

VENTURA COUNTY AIR POLLUTION CONTROL DISTRICT

**RULE 74.15 - BOILERS, STEAM GENERATORS AND PROCESS HEATERS**

*(Adopted 3/28/89, Revised 12/3/91, 11/8/94)*

A. Applicability

1. The provisions of this rule shall apply to boilers, steam generators and process heaters used in all industrial, institutional and commercial operations, except as follows:
  - a. Utility electric power generating units and any auxiliary boiler used with a utility electric power generating unit.
  - b. Water heaters.

B. Requirements

1. No person shall allow the discharge into the atmosphere from any boiler, steam generator or process heater with a rated heat input capacity of equal to, or greater than, five (5) million BTU's per hour, and an annual heat input rate of equal to, or greater than,  $9 \times 10^9$  BTU's per calendar year, oxides of nitrogen emissions in excess of 40 parts per million volume. Carbon monoxide emissions from units subject to this rule shall not exceed 400 ppmv.

Units subject to the above provisions shall test for compliance not less than once every 24 months.

2. Any boiler, steam generator or process heater with a rated heat input capacity of equal to, or greater than, five (5) million BTU's per hour, and having an annual heat input rate of less than  $9 \times 10^9$  BTU's per calendar year, shall comply with one of the following requirements:
  - a. The unit shall be operated in a manner that maintains stack gas oxygen concentrations at less than or equal to three (3) percent on a dry basis for any 15-consecutive-minute averaging period. Units subject to this provision shall test for compliance every six (6) months; or
  - b. The unit shall be operated using a stack gas oxygen trim system set at three (3) percent oxygen. The tolerance of the setting shall be  $\pm$  five (5) percent. Units subject to this provision shall test for compliance every twelve (12) months; or
  - c. The unit shall be tuned at least twice per calendar year, at intervals from four (4) to eight (8) months apart, in accordance with the procedure

described in Attachment 1 for forced draft fired equipment or Attachment 2 for natural draft fired equipment, except as follows:

- 1) If the unit operates less than six continuous months per calendar year, one tune-up per calendar year shall be required. Continuity shall be broken after downtime of greater than seven (7) days.
  - 2) If the unit is operated less than ten (10) days per calendar year, no tune-up shall be required.
- ; or
- d. The unit shall comply with the emission and testing requirements of Subsection B.1.
3. In lieu of compliance with the provisions of Subsection B.1 of this rule, the pilot burners associated with Units H-1 and H-2 on District Permit to Operate 0271 shall meet an alternate NOx emission limit of 90 ppmv.

#### C. Exemptions

1. The provisions of this rule shall not apply to any boiler, steam generator or process heater with a rated heat input capacity of less than five (5) million BTU's per hour.
2. The provisions of Subsection B.1 of this rule shall not apply to any boiler, steam generator or process heater operated on alternate fuel under the following conditions:
  - a. Alternate fuel use is required due to the curtailment of natural gas service to the individual unit by the natural gas supplier. Alternate fuel use in this case shall not exceed the period of natural gas curtailment.
  - b. Alternate fuel use is required to maintain the alternate fuel system. Alternate fuel use in this case shall not exceed 50 hours per year.

The tune-up requirements specified in Section B.2.c shall not be required for alternate fuel use.

3. The provisions of Subsection B.1 of this rule shall not apply to the use of an emergency standby unit when a breakdown occurs to the primary unit, and the breakdown is reported pursuant to the breakdown reporting requirements of Rule 32. Emissions resulting from the operation of the standby unit shall not exceed the total annual or hourly permitted emission rate of the primary unit. Operation of the standby unit shall not occur beyond the period of the primary unit's emergency breakdown.

4. The provisions of Subsection B.1 of this rule shall not apply during the cold startup of an applicable unit. For units with a rated heat input capacity of equal to, or greater than, one hundred (100) million BTU's per hour, the duration of this exemption shall not exceed three (3) hours. For units with a rated heat input capacity of less than one hundred (100) million BTU's per hour, the duration of this exemption shall not exceed one (1) hour.
5. The provisions of Subsection B.1 of this rule shall not apply during excess emission occurrences associated with the ramp-up and ramp-down procedures used for transition between the pilot burners and the main burners associated with Units H-1 and H-2 on District Permit to Operate 0271. For each ramp-up or ramp-down event, cumulative periods of exemption shall not exceed three (3) hours.

