

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-171-9
Relating to Exemptions Under Section 27156
of the Vehicle Code

ADVANCED TURBO SYSTEMS, INC.
ATS WASTEGATED TURBINE HOUSING ASSEMBLY

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 Section 39515 and Section 39516 of the Health and Safety Code and Executive Order G-45-9;

IT IS ORDERED AND RESOLVED: That the installation of the ATS Wastegated Turbine Housing Assembly manufactured by Advanced Turbo Systems, Inc. of 5919 South 350 West, P.O. Box 57547, Murray, Utah 84107, 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 the 1994-1997 Ford Motor Company pickup vehicles installed in 7.3L Navistar International Powerstroke heavy-duty diesel engine.

This exemption shall not apply to any device, apparatus, or mechanism advertised, offered for sale or sold with, or installed on, a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

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

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.

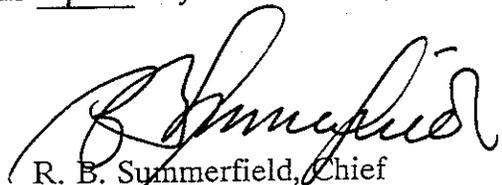
The ARB finds that reasonable grounds exist to believe that use of the ATS Wastegated Turbine Housing Assembly may adversely affect emissions of motor vehicles when operating under conditions outside the parameters of the previously prescribed test procedures. Accordingly, the ARB reserves the right to conduct additional emission tests, in the future, as such tests are developed, that will more adequately measure emissions from all cycle phases. If such tests results demonstrate that the ATS Wastegated Turbine Housing Assembly adversely affect emissions during off-cycle conditions (defined as those conditions which are beyond the parameters of the Cold-Start CVS-75 Federal Test Procedure), this Executive Order shall be effectively rescinded as of the date the test results are validated. Further, if such test results or other evidence provides the ARB with reason to suspect that the ATS Wastegated Turbine Housing Assembly will affect the durability of the emission control system, Advanced Turbo Systems, Inc. shall be required to submit durability data to show that the durability of the vehicle emission control system is not, in fact, affected and/or that the add-on or modified part demonstrates adequate durability.

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 ADVANCED POWER SYSTEMS, INC.'S WASTEGATED TURBINE HOUSING ASSEMBLY.

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

Violation of any of the above conditions shall be grounds for revocation of this order. The order may be revoked only after ten day written notice of intention to revoke the order, in which period the holder of the order may request in writing a hearing to contest the proposed revocation. If a hearing is requested, it shall be held within ten days of receipt of the request and the order may not be revoked until a determination after hearing that grounds for revocation exist.

Executed at El Monte, California, this 4th day of November, 1997.


R. B. Summerfield, Chief
Mobile Source Operations Division

State of California
AIR RESOURCES BOARD

EVALUATION OF ADVANCED TURBO SYSTEMS, INC.'S WASTEGATED
TURBINE HOUSING ASSEMBLY FOR 1994-1997 FORD
MOTOR COMPANY PICKUP TRUCKS POWERED BY A 7.3L
NAVISTAR POWERSTROKE HEAVY-DUTY DIESEL ENGINE FOR EXEMPTION
FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156
IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF
THE CALIFORNIA CODE OF REGULATIONS

November, 1997

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by

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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, Inc. (ATS) of 5919 S. 350 W., Murray, Utah 84107, has applied for exemption from the prohibitions in Section 27156 of the California Vehicle Code for their Wastegated Turbine Housing Assembly. The ATS Wastegated Turbine Housing Assembly is designed for installation in 1994-1997 Ford pickup trucks powered by a 7.3L Navistar Powerstroke heavy-duty diesel engine.

ATS has submitted a complete application with all the required information. Based on an engineering evaluation of the functional test data submitted from steady-state heavy-duty chassis dynamometer testing, the staff concludes that ATS, Inc.'s Wastegated Turbine Housing Assembly will not adversely affect exhaust emissions from vehicles for which an exemption is requested.

The staff recommends that Advanced Turbo Systems, Inc. be granted an exemption from the prohibitions in Vehicle Code Section 27156 and that Executive Order D-171-9 be issued.

