

State of California  
AIR RESOURCES BOARD

EXECUTIVE ORDER D-161-25  
Relating to Exemptions Under Section 27156  
of the Vehicle Code

GALE BANKS ENGINEERING  
TURBOCHARGER SYSTEM MODEL 6.9F

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

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

IT IS ORDERED AND RESOLVED: That the installation of add-on Turbocharger System model 6.9F manufactured by Gale Banks Engineering of 546 Duggan Avenue, Azusa, California 91702, using a Rotomaster Turbocharger Model No. T04B or a Schwitzer/Banks Turbocharger Model No. T04B25 with an A/R rating of 1.0 has been found not to reduce the effectiveness of required motor vehicle pollution control devices and complies with the 40 percent snap idle smoke opacity standard specified in Title 13, California Code of Regulations, Sections 2180-2187, and therefore is exempt from the prohibitions of Section 27156 of the Vehicle Code for the 1988-1992 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

Modifications to the OEM emission related parts due to the installation of the turbocharger system include replacement of the air cleaner assembly, a new 3" low-restriction muffler, and 3" diameter exhaust pipe. Fuel setting is adjusted by turning the fuel pump screw 60 degrees or 1/6 turn clockwise for 1992 models, and 90 degrees or 1/4 turn clockwise for 1991 and older models.

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 installation instructions for this turbocharger system 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 turbocharger system, as exempt by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

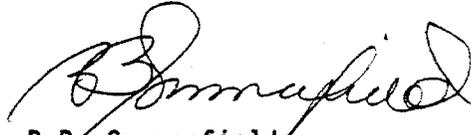
Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not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

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 GALE BANKS ENGINEERING'S TURBOCHARGER SYSTEM MODEL 6.9F FOR INSTALLATION ON 1988-1992 FORD MOTOR COMPANY VEHICLES POWERED BY A 7.3L NAVISTAR INTERNATIONAL HEAVY-DUTY DIESEL ENGINE.

No claim 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 communications.

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 14<sup>th</sup> day of May, 1992.



R.B. Summerfield  
Assistant Division Chief  
Mobile Source Division

State of California  
AIR RESOURCES BOARD

EVALUATION OF GALE BANKS ENGINEERING'S ADD-ON TURBOCHARGER SYSTEM MODEL 6.9F  
FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156  
IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE  
CALIFORNIA CODE OF REGULATIONS

May, 1992

State of California  
AIR RESOURCES BOARD

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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 the mention of trade names or commercial products constitute endorsement or recommendation for use.)

SUMMARY

Gale Banks Engineering (Banks) has requested an update to Executive Order D-161-17, which exempts their Turbocharger System Model 6.9F from the prohibitions in Vehicle Code Section 27156, to include the 1992 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

The 1992 model year 7.3L Navistar International heavy-duty diesel engine is carried over from the previous year for which an exemption has been granted. In addition, smoke opacity tests conducted at Gale Banks shows that the add-on turbocharger system will have no adverse effect on exhaust emissions from the engine for which the exemption update is requested.

The staff recommends that Banks be granted an update as requested and that Executive Order D-161-25 be issued.

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I. INTRODUCTION

Gale Banks Engineering (Banks) of 546 Duggan Avenue, Azusa, California 91702, has requested an update to Executive Order (E.O.) D-161-17 to include the 1992 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine. The E.O. D-161-17 currently exempts Bank's Turbocharger System Model 6.9F from the prohibitions of Vehicle Code (VC) Section 27156 for 1988-1991 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine.

II. CONCLUSION

Since the 1992 model year 7.3L Navistar International heavy-duty diesel engine is carried over from the previous year for which an exemption has been granted and the snap-idle test results indicate that smoke opacity of the modified vehicle was less than the 40 percent standard, the staff believes that the add-on turbocharger system will have no adverse effect on exhaust emissions from the engine for which the exemption update is requested.

III. RECOMMENDATIONS

The staff recommends that Banks be granted an exemption for the add-on turbocharger system model 6.9F for 1988-1992 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine and that Executive Order D-161-25 be issued.

