

Engines

Program Description

This strategy to reduce ambient ozone levels within the non-attainment area (NAA) involves modifying Colorado Air Quality Control Commission Regulation No. 7 (Reg. 7) in order to reduce emissions from engines. Three options to accomplish this are:

- Expand Reg. 7 applicability regarding emission standards for small engines
- Require installing electric compressors
- Expand Reg. 7 applicability regarding large engine control requirements from NAA to state-wide

Expand Reg. 7 Applicability – Small Engines

Reg. 7, Part XVII.E, contains emission standards for volatile organic compounds (VOCs), nitrogen oxides (NO_x), and carbon monoxide (CO) from engines rated 100 hp or more that were either constructed or relocated to Colorado after dates listed in Reg. 7 (range from July 1 2007 through January 1, 2011). The requirement does not apply to engines that are exempt from obtaining a construction permit under Reg. 3, Part B, II.D.1.c.(iii) (engines rated less than 50 hp in NAAs or less than 100 hp in attainment areas).

The Colorado Air Pollution Control Division (APCD) is considering modifying Reg. 7 by adding emission standards for NO_x, CO, and VOC from engines rated up to 100 hp, based on a new Environmental Protection Agency (EPA) rule. On December 20, 2007, the EPA issued a rule that will reduce emissions of NO_x, CO, and VOC from new stationary spark ignition internal combustion engines (SI ICE), which are equivalent to reciprocating internal combustion engines (RICE). This rule creates the New Source Performance Standard (NSPS), which is promulgated under 40 CFR part 60, subpart JJJJ (NSPS JJJJ). It will become effective March 18, 2008.

Install Electric Compressors

Natural gas-fired engines are often used to run compressors, generators, and pumps. In some operations, part of the produced natural gas is used to power these engines. Natural gas emissions result from leaks in the gas supply line to the engine, incomplete combustion, or system malfunctions. If electric compressors are installed in place of natural gas-fired engines, electrical power would be needed. Remote facilities with an available electrical power source and high compressor maintenance cost may be good candidates for using electric compression.

Expand Reg. 7 Applicability – Large Engines

Section XVI.B of Reg. 7 requires that emissions from most natural-gas fired stationary and portable RICE with a design rate greater than 500 horsepower (hp) and located in the NAA must be controlled as follows:

- Rich burn RICE must use a non-selective catalyst reduction (NSCR) and an air fuel controller
- Lean burn RICE must use an oxidation catalyst

The APCD is considering modifying Reg. 7 so that these air pollution emission controls for existing and future engines will be required state-wide, rather than just in the NAA. RICE that are exempt within the NAA will also be exempt state-wide. This may reduce ozone in the NAA as emissions do not necessarily remain local.

Air Quality/Health and Welfare Benefits

While health benefits are not quantified here, it is understood that reducing direct emissions of VOC, NO_x, and CO will reduce air toxics and other criteria pollutants. This will reduce the incidence of human health impacts caused by pulmonary, cardiovascular, respiratory, and nervous system disease. Because ozone damages crops, forests, and other natural plant life, all would benefit if emissions are reduced. NO_x

reductions benefit wildlife by reducing contributions to nitrogen deposition. This strategy would also reduce emissions of methane and other greenhouse gases, which contribute to climate change.

Expand Reg. 7 Applicability – Smaller Engines

EPA estimates that that nationally (based on all new SI ICE of all sizes), the revised NSPS JJJJ will reduce emissions from new stationary SI ICE by 2020 as follows: 84,000 tons per year (tpy) NO_x, 49,000 tpy CO, and 2,400 tpy VOC.¹

The APCD will estimate the air quality impacts of revising Reg. 7 to be consistent with NSPS JJJJ by determining how many engines rated less than 100 hp are currently being used and prorate based on the EPA reported national benefits. The number of engines will be provided in the Independent Petroleum Association of Mountain States (IPAMS) February 2008 report.

Install Electric Compressors

Companies have reported that installing electric motors in place of natural gas-fired units decreases gas losses. Electric motors reduce the chance of leakage by eliminating the need for fuel gas, require less maintenance, and improve operational efficiency. When one 3,000 hp reciprocating engine is replaced with an electric compressor, methane emissions are reduced 6,440 thousand cubic feet (Mcf) per year (based on an emissions factor of 2.11 Mcf per year per hp). Companies have reported reducing methane emissions from 40 to 16,000 Mcf per year.²

Expand Reg. 7 Applicability – Large Engines

To be determined.

Program Costs

Expand Reg. 7 Applicability – Smaller Engines

EPA estimates that that nationally (based on all new SI ICE of all sizes), the revised NSPS JJJJ will have a capital and annual cost impact of \$43.5 million and \$16.5 million, respectively, by 2020. It is estimated that nationally, 150,000 stationary SI ICE will be affected by the final rule by the year 2015, and 433,000 will be affected by 2030.¹

The APCD will estimate the cost impacts of revising Reg. 7 to be consistent with NSPS JJJJ by determining how many engines rated less than 100 hp are currently being used and prorate based on the EPA reported national benefits. The number of engines will be provided in the Independent Petroleum Association of Mountain States (IPAMS) February 2008 report.

Install Electric Compressors

Installing an electric motor in place of a natural gas-driven engine would increase operational efficiency, reduce maintenance costs, and yield significant methane savings. The capital and electricity costs are greater for an electric motor compared to those for a gas driven engine. The savings from maintenance costs relative to the cost of energy would not be justified unless the engine is at the end of its economic life. Capital costs are greater than \$10,000, operating and maintenance costs are greater than \$1,000, and the payback is greater than 10 years.²

Expand Reg. 7 Applicability – Large Engines

To be determined

Implementation/Administration

This strategy has the potential to significantly increase the number of regulated sources, and has reporting, permitting, and/or compliance assurance impacts to the APCD.

¹ US EPA, *Federal Register, Part III, 40 CFR Parts 60, 63, 85 et al., Standards of Performance for Stationary Spark Ignition Internal Combustion Engines and National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines, Final Rule.* January 18, 2008

² US EPA, *PRO Fact Sheet No. 105, Install Electric Compressors*