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I. INTRODUCTION

Advanced Turbo Systems, Inc. (ATS) of 5919 S. 350 W., Murray, Utah 84107, has applied for an exemption from the prohibitions of Vehicle Code Section (VC) 27156 for their Wastegated Turbine Housing Assembly. The Wastegated Turbine Housing Assembly is designed for installation on 1994-1997 Ford Motor Company pickup trucks powered by a 7.3L Navistar Powerstroke heavy-duty diesel engine. ATS has submitted functional test data obtained from steady-state heavy-duty chassis dynamometer testing conducted on a 1996 model-year California certified 7.3L Navistar heavy-duty diesel engine.

II. CONCLUSIONS

Staff conducted an engineering evaluation and based on the test data submitted by ATS, the staff concludes that the ATS Wastegated Turbine Housing Assembly will not have any adverse effects on the exhaust emissions from the engine for which the exemption is requested.

III. RECOMMENDATION

The staff recommends that Advanced Turbo Systems, Inc. be granted an exemption from the prohibitions in California Vehicle Code Section 27156 for the 1994-1997 model-year Ford Motor Company pickup trucks powered by a 7.3L Navistar Powerstroke heavy-duty diesel engine and that Executive Order D-171-9 be issued.

IV. DEVICE DESCRIPTION

The ATS Wastegated Turbine Housing Assembly is designed for installation on 1994-1997 Ford Motor Company pickup trucks powered by a 7.3L Navistar Powerstroke heavy-duty diesel engine. The subject housing assembly is a direct replacement for the stock unit except that it incorporates a smaller turbine nozzle and a wastegate control unit to limit maximum boost. ATS uses an Allied Signal Turbocharger, model number TP38. The dimensions of the replacement turbocharger turbine housing has been changed from those of the OEM turbocharger. The turbine nozzle area (A) and the distance from the center of the turbine wheel to the centroid of area (R) of the replacement turbocharger have been reduced, decreasing the A/R ratio from 1.15 to 1.00. The smaller turbine nozzle allows a faster boost rise which increases the turbine inlet gas velocity at lower engine speeds. By providing a faster boost rise during transient accelerations, more air (boost) is available for the combustion process thereby assuring more complete burning of the fuel. Ultimate boost level is then controlled by the wastegate which protects the engine from being exposed to excessive cylinder pressures. Additionally, the smaller nozzle housing allows the turbocharger housing to accelerate faster thereby providing improved engine response and reduced snap-idle smoke. The manufacturer claims adding the wastegate would improve driveability and emission performance. Engine horsepower remains the same since there is no change in maximum fuel delivery. Utilizing the ATS Wastegated Turbine Housing Assembly would improve low-end acceleration characteristics while retaining the original maximum power rating. The manufacturer states there are no modifications or alterations to the OEM's engine management control system or power rating.

V. DISCUSSION

Advanced Turbo Systems, Inc. has requested an exemption for the 1994-1997 Ford Motor Company pickup trucks powered by a 7.3L Navistar Powerstroke heavy-duty diesel engine. The ATS Turbine Housing Assembly is the same as the OEM except for a smaller turbine nozzle which allows for a faster boost at lower engine speeds and a wastegate that limits maximum boost during accelerations. These changes are intended to improve the response of the turbocharger and reduce the time between the opening of the throttle and the turbocharger reaching operating speed. The reduction of the turbo lag time could decrease hydrocarbons and particulate emissions by reducing the duration of the oxygen shortage. The difference in the turbo lag time between the OEM turbo and ATS's turbo with wastegate is not sufficient to increase the combustion temperature. Also, faster response of the turbocharger, for short durations, during low end acceleration would not impact NOx emissions since there will be no sufficient increase in the combustion temperature. The ATS Turbine Housing Assembly for the older 7.3L Navistar heavy-duty diesel engines are similar to those present on newer model-year California-certified 7.3L Navistar heavy-duty diesel engines equipped with a turbocharger and wastegate.