D. Recordkeeping Requirements

1. Any person subject to the provisions of Subsection B.2 of this rule shall install a totalizing fuel meter for each applicable unit and for each fuel. The meter shall be used to demonstrate that each unit operates at or below the applicable heat input level.

Meters shall be accurate to  $\pm$  one (1) percent, as certified by the manufacturer in writing. Totalizing fuel meter readings shall be recorded monthly, shall be maintained for a period of four (4) years, and shall be made available for inspection by the Air Pollution Control Officer upon request.

2. Any person subject to the provisions of Subsection B.2.c of this rule shall submit a report to the District twelve (12) months after achieving compliance with Subsection B.2.c. Reports shall continue to be submitted every twelve (12) months. This report shall verify that each tune-up has been performed and that the results were satisfactory. The report shall contain all information or documentation that the Air Pollution Control Officer may determine, in writing, to be necessary.
3. Any person utilizing alternate fuel, pursuant to the provisions of Subsection C.2 of this rule, shall maintain permanent daily records of each occurrence. Each record shall include the type of fuel, the quantity of fuel, and the duration of the occurrence. Records shall be maintained for a period of four (4) years and shall be available for inspection by the Air Pollution Control Officer upon request.

E. Test Methods

1. Compliance with the emission requirements in Section B shall be determined using the following test methods:

- a. Oxides of Nitrogen - ARB Method 100
  - b. Carbon Monoxide - ARB Method 100
  - c. Stack Gas Oxygen - ARB Method 100
2. Emission tests resulting in compliance determinations for the requirements of Subsection B.1 and B.3 shall be conducted on units in "as-found" operating condition. However, no emission test for this rule shall be conducted during start-up, shutdown or under breakdown conditions.
  3. The NO<sub>x</sub> parts per million emission limitation specified in Subsection B.1 and B.3 is expressed as nitrogen dioxide. The limitations for both NO<sub>x</sub> and CO are referenced at three (3) percent volume stack gas oxygen on a dry basis averaged over 15 consecutive minutes.

F. Violations

1. Failure to comply with any provision of this rule shall constitute a violation of this rule.
2. Any unit subject to the provisions of Subsection B.2 shall comply with the provisions of Subsection B.1 if the unit operates during any twelve (12) month period at a total annual heat input rate greater than the applicable annual heat input rate specified in Subsection B.2.

G. Definitions

1. "Boiler, Steam Generator": Any external combustion equipment fired with liquid and/or gaseous fuel and used to produce steam. These terms do not include any unfired waste heat recovery boiler that is used to recover sensible heat from the exhaust of any combustion equipment.
2. "Cold startup procedure": The process of bringing an applicable unit and its associated emission control device up to operating temperature after the unit has experienced zero fuel flow for a period of time and is considered cold. An applicable unit shall be considered cold if the temperature of the flue gas leaving the economizer outlet is less than 100 degrees F.
3. "Process Heater": Any external combustion equipment fired with liquid and/or gaseous fuel and which transfers heat from combustion gases to water or process streams. Process Heater does not include any kiln or oven used for drying, baking, cooking, calcinating or vitrifying or any fuel-fired degreasing or metal finishing equipment.

4. "Rated Heat Input Capacity": The heat input capacity specified on the nameplate of the unit's burner. If the burner has been permanently altered or modified such that the maximum heat input is different than the input capacity specified on the nameplate, and this alteration or modification has been approved in writing by the Air Pollution Control Officer, then the new maximum heat input shall be considered as the rated heat input capacity.
5. "Unit": Any boiler, steam generator or process heater as defined in Subsections G.1 and G.2 of this rule.
6. "Water Heater": A device that heats water to a thermostatically-controlled temperature of no more than 210 degrees Fahrenheit for delivery on demand.

