaust emissions from the vehicles described above. Testing performed at the Haagen-Smit Laboratory confirmed the results of the tests performed by ATS.

To demonstrate that this modification to the crankcase ventilation system will not have an adverse effect on crankcase emission control, ATS performed back-to-back crankcase pressure tests on five Ford 6.9 diesel vehicles. The results of these tests show that the crankcase pressures are not significantly affected by the modification to the crankcase ventilation system.

Since Executive Order D-171 does not include this modification to the crankcase ventilation system, the staff recommends that ATS be granted an updated exemption as requested and that Executive Order D-171-1 be issued.

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EVALUATION OF THE ADVANCED TURBO SYSTEMS ADD-ON TURBOCHARGER KIT  
MODEL NO. ATS 6.9L FOR INSTALLATION ON 1983-1987 FORD MOTOR COMPANY  
HEAVY-DUTY VEHICLES EQUIPPED WITH A 6.9 LITER NAVISTAR  
INTERNATIONAL HEAVY-DUTY DIESEL ENGINE

I. INTRODUCTION

Advanced Turbo Systems (ATS) of 5919 South 350 West, Murray, Utah, 84107, has requested a modification of their exemption (Executive Order D-171) from the prohibitions of Vehicle Code Section 27156 for their add-on turbocharger kit Model No. ATS 6.9L for 1983-1987 Ford Motor Company heavy-duty vehicles equipped with a 6.9 liter Navistar International heavy-duty diesel engine. The requested modification includes the removal of the original equipment manufacturer (OEM) crankcase depression regulator.

The ATS turbocharger kit requires the removal of the OEM crankcase depression regulator to facilitate installation of the turbocharger. Although part of the original kit, this provision was overlooked in Executive Order D-171. The crankcase ventilation function is then accomplished by venting the drivers side valve cover to the turbocharger compressor inlet with hose and fittings included in the kit. This modification to the crankcase ventilation system was not recorded on the original Executive Order because the staff was led to believe that the crankcase depression regulator was relocated rather than removed due to statements in the exemption application. Back-to-back exhaust emissions testing of the ATS turbocharger system with this crankcase ventilation modification showed no adverse exhaust emissions effects. The modification retains a closed crankcase and ATS performed back-to-back crankcase pressure tests on five vehicles to demonstrate that the modification does not significantly affect the crankcase pressures of the Ford 6.9L diesel engine. Therefore, the staff concludes that crankcase emissions will not be significantly affected.

Executive Order D-171-1 has been prepared in order to include this crankcase ventilation modification.

## II. CONCLUSION

Based on the previous evaluation of the ATS turbocharger system and the new test data submitted by ATS the staff concludes that the modification to the crankcase ventilation system will not adversely affect emissions (exhaust and crankcase) from the vehicles for which an updated exemption has been requested.

## III. RECOMMENDATIONS

The staff recommends that ATS be granted an updated exemption as requested and that Executive Order D-171-1 be issued.

## IV. TURBOCHARGER KIT DESCRIPTION

The purpose of the ATS turbocharger system is to increase the power output of the engine by increasing the volumetric efficiency of it by compressing the intake charge to pressures above that of the atmosphere. This increased pressure allows a greater charge density to enter the combustion chamber providing more oxygen for combustion. The maximum fuel delivery is slightly increased in order to maintain proper air-fuel ratios with the increased air flow from the turbocharger when it is providing positive manifold pressure (boost).

The major components of the system include a 0.96 A/R ratio AiResearch Model No. T04B turbocharger, custom intake adaptors, exhaust tubing, muffler, air cleaner assembly, brackets, hoses and the hardware necessary to complete the installation.

The OEM crankcase depression regulator is replaced with tubing, fittings with a 0.375 inch orifice supplied in the kit.

Maximum positive manifold pressure is limited to 12 psig by the size of the turbine and the compressor. The maximum engine speed is regulated by the

OEM fuel injection governor which is not modified by the installation of the kit. Therefore, by controlling maximum engine speed, maximum turbine speed and corresponding boost pressures are also controlled.

Installation instructions, included in every kit, show the kit installer how to properly install the turbocharger system and adjust the maximum fuel delivery properly.

#### V. TURBOCHARGER KIT EVALUATION

For details of the evaluation of the exhaust emissions effects of the ATS turbocharger kit refer to the November, 1986 staff report entitled "EVALUATION OF THE ADVANCED TURBO SYSTEMS ADD-ON TURBOCHARGER KIT MODEL NO. ATS 6.9L FOR INSTALLATION IN FORD MOTOR COMPANY HEAVY-DUTY VEHICLES POWERED BY A 6.9 LITER NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE".

At the request of the staff ATS performed back-to-back crankcase pressure tests on five vehicles. The tests were performed at the ATS installation facility before and after the turbocharger installation. Crankcase pressures were measured at the oil filler pipe using a standard manometer. Pressures were recorded at wide open throttle at governor speed (approximately 3300-3600 rpm). The results of these tests are shown in Table 1.

Table 1

| <u>Vehicle Model and Year</u> | <u>Mileage</u> | <u>Naturally Aspirated<br/>Crankcase Pressure<br/>H<sub>2</sub>O" (Vacuum)</u> | <u>Turbocharged<br/>Crankcase Pressure<br/>H<sub>2</sub>O" (Vacuum)</u> |
|-------------------------------|----------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| F-350 1983                    | 92,842         | 3.5                                                                            | 3.5                                                                     |
| F-250 1984                    | 43,859         | 4.0                                                                            | 4.5                                                                     |
| F-250 1986                    | 46,203         | 4.0                                                                            | 4.25                                                                    |
| F-350 1987                    | 3,025          | 4.25                                                                           | 4.5                                                                     |
| F-250 1987                    | 2,604          | 3.5                                                                            | 4.0                                                                     |

## VI. DISCUSSION

The previous evaluation of the ATS turbocharger kit overlooked the modification to the crankcase ventilation system. The modification was present on the test vehicle and therefore the exhaust emissions test results show that the turbocharger installation and the crankcase ventilation modification do not have an adverse effect on exhaust emissions.

Since the modification maintains a closed crankcase, the only other concern is the effect of the modification on crankcase pressures. Data supplied by ATS demonstrates that the modification does not have a significant effect on crankcase pressures.

The staff recommends that Executive Order D-171-1 be issued to include this modification as part of the exempted turbocharger kit and clear up any confusion which Executive Order D-171 may have caused.

APPENDIX