UPDATED INFORMATIVE DIGEST

ADOPTION OF EMISSION STANDARDS AND TEST PROCEDURES FOR NEW 2001 AND LATER OFF-ROAD LARGE SPARK-IGNITION ENGINES

Sections Affected: This action adopts the following sections of Title 13, California Code of Regulations, and the documents incorporated by reference therein: Chapter 9, Off-road Vehicles and Engines Pollution Control Devices; Article 4.5, Large Spark-Ignition Engines; Sections 2430, et seq., and the incorporated "California Exhaust Emission Standards and Test Procedures for New 2001 and Later Off-Road Large Spark-Ignition Engines." This action amends the following sections of Title 13, California Code of Regulations, and the documents incorporated by reference therein: Chapter 9, Off-road Vehicles and Engines Pollution Control Devices; Article 3, Off-Highway Recreational Vehicles and Engines; Sections 2411-2414, and the incorporated "California Exhaust Emission Standards and Test Procedures for 1995 and Later Off-Highway Recreational Vehicles and Engines."

Background: The California Clean Air Act as codified in the Health and Safety Code sections 43013 and 43018 grants the ARB authority to regulate off-road mobile source categories. Included are marine vessels, locomotives, utility engines, off-road motorcycles, and off-highway vehicles. Measure M11 of the California 1994 State Implementation Plan for Ozone directed staff to develop emission control regulations specifically for spark-ignition engines above 25 horsepower. In crafting the proposal, the ARB staff met with engine manufacturers, trade associations, emission control manufacturers and developers, fuel system suppliers, and other interested parties in numerous individual meetings and calls. The staff also held a public workshop on May 19, 1998.

Regulations: On October 22, 1998, the Board considered and approved regulations that apply to off-road spark-ignition engines 25 horsepower or above, with some exceptions. The regulations will be implemented with engines produced on or after January 1, 2001. The regulations exclude construction and farm equipment engines below 175 horsepower, consistent with the 1990 federal Clean Air Act Amendments' preemption of state authority, and the United States Environmental Protection Agency's (U.S. EPA) subsequent implementation of that provision. The regulations also excludes marine propulsion engines, engines used in devices that operate on rails or tracks, recreational vehicles, snowmobiles, and gas turbines. The regulations establish exhaust emission standards for hydrocarbons (HC) and oxides of nitrogen (NOx) combined, and for carbon monoxide (CO). The regulations also establish emission test procedures, test cycles, and fuel specifications, which are representative of actual use in California, and emissions compliance requirements. All of the testing and fuel specifications have been developed with industry input.

The Board approved a certification process which is most similar to the streamlined small off-road engine certification process recently developed by ARB, U.S. EPA, and industry. That process allows ARB to receive the most useful and pertinent information on a timely basis, while providing electronic submission and minimizing the administrative burden on manufacturers.

Many of the engines below one liter in displacement share characteristics with the larger of the small off-road engines below 25 horsepower, as opposed to the engines greater than one liter, which tend to be de-featured versions of current or past automobile engines. For engines with a displacement of 1.0 liter or less, the Board approved emission standards (shown in Table 1) which are implemented in 2002. These engines are to use the small off-road engine test procedures for compliance.

For engines with a displacement greater than 1.0 liter, the Board approved two tiers of emission standards, shown below in Table 1. Tier 1 is implemented through a phase-in schedule, beginning in 2001; manufacturers would be required to show that 25 percent of their California large spark-ignition engines comply with the emission standards in 2001, 50 percent in 2002, and 75 percent in 2003. For this first tier, manufacturers are responsible for showing compliance with the emission standards when the engine is new (i.e., they are not subject to the in-use standards). The phase-in will provide industry with flexibility to develop controlled engines over a period of years instead of developing all their engines by 2001. Small volume manufacturers, those that produce fewer than 2000 large spark-ignition engines annually nationwide, are exempt from complying with the Tier 1 requirements.

The second tier of emissions standards (Tier 2), to be implemented in 2004, requires 100 percent of manufacturers' engines to comply with the proposed standards for the engines' useful lives. Manufacturers are required to demonstrate that their engines comply with the emission standards in-use. However, manufacturers have the added flexibility of a less stringent in-use standard during the first three years of Tier 2. The implementation of Tier 2 is expected to coincide with the implementation of a harmonized federal (nationwide) program.

In general, staff anticipates that manufacturers of large spark-ignition engines over 1.0 liter will use three-way catalysts with closed-loop controls to meet the adopted emission standards. Manufacturers will likely continue to use systems developed for Tier 1 to comply with the Tier 2 requirements, but with greater attention paid to maintaining emission control over the useful life of the engine.