#### H. Increments of Progress

1. For units subject to Subsection B.1 and with a rated heat input capacity of equal to or greater than ten (10) million BTU's per hour, complete Authority to Construct applications shall be submitted to the APCD before March 1, 1990, and final compliance shall be demonstrated before September 1, 1991.
2. For units subject to Subsection B.1 and with a rated heat input capacity of equal to or greater than five (5) million BTU's per hour, but less than ten (10) million BTU's per hour, complete Authority to Construct applications shall be submitted to the APCD before March 1, 1991, and final compliance shall be demonstrated before March 1, 1992.
3. For units subject to Subsections B.2, final compliance shall be demonstrated by March 1, 1990.

## ATTACHMENT 1

### Equipment Tuning Procedure<sup>1</sup> for Forced Draft Fired Equipment

Nothing in this Equipment Tuning Procedure shall be construed to require any act or omission that would result in unsafe conditions or would be in violation of any regulation or requirement established by Factory Mutual, Industrial Risk Insurers, National Fire Prevention Association, the California Department of Industrial Relations (Occupational Safety and Health Division), the Federal Occupational Safety and Health Administration, or other relevant regulations and requirements.

1. Operate the unit at the firing rate most typical of normal operation. If the unit experiences significant load variations during normal operation, operate it at its average firing rate.
2. At this firing rate, record stack gas temperature, oxygen concentration, and CO concentration (for gaseous fuels) or smoke-spot number<sup>2</sup> (for liquid fuels), and observe flame conditions after unit operation stabilizes at the firing rate selected. If the excess oxygen in the stack gas is at the lower end of the range of typical minimum values<sup>3</sup>, and if the CO emissions are low and there is not smoke, the unit is probably operating at near optimum efficiency - at this particular firing rate. However, complete the remaining portion of this procedure to determine whether still lower oxygen levels are practical.
3. Increase combustion air flow to the furnace until stack gas oxygen levels increase by one to two percent over the level measured in Step 2. As in Step 2, record the stack gas temperature, CO concentration (for gaseous fuels) or smoke-spot number (for liquid fuels), and observe flame conditions for these higher oxygen levels after boiler operation stabilizes.
4. Decrease combustion air flow until the stack gas oxygen concentration is at the level measured in Step 2. From this level gradually reduce the combustion air flow, in small increments. After each increment, record the stack gas temperature, oxygen

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1. This tuning procedure is based on a tune-up procedure developed by KVB, Inc. for the EPA.
  2. The smoke-spot number can be determined with ASTM Test Method D-2156 or with the Bacharach method. ASTM Test Method D-2156 is included in a tuneup kit that can be purchased from the Bacharach Company.
  3. Typical minimum oxygen levels for boilers at high firing rates are:
    1. For natural gas: 0.5% - 3%
    2. For liquid fuels: 2% - 4%

concentration, CO concentration (for gaseous fuels) and smoke-spot number (for liquid fuels). Also observe the flame and record any changes in its condition.

5. Continue to reduce combustion air flow stepwise, until one of these limits is reached:
  - a. Unacceptable flame conditions - such as flame impingement on furnace walls or burner parts, excessive flame carryover, or flame instability.
  - b. Stack gas CO concentrations greater than 400 ppm.
  - c. Smoking at the stack.
  - d. Equipment-related limitations - such as low windbox/furnace pressure differential, built in air-flow limits, etc.
6. Develop an O<sub>2</sub>/CO curve (for gaseous fuels) or O<sub>2</sub>/smoke curve (for liquid fuels) similar to those shown in Figures 1 and 2 using the excess oxygen and CO or smoke-spot number data obtained at each combustion air flow setting.
7. From the curves prepared in Step 6, find the stack gas oxygen levels where the CO emissions or smoke-spot number equal the following values:

<u>Fuel</u>	<u>Measurement</u>	<u>Value</u>
Gaseous	CO Emissions	400 ppm
#1 & #2 oils	smoke-spot number	number 1
#4 oil	smoke-spot number	number 2
#5 oil	smoke-spot number	number 3
Other oils	smoke-spot number	number 4

The above conditions are referred to as CO or smoke threshold, or as the minimum excess oxygen level.

