2001
Clean Air Plan
Appendix B

Stationary Source Control Measure Documentation

FINAL

December 2002

Santa Barbara County Air Pollution Control District

SBCAG santa barbara county association of governments

FINAL

SANTA BARBARA COUNTY
2001 CLEAN AIR PLAN

APPENDIX B
STATIONARY SOURCE
CONTROL MEASURE DOCUMENTATION

December 2002

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B.1. INTRODUCTION

Appendix B documents the stationary source emission control measures summarized in Chapter 4 of the 2001 Clean Air Plan (CAP). The following briefly describes each Appendix B section:

- Section B.2 describes all adopted control measures. An adopted measure is a measure that the APCD Board has adopted and has submitted for inclusion into the State Implementation Plan (SIP). There are a few SIP-approved rules (e.g., Rule 317, Organic Solvents, Rule 332, Petroleum Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds) that Section B.2 does not include because the rules:
  1. Predate the APCD's 1989 Air Quality Attainment Plan, and
  2. Have no control measures associated with them.
- Section B.3 discusses proposed control measures that the APCD intends to develop and adopt. A proposed control measure is a control measure to be adopted for the purpose of attaining the state 1-hour ozone standard and to be identified as a *contingency* control measure for the purpose of maintaining the federal 1-hour ozone standard. Section B.3 provides a blueprint for the APCD to develop rules for reducing ozone precursors.
- Section B.4 provides rationale for the deletion of certain control measures that previous clean air plans included. The Section B.4 deletion information does not include all items indicated as *deleted* in Table 4-1, because earlier plans deleted items. Section B.4 only includes the control measures that:
  1. The 1998 CAP listed as *emission control measures for further study*, and
  2. Staff analyses show are not cost-effective and/or do not have significant emission reductions.

  The APCD can later reexamine deleted control measures to determine if the cost-effectiveness and/or potential emission reductions have changed.
- Section B.5 discusses a measure staff recommends for further study.
- Section B.6 provides the control efficiency data for the control measures, where the control efficiency data is currently available.

The information in Sections B.2 and B.3 includes the following data:

Rule Number, Control Measure Identity Code and Title:

This information is in the heading for each control measure. The APCD may modify the actual rule number and/or title during the rule development process. The emission control measure identity code, an alphabetical and numerical combination, refers to the codes the APCD used in the 1991 Air Quality Attainment Plan, the 1993 Rate of Progress Plan, the 1994 CAP, and the 1998 CAP.

The alphabetical component of the code refers to a general source category. For example, the "R" in R-PG-5 indicates that the measure is a ROC control measure, the "PG" indicates that this is a Petroleum General measure. Other types of ROC measures include General (GN), Petroleum Marketing (PM), Petroleum Production (PP), Petroleum Storage Tanks (PT), Surface Coatings (SC), and Solvents (SL). Also "N" is used, as in N-XC-6, to describe that this is a NO_x control measure. The NO_x control measures are listed as either "XC" indicating an External Combustion or “IC” indicating Internal Combustion.

Source Category(ies):

This section identifies the types of processes subject to the control measure using Source Classification Codes (SCC) for stationary sources and Category of Emission Source (CES) code numbers for area-wide sources. Refer to Appendix A, Emission Inventory and Forecasting Documentation, for a detailed listing of this information.

Source Characteristics:

The source characteristics section provides a general description of the source categories that are subject to the control measure.

Control Methods:

The control methods section describes how the emissions from these sources are to be controlled.

Schedule:

The schedule section provides dates for actual or estimated adoption and implementation of the control measure or rule.

Emission Reduction Summary:

This section presents the following information from the planning emission inventory for the years 2005, 2010, and 2015:

1. The pollutant(s) being controlled (either ROC or NO_x)
2. The projected baseline emissions before controls are applied
3. The projected emission reductions in tons per average summer day of ROC or NO_x
4. The projected emissions, after the control has been applied

For applicable control measures, this section also includes information regarding emissions from sources on the Outer Continental Shelf (OCS).

Control Measure Efficiency:

Table B-5 lists the efficiencies for each control measure (*adopted* and *proposed*). The Table B-5 data provides the basis for each control measure efficiency and breakdowns the data for by CES or SCC source type number. For each of the source types, the table shows the type of pollutant being controlled; control (design) efficiency; percent exempt; percent implemented by 2005, 2010, or 2015; compliance efficiency; composite efficiency; and the control factor.

Implementing Agency:

This is the agency that is responsible for implementing a control measure. (The Santa Barbara County Air Pollution Control APCD is the agency that is responsible for most of the stationary source control measures).

Attainment Plan References:

This section references other state and federal ozone standard attainment plans where these control measures have been documented, such as the 1989 Air Quality Attainment Plan (AQAP),

the 1991 AQAP, the 1993 Rate-of-Progress Plan, the 1994 Clean Air Plan, and the 1998 Clean Air Plan.

References:

This section describes the technical sources relied upon for information regarding the description, emissions, and control efficiencies for each of these control measures.

B.2. ADOPTED EMISSION CONTROL MEASURES

B.2.1 Rule 341 - Municipal Solid Waste Landfills [1] and Rule 901 - New Source Performance Standards (NSPS)[2] (R-GN-1)

Source Category:

CES# 5728 Municipal Waste Disposal, Biodegradation

Source Characteristics:

Decomposition of refuse in municipal solid waste disposal sites produces landfill gas. This gas consists primarily of carbon dioxide and methane with smaller amounts of non-methane organic compounds (NMOCs) some of which are potentially hazardous. The gas produced from this decomposition also contains small amounts of ROC (normally less than 2 percent) that migrate through the layers of waste and soil until it reaches the surface where it is emitted to the atmosphere. The ROC can react with nitrogen oxides in the presence of sunlight to form photochemical smog, which can be toxic and/or odorous.

Control Methods:

Rule 341 implements the USEPA Emission Guidelines (EG) for Municipal Solid Waste Landfills (40 CFR 60 Cc). Rule 901 adopted the New Source Performance Standards (NSPS) for

[1] The USEPA approved California's *State Plan for Municipal Solid Waste Landfills* on September 23, 1999 (64 FR 51447). The State Plan submitted by CARB, pursuant to Section 111(d) of the Clean Air Act, included Santa Barbara County APCD Rule 341.

[2] The District incorporated and adopted 40 CFR Subpart WWW, Standards of Performance for Municipal Solid Waste Landfills, on May 16, 1996.

Municipal Solid Waste Landfills (40 CFR 60 WWW) by reference. These regulations require landfills with waste design capacities exceeding 2.5 million megagrams (2.75 million tons) and estimated emissions greater that 50 megagrams (55 tons) per year of NMOC to control gas emissions by installing a landfill gas collection and disposal system.

Schedule:

The Board adopted the New Source Performance Standards for municipal solid waste landfills by reference in Rule 901 on May 16, 1996. On September 18, 1997, the APCD adopted Rule 341 to implement the emission guidelines. Rule 341 required the Tajiguas Landfill to have an operating control system in place by December of 1998. In addition, Rule 341 required the City of Santa Maria Landfill to have an operating control system in place by July 18, 2000. Both of these sources complied with the Rule 341 requirements before their respective deadlines.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.5435	0.6119	0.6866
Projected Emission Reductions	0.1984	0.2233	0.2506
Projected Emissions After Control	0.3451	0.3886	0.4360

Control Measure Cost-Effectiveness:

Rule 341 implemented the USEPA Emission Guidelines for Municipal Solid Waste Landfills. The APCD staff report relied upon the cost-effectiveness data provided by the USEPA in the MSW Landfill Background Information Document. Table 3 of the Background Document presents cost data indicating that 92 percent of the affected landfills will have a cost-effectiveness of $4,500 per ton of non-methane organic compounds controlled. Assuming 93 percent of non-methane organic compounds are ROCs for landfills, this cost-effectiveness can be converted to approximately $4,800 per ton or ROC.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-18.
- 1991 Air Quality Attainment Plan: R-GN-1.
- 1993 Rate of Progress Plan: R-GN-1.
- 1994 Clean Air Plan: R-GN-1.
- 1998 Clean Air Plan: R-GN-1.

References:

- Santa Barbara Air Pollution Control District (SBCAPCD), Board Letter for Rule 341 (Municipal Solid Waste Landfills, September 18, 1997.

B.2.2 Rule 331 (R-PG-1) - Fugitive Emissions Inspection and Maintenance

Source Categories:

SCC#	3-06-008-01	Petroleum Ind. - Fugitive HC - Pipeline: Valves/Flanges
SCC#	3-06-008-02	Petroleum Ind. - Fugitive HC - Vessel Relief Valves
SCC#	3-06-008-04	Petroleum Ind. - Fugitive HC - Compressor Seals
SCC#	3-06-008-05	Petroleum Ind. - Fugitive HC - Miscellaneous: Sampling/Non-Asphalt Blowing/Purging/etc.
SCC#	3-06-008-06	Petroleum Ind. - Fugitive HC - Pump Seals with Controls
SCC#	3-06-008-11	Petroleum Ind. - Fugitive HC - Pipeline Valves: Gas Streams
SCC#	3-06-008-13	Petroleum Ind. - Fugitive HC - Pipeline Valves: Heavy Liquid Streams
SCC#	3-06-008-15	Petroleum Ind. - Fugitive HC - Open-ended Valves: All Streams
SCC#	3-06-008-16	Petroleum Ind. - Fugitive HC - Flanges: All Streams
SCC#	3-06-008-17	Petroleum Ind. - Fugitive HC - Pump Seals - Pump Seals: Light Liquid/Gas Streams
SCC#	3-06-008-18	Petroleum Ind. - Fugitive HC - Pump Seals - Heavy Liquid Stream
SCC#	3-06-008-19	Petroleum Ind. - Fugitive HC - Compressor Seals: Gas Streams
SCC#	3-06-008-21	Petroleum Ind. - Fugitive HC - Drains: All Streams
SCC#	3-06-008-22	Petroleum Ind. - Fugitive HC - Vessel Relief Valves: All Streams

SCC# 3-10-001-01 Oil and Gas Production - Crude Oil Production - Complete Well: Fugitive Emissions

SCC# 3-10-001-03 Oil and Gas Production - Crude Oil Production - Wells: Rod Pumps

SCC# 3-10-002-07 Oil and Gas Production - Natural Gas Production - Valves: Fugitive Emissions

CES# 46425 Oil Production Fugitive Losses - Unspecified

Source Characteristics:

The operation of gas and crude oil production and processing facilities requires a large number and variety of components such as pumps, compressors, flanges, fittings, valves, pressure relief valves and other components. In the course of operation, leakage of process fluids and gases from these components can be expected to occur. For most facilities, the actual percentage of leaking components is small; however, due to the large number of components used at such facilities, the resulting emissions of reactive organic compounds (ROC) are significant.

Control Methods:

Rule 331 requires operators of oil and gas production, processing, and refining facilities and chemical plants to seek out and repair leaks in valves, flanges, and connections. Some of these facilities contain over 10,000 components. Leaks in only a small fraction of these may cause substantial reactive organic gas emissions. The rule requires the operator to inspect most components every 3 months using a hand-held hydrocarbon analyzer. The rule allows an alternative screening process based on the formation of bubbles in a soap solution for sources that do not have continuously moving parts, that do not have surface temperatures greater than the boiling point or less than the freezing point of the soap solution, that do not have open areas to the atmosphere that the soap solution cannot bridge, or that do not exhibit evidence of liquid leakage.

Rule 331 defines a major leak as a leak that measures 10,000 ppmv or more as methane. In addition, the rule defines a liquid leak as the dripping of liquid at the rate of more than three drops per minute or a visible mist. If the operator finds a major leak or a liquid leak, the rule requires the operator to repair the component within a specified time frame. The rule provides 1)

allowances for less frequent inspections if the facility is found to be relatively leak free, 2) exemptions for components which contain relatively unreactive fluids, and 3) alternative leak screening techniques that are less expensive than detecting leaks using analyzers.

Schedule:

The Board adopted Rule 331 in December 1991 with full implementation in 1992. OCS implementation occurred during 1995.

Emission Reduction Summary:

ROC Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	1.8093	1.5635	1.3407
Projected Emission Reductions	1.0764	0.9302	0.7977
Projected Emissions After Control	0.7329	0.6333	0.5430

[1]Emissions from on-shore sources only

OCS - ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	1.5192	1.5192	1.5192
Projected Emission Reductions	0.8994	0.8994	0.8994
Projected Emissions After Control	0.6198	0.6198	0.6198

Control Measure Cost-Effectiveness:

The Staff Report for Rule 331 (December 10, 1991), relied on cost-effectiveness numbers from the South Coast Air Quality Management District's development their fugitive inspection and maintenance rule. The South Coast study estimated the cost-effectiveness to be $7,400 per ton of reactive organic compound reduced.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-11.
- 1991 Air Quality Attainment Plan: R-PG-1.
- 1993 Rate-Of-Progress Plan: R-PG-1.
- 1994 Clean Air Plan: R-PG-1.
- 1998 Clean Air Plan: R-PG-1.

References:

- California Air Resources Board (CARB), Determination of Reasonably Available Control Technology for Control of Fugitive Emissions of Volatile Organic Compounds from Oil and Gas Production and Processing Facilities, Chemical Plants, and Pipeline Transfer Stations, October 1993.
- Santa Barbara County Air Pollution Control District, Final Santa Barbara County 1989 Air Quality Attainment Plan, Appendix B, Offshore Emission Inventory and Forecast Documentation, May 1990.
- SBCAPCD, Final Santa Barbara County 1989 Air Quality Attainment Plan, Appendix C, Stationary Source Emission Controls, May 1990.
- SBCAPCD, Modeling of Fugitive Hydrocarbon Emissions, January 1986.
- SBCAPCD, Staff Report, Proposed Rule 331 Fugitive Emissions Inspection and Maintenance, December 1991.
- South Coast Air Quality Management District (SCAQMD), Staff Report, Proposed Rule 1173 - Fugitive Emissions of Reactive Organic Compounds, May 1989.
- United States Environmental Protection Agency (USEPA), Federal Register, State Implementation Plans; Approval of Post-1987 Ozone and Carbon Monoxide Plan Revisions for Areas Not Attaining the National Ambient Air Quality Standards; Notice, Vol. 52, No. 226, November 24, 1987, Pages 45044-45122.
- USEPA, Office of Air Quality Planning and Standards, Control of Volatile Organic Compound Equipment Leaks from Natural Gas/Gasoline Processing Plants, December 1983.

B.2.3 Rule 316 (R-PM-1, R-PM-2, R-PM-3) - Storage and Transfer of Gasoline

Source Categories:

CES# 46482 Bulk Plant Tank Car and Truck Working Losses

CES# 46532 Underground Tanks, Working Loss

CES# 46540 Vehicle Refueling, Vapor Replacement

Source Characteristics:

Rule 316 limits emissions of vaporized gasoline from gasoline bulk plants, terminals, and dispensing facilities. Besides being a ROC emission, vaporized gasoline contains toxic air contaminants (e.g., benzene). Therefore, in addition to controlling ozone precursors, Rule 316 reduces emissions of toxic air contaminants.

Gasoline bulk plants are facilities that transfer gasoline into delivery trucks for distribution to *gasoline dispensing facilities* (e.g., gas stations). In the process of gasoline transfer, uncontrolled systems displace vapors into the atmosphere, either when bulk plant/terminals tanks are loaded, or when trucks are loaded from the storage tanks.

