

ANTELOPE VALLEY AIR QUALITY MANAGEMENT DISTRICT

**RULE 1110 -- EMISSIONS FROM STATIONARY INTERNAL COMBUSTION
ENGINES (DEMONSTRATION)**

(Adopted: 11/06/81)

(a) Definitions

For purposes of this rule, the following definitions shall apply:

- (1) A Stationary Internal Combustion Engine (engine) is any spark ignition (Otto cycle) internal combustion engine that is operated at a specific site for more than one year or is attached to a foundation at that site.
- (2) A Rich-Burn Engine is an engine that is operated with an exhaust stream oxygen concentration of less than one percent by volume.
- (3) A Lean-Burn Engine is an engine that is operated with an exhaust stream oxygen concentration greater than one percent by volume.
- (4) An Existing Engine is an engine that prior to November 6, 1981:
 - (A) has been issued a valid Permit to Construct or Operate by the District, or
 - (B) Is in operation, including those operating pursuant to the provisions of District Rule 219(b)(1), or
 - (C) Is subject to review due to submittal of an application for Permit to Construct or Operate which has been deemed complete by the Executive Officer.
- (5) Output is the shaft output from the engine plus energy reclaimed by any heat recovery system, subject to the approval of the Executive Officer.
- (6) Rated Brake Horsepower is the rating specified by the engine manufacturer.

(b) Requirements

- (1) Owners and/or operators of more than 5,000 total installed rated brake horsepower of existing engines shall participate in a program to demonstrate the effectiveness of methods for the reduction of oxides of nitrogen emissions from such engines, where:
 - (A) Rich-burn engines demonstrate that:
 - (i) Oxides of nitrogen emissions do not exceed 0.28 microgram per joule output (0.75 g/bhp-hr), or
 - (ii) These engines have been modified or equipped with control devices to reduce oxides of nitrogen emissions by 90 percent, or
 - (iii) Alternate emission limits of 48 ppm by volume oxides of nitrogen, corrected to 15 percent oxygen by volume, or limits as allowed by Attachment "A" are not exceeded, or
 - (iv) With control equipment installed and operating the emission limits of rich-burn engines, subsection (i), (ii) and (iii) above, cannot be met. For such engines the Executive Officer may alter emission limits and require continuation of testing, after studying costs, to provide meaningful information.
 - (B) Lean-burn engines demonstrate that:
 - (i) Oxides of nitrogen emissions do not exceed 0.56 microgram per joule output (1.5 g/bhp-hr), or
 - (ii) These engines have been modified or equipped with control devices to reduce oxides of nitrogen emissions by 80 percent, or
 - (iii) Alternate emission limits of 96 ppm by volume oxides of nitrogen, corrected to 15 percent oxygen by volume, or limits as allowed by Attachment "A" are not exceeded, or
 - (iv) With control equipment installed and operating the emission limits of lean-burn engines, subsections (i), (ii) and (iii) above, cannot be met. For such engines the Executive Officer may alter emission limits and require continuation of testing, after studying costs, to provide meaningful information.
 - (C) The number of demonstration engines to be selected for testing by each owner and/or operator are determined from the Table of Sample Requirements Rich-Burn Engines and Table of Sample Requirements Lean-Burn Engines below, except for substitutions allowed by the Executive Officer, but the total test engine horsepower shall not exceed five percent of the total horsepower of all engines under the control of the same owner and/or operator.

The engines selected for testing shall show as much diversification of engine model and control system as possible and the selection shall be subject to the approval of the Executive Officer.

(i) TABLE OF SAMPLE REQUIREMENTS
RICH-BURN ENGINES

<u>No. of Rich-Burn Engines Operated In District Each Operated At Least 2,000 hr/yr</u>	<u>Ranges of Rated Brake Horsepower Per Engine</u>	<u>No. of Demonstration Engines Required</u>
20 or less	50 to 200	None
21 to 50	50 to 200	1
51 to 80	50 to 200	2
over 80	50 to 200	3
7 or less	201 to 500	None
8 to 15	201 to 500	1
over 15	201 to 500	2
7 or less	501 to 1,000	None
8 to 15	501 to 1,000	1
over 15	501 to 1,000	2
4 or less	over 1,000	None
5 to 10	over 1,000	1
over 10	over 1,000	2