ATS submitted torque and horsepower curves for vehicles equipped with the ATS turbo system and the stock configuration. The testing was performed on a heavy-duty truck dyno with a 1996 California-certified 7.3L Navistar heavy-duty diesel engine. This data supports the manufacturer's claim that the purpose of the ATS Turbine Housing Assembly is to improve low-end engine performance while retaining the original power rating. In addition, by providing a faster turbo response during low-end acceleration there should be no impact on exhaust emissions.

The 1997 model-year 7.3L Navistar heavy-duty diesel engine is a carry-over from previous model-years. Therefore, the ATS Turbine Housing Assembly will have no adverse emissions effect on the engines for which exemption is requested.

APPENDIX

WASTEGATED TURBO HOUSING INSTRUCTION

READ THROUGH INSTRUCTIONS BEFORE INSTALLING

1. Remove engine shroud.

Remove the three acorn nuts that hold the engine shroud on. Remove the turbo air inlet hose, with a flat bladed screwdriver.

2. Remove the stock pressure chamber "Y"

Using a flat bladed screwdriver. Loosen the four hose clamps on the hump hoses. Next loosen the V band clamp which holds the pressure chamber to the turbo. Remove pressure chamber along with the hump hoses from the engine. CAUTION: DO NOT LOSE THE O-RING WHICH SEALS THE TURBO TO THE PRESSURE CHAMBER.

3. Remove ATS Pressure Chamber "Y"

(Only if equipped with ATS Intercooler System)
Using a flat bladed screwdriver loosen the two clamps on passenger side pipe and remove pipe. Next loosen the four clamps on hump hoses and remove ATS pressure chamber "Y" and hump hoses, then loosen the V clamp and clamp on drivers side pipe and remove. CAUTION: DO NOT LOSE THE O-RING WHICH SEALS TURBO TO DRIVERS SIDE PIPE.

4. Remove Turbo.

Remove the marmon (V band clamp) that holds the final exhaust, using a 7/16" deep socket with extension and ratchet. Unhook the rod that controls the butterfly in discharge housing, slide collar over and rod will pop off, then remove the three twelve point 5/16 bolts holding the discharge housing to the turbo, using a 5/16 twelve point combination wrench or twelve point socket with extension and ratchet. Remove the two 10mm bolts using a 13mm flex socket with extension and ratchet. Remove the two 10mm nuts using a 15mm combination wrench, which holds the turbo housing to the turbo inlet feed flange, then remove the four 8mm bolts holding the turbo to the engine, using a 10mm flex socket with extension and ratchet, then remove turbo from engine. CAUTION: DO NOT DAMAGE OIL FEED AND OIL RETURN O-RINGS.

5. Remove Turbine Housing.
Remove the four 5/16" twelve point bolts that hold the turbine housing to the turbo. Using a 5/16" twelve point combination wrench, then remove housing and clean all surfaces.
6. Install New Wastegated Turbine housing.
Install the new wastegated turbine housing on turbo, using Anti-seize on the four 5/16" twelve point bolts and tighten.
7. Install Turbo
Set turbo on engine. Re-install the four 8mm bolts and tighten using 10mm flex socket with extension and ratchet. Using Anti-seize on bolts and nuts. Tighten the two 10mm bolts with a 13mm flex socket, extension and ratchet, then tighten the two 10mm nuts with a 15mm combination wrench. Install discharge housing, coating the three 5/16" twelve point bolts with Anti-seize and tighten. Hook up butterfly rod and re-install maxon V band clamp, tighten with 7/16" deep socket and ratchet.
8. Install stock pressure chamber "Y"
Grease o-ring and install in grove on turbo port. Set pressure chamber in place, using a flat bladed screwdriver tighten up clamps on hump hoses and V clamp on turbo port. Install turbo air inlet hose, tighten both clamps with flat bladed screwdriver.
9. Install Wastegate Hose with Stock Pressure Chamber "Y"
Cut the stock hose connection between the intake manifold pressur sensing port and the stock MAP sensor on the firewall and install the supplied barbed "T" fitting and clamps. Attach the remaining leg of the "T" fitting to the barbed fitting on the by-pass turbine housing actuator utilizing the supplied hose and clamps.
10. Start engine and check for leaks
11. Install engine shroud (NON INTERCOOLED)
set shroud in place and tighten the three acorn nuts.