Gasoline dispensing facilities produce emissions in two ways. First, during the loading of gasoline storage tanks, liquid gasoline displaces vaporized gasoline and, if uncontrolled, the vaporized gasoline is released to the atmosphere. Rule 316 requires a vapor recovery system to control these emissions. The vapor recovery system directs the gasoline vapors to the delivery truck. These systems are called a "Phase I vapor recovery" balance system. Second, during vehicle fueling, vaporized gasoline is displaced by the gasoline placed in vehicle gas tanks. If uncontrolled, the vaporized gasoline escapes into the atmosphere. Rule 316 requires the use of a control system during fueling. These controls systems are referred to as "Phase II vapor recovery." The Phase II vapor recovery system may be a balance system that returns the vaporized gasoline to the storage tank or a disposal system that directs the vaporized gasoline to an incinerator (thermal oxidizer).

Control Methods:

Rule 316 requires:

1. Bulk plants to use CARB-certified Phase I vapor recovery systems that reduce emissions to 0.5 pounds per 1000 gallons of gasoline loaded into tank trucks.
2. Delivery trucks to use CARB-certified Phase I vapor recovery systems when delivering to any storage container with 250 gallons or more capacity.
3. CARB approved Phase II vapor recovery systems for all gasoline storage tanks with a capacity of 250 gallons or more that are used for motor vehicle fueling.

The Board made a minor change to Rule 316 in April 1997 to change references from Rule 201 and 205 to Regulation II and Regulation VIII, respectively.

Schedule:

The Board last adopted major significant changes to Rule 316 in November 1990. These rule revisions required full implementation by 1992.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.4945	0.5196	0.5446
Projected Emission Reductions	0.3039	0.3194	0.3349
Projected Emissions After Control	0.1905	0.2002	0.2098

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-1, R-2, R-3.
- 1991 Air Quality Attainment Plan: R-PM-1, R-PM-2, R-PM-3.
- 1993 Rate of Progress Plan: R-PM-1, R-PM-2, R-PM-3.

- 1994 Clean Air Plan: R-PM-1, R-PM-2, R-PM-3.
- 1998 Clean Air Plan: R-PM-1, R-PM-2, R-PM-3.

References:

- SBCAPCD, Staff Report Proposed Revisions to District Rule (Storage and Transfer of Gasoline), July 10, 1990.
- USEPA, Control of Volatile Organic Emissions from Bulk Gasoline Plants, EPA-450/2-77-035, December 1984.

B.2.4 Rule 344 (R-PP-1) - Petroleum Sumps, Pits and Well Cellars

Source Categories:

SCC# 3-10-001-04 Crude Oil Sumps
SCC# 3-10-001-05 Crude Oil Pits
SCC# 3-10-001-08 Crude Oil Well Cellars

Source Characteristics:

Sumps, pits, and well cellars are open impoundments, usually in the ground, although some are located on platforms such as offshore oilrigs. When in use, they contain a combination of crude oil and water. Typically, sumps and pits are shallow in comparison to tanks, and therefore have a larger surface area open to the air than the same volume of liquid in a tank. Liquid in sumps and pits separate by gravity due to density differences. Sumps and pits are frequently configured to allow the oil and/or water to be removed separately. Well cellars are impoundments that surround the base of the wellhead. Covers for well cellars are not airtight, and consist of materials such as metal mesh or wooden boards.

There are three main types of sumps. *Primary sumps* hold liquid from oil production wells or a field gathering system. *Secondary sumps* hold the oily water from a previous separation process. *Tertiary sumps* hold wastewater that has undergone secondary separation or the equivalent.

The liquids in sumps and pits separate with oil floating on top of the water. Uncontrolled sumps and pits emit ROC vapors as reactive organic compounds evaporate from the liquid surfaces. Wind disturbances and heat from the process and sunlight affect the rate of evaporation.

Control Methods:

Rule 344 reduces emissions from petroleum sumps and pits and from well cellars. The rule prohibits the use of primary sumps and pits. It also requires owners or operators of post-primary sumps and pits with a surface area of greater than 1000 square feet to install controls to reduce the emissions of ROC into the atmosphere by at least 80 percent. Choices for control include replacing the sump or pit with a tank, rigid and flexible floating covers, and fixed covers in combination with vapor recovery. The rule provides exemptions for low emitting sumps, facilities that produce less than 150 barrels of oil per day, spill containment around tanks, shut in sumps and pits, post tertiary sumps and pits, and pits used less than 30 days per year. The rule phased in control requirements for sumps and pits over a two-year period. The first phase required sumps and pits with surface areas greater than or equal to 2000 square feet to be controlled by April 30, 1996. The second phase required controls on sumps and pits with surface areas less than 2000 square feet by October 30, 1997. This allowed the smaller facilities more time to plan for and budget for control equipment. The rule also requires owners and operators to prevent the buildup of crude oil in well cellars. This encourages the proper maintenance of components at the well head in order to avoid repeated pumping of crude oil from well cellars.

Schedule:

The Board adopted Rule 344 in November 1994 with full implementation required by May 1998.

Emission Reduction Summary:

ROC Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.2969	0.2595	0.2245
Projected Emission Reductions	0.1696	0.1482	0.1282
Projected Emissions After Control	0.1274	0.1113	0.0963

[1]Emissions from on-shore sources only

OCS - ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0028	0.0028	0.0028
Projected Emission Reductions	0.0016	0.0016	0.0016
Projected Emissions After Control	0.0011	0.0011	0.0011

Control Measure Cost-Effectiveness:

The Staff Report for Rule 344 included cost-effectiveness data for sumps and pits as included in the Technical Support Document for the Suggested Control Measure for the Control of Organic Compound Emissions from Sumps Used in Oil Production Operations. Taking into account the exemption level of Rule 344, the cost-effectiveness ranged from $0.07 to $8.71 per pound of ROC reduced ($140 to $17,440 per ton of ROC reduced). This range varied depending on the API Gravity of the oil, the size of the sump or pit, the stage of separation taking place in the sump or pit, and the method of control selected.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-15.
- 1991 Air Quality Attainment Plan: R-PP-1.
- 1993 Rate of Progress Plan: R-PP-1.
- 1994 Clean Air Plan: R-PP-1.
- 1998 Clean Air Plan: R-PP-1.

References:

- CARB, Technical Support Document for Suggested Control Measure for the Control of Organic Compound Emissions from Sumps Used in Oil Production Operations, August 11, 1988.

- SBCAPCD, Staff Report Proposed Rule 344 - Sumps, Pits and Well Cellars, October 24, 1994.

B.2.5 Rule 346 (R-PP-9) - Loading of Organic Liquid Cargo Vessels

Source Categories:

SCC# 4-06-001-32 Tank Cars/Trucks, Crude Oil, Submerged Load, Normal Service
SCC# 4-06-001-35 Pet. Marketing, Tank Cars/Trucks, Dist. Oil: Submerged/Normal
SCC# 4-06-001-37 Pet. Marketing, Tank Cars/Trucks, Crude Oil: Splash/Normal
SCC# 4-06-001-42 Pet. Marketing, Tank Cars/Trucks, Crude Oil-Submrg, Load-Bal
SCC# 4-06-001-45 Tank Cars/Trucks, Crude Oil, Splash Load Balance SVC
SCC# 4-06-001-48 Pet. Marketing, Tank Cars/Trucks, Crude Oil: Submerged/Clean
SCC# 4-06-001-49 Pet. Marketing, Tank Cars/Trucks, Jet Naphtha, Clean Tank
SCC# 4-06-001-61 Pet. Marketing-Tank Cars/Trucks, Dist. Oil: Submerged/Clean
SCC# 4-06-001-99 Pet. Marketing Tank Car and Trucks

Source Characteristics:

Industry transports organic liquids in a variety of vessels such as marine tankers, rail tank cars, and tanker trucks. This measure applies to the transfer of organic liquids into tanker trucks, trailers, or railroad cars equipped with storage devices for the purpose of transporting petroleum products or organic liquids. Rule 346 does not apply to the transfer of gasoline into gasoline delivery vessels at bulk plants because Rule 316 governs such operations. Through the definition of *organic liquid cargo vessel*, Rule 346 does not apply to marine vessels. The APCD governs the transfer of organic liquids into a tank vessel from a marine terminal via Rule 327.

During transport vessel loading, the tank's organic liquid level rises, displacing ROC vapors from the tank. If uncontrolled, the equipment vents the ROC vapors to atmosphere.

Control Methods:

ROC emissions from organic liquid cargo vessel loading are minimized by employing submerged fill pipes and overfill protection systems. Vapor recovery systems control the emissions from organic liquid cargo vessel loading operations.

Vehicles that deliver ROC must be equipped with:

1. A submerged fill pipe (which allows the liquid to be loaded into the bottom of the transfer vessel as opposed to "splash loading" the liquid through the top of the vessel).
2. An overfill protection system.
3. A vapor recovery system that is compatible with the loading facility.

In addition, Rule 346 requires the following facilities to be equipped with a bottom-loaded vapor recovery system that reduces displaced vapor from being released into the atmosphere by at least 90 percent:

1. Facilities transferring more than 20,000 gallons per day of organic compounds with a true vapor pressure of 1.5 psi or higher, or
2. Facilities that transfer more than 150,000 gallons per year of organic liquids with a true vapor pressure of 0.5 psi or higher.

Schedule:

The Board adopted Rule 346 in October 1992 with full implementation required by 1995.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0116	0.0074	0.0046
Projected Emission Reductions	0.0018	0.0012	0.0007
Projected Emissions After Control	0.0097	0.0062	0.0038

Control Measure Cost-Effectiveness:

The cost-effectiveness data in the Rule 346 Staff Report (October 13, 1992) estimated the cost-effectiveness to be 680 dollars per ton of ROC reduced. For the Rule 346 cost-effectiveness capital costs, staff used inflation adjusted capital costs from the September 1990 Ventura County APCD Staff Report for Rule 71.3, Transfer of Reactive Organic Compound Liquids.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N/A
- 1991 Air Quality Attainment Plan: R-PP-9.
- 1993 Rate-of-Progress Plan: R-PP-9.
- 1994 Clean Air Plan: R-PP-9.
- 1998 Clean Air Plan: R-PP-9.

References:

- SBCAPCD, Final 1991 Air Quality Attainment Plan, Appendix C, Emission Controls, Control Measure R-PP-9, December 1991.
- SBCAPCD, Staff Report for Rule 346, Loading of Organic Liquid Cargo Vessels, October 13, 1992.
- SBCAPCD, Rules and Regulations, October 13, 1992.

- Ventura County APCD (VCAPCD), Staff Report for Rule 71.3, Transfer of Reactive Organic Compound Liquids, September 11, 1990.

B.2.6 Rule 343 (R-PT-1) - Petroleum Storage Tank Degassing

Source Category:

SCC# 4-03-888-01 Petroleum Storage, Fugitive Emissions, Tank Cleaning

Source Characteristics:

Stationary tanks, reservoir, or other containers handling organic liquid (e.g., petroleum products) must be opened periodically for tank maintenance and other process-related purposes. If not removed, excessive sludge or sediment can adversely affect the quality of the stored product, the tank capacity, and/or the ability to remove product from the tank. To accomplish the tank maintenance, the operator transfers the tank contents to another tank and removes the organic vapors from the tank. If uncontrolled, the operator uses an exhaust fan to remove ROC during the degassing process. Safety requirements dictate that the tank operator perform the degassing process so personnel can safely enter the tank. The operator opens a tank every 3 to 5 five years depending on the size and use of the tank.

Control Methods:

The rule requires use of one of the following control techniques that results in an emission control device efficiency of at least 90 percent:

1. For fixed roof tanks, the liquid displacement method. This method involves the displacement of tank vapors with a low vapor pressure or non-ROC liquid. The liquid displaces headspace vapors to a vapor recovery or ROC destruction device. During the liquid-emptying stroke, the operator uses a non-ROC or low-ROC make-up gas to fill the headspace. The operator may need to repeat the cycle of filling and emptying the tank until the ROC concentration in the headspace is less than 10 percent of its original level.

2. For floating roof tanks, the liquid balancing technique. This procedure involves successive mixing of tank contents with a low vapor pressure liquid until the mixture is not subject to Rule 343. This is done until the vapor pressure of the mixture is below the control threshold.

3. Negative pressure displacement coupled with incineration in a manner approved by the Control Officer.

4. Refrigerated condensation that reduces the vapors to minus 1000 degrees Fahrenheit or lower and is capable of handing the displaced vapors.

5. Any other control method/equipment that is at least 90 percent efficient in reducing ROC emissions in a manner approved by the Control Officer.

In addition, for underground tanks, the operator shall degasify the tank with refrigerated condensation that reduces the vapors to minus 100 degrees Fahrenheit or lower or a device that is at least 90 percent efficient.

Schedule:

The Board adopted Rule 343 in December 1993, with full implementation required by 1994.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0000	0.0000	0.0000
Projected Emission Reductions	0.0000	0.0000	0.0000
Projected Emissions After Control	0.0000	0.0000	0.0000

Control Measure Cost-Effectiveness:

The Supplemental Staff Report for Rules 316, 325, 326, and 343 for the December 7, 1993 Board Hearing estimated the cost-effectiveness for Rule 343 to range from $0.33 to $7.06 per pound of ROC reduced ($660 to $14,420 dollars per ton) in terms of 1993 dollars.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-8.
- 1991 Air Quality Attainment Plan: R-PT-1.
- 1993 Rate of Progress Plan: R-PT-1.
- 1994 Clean Air Plan: R-PT-1.
- 1998 Clean Air Plan: R-PT-1.

References:

- SBCAPCD, Rules and Regulations, Rule 343, Petroleum Tank Degassing, December 14, 1993.
- SBCAPCD, Supplemental Staff Report on Revised Rule 316 and Proposed Rules 325, 326, and 343, for hearing on December 7, 1993.
- SCAQMD, Staff Report on Proposed Rule 1149 - Storage Tank Degassing, October 23, 1987.
- VCAPCD, Draft Staff Report on Proposed Rule 74.26, Tank Degassing Operations, December 15, 1993.

B.2.7 Rule 325 (R-PT-2) - Crude Oil Production and Separation

Source Categories:

SCC# 3-06-005-03 Oil/Water Separators, Fugitive Emissions

SCC# 3-10-001-32 Fixed Roof Tank, Wash Tank, Flashing Loss, Crude Oil

SCC# 3-10-005-06 Oil-Water Separation Wastewater Holding Tanks

SCC# 4-03-010-10 Fixed Roof Tank, Breathing Loss, Crude Oil, 67K BBL

SCC# 4-03-010-11 Fixed Roof Tank, Breathing Loss, Crude Oil, 250K BBL

SCC# 4-03-010-12 Fixed Roof Tank, Working Loss, Crude Oil

SCC# 4-03-010-97 Fixed Roof Tank, Breathing Loss, Specify Liquid
SCC# 4-03-010-99 Fixed Roof Tank, Working Loss, Specify Liquid
SCC# 4-03-011-09 Floating Roof Tank, Crude Oil, Standing Loss
SCC# 4-03-011-17 Floating Roof Tank, Crude Oil, Withdrawal Loss
SCC# 4-03-011-32 Floating Roof Tank, Ext. Primary Seal, Crude Oil
SCC# 4-03-011-42 Floating Roof Tank, Ext. Secondary Seal, Crude Oil
CES# 46458 Fugitive Losses, Tanks

Source Characteristics:

ROC emissions occur during the production, gathering, storage, processing, and separation of crude oil and natural gas. Storage tanks and wastewater separators emit ROC, H_2S, and other toxic pollutants from fixtures such as gauge hatches, sampling ports, and unsealed openings.

Three things contribute to the creation of ROC vapors in fixed roof storage tanks:

1. Flashing loss - This is caused by the out gassing of ROC entrained in the liquid. The pressure drop between the influent pipeline pressure and the tank's headspace pressure cause the flashing loss.

