

Attachment 2

TECHNICAL SUPPORT DOCUMENT FOR R.C.S.A. SECTIONS 22a-174-3b and 22a-174-3c

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I. INTRODUCTION

This document specifies the derivation of limitations on fuel use and purchase and coating use and purchase for five stationary source categories. The limitations are derived for the purpose of establishing enforceable conditions for the five source categories that would limit potential emissions of any single air pollutant to less than 15 tons per year. The values derived provide the basis for limitations included in revisions proposed for public comment to two regulations to control air pollution.

The values derived are included in two new proposed Regulations of Connecticut State Agencies (R.C.S.A.): section 22a-174-3b concerning exemptions from permitting for five source categories and section 22a-174-3c concerning limitations on potential to emit for the same five source categories. The five source categories included are external combustion units, automotive refinishing operations, emergency engines, nonmetallic mineral processing and surface coating operations. The fuel and coating use limits in new R.C.S.A. section 22a-174-3b limit potential emissions to less than 15 tons per year, while the fuel and coating purchase limits in R.C.S.A. section 22a-174-3c are designed to limit potential emissions to less than 7 tons per year. The owner or operator of a source operated in compliance with either Section 22a-174-3b or Section 22a-174-3c will be exempt from the requirement to obtain either a general permit pursuant to section 22a-174(l) of the Connecticut General Statutes or a permit pursuant to section 22a-174-3a of the R.C.S.A. Sections 22a-174-3b and 22a-174-3c differ in the administrative requirements imposed on the owners or operators.

The limitations derived are similar to requirements now included in general permits to construct and operate that the Department issues for automotive refinishing operations, surface coating operations and emergency engines. The information gained from the general permit program provides the Department with an extensive database to use to develop the requirements of Sections 22a-174-3b and 22a-174-3c and the calculations made in this document. The following pages provide the detail of the assumptions and background calculations used to develop each fuel or coating limitation and other operating procedures for each source category.

II. External Combustion Units

R.C.S.A. Section 22a-174-3b defines “external combustion unit” as a “device that combusts only natural gas, propane or fuel oil, which is not a stationary internal combustion engine or turbine, and includes, but is not limited to, a boiler, heater, drying oven, curing oven, or furnace.”

The emission threshold for obtaining a permit under R.C.S.A. 22a-174-3a will be 15 tons per year. Since R.C.S.A. 22a-174-3b sets enforceable conditions on this source category to limit its potential emissions to below 15 tons per year, owners or operators may choose to operate in compliance with Section 22a-174-3b rather than obtain a permit issued pursuant to Section 22a-174-3a or a general permit issued under Section 22a-174(l) of the general statutes. Such owner or operator may select which of the three compliance options – a general permit, individual NSR permit or operation under Section 22a-174-3b – is best suited to its needs. An owner or operator willing to further reduce potential emissions may choose to operate under the more restrictive fuel purchase limitations in R.C.S.A. Section 22a-174-3c in exchange for less burdensome record keeping requirements offered. The emission thresholds derived below will limit the potential emissions to less than 15 or 7 tons per year, as indicated.

For this source category, the fuel use restrictions in Section 22a-174-3b and the fuel purchase restrictions in Section 22a-174-3c were developed for each of four types of fuel as follows: the pollutant with the highest AP-42 emission factor was used as the limiting pollutant.

A. Natural Gas Combustion

For natural gas combustion, NO_x has the highest emission factor, therefore is the limiting pollutant.

Emission Factor Source: AP-42, Fifth edition, section 1.4

140 # NO_x/MMscf

where MMscf is equal to million standard cubic feet.

Higher heating value of natural gas: 1,020 Btu/1 scf

140 # NO_x/MMscf x 1 scf/1,020 Btu = 0.14 #/MMBtu,
which is below the NO_x RACT limit of 0.20 #/MMBtu.

How much fuel can a unit burn to emit 15 tpy and 7 tpy?

1 MMscf/140 # NO_x x 15 tons / year x 2,000 #/ton = 214 MMscf/yr, and

1 MMscf/140 # NO_x x 7 tons/year x 2,000 #/ton = 100 MMscf/yr

B. Propane Combustion

For Propane combustion NO_x is the limiting pollutant.

NO_x Emission Factor: 19 # / 1000 gallons; AP-42, Fifth edition, Section 1.5

Higher heating value of propane: 91,600 Btu/gallon

Conversion factor: 36.64 scf/gallon propane

$19 \text{ \#/1000 gallons} \times 1 \text{ gallon/91,600 Btu} = 0.21 \text{ \#/MMBtu}$

How much fuel can a unit burn to emit 15 tpy and 7 tpy?