(ii) TABLE OF SAMPLE REQUIREMENTS FOR
LEAN-BURN ENGINES

<u>No. of Lean-Burn Engines Operated in District Each Operated At Least 2,000 hr/yr</u>	<u>Ranges of Rated Brake Horsepower Per Engine</u>	<u>No. Lean-Burn Demonstration Engines Required</u>
6 or less	500 and over 500	None
7 to 15	500 and over 500	1
16 to 24	500 and over 500	2
Over 24	500 and over 500	3

- (D) Notwithstanding provisions of section (C), where an owner and/or operator has engines totaling more than 5,000 installed rated brake horsepower which operate more than 2,000 hours per year each, he shall provide at least one demonstration engine for the test program.
- (E) The hours operated by test engines in the demonstration program shall be recorded in log books or by elapsed time recorders.
- (F) The owner and/or operator shall submit to the Executive Officer the list by model and rating of all his engines, the list of selected test engines which are to be retrofitted with control devices or engine modifications, and the test plan, prepared following the guidelines provided by the Executive Officer, for the demonstration program by January 5, 1982. After approval of the selected test engines and test plan by the Executive Officer, the owner and/or operator shall:
 - (i) Have rich-burn engines modifications completed and control systems installed and operating within six months, and
 - (ii) Have lean-burn engines modifications completed and control systems installed and operating within twenty-four months, or
 - (iii) Have received approval from the Executive Officer for an extension in program schedule because of nonavailability of control equipment and/or support services, or
 - (iv) Received approval from the Executive Officer for delay in program implementation, not to exceed 12 months, because of funding problems (for Public Service Agencies).
- (G) Sequential measurements for oxides of nitrogen reduction, along with measurements of concentrations of oxygen, carbon monoxide, carbon dioxide, total hydrocarbons, and non-methane hydrocarbons by method referenced in Attachment "B" or equivalent, are made by the owner and/or operator within the first month of operation and, at a minimum, after each 2,000 hours of operation or each 6 months of operation, whichever comes first. Measurements of ammonia shall be made if deemed necessary by the Executive Officer.
- (H) The test program continues for at least 12 consecutive months or until 4,000 hours of operation are accumulated for each test engine, whichever occurs first.
- (I) Breakdown or failure of control equipment to control oxides of nitrogen emissions within allowable limits of this rule during the program for periods exceeding forty-eight hours shall be summarized in a monthly report to the Executive Officer, together with a description of the corrective measures undertaken and/or to be undertaken.

- (J) Test results shall be reported to the Executive Officer within sixty days after completion of each test period.
- (2) After oxides of nitrogen control device installation or engine modifications a person shall not operate a test engine without periodic manual air-fuel ratio adjustments or automatic controls to minimize the discharge of carbon monoxide (CO) into the atmosphere.
- (3) Notwithstanding Rule 219, owners and/or operators of demonstration engines and/or control devices shall apply for permits to construct and operate the demonstration engines and/or control devices. A test engine with control equipment will be considered a single permit unit.
- (4) If an owner and/or operator participating in the test program meets the other requirements of this rule, the failure of his control equipment to meet the specified emission limits will not constitute a violation of the rule.
- (5) Owners and/or operators may apply engine test program results from this District and from other adjacent counties provided:
 - (A) That the subject engine is, or would be considered in the case of an adjacent county, an existing engine; and
 - (B) That other requirements of this rule are met; and
 - (C) The control was not installed to comply with the requirements of any other non-demonstration rule or regulation, including mitigations provided as offsets or emission reductions credits for New Source Review, Prevention of Significant Deterioration, or Emission Banking.
- (6) Owners and/or operators may appeal to the South Coast Air Quality Management Hearing Board:
 - (A) Any decision of the Executive Officer to continue a test program when costs are excessive.
 - (B) A requirement to test selected engines which are deemed to be obsolete for purposes of application of NO_x control technology.
 - (C) Any decision of the Executive Officer to include an owner/operator in the test program, if such owner/operator is included in the program due to engines which will be permanently removed from service no later than three months after the dates specified in subsection (b)(1)(F)(i) or (b)(1)(F)(ii), as appropriate.