Table 1
Exhaust Emission Standards
(grams per brake horsepower-hour)
[grams per kilowatt-hour][1]

Model Year	Engine Displacement	Durability Period	Hydrocarbon plus Oxides of Nitrogen	Carbon Monoxide
2002 and subsequent	≤1.0 liter	1,000 hours or 2 years	9.0 [12.0]	410 [549]
2001 - 2003[2],[3]	> 1.0 liter	N/A	3.0 [4.0]	37.0 [49.6]
2004 - 2006[4]	> 1.0 liter	3500 hours or 5 years	3.0 [4.0]	37.0 [49.6]
2007 and subsequent	> 1.0 liter	5000 hours or 7 years	3.0 [4.0]	37.0 [49.6]

Note: (1) Standards in grams per kilowatt-hour are given only as a reference. Pollutant emissions reported to ARB by manufacturers must be in grams per brake horsepower-hour.

(2) Small volume manufacturers are not required to comply with these emission standards.

(3) Manufacturers must show that at least 25 percent of its California engine sales comply with the standards in 2001, 50 percent in 2002, and 75 percent in 2003.

(4) The standards for in-use compliance for engine families certified to the standards in the row noted are 4.0 g/bhp-hr (5.4 g/kW-hr) hydrocarbon plus oxides of nitrogen and 50.0 g/bhp-hr (67.0 g/kW-hr) carbon monoxide, with a useful life of 5000 hours or 7 years. In-use averaging, banking, and trading credits may be generated for engines tested in compliance with these in-use compliance standards. If the in-use compliance level is above 3.0 but does not exceed 4.0 g/bhp-hr hydrocarbon plus oxides of nitrogen or is above 37.0 but does not exceed 50.0 g/bhp-hr carbon monoxide, and based on a review of information derived from a statistically valid and representative sample of engines, the Executive Officer determines that a substantial percentage of any class or category of such engines exhibits within the warranty periods noted in Section 2435, an identifiable, systematic defect in a component listed in that section, which causes a significant increase in emissions above those exhibited by engines free of such defects and of the same class or category and having the same period of use and hours, then the Executive Officer may invoke the enforcement authority under Section 2439, Title 13, California Code of regulations to require remedial action by the engine manufacturer. Such remedial action is limited to owner notification and repair or replacement of defective components, without regard to the requirements set forth in Section 2439(b)(5) or Section 2439(c)(5)(B)(vi). As used in the section, the term “defect” does not include failures that are the result of abuse, neglect, or improper maintenance.

In addition to the exhaust emission standards, the regulations require all engines produced in model year 2001 or later to have closed crankcases. This requirement is already met by a majority of the engines in the off-road large spark-ignition (LSI) category.

For the 2001 through 2003 model year engines over 1.0 liter, manufacturers are required to provide a two year emissions defects warranty to the ultimate purchaser. Beginning with the 2004 model year, emissions defects warranties are extended to, depending on cost, three years or five years for the high cost parts. The warranty will ensure that emissions-related parts are free of defects.

Compliance of production engines are determined through the Cumulative Sum procedure used by both ARB and the U.S. EPA for small off-road engines. The Cumulative Sum procedure replicates the statistical foundation of the federal Selective Enforcement Audit program, while providing greater opportunity for a quick decision, thus minimizing the manufacturer's possible testing burden. In addition to the Cumulative Sum production line testing described above, new engine compliance testing similar to other on- and off-road programs are included.

For engines with a displacement greater than 1.0 liter, Tier 1 does not require manufacturers to meet an emissions durability standard. Therefore, there is no in-use component for Tier 1. However, Tier 2 requires manufacturers to demonstrate that their emission-controlled engine complies with the emission standards for its durability period. The durability period is dependent on the model year, as shown in Table 1. To ensure that the durability requirements are followed, the Board also adopted an in-use compliance testing program. For 2004 and subsequent model years, manufacturers must test up to 25 percent of the total number of engine families in-use. For manufacturers producing fewer than four engine families in a model year, a maximum of one engine family may be tested each year. Small volume manufacturers and low volume engine families (less than 500 engines) have a reduced testing burden. There is no in-use component for engines with a displacement of 1.0 liter or less.

If a selected in-use engine fails to meet the applicable exhaust emission standards, the manufacturer must report within 72 hours after completion of the test, specifying the emission results and the pollutant which failed. The manufacturer must determine the reason for noncompliance and report all such reasons within fifteen business days of the end of testing. Additional time beyond the initial fifteen may be granted provided the manufacturer receives prior approval from the Executive Officer. The Executive Officer will consider failure rates, average emission levels and the existence of any defects, among other factors, in determining whether to pursue remedial action for a failed engine family. While the Executive Officer is able to order a recall, the manufacturer may instead concede failure and perform a voluntary emissions recall. Once ARB determines that a substantial number of engines fail to conform with the requirements, the manufacturer does not have the option of a voluntary recall.