$1000 \text{ gallons/19 \#} \times 15 \text{ tons/yr} \times 2000 \text{ \#/ton} = 1,578,947 \text{ gallons, and}$

$1000 \text{ gallons/19 \#} \times 7 \text{ tons/yr} \times 2000 \text{ \#/ton} = 736,842 \text{ gallons, respectively.}$

C. Distillate Fuel Oil

Sulfur dioxide (SO₂) has the highest emission factor and therefore is the limiting pollutant. Section 21a-16 of the Connecticut General Statutes (C.G.S.) limits the sulfur content in distillate oil to 0.3%.

Emission Factor Source: AP-42, Fifth edition, section 1.3

$142 (\%S) \text{ \# SO}_2/1000 \text{ gallons}$

where: S is equal to the sulfur content in distillate oil.

Higher heating value of distillate oil = 139,000 Btu/gallon of distillate oil

$142 (0.3) \text{ \# SO}_2/1000 \text{ gallons} \times 1 \text{ gallon/139,000 Btu} = 0.31 \text{ \#/MMBtu}$

How much fuel can a unit burn to emit 15 tpy and 7 tpy of SO₂?

$1000 \text{ gallons/142 (0.3) \# SO}_2 \times 15 \text{ tons/yr} \times 2,000 \text{ \#/ton} = 704,225 \text{ gallons, and}$

$1000 \text{ gallons/142 (0.3) \# SO}_2 \times 7 \text{ tons/yr} \times 2,000 \text{ \#/ton} = 328,638 \text{ gallons, respectively.}$

D. Residual Fuel Oil

Sulfur dioxide has the highest emission factor and therefore is the limiting pollutant. R.C.S.A. Section 22a-174-19 allows a maximum sulfur content in fuel of 1%. R.C.S.A. Section 22a-174-1 defines “residual fuel” as “any fuel oil of No. 4, No. 5, or No. 6 grades, as defined by Commercial Standard C.S. 12-48.”

Emission Factor Source: AP-42, Fifth edition, section 1.3

157 (%S) # SO₂/1000 gallons

where: S is equal to the sulfur content in residual oil.

Higher heating value of residual oil (No. 6) = 150,000 Btu/gallon of residual oil

157 (1.0) # SO₂/1000 gallons x 1 gallon/150,000 Btu = 1.04 #/MMBtu

How much fuel can a unit burn to emit 15 tpy and 7 tpy of SO₂?

1000 gallons / 157(1.0) # SO₂ x 15 tons/yr x 2,000 #/ton = 191,082 gallons, and

1000 gallons / 157(1.0) # SO₂ x 7 tons/yr x 2,000 #/ton = 89,172 gallons, respectively.

A 0.5% sulfur content is required for residual fuel oil combustion in R.C.S.A. Section 22a-174-3b. This, combined with the fuel limitations above, will result in SO₂ emissions of 7.5 tpy.

E. Additional Requirements

Additional requirements have been included in R.C.S.A. Section 22a-174-3b for external combustion equipment. The regulation specifies a heat input limit and stack height requirement in addition to the fuel limitation. These limitations address compliance with the National Ambient Air Quality Standards. An annual tune-up is also required. EPA will grant the Department credit towards attainment if this provision is included in the 2001 NOx shortfall submission.

III. Automotive Refinishing Operations

Proposed R.C.S.A. Section 22a-174-3b defines “automotive refinishing operations” as “the process for coating, painting or repairing the pre-existing coat or paint applied to automobiles and automotive components at an automobile manufacturing plant, including, but not limited to surface preparation, primer application, topcoat application and applicator cleaning.”

Through the automotive refinishing operations General Permit program, the Department has obtained extensive knowledge with this source category. The thresholds are based on paint or coating usage rather than emissions. Material balances are used to calculate the estimated emissions.

A. Assumptions

- 7 # volatile organic compounds (VOC) per gallon of coating (NB: experience shows 6 #/gallon is more realistic).
- All VOC is in the form of HAPs to ensure HAPs remain less 10 tpy.
- Coating usage is total for all automotive refinishing operations at the facility.
- Paints or coatings include solvents and exclude water.
- Field engineer staff believes that the yearly usage will be more than sufficient for a certain number of businesses to choose operation under this regulation.

B. Material balance

$7 \text{ # VOC/gallon of coating} \times 1,000 \text{ gallons/yr} \times 1 \text{ ton}/2000 \text{ #} = 3.5 \text{ tpy VOC}$

$7 \text{ # VOC/gallon of coating} \times 2,000 \text{ gallons/yr} \times 1 \text{ ton}/2000 \text{ #} = 7.0 \text{ tpy VOC}$

C. Additional Requirement

A requirement has been placed in R.C.S.A. Section 22a-174-3b to achieve additional VOC reduction credit for the ozone SIP. A high volume low pressure gun or an applicator with at least 65% transfer efficiency is required.