Compare this minimum value of excess oxygen to the expected value provided by the combustion unit manufacturer. If the minimum level found is substantially higher than the value provided by the combustion unit manufacturer, burner adjustments can probably be made to improve fuel and air mixing, thereby allowing operation with less air.

8. Add 0.5 to 2.0 percent to the minimum excess oxygen level found in Step 7 and reset burner controls to operate automatically at this higher stack gas oxygen level. This

margin above the minimum oxygen level accounts for fuel variations, variations in atmospheric conditions, load changes, and nonrepeatability or play in automatic controls.

9. If the load of the combustion unit varies significantly during normal operation, repeat Steps 1-8 for firing rates that represent the upper and lower limits of the range of the load. Because control adjustments at one firing rate may affect conditions at other firing rates, it may not be possible to establish the optimum excess oxygen level at all firing rates. If this is the case, choose the burner control settings that give best performance over the range of firing rates. If one firing rate predominates, settings should optimize conditions at that rate.
10. Verify that the new settings can accommodate the sudden changes that may occur in daily operation without adverse effects. Do this by increasing and decreasing load rapidly while observing the flame and stack. If any of the conditions in Step 5 result, reset the combustion controls to provide a slightly higher level of excess oxygen at the affect firing rates. Next, verify these new settings in a similar fashion. Then make sure that the final control settings are recorded at steady-state operating conditions for future reference.



Figure 1

Oxygen/CO Characteristic Curve

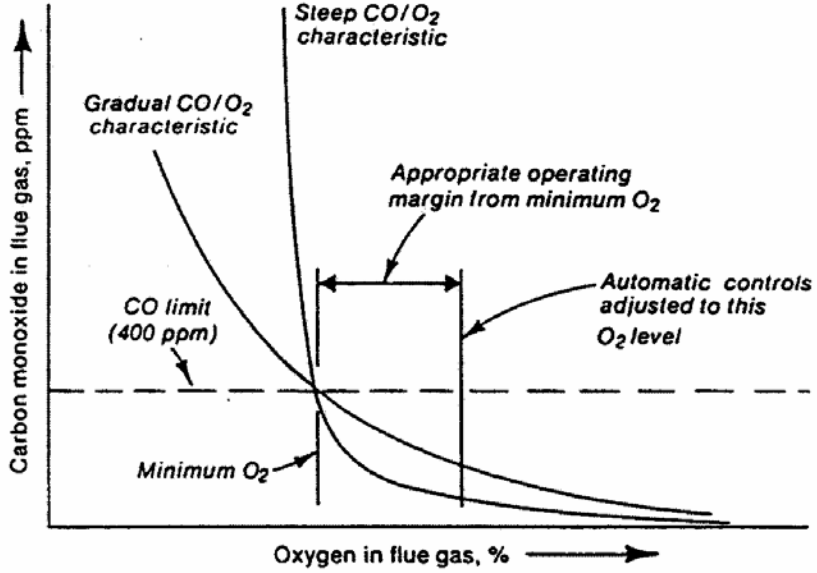
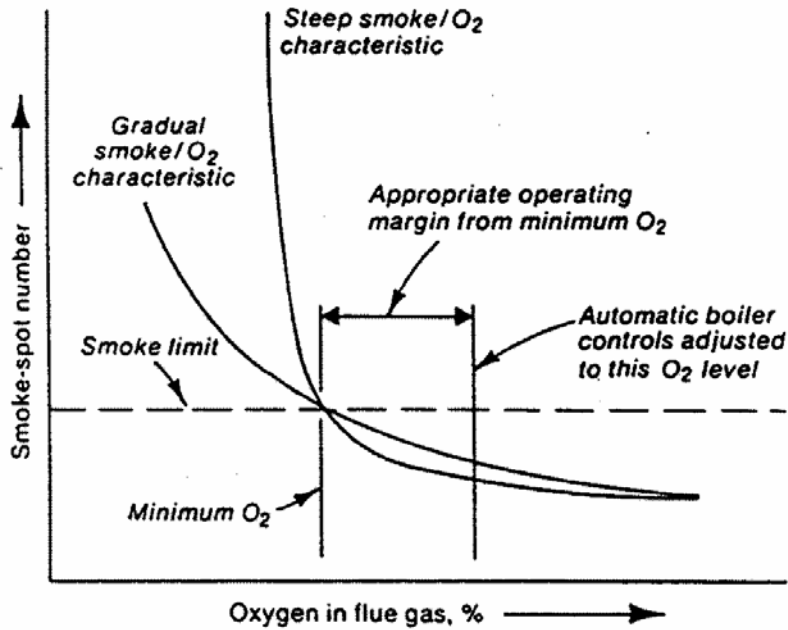