Manufacturers have the option of participating in an in-use emission credit program. Emission credits are generated when the emission level of in-use engines tested by the manufacturers are below the standards. More engines per engine family tested generates a greater percentage of usable emission credits. Manufacturers may use in-use emission credits to remedy in-use testing noncompliance.

As mentioned above, the Board adopted provisions to provide relief for small-volume manufacturers that produce less than 2000 engines annually nationwide. Specifically, small-volume manufacturers of engines above 1.0 liter are not required to meet the emission standards until 2004, a three year delay. The durability demonstration and in-use testing program also include a means to reduce the testing burden on small-volume manufacturers.

At the hearing, the Board approved an alternative to the exhaust emissions standards proposed in the staff report. The alternative is projected to attain the same emissions reductions from these engines as the original staff proposal, but will provide manufacturers greater flexibility to attain those reductions. The differences in the alternative, as compared to what was proposed in the staff report, have been discussed above and include: 1) a delay of the implementation of the emission standards for engines with a displacement of 1.0 liter or less until 2002, 2) less stringent emission standards of 9.0 g/bhp-hr NOx+HC and 410 g/bhp-hr CO for those engines with a displacement of 1.0 liter or less, 3) allowing the use of the small engine test procedures for those engines with a displacement of 1.0 liter or less, 4) less stringent in-use standards during the first three years of Tier 2 for engines with a displacement of greater than 1.0 liter.

The Board also directed staff to conduct two technology reviews. The first review will occur in 2000 and will focus mostly on the Tier 1 standards. The second review will occur in 2002 and will focus on the Tier 2 standards. However, the Board's directive did not restrict or limit staff from acknowledging and addressing any new information that may become available before or after either technology review. These reviews will enable the ARB staff and industry to determine how the application of technology is progressing by analyzing available data, identify any previously unforseen challenges, and recommend regulatory changes, if warranted.

Finally, the Board directed staff to investigate the possibility of optional standards within the scope of the 15-day Notice of Modified Text. However, the Board noted that if no consensus could be reached between industry during that time, the issue would not be included in the 15-day notice, but in a subsequent process. Based on discussions with industry and other interested parties, staff determined that the optional standards program is too difficult to incorporate as a 15-day change. Therefore, staff is currently working on an optional more stringent emission standards program which will include LSI engines and other off-road engines .

The Board also considered and approved amendments to the Off-Highway Recreational Vehicle (OHRV) regulations. The amendments consisted of the deletion of the term "specialty vehicle" from the regulations. As a result, specialty vehicles with engines greater than 25 horsepower are included in this large engine regulation. The Small Off-Road Engine regulations had previously been amended to include specialty vehicles with engines less than 25 horsepower. .

At the hearing, the Board also approved a modification to the OHRV rule proposed by staff that was not presented in the Large Engine staff report. The alternative is projected to attain the same emissions reductions from these engines as the original staff proposal, but will provide manufacturers greater flexibility to attain those reductions. The modification, which consisted of

the deletion of the weight limit from the "all-terrain vehicle" (ATV) definition, resulted in the inclusion of all ATVs into the OHRV regulation. Though a narrative version of these amendments was approved at the hearing on Large Off-Road Spark-Ignition Engine regulations for subsequent modification, the textual changes were noticed a few weeks later in the notice of proposed amendments to the OHRV regulations.

Comparison to Federal Regulations: Currently, there are no federal regulations for this source category. However, the U.S. EPA is anticipated to promulgate regulations for large spark-ignition engines to satisfy the requirements of SIP measure M12. Those regulations are expected to be harmonized with California's Tier 2 program. The cost of the separate California program is justified by the benefit to human health, public welfare, and the environment. In addition, the differences from the anticipated federal program are authorized by Health and Safety Code sections 43013 and 43018.

Consideration of Alternatives: The regulations proposed in this rulemaking were the result of extensive discussions and meetings involving staff and the directly affected parties (e.g., large off-road engine and equipment manufacturers). Staff considered all of the alternatives proposed by industry and was able to incorporate a majority of industry's proposed amendments into the modified regulatory language presented to the Board. The Board rejected several major alternatives for the reasons described in the staff report at page 56, and in the Responses to Comments found in the Final Statement of Reasons. Also, a number of additional modifications proposed during the comment periods were incorporated into the final regulations. The Board determined that no alternative considered by the agency would be more effective in carrying out the purpose for which the regulatory action was proposed or would be as effective and less burdensome to affected private persons than the action taken by the Board.