2. Working loss - This is caused by the displacement of tank headspace vapors by entering liquid. If uncontrolled, the rising liquid displaces the vapors in the headspace through a vent to atmosphere.

3. Breathing loss - This refers to the expansion and contraction of the tank headspace vapors due to diurnal temperature changes. During the day, the sun increases the tank temperature, thereby causing headspace vapors to expand. If uncontrolled, gauge hatches, sampling ports, unsealed openings, and pressure relief valves will vent excessive vapors to atmosphere.

Winds also increase tank emissions by creating low pressures zones outside the tank. In addition, the sweeping effect of wind removal of ROC from emitting surfaces causes the

headspace to maintain a low diffusion gradient thereby increase the volatilization of reactive organic compounds.

Control Methods:

Rule 325 applies to equipment used in the production, gathering, storage, processing, and separation of crude oil and natural gas prior to custody transfer. The rule requires all tanks be liquid-tight. Rule 325 requires a tank battery to be equipped with a vapor recovery system that consists of one of the following:

1. A system that directs all vapors to a fuel gas system, a sales gas system, underground injection, or a flare that combusts reactive organic compounds.
2. Any other system that processes all vapors and has a ROC removal efficiency of at least 90 percent.

Section D.2 requires tanks exempt from the above tank battery requirements, to be equipped with a solid roof, leak-free hatches, and pressure-vacuum relief valves. Rule 325 requires portable tanks storing or holding crude oil to have closed covers that are impermeable to ROC vapors and a pressure-vacuum valve. For produced gas, except gas used in a tank battery vapor recovery system and gas from a well undergoing routine maintenance, the rule requires that the produced gas be controlled at all times using one of the following:

1. A system handling gas for fuel, sale, or underground injection
2. A flare that combusts reactive organic compounds
3. A device with a ROC vapor removal efficiency of at least 90 percent.

Schedule:

The Board adopted Rule 325 January 1994 with full implementation required by 1996.

Emission Reduction Summary:

The following emission inventory data include the inventory and reductions associated with Rule 325 and Rule 326 because the two rules affect the same source classification codes.

ROC Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0555	0.0406	0.0297
Projected Emission Reductions	0.0309	0.0217	0.0151
Projected Emissions After Control	0.0246	0.0189	0.0145

[1]Emissions from on-shore sources only

OCS - ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0691	0.0691	0.0691
Projected Emission Reductions	0.0419	0.0419	0.0419
Projected Emissions After Control	0.0272	0.0272	0.0272

Control Measure Cost-Effectiveness:

The Supplemental Staff Report for Rules 316, 325, 326, and 343 for the December 7, 1993 Board Hearing estimated the cost-effectiveness for Rule 325 to range from $0.18 to $5.48 per pound of ROC reduced ($360 to $10,960 dollars per ton) in terms of 1993 dollars.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-9, R-10, R-14.
- 1991 Air Quality Attainment Plan: R-PT-2.
- 1993 Rate of Progress Plan: R-PT-2.
- 1994 Clean Air Plan: R-PT-2.
- 1998 Clean Air Plan: R-PT-2.

References:

- SBCAPCD, Rules and Regulations, Rule 325, Crude Oil Production and Separation, January 1994.
- SBCAPCD, Supplemental Staff Report on Revised Rule 316 and Proposed Rules 325, 326 and 343, for hearing on December 7, 1993.
- USEPA, Model Volatile Organic Compound Rules for Reasonably Available Control Technology, Rule XX.3028, Petroleum Liquid Storage in External Floating Roof Tanks, June 1992.
- USEPA, Model Volatile Organic Compound Rules for Reasonably Available Control Technology, Rule XX.3029, Petroleum Liquid Storage in Fixed Roof Tanks, June 1992.

B.2.8 Rule 326 (R-PT-2) - Storage of Reactive Organic Compound Liquids

Source Categories:

SCC# 4-03-010-10 Fixed Roof Tank, Breathing Loss, Crude Oil, 67K BBL
SCC# 4-03-010-11 Fixed Roof Tank, Breathing Loss, Crude Oil, 250K BBL
SCC# 4-03-010-12 Fixed Roof Tank, Working Loss, Crude Oil
SCC# 4-03-010-97 Fixed Roof Tank, Breathing Loss, Specify Liquid
SCC# 4-03-010-99 Fixed Roof Tank, Working Loss, Specify Liquid
SCC# 4-03-011-09 Floating Roof Tank, Crude Oil, Standing Loss
SCC# 4-03-011-17 Floating Roof Tank, Crude Oil, Withdrawal Loss
SCC# 4-03-011-18 Floating Roof Tank, Crude Oil, Withdrawal Loss
SCC# 4-03-011-32 Floating Roof Tank, Ext. Primary Seal, Crude Oil
SCC# 4-03-011-42 Floating Roof Tank, Ext. Secondary Seal, Crude Oil
SCC# 4-03-011-53 Floating Roof Tank, Jet Naphtha (JP-4), Standing Loss, Internal
CES# 46458 Fugitive Losses, Tanks

Source Characteristics:

The storage and transfer of reactive organic compound liquids into an uncontrolled tank cause ROC emissions. The Rule 325 source characteristics discussion provides information on the mechanisms of the storage and transfer losses from fixed roof storage tanks. In addition to

applying to fixed roof tanks, Rule 326 applies to floating roof tanks. During the liquid withdrawal process, ROC emissions occur as a floating roof drops down causing the sides of the tank that have been wetted with organic compound liquids to be exposed. A tank equipped with a floating cover and a fixed roof is an internal floating roof-type tank.

Control Methods:

Rule 326 applies to organic liquid storage tanks not subject to Rule 325. Tanks subject to Rule 326 need to be equipped with submerged fill, pressure vacuum relief valve, and/or a vapor loss control device. Acceptable vapor loss control devices include an external/internal floating roof, a vapor recovery system, or an equivalent system that has a vapor removal rate that is at least 95 percent efficient by weight. Rule 326 also has equipment requirements for closure devices, external roofs, and internal roofs.

Schedule:

The Board adopted Rule 326 in December 1993, with full implementation required by 1995.

Emission Reduction Summary:

Please refer to emission reductions shown for Rule 325. The emissions and emission reductions are combined for Rules 325 and 326 since the two rules affect the same categories of equipment.

Control Measure Cost-Effectiveness:

The Supplemental Staff Report for Rules 316, 325, 326, and 343 for the December 7, 1993 Board Hearing estimated the cost-effectiveness for Rule 325 to range from $0.18 to $5.48 per pound of ROC reduced ($360 to $10,960 dollars per ton) in terms of 1993 dollars.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-9, R-10.
- 1991 Air Quality Attainment Plan: R-PT-2.
- 1993 Rate of Progress Plan: R-PT-2.
- 1994 Clean Air Plan: R-PT-2.
- 1998 Clean Air Plan: R-PT-2.

References:

- SBCAPCD, Rules and Regulations, Rule 326, Storage of Reactive Organic Compounds, December 14, 1993.
- SBCAPCD, Supplemental Staff Report on Revised Rule 316 and Proposed Rules 325, 326 and 343, for hearing on December 7, 1993.
- USEPA, Model Volatile Organic Compound Rules for Reasonably Available Control Technology, Rule XX.3028, Petroleum Liquid Storage in External Floating Roof Tanks, June 1992.
- USEPA, Model Volatile Organic Compound Rules for Reasonably Available Control Technology, Rule XX.3029, Petroleum Liquid Storage in Fixed Roof Tanks, June 1992.

B.2.9 Rule 323 (R-SC-1) - Architectural Coatings

Source Categories:

CES# 46763	Oil Based (general)
CES# 85399	Oil Based Primers - Sealers
CES# 85407	Oil Based Quick Dry - Primers, Sealers, And Undercoaters
CES# 85464	Oil Based Stains - Semitransparent
CES# 85472	Oil Based Stains - Opaque
CES# 85506	Oil Based Quick Dry - Enamels
CES# 85514	Oil Based Lacquer - Clear
CES# 85530	Oil Based Flat Coatings

CES# 85555 Oil Based Medium Gloss
CES# 85597 Oil Based Dry Fog Coatings
CES# 85654 Oil Based Industrial Maintenance
CES# 85670 Oil Based Roof Coatings
CES# 85688 Oil Based Swimming Pool
CES# 85712 Oil Based Wood Preservatives - Semitransparent
CES# 85811 Water Based Varnish - Clear
CES# 85852 Water Based Flat Coatings

Source Characteristics:

The painting of structures with architectural coatings and related equipment cleanup cause the release of ROC and toxic air contaminants (e.g., benzene, toluene, and xylene) emissions. Architectural coatings are typically non-aerosol and include lacquers, sealers, maintenance coatings, primers, stains and enamels.

Control Methods:

Because architectural coating painting operations are typically portable and infrequent at the same site, use of add-on control equipment (e.g., carbon adsorption) is difficult to apply to the process. The most practical and efficient way to reduce ROC emissions from this source category is through the use of coatings formulated with water, low solvent, or exempt solvent bases. Coatings reformulated from solvent-based coatings to water-based coatings require less use of thinners and cleanup solvents. Therefore, emissions from thinner and cleanup use will also decrease.

Rule 323 limits the amount of ROC per liter in various architectural coatings that may be supplied, sold, offered for sale, applied, solicited for application, or manufactured for use within Santa Barbara County. The ROC content varies depending on coating application (e.g., primers, enamels, and stains).

Schedule:

The Board adopted significant changes to Rule 323 in February 1990 with full compliance required by 1994. In March of 1995, the APCD revised the rule by adding:

1. An ROC definition.
2. A requirement that ARB and USEPA must approve equivalent source test method for measuring the coatings ROC content.
3. A test method for the coatings' exempt solvent content.

In July 1996, the Board revised Rule 323 to remove the definition of ROC. Concurrent with this Rule 323 revision, the APCD revised the Rule 102 definition of ROC to include additional exempt compounds.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.8268	0.8690	0.9047
Projected Emission Reductions	0.0614	0.0646	0.0672
Projected Emissions After Control	0.7654	0.8045	0.8375

Control Measure Cost-Effectiveness:

The 1990 Staff report for Rule 323 estimated the cost-effectiveness for Rule 323 to range from a savings of $3.50 per pound of ROC reduced ($7,000 per ton) to cost of $6.40 per pound of ROC reduced ($12,800 per ton). For this estimate all dollar amounts are in terms of 1989 dollars. The March 1995 revision to Rule 323 was administrative in nature and thus did not affect the cost-effectiveness of the control measure.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-4.
- 1991 Air Quality Attainment Plan: R-SC-1.
- 1993 Rate of Progress Plan: R-SC-1.
- 1994 Clean Air Plan: R-SC-1.
- 1998 Clean Air Plan: R-SC-1.

References:

- SCAQMD, Final Air Quality Management Plan, 1989 Revision, Appendix IV-A, Tier I, Tier II, and Contingency Control Measures, March 1989.
- CARB, Suggested Control Measure for Architectural Coatings, May 12, 1989.
- SBCAPCD, Rules and Regulations, Rule 323, Architectural Coatings, July 18, 1996.

B.2.10 Rule 330 (R-SC-2) - Surface Coating of Metal Parts and Products

Source Categories:

SCC#	4-02-001-01	Organic Solvent, Surface Coating Paint, General
SCC#	4-02-001-10	Organic Solvent, Surface Coating, Solvent Base
SCC#	4-02-020-01	Organic Solvent, Surface Coating, Metal Furniture
SCC#	4-02-025-01	Organic Solvent, Surface Coating of Misc. Metal parts
SCC#	4-02-025-02	Solvent Surface Coating, Misc. Metal Parts: Clean/Pretreatment
SCC#	4-02-999-98	Organic Solvent, Surface Coating, Miscellaneous
CES#	46748	Industrial Coating, Unspecified
CES#	66662	Industrial Coating Metal Parts & Products

Source Characteristics:

Manufacturers and refurbishers apply coatings to metal products to provide protection from environmental elements and improve appearance. The coating process involves several steps, including surface preparation, base and topcoat application, and cleanup. Refurbishing or rework involves the removal of an existing coating and application of a new surface coating to

ensure that protection and performance characteristics are maintained. ROC emissions occur from the application and drying of the coating; the use of reducers/thinners, cleanup solvents, and stripping solutions; and from storage of unused coating and solvent products.

Control Methods:

Rule 330 reduces ROC emissions from metal coating operations by requiring the use of the following.

1. Complying coatings or an alternative compliance method with add-on control equipment. The ROC content limit varies depending on the type of coating (e.g., industrial maintenance, powder coat, air-dried, baked). The add-on control equipment must have a collection system that is 90 percent effective, a control device that reduces emissions from the collection system by at least 95 percent, and the control equipment must be approved by the APCO.

2. High transfer efficiency application methods. A source may use coating application methods not listed in the rule, provided the source can demonstrate the alternative method is at least 65 percent efficient as demonstrated by the test method required by the rule.

3. Good ROC housekeeping practices (keeping containers for reactive organic compounds closed when not in use).

The ROC limits do not apply to separate formulations of coatings used in volumes of less than 20 gallons per year provided, the total volume of all noncompliant coatings used does not exceed 55 gallons per year.

Schedule:

To address USEPA-identified deficiencies, the Board adopted significant revisions to Rule 330 on July 10, 1990. This version of Rule 330 required full implementation by 1992. The APCD made minor changes to Rule 330 on July 24, 1990 and in November 1990. In April 1995, the APCD modified Rule 330 to streamline recordkeeping, delete the emission limit for new sources, delete the compliance schedule, and add a Section D exemption for sources using 200 gallons per

year or less of noncompliant coatings. In response to additional USEPA-identified deficiencies, the APCD decreased the 200 gallons per year exemption to 55 gallons per year and added daily recordkeeping requirements for non-exempt coatings in January 2000. The APCD does not expect the Rule 330 revisions to affect implementation. Presently, all source subject to Rule 330 are required to comply with it.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	1.0544	1.1869	1.3194
Projected Emission Reductions	0.0885	0.0992	0.1099
Projected Emissions After Control	0.9659	1.0877	1.2095

Control Measure Cost-Effectiveness:

The January 20, 2000 Board Package for revising Rule 330 included the following cost-effectiveness data:

CONTROL TECHNIQUE	COST-EFFECTIVENESS RANGE ($/Ton)
WATERBORNE COATINGS	500 to 1,527
HIGH SOLIDS COATINGS	1,014 to 3,308
ELECTRODEPOSITION	-343 to 2,036
POWDER DEPOSITION	-603 to 3,122
CARBON ADSORPTION, THERMAL INCINERATION, OR CATALYTIC INCINERATION	1,952 to 24,461

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-7.
- 1991 Air Quality Attainment Plan: R-SC-2.
- 1993 Rate of Progress Plan: R-SC-2.
- 1994 Clean Air Plan: R-SC-2.
- 1998 Clean Air Plan: R-SC-2.

References:

- SBCAPCD, Board Package on Proposed Modifications to Rule 330, Surface Coating of Metal Parts and Products), January 20, 2000.
- SBCAPCD, Final Santa Barbara County 1991 Air Quality Attainment Plan, Appendix C, Stationary Source Control Measures, December 1991.