IV. TURBOCHARGER KIT DESCRIPTION AND OPERATION

The purpose of the Banks turbocharger system is to increase the power output of the engine 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 and increase the volumetric

efficiency of the engine. The maximum fuel delivery is slightly increased to maintain proper air-fuel ratios when the turbocharger is providing positive manifold pressure (boost). Maximum positive manifold pressure is limited to 7 psi by the size of the turbine and the compressor. The maximum engine speed is regulated by the original equipment manufacturer (OEM) fuel injection governor. Controlling the maximum engine speed also controls the maximum engine turbine speed and corresponding boost pressure.

The major components of the kit include a 1.0 air ratio (A/R) Rotomaster Model No. T04B or a Schwitzer/Banks Model No. T04B25 turbocharger, custom intake and exhaust tubing, air cleaner assembly, brackets, hoses and the hardware necessary to complete the installation. Modification to the OEM emission related parts due to the installation of the turbocharger system include replacement of the air cleaner assembly and replacement of the OEM exhaust system with a 3" diameter exhaust system. To meet the newly implemented opacity standard of 40 percent, Banks has modified the compressor wheel from a U trim compressor wheel to an H3 trim compressor wheel. Also, the fuel setting is reduced five (5) percent for 1992 models by turning the fuel pump adjustment screw 60 degrees (1/6 turn clockwise), instead of the 90 degrees (1/4 turn clockwise) adjustment for the previous models.

#### V. DISCUSSION

The applicant is making the add-on Turbocharger System Model 6.9F available for 1992 model year Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine. Certification documents show that the 1992 model year 7.3L Navistar International heavy-duty diesel engine is carried over from the previous year for which the turbocharger system has been exempted. Previous testing of the turbocharger showed no adverse affect on exhaust emissions. However, starting with the 1992 model

year heavy-duty diesel vehicles, snap-idle smoke opacity testing was required pursuant to California Code of Regulations (CCR) Section 2182, Heavy-Duty Diesel Vehicle Smoke Opacity Test Procedures. The overall smoke opacity could not exceed 40 percent as required by the CCR Section 2182 (c). In the past, Gale Banks through the Specialty Equipment Manufacturers Association (SEMA), claimed that the current aftermarket turbocharged configuration could not meet the 40 percent opacity standard because turbochargers do not kick-in immediately upon engine start up. Thus, during transient periods, air is momentarily restricted even though fuel is increased, causing an increase in peak smoke. To meet the 40 percent opacity standard, Banks modified the turbocharger system to use a new Schwitzer or Garrett H3 trim compressor wheel (part numbers 166198 and 408105-5371 respectively). The H3 trim compressor wheel reduces the response time (boost to fuel) of the turbocharger which has a favorable impact on particulate emissions as well as meeting the 40 percent opacity standard. The new trim compressor wheel does not change the overall characteristics of the turbocharger. Furthermore, the fuel setting for 1992 model year California certified engines is reduced five (5) percent due to the snap idle test requirements. Since the H3 trim wheel does not change the overall characteristics of the turbocharger and the fuel adjustment (90 degrees or 1/4 turn clockwise) of previous model years represent the 'worst case' condition, no additional emission testing (other than the smoke opacity test) was required. The applicant claims no other modifications to the system are necessary for installation on 1992 model year applicable vehicles.

Smoke opacity testing was conducted at the Gale Banks Engineering facility using a 1991 Ford Super-Duty truck powered by a 7.3L Navistar International heavy-duty diesel engine to determine if the vehicle with the

turbocharger installed is within the 40 percent standard. Bank's opacity readings are shown below.

Snap-Idle Smoke Opacity Test Results

22%, 23%, 22%

The snap-idle test results indicate that smoke opacity of the modified vehicle was less than 40 percent. This demonstrates that the addition of the Gale Banks Turbocharger System Model 6.9F will not have an adverse effect on emissions for 1988-1992 Ford Motor Company vehicles powered by a 7.3L Navistar International heavy-duty diesel engine for which the exemption was requested.

Banks has submitted all the required information and fulfilled the requirements for an exemption.