IV. Emergency Engines

In determining potential emissions for emergency engines, the Department relies on an EPA's Memorandum, Calculating Potential to Emit (PTE) for Emergency Generators, from John S. Seitz, Director, dated September 6, 1995 (attached). In this memorandum EPA identifies 500 hours as an appropriate number of hours to use in calculating potential to emit (PTE), not 8760 hours per year.

For an emergency engine with a NO_x RACT limit of 8 grams/horsepower-hour (diesel) and operating the full 500 hours, it would take a 1,587 horsepower (1.2 MW) engine to emit 7 tpy.

For a natural gas fueled emergency engine with a NO_x RACT limit of 2.5 grams/horsepower-hour and operating the full 500 hours, it would take a 5,080 horsepower (4 MW) engine to emit 7 tpy.

NO_x has the highest emission factor and would be the limiting pollutant for diesel emergency engines.

For demonstration purposes, an emergency engine with a 1000 gallon limitation (size of engine not being a factor) would emit the following:

For engines less than 600 hp:

Emission Factor = 4.41 # / MMBtu NO_x. Source = AP-42, Fifth edition, Section 3.3.

$4.41 \text{ \#/MMBtu} \times 139,000 \text{ Btu/gallon} \times 1000 \text{ gallons/yr} \times 1 \text{ ton}/2000 \text{ \#} = 0.3 \text{ tpy}$

For engines greater than 600 hp:

Emission Factor: 3.2 #/MMBtu NO_x. Source: AP-42, Fifth edition, Section 3.4.

$3.2 \text{ \#/MMBtu} \times 139,000 \text{ Btu/gallon} \times 1000 \text{ gallons/yr} \times 1 \text{ ton}/2000 \text{ \#} = 0.2 \text{ tpy}$

V. Nonmetallic Mineral Processing

R.C.S.A. Section 22a-174-3b defines “nonmetallic mineral processing equipment” as “any crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin or other equipment used to crush or grind any nonmetallic mineral.”

A New Source Performance Standard (NSPS) exists for this source category, 40 CFR 60 Subpart OOO. Subpart OOO regulates particulate emissions. Therefore, Section 22a-174-3b addresses NOx as the limiting pollutant.

The fuel limitation is the fuel consumption total for operating all processing equipment. In most instances, all processing equipment is operated by one engine but as many as three engines may be used. An engine size threshold has been added because of the change in emission factor. The fuel limitations will restrict NOx emissions to less than 15 tpy.

A. For engines less than 600 hp

NOx Emission Factor: 4.41 # / MMBtu. Source: AP-42, Fifth edition, Section 3.3.

$15 \text{ tons / yr} \times 2000 \text{ # / ton} \times 1 \text{ MMBtu} / 4.41 \text{ #} \times 1 \text{ gallon} / 139,000 \text{ Btu} = 48,940 \text{ gallons}$

B. For engines greater than 600 hp

Emission Factor: 3.2 #/MMBtu; NOx. Source: AP-42, Fifth edition, Section 3.4.

$15 \text{ tons/yr} \times 2000 \text{ #/ton} \times 1 \text{ MMBtu} / 3.2 \text{ #} \times 1 \text{ gallon} / 139,000 \text{ Btu} = 67,446 \text{ gallons}$

C. Additional Requirements

An additional requirement has been included to limit the sulfur content of fuel oil to 0.05%. The Department believes that this will not place undue hardship on the source since most operations are portable and will be able to obtain and use the low sulfur fuel at each location. The cost differential between 0.3% and 0.05% is insignificant.

VI. Surface Coating Operations

R.C.S.A. Section 22a-174-3b defines “surface coating operation” as “a process used to add a layer of material to a surface including spray painting, dip coating, roller coating, and electrostatic deposition.” Surface coating operations do not include printing, publishing, or packaging operations.

Powder coating and plasma spraying are considered to have controls as an integral part of the process.

Coating limitations will limit emissions to less than 10 tpy.

A. Assumptions

- Maximum of 6.3 # VOC per gallon of coating
- All VOCs are HAPs to ensure HAPs remain below 10 tpy
- Coating usage is total for all coating operations at the facility
- Paints or coatings include solvents and excludes water.

B. Material balance

6.3 # VOC/gallon of coating x 1,500 gallons/yr x 1 ton/2000 # = 4.7 tpy VOC

6.3 # VOC/gallon of coating x 3,000 gallons/yr x 1 ton/2000 # = 9.45 tpy VOC