B.2.11 Rule 337 (R-SC-2) - Surface Coating of Aircraft or Aerospace Vehicle Parts and Products

Source Categories:

SCC# 4-02-024-01 Organic Solvent, Surface Coating, Large Aircraft, Prime Coat
SCC# 4-02-024-02 Organic Solvent, Surface Coating, Large Aircraft, Clean/Pre-treatment
SCC# 4-02-024-03 Organic Solvent, Surface Coating, Large Aircraft, Coating Mixing
SCC# 4-02-024-05 Organic Solvent, Surface Coating, Large Aircraft, Equipment Cleanup
SCC# 4-02-024-06 Organic Solvent, Surface Coating, Large Aircraft, Topcoat Operation

Source Characteristics:

Manufacturers and refurbishing facilities apply coatings to aircraft and aerospace products to provide protection from environmental elements, reduce drag resistance, and improve appearance. The coating process involves several steps, including surface preparation, base and topcoat application, and clean up. ROC emissions occur from the application and drying of the coating; the use of reducers/thinners, cleanup solvents, and stripping solutions; and from storage of unused coating and solvent products.

Control Methods:

Rule 337 reduces ROC emissions from surface coating operations on aircraft and aerospace vehicle parts and products by requiring the use of the following.

1. Complying coatings and strippers or an alternative compliance method with add-on control equipment. The ROC content limit varies depending on the type of coating (e.g., primer, topcoat, rust preventers, adhesive bonding primer, sealant). The add-on control equipment must have a collection system that is 90 percent effective, a control device that reduces emissions from the collection system by at least 95 percent, and the equipment must be approved by the APCO.

2. High transfer efficiency application methods. A source may use coating application methods not listed in the rule provided the source can demonstrate the alternative method is at least 65 percent efficient as demonstrated by the test method required by the rule.

3. Good ROC housekeeping practices (keeping containers for reactive organic compounds closed when not in use).

The ROC limits do not apply to separate formulations of coatings used in volumes of less than 20 gallons per year provided the total volume of all noncompliant coatings used does not exceed 200 gallons per year.

Schedule:

The Board adopted Rule 337 on July 10, 1990, with full implementation required by July 1991. The APCD made a minor amendment to Rule 337 on July 24, 1990. In October 1994, the APCD modified Rule 337 to:

1. Raise the ROC limit for wing coatings and space vehicles.
2. Add a Section D exemption for sources using 200 gallons per year or less of non-compliant coatings.
3. Streamline recordkeeping.
4. Delete the compliance schedule.

The APCD did not expect the 1994 Rule 337 revisions to affect implementation. Presently, there are no sources subject to Rule 337.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0000	0.0000	0.0000
Projected Emission Reductions	0.0000	0.0000	0.0000
Projected Emissions After Control	0.0000	0.0000	0.0000

Control Measure Cost-Effectiveness:

The July 10, 1990 Staff Report for Rules 330 and 337 estimated the cost-effectiveness of Rule 337 to range from a savings, to a cost of $3,000 per ton of ROC reduced in terms of 1990 dollars. The 1994 revision to Rule 337 improved this cost-effectiveness by relaxing coating ROC limits for aerospace vehicle coatings and wing coatings. These categories had been problematic for the aerospace industry. For the 1994 rule revision, the APCD did not calculate cost-effectiveness for wing coatings and space vehicles since it simply made compliance with the limits practical.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-7.
- 1991 Air Quality Attainment Plan: R-SC-2.
- 1993 Rate of Progress Plan: R-SC-2.
- 1994 Clean Air Plan: R-SC-2.
- 1998 Clean Air Plan: R-SC-2.

References:

- SBCAPCD, Staff Report for Rule 337, Surface Coating of Aircraft or Aerospace Vehicle Parts and Products, July 10, 1990.

- SBCAPCD, Staff Report for Revised Rule 337, Surface Coating of Aircraft or Aerospace Vehicle Parts and Products, October 20, 1994.
- SBCAPCD, Final Santa Barbara County 1991 Air Quality Attainment Plan, Appendix C, Stationary Source Control Measures, December 1991.

B.2.12 Rule 339 (R-SC-4) - Motor Vehicle and Mobile Equipment Coating Operations

Source Categories:

SCC#	4-02-004-10	Organic Solvent, Surface Coating, Lacquer, General
SCC#	4-02-006-10	Organic Solvent, Surface Coating, Primer, General
SCC#	4-02-016-06	Organic Solvent, Surface Coating, Autos/Light Truck Topcoat
SCC#	4-02-999-98	Organic Solvent, Surface Coating, Miscellaneous
CES#	46789	Commercial Coating, Automobile Refinishing

Source Characteristics:

Painting motor vehicles and mobile equipment cause ROC emissions. In addition, the process may cause some toxic compounds to be emitted. The sources of ROC emissions affected by this control measure are automobile body repair and paint shops, automobile dealers, "do-it-yourselfers," and companies/agencies with their own in-house motor vehicle and mobile equipment coating operations. Product manufacturers and their representatives are also subject to provisions of the control measures related to product formulation.

Control Methods:

Rule 339 requires the use of low-ROC coatings and the use of an approved application method or an alternative application method that achieves a transfer efficiency of at least 65 percent. Sources may use add-on exhaust control equipment, such as afterburners or carbon adsorbers, to attain an equivalent amount of emissions reduction that would have been achieved by using coatings complying with the rule. The add-on equipment must capture at least 90 percent of the emissions generated, and reduce these emissions by at least 95 percent. The APCD based Rule 339 on the ARB guidance document titled, "Determination of Reasonably Available Control

Technology and Best Available Retrofit Control Technology for Automotive Refinishing Operations," dated January 8, 1991.

Schedule:

The Board adopted Rule 339 in November 1991 with full implementation required by 1992. The APCD modified the rule in May 1994 to streamline recordkeeping, require that ARB and USEPA approve alternative source test methods, and require rule compliance by August 15, 1994 for registered motor vehicle owners performing their own surface coating. The APCD revised the rule in December 1994 to:

1. Increase ROC limits for coatings that manufacturers had been unable to reformulate to be compliance coatings.
2. Restrict the use of multiple applications of precoats.
3. Eliminate the 5 percent limit on use of specialty coatings.
4. Increase the surface area limit when painting outside the booth from 9 to 16 square feet.
5. Delete the compliance schedule.

The APCD's analysis for the December 1994 rule modifications indicated that the emission reductions lost from raising the coating ROC limits would be recovered by removing the exemption from ROC limits for do-it-yourselfers.

The Board adopted a minor change to Rule 339 in April 1997 relative to the reference to reactive organic compounds. The APCD does not expect the 1997 Rule 339 revisions to affect implementation. Presently, Rule 339 requires all sources subject to the rule to comply with it.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.1813	0.1936	0.2058
Projected Emission Reductions	0.0432	0.0462	0.0491
Projected Emissions After Control	0.1381	0.1474	0.1567

Control Measure Cost-Effectiveness:

The November 1991 Rule 339 Amendment Staff Report indicates the cost-effectiveness of this control measure ranges from a savings of $2,225 per ton to an expense of $15,306 per ton of ROC reduced. The APCD based the low-end estimate on an auto body shop that already had most of the equipment for applying coatings that meet the rule limits. Staff based the high-end cost-effectiveness number on a source that had to buy all new equipment, including a new high-tech spray booth, to comply with the rule requirements.

The 1994 Rule 339 revisions delayed or removed ROC limits that would have require the purchase of expensive equipment for proper paint application. As a result of the 1994 rule modifications, the Rule 339 cost-effectiveness figures tends towards the low-end figures shown in the November 1991 Staff Report.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-24.
- 1991 Air Quality Attainment Plan: R-SC-4.
- 1993 Rate of Progress Plan: R-SC-4.
- 1994 Clean Air Plan: R-SC-4.
- 1998 Clean Air Plan: R-SC-4.

References:

- SBCAPCD, Staff Report for Rule 339, Motor Vehicle and Mobile Equipment Coating Operations, November 5, 1991.
- SBCAPCD, Staff Report for Revised Rule 339, Motor Vehicle and Mobile Equipment Coating Operations, December 1995.

- SBCAPCD, Final Santa Barbara County 1991 Air Quality Attainment Plan, Appendix C, Stationary Source Control Measures, December 1991.
- CARB, Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Automotive Refinishing Operations, January 8, 1991.

B.2.13 Rule 351 (R-SC-5) - Surface Coating of Wood Products

Source Categories:

SCC# 4-02-019-01 Surface Coating, Wood Furniture, Coating Operation

CES# 66670 Industrial Coating, Wood Furniture and Fixtures

Source Characteristics:

Wood product coatings use ROC-bearing solvents as carriers for binders, sealers, stains, and pigments. ROC emissions occur during coating application, drying, and cleaning of application equipment. Sources affected by this rule are cabinetmakers, household and office furniture manufacturers, and wood refinishing shops.

Control Methods:

Rule 351 requires the use of low-ROC coatings and the use of an approved application method or an alternative application method that achieves a transfer efficiency of at least 65 percent. Sources may use add-on exhaust control equipment, such as afterburners or carbon adsorbers, to attain an equivalent amount of emissions reduction that would have been achieved by using coatings complying with the rule. The add-on equipment must reduce uncontrolled emissions by at least 85 percent. ROC limits vary depending on the type of application (e.g., stains, fillers, and coatings).

Schedule:

The Board adopted Rule 351 August 1993 with full implementation required by 1999. The APCD modified the rule in September 1995 to delay the July 1995 ROC limits to July 1997, delete the stripper ROC limit, add good housekeeping requirements, delete obsolete recordkeeping requirements, and delete compliance schedule dates that had already passed. The

APCD modified the rule in August 1998 to delay implementation of lower limits from 1999 to 2005, add an exemption for coatings used on wood products installed in motor vehicles, and require monthly recordkeeping. This modification caused minimal impacts on the emission reductions. The APCD updated the control measure emission reductions to reflect the impact from the rule modifications.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0696	0.0784	0.0872
Projected Emission Reductions	0.0125	0.0140	0.0156
Projected Emissions After Control	0.0571	0.0643	0.0716

Control Measure Cost-Effectiveness:

The August 1993 Staff Report for Rule 351 shows the cost-effectiveness for this control measure to be $2,000 per ton of ROC reduced. The subsequent revisions to Rule 351 have helped to ensure that the cost-effectiveness of Rule 351 has stayed fairly low. Although the newer, complying coatings cost more than the traditional solvent borne coating, in many cases, the newer coatings result in a more durable finish. Thus, direct cost comparisons can be misleading if quality of the end product is not taken into account. The final implementation of the water borne coating technologies scheduled for July of 2005, may result in an increase in the cost of compliance. However, with the additional years to develop new coatings, it is possible that the manufacturers can develop complying lower emitting coatings without a significant increase in cost.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-25.
- 1991 Air Quality Attainment Plan: R-SC-5.

- 1993 Rate of Progress Plan: R-SC-5.
- 1994 Clean Air Plan: R-SC-5.
- 1998 Clean Air Plan: R-SC-5.

References:

- SBCAPCD, Staff Report Proposed Rule 351, Surface Coating of Wood Products, April 27, 1993.
- SBCAPCD, Staff Report Proposed Revisions to Rule 351, Surface Coating of Wood Products, September 21, 1995.
- SBCAPCD, Staff Report for Proposed Revisions to Rule 351, Surface Coating of Wood Products, August 20, 1998.
- SCAQMD, Rule Development Section, Supplemental Staff Report Proposed Amended Rule 1136-Wood Products Coatings, July 5, 1988, Rule Evaluations, Category: Wood Furniture and Cabinet Coating Operations, May 22, 1985.

B.2.14 Rule 320 (R-SL-1) - Petroleum Solvent Dry Cleaners

Source Categories:

SCC#	4-10-002-01	Petroleum and Solvent Evaporation - Dry Cleaning - Petroleum Solvent - Commercial (Tons Clothes Cleaned)
SCC#	4-10-002-02	Petroleum and Solvent Evaporation - Dry Cleaning - Petroleum Solvent - Commercial (Tons Solvent Consumed)
CES#	46797	Dry Cleaning - Petroleum Solvent

Source Characteristics:

Existing petroleum solvent dry cleaning operations in Santa Barbara County use closed-loop dry-to-dry machines. During the wash cycle, the machine cleans the articles by immersion and agitation in the cleaning solution. After completion of the wash cycle the machine spins the articles at high speeds to remove excess solvent. When the spin cycle has terminated, the machine tumbles the articles in a heated air stream to vaporize the remaining solvent.

Control Methods:

Refrigeration coils condense most of the solvent vapors during the drying cycle. Ducting from the refrigeration coils returns uncondensed vapors to the drum area for recirculation. Spin disk and cartridge filters remove suspended material in the used solvent. The machine has an integral still system to recycle the solvent.

Rule 320 requires a number of operation and maintenance practices (e.g., the operator can not use the equipment if it has a liquid leak, the operator shall store solvents and used filtering material in closed containers). In addition, Rule 320 requires a machine to have a control system (e.g., carbon adsorber) to reduce exhaust gases from the machine by 90 percent. This exhaust control requirement applies only if a facility consumes more than 2,642 gallons of solvent per year. The existing Santa Barbara County petroleum solvent dry cleaning facilities have solvent consumption rates well below the Rule 320 threshold for requiring exhaust gas control equipment.

Schedule:

The Board adopted Rule 320 in June 1979 with full implementation by July 1, 1985.

Emission Reduction Summary:

ROG Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0016	0.0017	0.0018
Projected Emission Reductions	0.0001	0.0001	0.0001
Projected Emissions After Control	0.0016	0.0017	0.0018

Control Measure Cost-Effectiveness:

According to the USEPA Control Techniques Guideline for Control of Volatile Organic Compound Emissions from Large Petroleum Dry Cleaners, the cost-effectiveness of a machine equipped with a refrigerated chiller has cost savings range from a of 336 to 435 dollars per ton of hydrocarbons.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-5
- 1991 Air Quality Attainment Plan: R-SL-1.

References:

- SBCAPCD Permit Files (Dry Cleaners with Facility ID Numbers: 1007, 1374, 2444, and 2644).
- USEPA, Control Techniques Guideline, Control of Volatile Organic Compound Emissions from Large Petroleum Dry Cleaners, September 1982.

B.2.15 Rule 321 (R-SL-2) - Solvent Cleaning Operations[1]

Source Categories:

SCC#	4-01-002-99	Degreasing - Other Not Classified: Open-top Vapor Degreasing
SCC#	4-01-003-07	Degreasing - Cold Cleaning (Batch, Conveyor, Spray Gun) - Isopropyl Alcohol
SCC#	4-01-003-98	Cold Cleaning/Stripping
CES#	83667	Cold Cleaning (Batch, Conveyor, Spray Gun) - Alcohols
CES#	83675	Cold Cleaning (Batch, Conveyor, Spray Gun) - Chlorofluorocarbons
CES#	83683	Cold Cleaning (Batch, Conveyor, Spray Gun) - Glycol Ethers (Unspecified)

[1] The APCD changed Rule 321's title on September 18, 1997 to *Solvent Cleaning Operations.* Staff anticipate changing the Rule 321 title to *Solvent Degreasers* and titling a new Rule 362 as *Solvent Cleaning Operations.* Rule 321 primarily applies to solvent cleaning tanks. A more descriptive title for Rule 321 is *Solvent Degreasers.* The new Rule 362 will govern solvent cleaning methods such as wipe cleaning and hand held spray bottles.