- (7) Engines tested in this Demonstration Program shall be permitted to operate with the NO_x control system used under this rule for a period of ten years from November 6, 1981 and shall not be subject to conditions of any other subsequent NO_x rule during that ten-year period.

(c) Exemptions

- (1) The provisions of this rule shall not apply to:
 - (A) Existing engines with less than 50 brake horsepower rating.
 - (B) Existing non-carbureted turbocharged four-stroke and existing two-stroke Otto cycle engines all less than 500 brake horsepower rating.
 - (C) Engines used directly and exclusively for agricultural operation necessary for the growing of crops, or the raising of fowl or animals.
 - (D) Diesel cycle engines or gas turbines.
 - (E) Emergency standby engines which operate only as temporary replacements for primary mechanical or electrical power sources during periods of fuel or energy shortage or while the primary power source is undergoing repairs.
 - (F) Engines used exclusively for fire fighting operations.

[SIP: Approved 5/3/84, 49 FR 18822, 40 CFR 52.220(c)(121)(i)(C)]

ATTACHMENT A
Alternative Emission Limit to Limit
the Oxides of Nitrogen (NO_x) Emissions
from Stationary Internal Combustion Engines

For stationary internal combustion engines, emissions of oxides of nitrogen shall not exceed an emission limit as determined by the following equation:

$$\text{EMISSION LIMIT} = \frac{\text{STANDARD} \times \text{UNIT EFFICIENCY}}{\text{STANDARD EFFICIENCY}}$$

The STANDARD is 48 ppm NO_x for rich-burn or 96 ppm for lean-burn as corrected to 15 percent oxygen at an engine STANDARD EFFICIENCY of 30 percent.

UNIT EFFICIENCY equals the total shaft output and reclaimed heat from any heat recovery system divided by the energy input (as determined by a fuel measuring device accurate to ± 5 percent and based on the higher heating value of the fuel). Any engine which has a tested efficiency greater than 30 percent is allowed a 30 percent unit efficiency for the purpose of this limitation.

The volume concentration (ppm) of the oxides of nitrogen (NO_x) shall be corrected to 15 percent oxygen (O₂) on a dry basis as follows:

$$\text{PPM NO}_x (15\% \text{ O}_2) = \text{PPM NO}_x (\text{measured}) \times \frac{20.9\% - 15\%}{20.9\% - \% \text{ O}_2} \text{ measured}$$

ATTACHMENT B
Modified EPA Method 20

For the purpose of this rule, the following modifications shall be applied to EPA Reference Method 20 as published in the Federal Register on September 10, 1979.

- (1) General Note - All references to SO₂ of sulfur measurement shall be deleted.
- (2) Section 4.1.4 - The NO_x to NO converter as shown in Figure 20.1 is normally integrated into the NO_x analyzer. In addition, the deletion of the converter shall not be an option as it presently is in Method 20.
- (3) Section 4.3 - Calibration gases shall be at 0, 50 percent, and 90 percent of full scale. The full scale value shall be selected so that the measured value is approximately 50 percent of scale.
- (4) Section 6.1.2 - Delete all references to a preliminary O₂ traverse; however, O₂ shall be measured continuously during the test.
- (5) Section 6.1.2.1 - To allow for very small cross sections the minimum number of points shall be adjusted at the discretion of the Executive Officer.
- (6) Section 6.2 - Testing shall be at actual load conditions. The test period shall be a minimum of fifteen minutes per load condition to determine compliance initially. However, if the source is not in compliance after the initial fifteen minutes, the test shall be continued for at least one hour and forty-five minutes. The stack shall be traversed initially to determine the degree of stratification in the stack. Sampling time at each traverse point shall be a minimum of two minutes plus system response time. The remainder of the test period shall be with the probe inlet at the average point.
- (7) An ultimate analysis or equivalent shall be performed on the fuel fired using ASTM Method D3178-74 or D3176 (liquid fuels) or D1946-67 (72) (gaseous fuels) as applicable, to determine the theoretical maximum concentration in the flue gases shall not deviate by more than an amount specified by the Executive Officer, from the predicted O₂ concentration based on the concurrent CO₂ measurement and the ultimate analysis.