Figure 2

Oxygen/Smoke Characteristic Curve



## ATTACHMENT 2

### Equipment Tuning Procedure for Natural Draft-Fired Equipment

Nothing in this Equipment Tuning Procedure shall be construed to require any act or omission that would result in unsafe conditions or would be in violation of any regulation or requirement established by Factory Mutual, Industrial Risk Insurers, National Fire Prevention Association, the California Department of Industrial Relations (Occupational Safety and Health Division), the Federal Occupational Safety and Health Administration, or other relevant regulations and requirements.

#### 1. Preliminary Analysis

- a. Verify that the boiler, steam generator, or process heater (unit) is operating at the lowest pressure or temperature that will satisfy load demand. This pressure or temperature will be used as a basis for comparative combustion analysis before and after tuneup.
- b. Verify that the unit operates for the minimum number of hours and days necessary to perform the work required.
- c. Verify that the size of air supply openings is in compliance with applicable codes and regulations. Air supply openings must be fully open when the burner is firing and air flow must be unrestricted.
- d. Verify that the vent is in good condition, properly sized and free from obstruction.
- e. Perform a combustion analysis (CO, O<sub>2</sub>, etc.) at both high and low fire, if possible. Record all data, as well as the following:
  - (1) Inlet fuel pressure at burner at high and low firing rates.
  - (2) Pressure above draft hood or barometric damper at high, medium and low firing rates.
  - (3) Steam pressure, water temperature, or process fluid pressure or temperature entering and leaving the unit.
  - (4) Inlet fuel use rate if meter is available.

#### 2. Checks & Corrections

- a. Clean all dirty burners or burner orifices. Verify that fuel filters and moisture traps are in place, clean, and operating properly. Confirm proper location and orientation of burner diffuser spuds, gas canes, etc. Replace or repair damaged or missing burner parts.

- b. Remove external and internal sediment and scale from heating surfaces.
- c. Verify that the necessary water or process fluid treatment is being used. Confirm flushing and/or blowdown schedule.
- d. Repair all leaks. In addition to the high-pressure lines, check the blow-off, drain, safety valve, bypass lines and, if used, the feed pump.

### 3. Safety Checks

- a. Test primary and secondary low water level controls.
- b. Check operating and limit pressure and temperature controls.
- c. Check pilot safety shut off operation.
- d. Check safety valve pressure setting and verify that the setting is consistent with unit load requirements.
- e. Check limit safety control and spill switch.

### 4. Adjustments

Perform the following checks and adjustments on a warm unit at high fire:

- a. Adjust unit to fire at the maximum inlet fuel use rate: record fuel manifold pressure.
- b. Adjust draft and/or fuel pressure to obtain acceptable, clean combustion at both high, medium and low firing rates. The carbon monoxide (CO) value should not exceed 400 parts per million (PPM) at 3% O<sub>2</sub>.

Verify that unit light-offs are smooth and safe. Perform a reduced fuel pressure test at both high and low firing rates in accordance with the manufacturers instructions.

- c. Check and adjust the modulation controller. Verify proper, efficient and clean combustion through the range of firing rates.

When optimum performance has been achieved, record all data.

5. Final Test

Perform a final combustion analysis on the warm unit at high, medium and low firing rates, if possible. Record data obtained from combustion analysis, as well as the following:

- a. Inlet fuel pressure at burner at high and low firing rates.
- b. Pressure above draft hood or barometric damper at high, medium and low firing rates.
- c. Steam pressure, water temperature, or process fluid pressure or temperature entering and leaving the unit.
- d. Inlet fuel use rate if meter is available.