CES# 83691	Cold Cleaning (Batch, Conveyor, Spray Gun) - Ketones (Unspecified)
CES# 83717	Cold Cleaning (Batch, Conveyor, Spray Gun) - Terpenes (Unspecified)
CES# 83725	Cold Cleaning (Batch, Conveyor, Spray Gun) - Toluene/Xylene
CES# 83741	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Pure Solvents
CES# 83758	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Solvent Blend
CES# 83766	Vapor Degreasing (Batch, Conveyor) - Chlorofluorocarbons
CES# 83774	Vapor Degreasing (Batch, Conveyor) - Dichlorofluoroethane
CES# 83824	Vapor Degreasing (Batch, Conveyor) - Misc. Solvent Blend

Source Characteristics:

Solvent degreasing occurs in many locations, such as automotive repair and body shops, aircraft and aerospace handling facilities, electronic manufacturing facilities, medical device manufacturing facilities, and other manufacturing facilities. Degreasing precedes operations such as painting, plating, repair, assembly, and machining. There are four basic types of solvent cleaning processes: cold solvent cleaning, solvent vapor cleaning, conveyorized solvent cleaning and liquid/gas-path cleaning. Degreaser operators expose objects to be cleaned to solvent or solvent vapors in tanks, trays, drums, or other containers. Solvent ROC emissions can occur from spills, evaporation from tanks, disturbances that affect the vapor zone on vapor degreasers, and by solvent carry-out (small amounts of liquid solvent remaining in cracks, crevices, and indentations, or remaining as a thin surface film on parts after removal from the degreaser).

Control Methods:

Rule 321 contains a number of provisions that reduce ROC emissions from degreasing operations. Control techniques include:

1. Following general good housekeeping operating procedures for minimizing emissions.
2. Minimizing workroom drafts.
3. Using covers, an internal draining facility (e.g., a parts basket where drained solvent is returned to the tank), low-volatility solvent, and units with adequate freeboard heights, ratios, and chillers.

Rule 321 complies with the ARB guidance document titled, "Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Organic Solvent Cleaning/Degreasing Operations," dated July 18, 1991.

Schedule:

The Board adopted major changes to Rule 321 in July 1990 with full implementation required by 1991. The APCD modified the rule in July 1997 to address USEPA-identified deficiencies with full implementation by July 17, 1998. This revision did not change the emission reductions expected from Rule 321.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.2243	0.2527	0.2810
Projected Emission Reductions	0.0949	0.1068	0.1188
Projected Emissions After Control	0.1295	0.1458	0.1622

Control Measure Cost-Effectiveness:

Based on the cost-effectiveness data from the July 18, 1991 CARB Determination of Reasonably Available Control Technology (RACT) and Best Available Retrofit Control Technology (BARCT) for Organic Solvent Cleaning and Degreasing Operations, the cost of retrofitting is as follows:

TYPE	CONTROL TECHNIQUE	COST-EFFECTIVENESS ($/ton)
Batch-Loaded Vapor Degreaser	Raising the Freeboard Ratio from 0.75 to 1.0	200
Batch-Loaded Vapor Degreaser (4.5 square feet working area)	Refrigerated Freeboard Chiller	4,000
Batch-Loaded Vapor Degreaser (16 square feet working area)	Refrigerated Freeboard Chiller	2,000
Batch-Loaded Vapor Degreaser	Carbon Adsorption	4,000 - 28,000
Conveyorized Vapor Degreaser	Refrigerated Freeboard Chiller	Cost Savings
Conveyorized Vapor Degreaser	Carbon Adsorption	1,400

The 1997 revision to Rule 321 did not include cost-effectiveness data because the amendments corrected minor USEPA noticed deficiencies and did not require additional use of any control equipment.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-6..
- 1991 Air Quality Attainment Plan: R-SL-2.
- 1993 Rate of Progress Plan: R-SL-2.
- 1994 Clean Air Plan: R-SL-2.
- 1998 Clean Air Plan: R-SL-2.

References:

- SBCAPCD, Rules and Regulations, Rule 321, Control of Degreasing Operations, July 10, 1990.
- SBCAPCD, Staff Report for Proposed Rule Amendments to Rule 321, Control of Degreasing Operations, July 17, 1997.
- CARB, Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Organic Solvent Cleaning and Degreasing Operations, July 18, 1991.

B.2.16 Rule 329 (R-SL-3) - Cutback and Emulsified Asphalt Paving Materials

Source Categories:

CES# 46870 Asphalt Paving, Cutback Asphalt

CES# 46888 Asphalt Paving, Road Oils

Source Characteristics:

Pavers use asphalt concrete to pave and maintain roads, driveways, and parking lots. The general types of asphalt include cutback asphalt, road oils, paving asphalt, and emulsified asphalt. Cutback asphalt contains a relatively large amount of petroleum solvents to keep the asphalt pliable. The petroleum solvents contain ROC that evaporate as the asphalt cures. Road oils are similar to cutback asphalt, except the petroleum solvents used are much less volatile, and require longer to cure. Paving asphalt relies on heat to keep the asphalt pliable for application. Producers keep emulsified asphalt pliable for application by mixing in water and limited amount of petroleum solvents.

ROC emissions occur during the paving application process and from the road surface for a period of time (in the range of months) following application. The amount of ROC emissions depends on the type and amount of solvent in the asphalt. To thin the asphalt, producers add:

1. Naphtha or gasoline to rapid cure cutbacks.
2. A kerosene-type distillate to medium cure cutbacks.
3. Residual oil to slow cure cutbacks (aka road oils).

For paving or hot-mix asphalt, producers reduce the material's viscosity at the batch plant by heating the asphalt to higher temperatures. Small amounts of emissions occur during application due to the evaporation of residual volatile materials from the hot asphalt.

Control Methods:

Rule 329 prohibits the use of cutback asphalt material which contains more than 0.5 percent by volume ROC that evaporate at 260 degrees Celsius (500 degrees Fahrenheit or less) or less. The rule also prohibits the use of any emulsified asphalt material which contains more than 3.0 percent by volume ROC that evaporate at 260 degrees Celsius (500 degrees Fahrenheit or less) or less.

Schedule:

The Board made major revisions to Rule 329 in February 1992 with full implementation required by 1992. These revisions lowered the permissible ROC content of asphalt and expanded the rule applicability to include construction and maintenance of driveways and parking lots.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.3398	0.3827	0.4256
Projected Emission Reductions	0.2018	0.2273	0.2529
Projected Emissions After Control	0.1379	0.1554	0.1728

Control Measure Cost-Effectiveness:

The Staff Report for Rule 329 indicated that there were no added costs for manufacturers of cutback asphalt to comply with Rule 329 since the only source in Santa Barbara County that had been producing cutback asphalt had already ceased production by the time of rule adoption. Also, no additional costs are associated with the use of cutback asphalt since the same equipment used to apply cutback asphalt can be used to apply emulsified asphalt.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-19.
- 1991 Air Quality Attainment Plan: R-SL-3.
- 1993 Rate-of-Progress Plan: R-SL-3.
- 1994 Clean Air Plan: R-SL-3.
- 1998 Clean Air Plan: R-SL-3.

References:

- SBCAPCD, Staff Report for Proposed Revision to Rule 329, Cutback Asphalt and Emulsified Asphalt Paving Materials, February 1992.
- Federal Register, State Implementation Plans; Approval of Post-1987 Ozone and Carbon Monoxide Plan Revisions for Areas Not Attaining the National Ambient Air Quality Standards; Notice, Vol. 52, No. 226, November 24, 1987, pp. 45044-45122.
- San Diego Air Pollution Control District, Rules and Regulations, Rule 67.7, Cutback and Emulsified Asphalt, July 1986.
- SBCAPCD, Final Santa Barbara County 1989 Air Quality Attainment Plan, Appendix C, Stationary Source Control Measures, May 1990, pages R-19-1 through R-19-4.
- SCAQMD, Rules and Regulations, Rules 1108, Cutback Asphalt, and 1108.1, Emulsified Asphalt, February 1, 1985 and November 4, 1983, respectively.
- USEPA, Control of Organic Compounds from Use of Cutback Asphalt, EPA 50/2-77-057, December 1977.
- CARB, Consideration of a Model Rule for the Control of Volatile Organic Compound Emissions from Cutback Asphalt Paving Materials, May 1979.
- USEPA, Summary of State VOC Regulations, EPA 450/2-85-003, April 1985.

B.2.17 Rule 349 (R-SL-5) - Polyester Resin Operations

Source Category:

CES# 74674 Fiberglass Impregnation and Fabrication

Source Characteristics:

The production of reinforced plastic materials through the process of combining polyester resin/styrene mixtures and glass fibers results in the release of styrene, a reactive organic compound, to the atmosphere. The potential for ROC emissions from fiberglass fabrication varies with the manner in which the fabricator mixes, pours, manipulates, and casts the resin. Sources of emissions include ovens (where the fiberglass is cured) and spray booths or other areas where the resin is applied. Activities using polyester resin/styrene mixtures include

manufacturing of synthetic marble, spas/hot tubs, surfboards, bathroom fixtures, panels, and swimming pools and boats.

Control Methods:

Rule 349 requires the use of:

1. High transfer efficiency spray guns or electrostatic spray equipment, and
2. Low-ROC resins, closed-mold systems, or resins containing a vapor suppressant, or
3. Add-on control devices that reduce uncontrolled emissions by 85 percent.

Rule 349 follows the ARB guidance document titled, "Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Polyester Resin Operations," dated January 1991.

Schedule:

The Board adopted Rule 349 in April 1993 with full implementation required by 1994.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0092	0.0104	0.0115
Projected Emission Reductions	0.0009	0.0011	0.0012
Projected Emissions After Control	0.0083	0.0093	0.0103

Control Measure Cost-Effectiveness:

The April 27, 1993 Staff Report for Rule 349 shows the costs of complying with Rule 349 were minimal. Reduced material usage, a benefit of using high transfer efficiency equipment, offsets the cost of purchasing complying spraying equipment. Operators in Santa Barbara County were using polyester resin that complied with Rule 349 before the APCD adopted the rule.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-20.
- 1991 Air Quality Attainment Plan: R-SL-5.
- 1993 Rate of Progress Plan: R-SL-5.
- 1994 Clean Air Plan: R-SL-5.
- 1998 Clean Air Plan: R-SL-5.

References:

- CARB, Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Polyester Resin Operations, January 8, 1991.
- SBCAPCD, Revised Staff Report for Rule 349 Polyester Resin Operations, March 5, 1993.

B.2.18 Rule 354 (R-SL-7) - Graphic Arts - Letter/Offset Printing

Source Categories:

SCC#	4-05-003-07	Printing/publishing, Ink Thinning Solvents, Naphtha
CES#	66829	Printing

Source Characteristics:

Rule 354 regulates emissions from graphic arts operations, including, rotogravure, and flexography, but not letterpress, offset lithography, and screen printing. ROC emissions from printing processes occur from the evaporation of solvents in inks, dampening solutions, and cleaning solutions.

Control Methods:

The rule limits ROC emissions from printing operations. The rule includes the following provisions: (1) limitations on the ROC content of inks, fountain solutions, and solvents; (2) requiring the use of closed containers for the disposal of cloth or paper used for cleaning; and (3)

restrictions on the application, storage, and disposal of solvent. In lieu of the above requirements, an approved control system may be operated that will achieve equivalent levels of control. The rule is based on the ARB guidance document titled, "Draft Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Graphic Art Operations."

The USEPA classified Rule 354 as a "RACT catch-up" rule. These means that, because the APCD should have adopted the rule before the 1990 base year, the APCD cannot apply the Rule 354 emission reductions to the rate-of-progress emission reductions in 1999, 2005, 2010, and 2015.

Schedule:

The Board adopted Rule 354 in June 1994 with full implementation required by 1995.

Emission Reduction Summary:

The APCD adopted Rule 354 as a RACT catch-up, which means the APCD should have adopted it before the 1990 base year. Therefore, the APCD subtracted the emission reductions from the base year inventory and did not apply the emission reductions towards the Rate of Progress demonstration.

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.4880	0.5178	0.5450
Projected Emission Reductions	0.0043	0.0046	0.0048
Projected Emissions After Control	0.4837	0.5133	0.5402

Control Measure Cost-Effectiveness:

The Staff Report for Rule 354 estimated that the cost of complying with Rule 354 through the use of low-ROC inks was minimal and may result in cost savings.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-30.
- 1991 Air Quality Attainment Plan: R-SL-7.
- 1993 Rate of Progress Plan: R-SL-7.
- 1994 Clean Air Plan: R-SL-7.
- 1998 Clean Air Plan: R-SL-7.

References:

- SBCAPCD, Final 1989 Air Quality Attainment Plan, Appendix C, Emission Controls, May 1990.
- VCAPCD, Staff Report for Rule 74.19, Graphic Arts, August 11, 1992.
- USEPA, Control of Volatile Organic Emissions from Existing Stationary Sources, Volume VIII: Graphic Arts - Rotogravure and Flexography, EPA-450/2-78-033, December 1978.

B.2.19 Rule 353 (R-SL-9) - Adhesives and Sealants.

Source Categories:

SCC#	4-02-007-01	Solvent, Surface Coating, Adhesive
SCC#	4-02-007-10	Organic Solvent, Surface Coating, Adhesive, General
CES#	83030	Adhesives and Sealant, Solvent Based

Source Characteristics:

The use of adhesives and sealants cause the evaporation of solvents (ROC emissions) during transfer, drying, surface preparation, and cleanup operations. Industry uses adhesives and sealants in product manufacturing, packaging, construction, and installation of metal, wood, rubber, plastic, ceramics, and fiberglass materials.

Control Methods:

Rule 353 reduces ROC emissions from the use of adhesives and sealants by:

1. Restricting the ROC content of adhesives and sealants at the point-of-sale by the rule's sales prohibition requirement

2. Requiring sources subject to the rule to use good housekeeping cleanup methods

In lieu of using compliant materials, a source may employ control equipment that achieves a reduction of uncontrolled emissions by at least 85 percent.

The APCD based the Rule 353 requirements on the ARB guidance document titled, "Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Adhesives and Sealants," dated December 1998.

Schedule:

The Board adopted Rule 353 on August 19, 1999 with full implementation by January 1, 2000.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.3137	0.3534	0.3931
Projected Emission Reductions	0.1430	0.1611	0.1792
Projected Emissions After Control	0.1707	0.1923	0.2139

Control Measure Cost-Effectiveness:

The August 19, 1999 Staff Report for Rule 353 specified, "The CARB Adhesive RACT/BARCT determination indicates the cost-effectiveness range for use of reformulated products is from $540 per ton of ROC (savings) to $2,320 per ton of ROC (cost). For use of add-on control, the guidance document indicates the cost-effectiveness range is $9,000 to $110,000 per ton of ROC

(cost). Further, the document indicates that the use of add-on control equipment to comply with the requirements will not be cost-effective for most sources, especially small businesses."

Control Measure Efficiency: Please refer to Section B.6.

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N/A
- 1991 Air Quality Attainment Plan: N/A
- 1993 Rate of Progress Plan: R-SL-9.
- 1994 Clean Air Plan: R-SL-9.
- 1998 Clean Air Plan: R-SL-9.

References:

- CARB, Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Adhesives and Sealants, February 8, 1999.
- SBCAPCD, Staff Report for Rule 353, Adhesives and Sealants, August 19, 1999.

B.2.20 Rule 333 (N-IC-1, N-IC-3) - Control of Emissions from Reciprocating Internal Combustion Engines

Source Categories:

SCC# 2-01-002-02 ICE Electrical Generation Natural Gas - Reciprocating
SCC# 2-02-001-02 ICE Industrial - Distillate Oil/Diesel - Reciprocating
SCC# 2-02-002-02 ICE Natural Gas - Reciprocating - Industrial
SCC# 2-02-009-02 ICE Kerosene/Naphtha (Jet Fuel) - Reciprocating - Industrial
SCC# 2-03-001-01 ICE Commercial/Institutional - Distillate Oil/Diesel - Reciprocating
SCC# 2-03-002-01 ICE Natural Gas - Reciprocating - Commercl/Instutnl

Source Characteristics:

This rule is directed at controlling NO_x emissions from spark-ignited (N-IC-1) and compression-ignited (N-IC-3) piston-type internal combustion engines (ICEs). The use of spark-ignited combustion is typical of piston-type engines burning natural gas, field gas, waste gas, or gasoline. There are two different types of spark-ignited engines: lean-burn and rich-burn. Compression-ignited engines operate differently in that the combustion process is not initiated until the compression stroke where fuel is injected into the combustion chamber. Upon injection, the fuel mixes with the hot air and spontaneously burns (no spark is required). Operators use both types of engines to drive rotating equipment in remote locations and the engines range in size from less than 50 to over 1,000 brake horsepower (bhp).

Control Methods:

Rule 333 applies to permitted spark-ignited and compression-ignited internal combustion engines that have a horsepower rating greater than or equal to 50 bhp. Table B.2.20-1 shows the control efficiencies anticipated from the Rule 333 control requirements for the different categories of engines.

TABLE B.2.20-1. RULE 333 CONTROL EFFICIENCIES FOR DIFFERENT ICE CATEGORIES

TYPE ENGINE	CONTROL EFFICIENCY (PERCENT)
Spark-Ignited, Rich-Burn	90
Spark-Ignited, Lean-Burn	80
Compression-Ignited	40

Engine owners and operators can comply with the requirements of Rule 333 by a number of options, including switching to electric motors, installing selective catalytic reduction equipment, nonselective catalytic reduction equipment, retarding diesel injection timing, lean-burn tuning of rich-burn spark-ignited engines, retarding the ignition on spark-ignited engines, and using pre-stratified charge or other combustion modification systems (e.g., Spiral Spin Technology).

The 1991 Rule 333 Staff Report predicted that complete implementation of the rule requirements by March 1994 would reduce NO_x emissions from the engine population by approximately 1,226 tons per year. (Staff based the Rule 333 NO_x emission reductions on the calendar year 1990 emission inventory.) The NO_x emission reductions and the Rule 333 control measure efficiency

anticipated during the 1991 Rule 333 rulemaking process were never achieved for reasons discussed later.

Based on the 1997 and 1999 inventory, the APCD estimates that Rule 333 control requirements achieved the NO_x emission reductions shown in Table B.2.20-2.

TABLE B.2.20-2. NO_x EMISSION REDUCTIONS FROM PISTON-TYPE INTERNAL COMBUSTION ENGINES

NO_x Emission Inventory	1997 (TPY)	1999 (TPY)
Baseline Emissions Before Any Controls (Rule 333 or Other Provisions)	1,638.47	1,199.71
Emission Reductions from Rule 333 Compliance	**491.56**	**307.37**
Emission Reductions from Other Provisions	87.40	107.33
Emissions After All Controls	1,059.51	785.01
Net Change	578.96	414.70

The Rule 333 NO_x emission reductions vary from year to year because the majority of the spark-ignited rich-burn engines in the inventory provide power to onshore oil and gas production operations and these operations vary over time. Table B.2.20-3 shows the historical Santa Barbara County onshore oil and gas production data from 1990 to 1999.

TABLE B.2.20-3. HISTORICAL SANTA BARBARA COUNTY ONSHORE OIL AND GAS PRODUCTION DATA

YEAR	NUMBER OF WELLS		OIL AND CONDENSATE		GAS			WATER	
	PRODUCING	SHUT-IN	OIL AND CONDENSATE (bbls)	DAILY PRO-DUCTION PER WELL (bbl)	GROSS GAS (Mcf)	NET GAS (Mcf)	GROSS GAS-OIL RATIO (ft^3/bbl)	WATER (bbl)	% WATER
1990	1,090	1,805	4,928,947	12.8	16,657,763	5,660,932	1,084	99,305,174	95.3
1991	1,098	1,724	4,781,514	12.3	18,868,793	4,981,217	1,056	98,501,027	95.4
1992	1,079	1,724	4,349,164	11.1	18,757,213	5,921,692	1,222	97,431,316	95.7
1993	1,057	1,728	4,257,765	11.4	15,441,032	5,057,991	1,192	97,039,938	95.8
1994	974	1,785	3,789,060	11.1	18,331,368	5,425,975	1,126	84,049,823	95.7
1995	905	1,755	3,269,584	10.3	10,916,502	4,626,483	1,092	73,854,290	95.8
1996	856	1,655	3,128,694	10.5	14,300,954	5,689,530	1,072	74,437,446	96.0
1997	875	1,578	3,395,337	11.1	13,596,889	3,151,056	1,025	79,556,105	95.9
1998	805	1,645	2,767,844	9.8	11,336,579	4,887,005	984	69,211,386	96.2
1999	667	1,749	2,434,865	9.8	11,113,977	3,890,751	971	62,277,732	96.4

Table B.2.20-3 indicates that the number of onshore producing wells and oil production have steadily declined over this time period. In addition, because many of the spark-ignited ICEs provide power to petroleum production pumps, the number of these engines in operation has also declined. Table B.2.20-4 shows the ICE emission inventory statistical data for years 1990, 1991, 1997, and 1999.

TABLE B.2.20-4. PISTON-TYPE INTERNAL COMBUSTION ENGINE EMISSION INVENTORY STATISTICAL INFORMATION

Inventory Year		1990	1991	1997	1999
Spark-Ignited ICE Data					
	No. of ICEs	883	845	744	673
	Agg. Gals/Year Burned	5.4×10^3	5.22×10^3	1.698×10^3	1.509×10^3
	Agg. Standard Cubic Feet/Year Burned	$2{,}322.21 \times 10^6$	$2{,}492.81 \times 10^6$	$1{,}546.17 \times 10^6$	$1{,}214.29 \times 10^6$
	Agg. Hours/Year	5,840,337	5,092,006	3,385,225	2,467,850
Compression-Ignited ICE Data					
	No. of ICEs	195	202	212	191
	Agg. Gals/Year	856.2×10^3	425.35×10^3	529.25×10^3	302.71×10^3
	Agg. Hours/Year	832,207	657,913	50,606	57,132
Baseline NOx Emissions Before any Controls, TPY		2,485.15	2,553.83	1,638.47	1,199.71
Number of ICEs in Inventory		1,078	1,047	956	864
Number of ICEs in Inventory with Known hp Ratings		1,022	1,010	928	831
Number of ICEs That Did Not Operate		185	234	270	289
Number of ICEs That Operated < 200 Hrs/Yr		246	300	418	421
Number of ICEs Controlled by Rule 333		0	0	102	89
Number of ICEs Controlled by Rule 333 That Did Not Operate During the Year		N/A	N/A	10	23
Number of ICEs Controlled For Reasons Other Than Rule 333		35	34	28	15
Number of ICEs Controlled, but not by Rule 333, and That Did Not Operate During the Year		27	10	11	3
NOx Em. Red. From Rule 333, TPY		0	0	375.88	191.69
NOx Em. Red. From Electrification Due to Rule 333, TPY		-	-	115.68	115.68
NOx Em. Red. Not From R 333, TPY		201.70	236.14	87.40	107.33
NOx Em. Red. From Shutdowns Not Due to Rule 333, TPY		-	-	307.94	307.94
Number of ICEs < 20 bhp		53	40	33	48
Number of ICEs > or = 20 bhp, but < 40 bhp		154	156	183	139
Number of ICEs > or = 40 bhp, but < 50 bhp		133	132	402	375
Number of ICEs > or = 50 bhp, but < 100 bhp		359	359	71	63
Number of ICEs > 100 bhp		323	323	239	206

The information in Table B.2.20-4 supports the conclusion that there has been a decline in the number of spark-ignited ICEs. In addition, the table shows the quantities of ICEs that did not operate, and those that did operate, but less than 200 hours per year, has been increasing.

Therefore, over the years there are fewer spark-ignited engines in the inventory and fewer engines in the population that operate in excess of 200 hours per year.

Aside from the fact that the number of ICEs and their baseline NO_x emissions before any control have decreased over the years, the District never achieved the control measure efficiency specified in the 1989 Air Quality Attainment Plan or anticipated during the 1991 rule development process. The lower control measure efficiency achieved by the Rule is primarily due to many engines becoming exempt from the Rule 333 emission control requirements. These engines became exempt from the Rule 333 control requirements because the operator either:

1) Limited the operations to less than 200 hours per year and accepted a permit with a condition limiting operations to less than 200 hours per year; or
2) Derated the engine's horsepower rating to less than 50 in an enforceable manner (e.g., the engine powers an electric generator thereby limiting the engine power output or installation of an enforceable derating device (orifice plate) by the engine manufacturer to ensure the engine is rated less than 50 bhp).

Between 1991 and 1997, the Table B.2.20-4 engine bhp population data shows a decrease of 288 ICEs in the 50 to 100 bhp range and an increase of 297 ICEs in the 20 to 49.99 bhp range. This is primarily due to derating by the installation of orifice plates.

Table B.2.20-5 lists the number of ICEs exempt from Rule 333 control requirements by derating and limiting operations to less than 200 hours per year (1999 inventory).

TABLE B.2.20-5. INTERNAL COMBUSTION ENGINES
EXEMPT FROM RULE 333 CONTROL REQUIREMENT

TYPE RULE 333 CONTROL EXEMPTION	SPARK-IGNITED ICEs	COMPRESSION-IGNITED ICEs	TOTAL
DERATING	301	2	303
PERMIT CONDITION < 200 HRS/YR	30	39	69

Based on the 1999 inventory, the uncontrolled NO_x from ICEs 40 bhp and greater, but less than 50 bhp totals 512 TPY. Options for controlling these engines are discussed in Chapter B.4.1 under *Emission Control Measure for Further Study*.

Some of the control techniques used to comply with the Rule 333 control requirements have caused increases of ROC emissions. Table B.2.20-6 shows the ROC increases for the different control techniques.

TABLE B.2.20-6. NO_x CONTROL TECHNIQUES THAT HAVE CAUSED ROC INCREASES

SCC	ROC INCREASE[1] (%)	DESCRIPTION	CONTROL TECHNIQUES	ROC INCREASE (Tons per Year)
20200102	11.1	Industrial - Compression-Ignited	Timing Retard Turbo-Charge, Clean Burn Kit	0.3
20200202	312.9	Industrial - Spark-Ignited, Natural Gas	NSCR, Lean Out of 2-Stroke ICEs, & Clean Burn Kits for 2-Stroke ICEs	68.6
20300201	207.3	Commercial/Institutional - Spark-Ignited, Natural Gas	Prestratified Charge Equipment	2.0
			TOTAL	70.9

The benefit of the 307 tons per year of NO_x emission reductions from the Rule 333 requirements outweigh the secondary adverse effects of increasing ROC emissions by 71 tons per year.

Schedule:

The Board adopted Rule 333 in December 1991 with full implementation in 1994. OCS implementation occurred in 1995. The APCD modified Rule 333 slightly in April 1997 to change a Rule 205 reference to Rule 802. The APCD anticipates making revisions to Rule 333, as discussed in Chapter B.3.5, to correct Rule 333 USEPA-identified deficiencies. The APCD needs to make these changes before the USEPA will consider the entire rule for inclusion into the State Implementation Plan (SIP).

[1] These figures are from the 1999 emission inventory and the figures represent the increase for the entire SCC category.

Emission Reduction Summary:

ROC Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.3286	0.2308	0.1644
Projected Emission Reductions	-0.4293	-0.3031	-0.2173
Projected Emissions After Control	0.7579	0.5339	0.3817

NO_x Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	1.1454	0.7460	0.4722
Projected Emission Reductions	0.4757	0.3079	0.1927
Projected Emissions After Control	0.6697	0.4381	0.2796

[1]Emissions from on-shore sources only.

OCS - ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0513	0.0513	0.0513
Projected Emission Reductions	-0.0179	-0.0179	-0.0179
Projected Emissions After Control	0.0692	0.0692	0.0692

OCS - NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.1564	0.1564	0.1564
Projected Emission Reductions	0.0308	0.0308	0.0308
Projected Emissions After Control	0.1256	0.1256	0.1256

Control Measure Cost-Effectiveness:

The 1991 Rule 333 Staff Report included cost-effectiveness analysis for this control measure. The cost-effectiveness figures varied depending on the type and size of the engine being controlled and the control method. The cost-effectiveness numbers provided in the Staff Report ranged from $569 to almost $20,000 per ton of NO_x reduced.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-8, N-10.
- 1991 Air Quality Attainment Plan: N-IC-1, N-IC-3.
- 1993 Rate-of-Progress Plan: N/A
- 1994 Clean Air Plan: N-IC-1, N-IC-3.
- 1998 Clean Air Plan: N-IC-1, N-IC-3.

References:

- SBCAPCD, Final 1989 Air Quality Attainment Plan, Appendix C, Emission Controls, May 1990.
- SBCAPCD, Final 1991 Air Quality Attainment Plan, Appendix C, Stationary Source Emission Controls, December 1991.
- SBCAPCD, Staff Report for Proposed Rule 333, December 1991.

B.2.21 Rule 352 (N-XC-1, N-XC-3) - Natural Gas-Fired Fan-Type Central Furnaces and Residential Water Heaters.

Source Categories:

CES#	54577	Residential, Natural Gas Water Heating
CES#	54569	Residential, Natural Gas Space Heating
CES#	58735	Commercial, Natural Gas Space Heating

Source Characteristics:

Fan-type central furnace heaters combust natural gas to heat buildings, warehouses, and other structures. Water heaters sized for residential use combust natural gas to heat water for use in

residences and businesses. Water is heated in these devices by controlled external combustion of utility grade natural gas.

Control Methods:

Rule 352 applies to:

1. Water heaters that are less than 75,000 British thermal units per hour heat input.
2. Fan-type central furnaces that are less than 175,000 British thermal units per hour heat input.
3. Combination heating and cooling fan-type central furnaces that have a cooling capacity less than 65,000 British thermal units per hour.

Rule 352 requires manufacturers to ensure that their fan-type central furnaces and/or residential water heaters meet a NO_x limit of 40 nanograms per joule of heat output. The rule also prohibits a person from supplying, selling, offering for sale, installing, or soliciting the installation of these furnaces and water heater for use within Santa Barbara County unless the equipment complies with the emission standard.

Schedule:

The Board adopted Rule 352 in September 1999 with implementation by March 16, 2000.

Emission Reduction Summary:

NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.4536	0.4775	0.4981
Projected Emission Reductions	0.0224	0.0280	0.0338
Projected Emissions After Control	0.4312	0.4495	0.4643

Control Measure Cost-Effectiveness:

According to the September 16, 1999 Staff Report for Rule 352, the South Coast AQMD estimated the cost-effectiveness for the same control measure for furnaces and residential water heaters to be $660 per ton of NO_x reduced. The staff report also indicates most manufacturers

already make complying units and have already absorbed the cost of the burner modifications; therefore, the APCD does not expect appliance price changes as a result of Rule 352.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-2, N-4.
- 1991 Air Quality Attainment Plan: N-XC-1, N-XC-3.
- 1993 Rate-of-Progress Plan: N-XC-1, N-XC-3.
- 1994 Clean Air Plan: N-XC-1, N-XC-3.
- 1998 Clean Air Plan: N-XC-1, N-XC-3.

References:

- SBCAPCD, Board Package for Proposed Rule 352, Natural Gas-Fired Fan-Type Central Furnaces and Residential Water Heaters, September 16, 1999.
- SCAQMD, Rules and Regulations, Rules 1111, NO_x Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces, and 1121, Control of Nitrogen Oxide from Residential-Type, Natural-Gas-Fired Water Heaters, July 8, 1993 and December 10, 1999, respectively.

B.2.22 Rule 342 (N-XC-4, N-XC-5, N-XC-6, N-XC-10, N-XC-11) - Control of Oxides of Nitrogen (NO_x) from Boilers, Steam Generators and Process Heaters

Source Categories:

SCC# 1-02-005-01 External Combustion Boiler, Distillate Oil, No. 1 and No. 2

SCC# 1-02-006-02 External Combustion Boiler, Natural Gas 10-100 Million (MM) British thermal units per hour (Btu/hr)

SCC# 1-02-006-03 External Combustion Boiler, Natural Gas (<10 MMBtu/hr)

SCC# 1-03-005-01 External Combustion Boiler, Comm./Inst., Distillate oil

SCC# 1-03-006-02 External Combustion Boiler, Comm./Inst., Natural Gas (10-100 MMBtu/hr)

SCC# 1-03-006-03 External Combustion Boiler, Comm./Inst., Natural Gas (<10 MMBtu/hr)

SCC# 3-05-002-06 Industrial Processes, Mineral Production, Asphalt Heater: Natural Gas

SCC# 3-06-001-03 Process Heaters, Oil Fired, Petroleum Refining SCC# 3-06-001-05 Process Heaters, Natural Gas Fired, Petroleum Refining

SCC# 3-10-004-04 Process Heaters, Natural Gas, Oil & Gas Production

SCC# 3-10-004-05 Process Heaters, Process Gas, Oil & Gas Production

SCC# 3-10-004-14 Steam Generators, Natural Gas, Oil & Gas Production

SCC# 3-10-004-15 Steam Generators, Process Gas, Oil & Gas Production

CES# 47142 Industrial, Natural Gas Combustion (unspecified)

CES# 47167 Commercial, Natural Gas Combustion (unspecified)

CES# 58727 Commercial, L.P.G. Combustion

CES# 66795 Industrial, L.P.G. Combustion

Source Characteristics:

Industrial, institutional, and commercial facilities use commercial and industrial boilers, steam generators, and process heaters to produce heat, steam, and hot water. Through the combustion process, these units emit oxides of nitrogen (NO_x), which can react in the atmosphere to form ozone and particulate matter.

Control Methods:

Rule 342 affects boilers, steam generators, and process heaters having heat input ratings 5 million British thermal units (Btu) per hour of greater. For units with annual heat inputs 9 billion Btu per year or more, NO_x emission levels shall not exceed 30 parts per million by volume (ppmv) when operated on natural gas and 40 ppmv when operated on oil. For units with annual heat inputs less than 9 billion Btu per year, the rule requires boilers to be operated at or below 3 percent excess oxygen, or be tuned at least once per year, or be operated in compliance with the emission levels specified above.

Schedule:

The Board adopted Rule 342 in March 1992, with full implementation in 1996. In April 1997, the APCD revised a Rule 202 reference.

Emission Reduction Summary:

NO_x Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.3696	0.3795	0.3924
Projected Emission Reductions	0.1017	0.1027	0.1049
Projected Emissions After Control	0.2678	0.2768	0.2875

[1]Emissions from on-shore sources only.

OCS - NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0047	0.0047	0.0047
Projected Emission Reductions	0.0025	0.0025	0.0025
Projected Emissions After Control	0.0022	0.0022	0.0022

Control Measure Cost-Effectiveness:

The March 10, 1992 Rule 342 Staff Report provided cost-effectiveness figures for boilers rated at 5, 10, 20, and 50 million Btu per hour. The cost-effectiveness data ranged from $1,569 to $18,137 per ton of NO_x reduced. This range does not include the unlikely cases where the annual throughput was extremely low. In such a case, the equipment could be exempt from the emission limit portions of the regulation by reducing the annual fuel consumption to less than 9 billion Btu per year.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-5, N-6, N-7.
- 1991 Air Quality Attainment Plan: N-XC-4, N-XC-5, N-XC-6, N-XC-10, N-XC-11.

- 1993 Rate of Progress Plan: N/A
- 1994 Clean Air Plan: N-XC-4, N-XC-5, N-XC-6, N-XC-10, N-XC-11.
- 1998 Clean Air Plan: N-XC-4, N-XC-5, N-XC-6, N-XC-10, N-XC-11.

References:

- CARB, Determination of Reasonably Available Control Technology and Best Available Control Technology for Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters, July 18, 1991.
- SBCAPCD, Staff Report for Rule 342 Control of Oxides of Nitrogen from Boiler, Steam Generators, and Process Heaters, February 18, 1992.

B.2.23 Rule 359 (N-XC-8) - Petroleum Flares & Relief Gas Oxidizers

Source Categories:

SCC# 3-06-009-03 Flares, Natural Gas, Refinery Flares

SCC# 3-06-009-04 Flares, Process Gas, Refinery Flares

SCC# 3-10-002-05 Natural Gas Production, Flares, Refinery Flares

Source Characteristics:

Flaring (or thermal oxidizing) is a combustion process that destroys reactive organic compounds in a high-temperature flame. The oil and gas production industry uses flares to oxidize hazardous hydrogen sulfide (H_2S) present in sour gas streams. The oxidation process converts the hydrogen sulfide to sulfur dioxide (SO_2) and water before it is released to atmosphere. The industry also uses flares to dispose of excess produced gas that cannot be consumed at the operation or economically treated and sold to a distributor.

Control Measure Description:

The rule exclusively affects oil and gas production, refining, and transportation industries. It relieves operators from some of the sulfur control requirements of APCD Rule 311, particularly those that occur during emergency flaring, while requiring additional emission controls during planned flaring. The rule requires flare operators to minimize flare gas volume, use technology

standards (e.g., smokeless design and pilot-light systems), and limit fuel sulfur content for OCS sources to existing prohibitory rule limits.

Schedule:

The Board adopted Rule 359 in June 1994, with full implementation in 1999.

Emission Reduction Summary:

ROC Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	*	*	*
Projected Emission Reductions	*	*	*
Projected Emissions After Control	*	*	*

NO_x Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	*	*	*
Projected Emission Reductions	*	*	*
Projected Emissions After Control	*	*	*

[1]Emissions from on-shore sources only.

OCS - ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	*	*	*
Projected Emission Reductions	*	*	*
Projected Emissions After Control	*	*	*

OCS - NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	*	*	*
Projected Emission Reductions	*	*	*
Projected Emissions After Control	*	*	*

* This rule is primarily a SO_x emission control rule. While we expect ROC and NO_x emission reductions, they are difficult to quantify.

Control Measure Cost-Effectiveness:

The June 28, 1994 Staff Report for Rule 359 estimated the cost-effectiveness of the rule to be:

- $103 to $4,364 per ton of ROC reduced.
- $7,245 per ton of NO_x reduced.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-21.
- 1991 Air Quality Attainment Plan: N-XC-8.
- 1993 Rate-of-Progress Plan: N/A
- 1994 Clean Air Plan: N-XC-8.
- 1998 Clean Air Plan: N-XC-8.

References:

- SBCAPCD, Flare Study Phase I Report, July 1991.
- SBCAPCD, Final 1989 Air Quality Attainment Plan, Appendix C, Emission Controls, May 1990.
- SBCAPCD, Final 1991 Air Quality Attainment Plan, Appendix C, Stationary Source Emission Controls, December 1991.

B.3. PROPOSED EMISSION CONTROL MEASURES[1]

B.3.1 Rule 323 (R-SC-1) - Architectural Coatings (Revised)

[1] Proposed emission control measures are control measures to be adopted for the purpose of attaining the state 1-hour ozone standard and to be identified as *contingency* control measures for the purpose of maintaining the federal 1-hour ozone standard.

Source Categories:

CES# 46763	Oil Based (General)
CES# 85597	Oil Based Dry Fog Coatings
CES# 85530	Oil Based Flat Coatings
CES# 85654	Oil Based Industrial Maintenance
CES# 85514	Oil Based Lacquer - Clear
CES# 85522	Oil Based Lacquer - Opaque
CES# 85563	Oil Based Low Gloss
CES# 85555	Oil Based Medium Gloss
CES# 85399	Oil Based Primers - Sealers
CES# 85506	Oil Based Quick Dry - Enamels
CES# 85407	Oil Based Quick Dry - Primers, Sealers, And Undercoaters
CES# 85670	Oil Based Roof Coatings
CES# 85456	Oil Based Stains - Clear
CES# 85472	Oil Based Stains - Opaque
CES# 85464	Oil Based Stains - Semitransparent
CES# 85688	Oil Based Swimming Pool
CES# 85431	Oil Based Waterproof Sealers - Clear
CES# 85449	Oil Based Waterproof Sealers - Opaque
CES# 85704	Oil Based Wood Preservatives - Clear
CES# 85712	Oil Based Wood Preservatives - Semitransparent
CES# 85852	Water Based Flat Coatings
CES# 85811	Water Based Varnish - Clear

Source Characteristics:

Architectural coatings are coatings applied to stationary structures and their accessories, to mobile homes, pavements, or curbs. The use of architectural coatings cause ROC emissions through the evaporation of solvents used in the coating material and in cleanup operations. In addition, these coating operations cause emissions of toxic compounds (e.g., benzene, toluene, and xylene).

Control Methods:

Because architectural coating painting operations are typically portable and infrequent at the same site, use of add-on control equipment (e.g., carbon adsorption) is difficult to apply to the process. The most practical and efficient way to reduce ROC emissions from this source category is through the use of coatings formulated with water, low-ROC solvent, or exempt solvent bases. Coatings reformulated from solvent-based coatings to water-based coatings require less use of thinners and cleanup solvents. Therefore, emissions from thinner and cleanup use will also decrease.

Rule 323 limits the amount of ROC per liter in various architectural coatings that may be supplied, sold, offered for sale, applied, solicited for application, or manufactured for use within Santa Barbara County. The ROC content varies depending on coating application (e.g., primers, enamels, and stains).

On June 22, 2000, the California Air Resources Board modified the Suggested Control Measure (SCM) for Architectural Coatings. The APCD plans to modify Rule 323 to be consistent with the SCM.[1] This revision would likely strengthen Rule 323 in some areas and relax it in others. The APCD anticipates the revision will result in no loss in emission reductions and may achieve a slight increase in the emission reductions.

Schedule:

The SCM includes a model rule that has the first compliance date of January 2003. However, the model rule has a "sale-through" clause allowing vendors to sell noncomplying products until January 2006, provided the manufacturer has correctly labeled the product. The APCD estimates obtaining a rule revision during the 2001 to 2003 time frame with full compliance within 1 year from the date of rule adoption, but no earlier than January 2003.

[1] During the rulemaking process, staff will research the appropriateness of including an industrial maintenance coating petition provision in the revised Rule 323 to allow use of industrial maintenance coatings having an ROC content up to 340 grams per liter.

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.7654	0.8045	0.8375
Projected Emission Reductions	0.0998	0.1049	0.1092
Projected Emissions After Control	0.6656	0.6996	0.7283

Control Measure Cost-Effectiveness:

The June 2000 CARB Suggested Control Measure for Architectural Coatings shows the cost-effectiveness figures range -$1,000 (cost savings) to $15,300 per ton of ROC reduced, with an average cost-effectiveness figure of $6,300 per ton of ROC reduced.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-4.
- 1991 Air Quality Attainment Plan: R-SC-1.
- 1993 Rate of Progress Plan: R-SC-1.
- 1994 Clean Air Plan: R-SC-1.
- 1998 Clean Air Plan: R-SC-1.

References:

- SCAQMD, Final Air Quality Management Plan, 1989 Revision, Appendix IV-A, Tier I, Tier II, and Contingency Control Measures, March 1989.
- CARB, Suggested Control Measure for Architectural Coatings, June 22, 2000.
- SBCAPCD, Rules and Regulations, Rule 323, Architectural Coatings, July 18, 1996.
- SBCAPCD, Comparison of ARB Proposed Suggested Control Measure for Architectural Coatings to Santa Barbara APCD Rule 323 Limits, May 2000.

B.3.2 Rule 321 (R-SL-2) - Solvent Degreasers (Revised)[1]

Source Categories:

SCC#	4-01-002-99	Degreasing - Other Not Classified: Open-top Vapor Degreasing
SCC#	4-01-003-07	Degreasing - Cold Cleaning (Batch, Conveyor, Spray Gun) - Isopropyl Alcohol
SCC#	4-01-003-98	Cold Cleaning/Stripping

CES#	83667	Cold Cleaning (Batch, Conveyor, Spray Gun) - Alcohols
CES#	83675	Cold Cleaning (Batch, Conveyor, Spray Gun) - Chlorofluorocarbons
CES#	83683	Cold Cleaning (Batch, Conveyor, Spray Gun) - Glycol Ethers (Unspecified)
CES#	83691	Cold Cleaning (Batch, Conveyor, Spray Gun) - Ketones (Unspecified)
CES#	83717	Cold Cleaning (Batch, Conveyor, Spray Gun) - Terpenes (Unspecified)
CES#	83725	Cold Cleaning (Batch, Conveyor, Spray Gun) - Toluene/Xylene
CES#	83741	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Pure Solvents
CES#	83758	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Solvent Blend
CES#	83766	Vapor Degreasing (Batch, Conveyor) - Chlorofluorocarbons
CES#	83774	Vapor Degreasing (Batch, Conveyor) - Dichlorofluoroethane
CES#	83824	Vapor Degreasing (Batch, Conveyor) - Misc. Solvent Blend

Source Characteristics:

Solvent degreasing occurs in many locations, such as automotive repair and body shops, aircraft and aerospace handling facilities, electronic manufacturing facilities, medical device manufacturing facilities, and other manufacturing facilities. Degreasing precedes operations such as painting, plating, repair, assembly, and machining. There are four basic types of solvent cleaning processes: cold solvent cleaning, solvent vapor cleaning, conveyorized solvent cleaning and liquid/gas-path cleaning. Degreaser operators expose objects to be cleaned to solvent or

[1] The APCD changed Rule 321's title on September 18, 1997 to *Solvent Cleaning Operations.* Staff anticipate changing the Rule 321 title to *Solvent Degreasers* and titling a new Rule 362 as *Solvent Cleaning Operations.* Rule 321 primarily applies to solvent cleaning tanks. A more descriptive title for Rule 321 is *Solvent Degreasers.* The new Rule 362 will govern solvent cleaning methods such as wipe cleaning and hand held spray bottles.

solvent vapors in tanks, trays, drums, or other containers. Solvent ROC emissions can occur from spills, evaporation from tanks, disturbances that affect the vapor zone on vapor degreasers, and by solvent carry-out (small amounts of liquid solvent remaining in cracks, crevices, and indentations, or remaining as a thin surface film on parts after removal from the degreaser).

Control Methods:

Rule 321 contains a number of provisions that reduce ROC emissions from degreasing operations. Current control techniques required by Rule 321 include:

1. Following general good housekeeping operating procedures for minimizing emissions.
2. Minimizing workroom drafts.
3. Using covers, an internal draining facility (e.g., a parts basket where drained solvent is returned to the tank), low-volatility solvent, and units with adequate freeboard heights, ratios, and chillers.

Additional control techniques that could be incorporated into Rule 321 include:

1. Requiring air-tight or airless cleaning systems in lieu of meeting the requirements for batch-loaded cold cleaners or open-top vapor degreasers.
2. Increasing the minimum freeboard ratio from 0.75 to 1 on open-top vapor degreasers and conveyorized degreasers.
3. Requiring that the solvent have an ROC content of 50 grams per liter or less for batch-loaded cold cleaners and conveyorized cold cleaners.

Concurrent with the adoption of a new Rule 362, Solvent Cleaning Operations, staff anticipate modifying Rule 321 to revise its title to *Solvent Degreasers*, revise the rule requirements to include the additional control techniques outlined above, and to make the rule similar to the South Coast AQMD Rule 1122, Solvent Degreasers.

Schedule:

The APCD plans on adopting revisions to Rule 321 concurrent with the adoption of new Rule 362, Solvent Cleaning Operations. The proposed schedule for adopting Rule 362 is during the 2004 to 2006 time frame. The revised Rule 321 will likely have an implementation period of one year for the new and/or revised requirements. [1]

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.1295	0.1458	0.1622
Projected Emission Reductions	0.0000	0.0562	0.0625
Projected Emissions After Control	0.1295	0.0896	0.0996

Control Measure Cost-Effectiveness:

Based on the cost-effectiveness data from the July 18, 1991 CARB Determination of Reasonably Available Control Technology (RACT) and Best Available Retrofit Control Technology (BARCT) for Organic Solvent Cleaning and Degreasing Operations, the cost of retrofitting is as follows:

TYPE	CONTROL TECHNIQUE	COST-EFFECTIVENESS ($/ton)
Batch-Loaded Vapor Degreaser	Raising the Freeboard Ratio from 0.75 to 1.0	200
Batch-Loaded Vapor Degreaser (4.5 square feet working area)	Refrigerated Freeboard Chiller	4,000
Batch-Loaded Vapor Degreaser (16 square feet working area)	Refrigerated Freeboard Chiller	2,000
Batch-Loaded Vapor Degreaser	Carbon Adsorption	4,000 - 28,000
Conveyorized Vapor Degreaser	Refrigerated Freeboard Chiller	Cost Savings
Conveyorized Vapor Degreaser	Carbon Adsorption	1,400

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

[1] Current control measure R-SL-2 requirements that are imbedded in the Rule 321 adopted on September 18, 1997 will remain in effect until one (1) year from the date of adoption of Rule 321.

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-6..
- 1991 Air Quality Attainment Plan: R-SL-2.
- 1993 Rate of Progress Plan: R-SL-2.
- 1994 Clean Air Plan: R-SL-2.
- 1998 Clean Air Plan: R-SL-2.

References:

- SBCAPCD, Rules and Regulations, Rule 321, Control of Degreasing Operations, July 10, 1990.
- SBCAPCD, Staff Report for Proposed Rule Amendments to Rule 321, Control of Degreasing Operations, July 17, 1997.
- CARB, Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Organic Solvent Cleaning and Degreasing Operations, July 18, 1991.
- SCAQMD, Rules and Regulations, Rule 1122, Solvent Degreasers, Amended July 11, 1997.
- SBCAPCD, Further Study Report for Requiring Use of Low-ROC or Aqueous Solvents When Performing Solvent Cleaning Operations, June 29, 2000.

B.3.3 Rule 362 (R-SL-2) - Solvent Cleaning Operations[1] (New)

Source Categories:

SCC#	4-05-003-14	Printing: Flexographic: Propyl Alcohol Cleanup
CES#	83659	Cold Cleaning (Remote Reservoir) - Petroleum Solvents
CES#	83832	Handwiping -Petroleum Solvents
CES#	83840	Handwiping, Alcohols

[1] The APCD changed Rule 321's title on September 18, 1997 to *Solvent Cleaning Operations.* Staff anticipate changing the Rule 321 title to *Solvent Degreasers* and titling the new Rule 362 as *Solvent Cleaning Operations.* Rule 321 primarily applies to solvent cleaning tanks. A more descriptive title for Rule 321 is *Solvent Degreasers.* The new Rule 362 will govern solvent cleaning methods such as wipe cleaning and hand held spray bottles.

CES# 83857 Handwiping, Chlorofluorocarbons
CES# 83865 Handwiping, Dichlorofluoroethane
CES# 83873 Handwiping, Glycol Ethers
CES# 83881 Handwiping, Ketones
CES# 83899 Handwiping, Methylene Chloride
CES# 83907 Handwiping, Perchloroethylene
CES# 83915 Handwiping, Terpenes
CES# 83923 Handwiping, Toluene/Xylene
CES# 83931 Handwiping, Trichloroethane
CES# 83949 Handwiping, Trichloroethylene
CES# 83956 Handwiping, Misc. Pure Solvents
CES# 83964 Handwiping, Misc. Solvent Blends

Source Characteristics:

Solvent cleaning activities occur during the production, repair, maintenance, or servicing of products, tools, machinery, and general work areas. Such cleaning may be performed at auto repair shops, garages and service stations, printing shops, metal fabrication facilities, aircraft and aerospace handling facilities, electronic manufacturing facilities, medical device manufacturing facilities, and filter manufacturing facilities. Rule 362 will not apply to certain solvent cleaning operations that are governed by other APCD rules. Such rules include:

1. Rule 321, Solvent Degreasers
2. New Rule 358, Semiconductor Manufacturing

The following rules will need to be revised to refer to the solvent requirements in Rule 362:

1. Rule 330, Surface Coating of Metal Parts and Products
2. Rule 337, Surface Coating of Aircraft or Aerospace Vehicle Parts and Products
3. Rule 339, Motor Vehicle and Mobile Equipment Coating Operations
4. Rule 349 Polyester Resin Operations
5. Rule 351, Surface Coating of Wood Products

6. Rule 353, Adhesives and Sealants
7. Rule 354, Graphic Arts

The APCD plans to provide exemptions to Rule 362 for:

1. Cleaning activities using cleaning agents that contain two percent or less organic solvent, as applied by weight.
2. Solvent use, clean up, and stripping of aircraft or aerospace vehicle parts and products (these will be covered in a revised Rule 337) – but the cleaning of coating application equipment and storage of solvent laden cloth and paper in association with this category shall be subject to Rule 362.
3. Stripping of cured coatings, cured ink, or cured adhesives.
4. Cleaning activities using solvents which are purchased in, and applied from, manufacturer- or distributor-labeled containers of one liter or less in volume, including aerosol products.
5. Janitorial cleaning, including graffiti removal.
6. Cleaning activities; except cleaning activities associated with surface coating of wood products, furniture, signs, metal parts or products, aircraft or aerospace vehicle parts or products, motor vehicle and/or mobile equipment, or graphic arts; conducted at residences, schools, medical care facilities, prisons, restaurants, health clubs, and theaters.

Control Methods:

Control techniques include:

1. Limiting solvent characteristics (ROC content in grams of ROC per liter and/or ROC composite partial pressure in mm Hg @ 20^{o}C (68^{o}F)).
2. Requiring use of cleaning devices or methods.
3. Establishing requirements for remote reservoir cleaners.
4. Requiring proper storage and transfer of the solvents.
5. Allowing use of alternative compliance through the use of add-on controls.

The APCD anticipates adopting provisions similar to the South Coast AQMD Rule 1171, Solvent Cleaning Operations. As in the SCAQMD Rule 1171, the control measure techniques will:

1. Apply to wipe cleaning (currently exempt from Rule 321).
2. Set solvent composite partial pressure limits and ROC limits in grams/liter (and equivalent pounds per gallon) for specific solvent cleaning activities, grouped in the following categories:
    a. Product cleaning during manufacturing process or surface preparation for coating, adhesive, or ink application
        1. General
        2. Electrical apparatus components and electronic components
    b. Repair and maintenance cleaning
        1. General
        2. Electrical apparatus components and electronic components
        3. Medical devices
    c. Cleaning of coatings, or adhesives application equipment
    d. Cleaning of ink application equipment
        1. General
        2. Flexographic or gravure printing
        3. Lithographic or letter press printing
        4. Screen printing
        5. Ultraviolet ink application equipment (except screen printing)
        6. Specialty flexographic printing
    e. Cleaning of polyester resin application equipment
3. Require certain cleaning methods or devices. These will include wipe cleaning, closed containers or hand held spray bottles, proper cleaning equipment (a solvent container that can be closed), cleaning device (listed in the APCD Policy and Procedure "Alternative Devices for Rule 362 Compliance"), remote reservoir cleaners, approved non-atomized solvent flow, and approved solvent flushing methods.
4. For remote reservoir cleaners, require proper operating methods such as preventing solvent vapors from escaping, directing solvent flow in a manner that will prevent liquid solvent

from splashing outside of the remote reservoir cleaner, not cleaning porous or absorbent materials, using only solvent containers and equipment that are free of liquid leaks.

5. Require proper storage and disposal of all ROC-containing solvents. The operators will need to store the solvents in non-absorbent, non-leaking containers which will be kept closed at all times except when filling or emptying.

Schedule:

The APCD anticipates adopting the proposed new Rule 362 during the 2004 to 2006 time frame with full implementation one year after the date of rule adoption.[1]

Emission Reduction Summary:

ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	1.4680	1.6536	1.8391
Projected Emission Reductions	0.0000	1.0103	1.1237
Projected Emissions After Control	1.4680	0.6432	0.7154

Control Measure Cost-Effectiveness:

The SCAQMD August 1996 Rule 1171 Amendment Staff Report included cost-effectiveness data. The 1996 Rule 1171 amendment data shows cost-effectiveness figures for two scenarios.

Scenario 1:

Facilities obtain their own cleaning needs (equipment, materials, and disposal) for both aqueous and petroleum-based cleaning operations. The SCAQMD analysis indicated the cost-effectiveness for this scenario was -$582 per ton of VOC reduced (savings).

Scenario 2:

Facilities obtain their own aqueous cleaning needs (equipment, materials, and disposal) versus

[1] Current control measure R-SL-2 requirements that are imbedded in the Rule 321 adopted on September 18, 1997 will remain in effect until one (1) year from the date of adoption of Rule 362.

the costs of contracting with a service company for petroleum-based cleaning operations. The SCAQMD analysis indicated the cost-effectiveness for this scenario was -$223 per ton of VOC reduced (savings).

The cost-effectiveness analysis for these two scenarios shows a cost savings. Therefore, sources complying with Rule 362 will save money by complying with the rule.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-6.
- 1991 Air Quality Attainment Plan: R-SL-2.
- 1993 Rate of Progress Plan: R-SL-2.
- 1994 Clean Air Plan: R-SL-2.
- 1998 Clean Air Plan: R-SL-2.

References:

- SCAQMD, Staff Report for Amending Rule 1171, Solvent Cleaning Operations, August 1996.
- SCAQMD, Board Packet for Amending Rule 1171, Solvent Cleaning Operations, September 16, 1996.
- SCAQMD, Rules and Regulations, Rule 1171, Solvent Cleaning Operations, Amended October 8, 1999.
- SBCAPCD, Further Study Report for Requiring Use of Low-ROC or Aqueous Solvents When Performing Solvent Cleaning Operations, June 29, 2000.

B.3.4 Rule 358 (R-SL-4) - Electronic Industry - Semiconductor Manufacturing (New)

Source Categories:

SCC#	4-01-002-99	Degreasing - Other Not Classified: Open-top Vapor Degreasing
SCC#	4-01-003-07	Degreasing - Cold Cleaning (Batch, Conveyor, Spray Gun) - Isopropyl Alcohol
SCC#	4-01-003-98	Other Not Classified, Gallons Solvent Consumed
SCC#	3-13-065-05	Semiconductor Manufacturing - Photoresist Operations: General
CES#	83659	Cold Cleaning (Remote Reservoir) - Petroleum Solvents
CES#	83667	Cold Cleaning (Batch, Conveyor, Spray Gun) - Alcohols
CES#	83675	Cold Cleaning (Batch, Conveyor, Spray Gun) - Chlorofluorocarbons
CES#	83683	Cold Cleaning (Batch, Conveyor, Spray Gun) - Glycol Ethers (Unspe
CES#	83691	Cold Cleaning (Batch, Conveyor, Spray Gun) - Ketones (Unspecified
CES#	83717	Cold Cleaning (Batch, Conveyor, Spray Gun) - Terpenes (Unspecifie
CES#	83725	Cold Cleaning (Batch, Conveyor, Spray Gun) - Toluene/Xylene
CES#	83741	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Pure Solvents
CES#	83758	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Solvent Blend
CES#	83766	Vapor Degreasing (Batch, Conveyor) - Chlorofluorocarbons
CES#	83774	Vapor Degreasing (Batch, Conveyor) - Dichlorofluoroethane
CES#	83824	Vapor Degreasing (Batch, Conveyor) - Misc. Solvent Blend
CES#	83832	Handwiping -Petroleum Solvents
CES#	83840	Handwiping, Alcohols
CES#	83857	Handwiping, Chlorofluorocarbons
CES#	83865	Handwiping, Dichlorofluoroethane
CES#	83873	Handwiping, Glycol Ethers
CES#	83881	Handwiping, Ketones
CES#	83899	Handwiping, Methylene Chloride
CES#	83907	Handwiping, Perchloroethylene
CES#	83915	Handwiping, Terpenes
CES#	83923	Handwiping, Toluene/Xylene
CES#	83931	Handwiping, Trichloroethane

CES# 83949 Handwiping, Trichloroethylene

CES# 83956 Handwiping, Misc. Pure Solvents

CES# 83964 Handwiping, Misc. Solvent Blends

Source Characteristics:

Semiconductor manufacturers use organic solvents in coatings, stripping materials, and cleaning operations. Use of photoresist is an integral process of semiconductor manufacturing and ROC emissions occur from the application, exposure, and development of photoresist. Semiconductor manufacturers also use inorganic toxic gases called dopants in certain steps to give the devices desirable electronic characteristics. About 99 percent of the dopants diffuse into the wafers. The semiconductor manufacturers collect most of the solvents in liquid form for reclamation or waste disposal.

Control Methods:

Control techniques include the use of:

1. The positive photoresist process for all semiconductor manufacturing or, if using the negative photoresist process, at least a 90 percent control of ROC emissions from the operations. To achieve the 90 percent control, semiconductor manufacturers will need to install control equipment, such as incinerators or carbon adsorbers.

2. Good housekeeping procedures for photoresist operations and solvent cleaning stations to prevent spills and unnecessary evaporation.

3. Covers on all solvent reservoirs, sinks, and containers that are in place when the operators are not using the equipment.

4. Freeboards such that the freeboard ratios (freeboard height divided by the smaller of the inside length or the inside width or, if applicable, the diameter) are greater than or equal to 1.0 for all solvent station reservoirs, sinks, and containers.

5. Low vapor pressure solvents and/or low-ROC solvents.

The APCD will likely adopt a rule that is similar to the South Coast AQMD Rule 1164, Semiconductor Manufacturing. When drafting a new or revised rule, the rulemaking staff usually rely on State or Federal guidance documents. Neither the USEPA nor ARB has issued a guidance document for this source category. To comply with the California Clean Air Act requirement that the Santa Barbara County APCD adopt every feasible measure, the APCD needs to consider regulations that have been successfully implemented elsewhere. In addition to the SCAQMD, the Bay Area AQMD and the Ventura County APCD have adopted semiconductor manufacturing rules.

Rule 358 will apply to all direct, indirect, and support stations associated with the manufacturing or production of semiconductor devices. Semiconductor device manufacturing includes all processing from crystal growth through circuit separation and encapsulation, including wafer production, oxidation, photoresist operation, etching, doping, and epitaxial growth operation.

Schedule:

The APCD anticipates adopting the proposed new Rule 358 during the 2007 to 2009 time frame with full implementation one year after rule adoption.

Emission Reduction Summary:

ROC Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0031	0.0035	0.0039
Projected Emission Reductions	0.0000	0.0000	0.0026
Projected Emissions After Control	0.0031	0.0035	0.0012

[1]The data shown in this table is for SCC number 3-13-065-06 only. The emission data for the other SCC and CES numbers subject to Rule 358 are included in the Rule 321 or Rule 361 emission reduction summaries.

Control Measure Cost-Effectiveness:

The cost-effectiveness estimates, in 1991 dollars, from the APCD's 1991 Air Quality Attainment Plan (Appendix C, R-SL-4 - Electronics Industry - Semiconductor Manufacturing) indicates:

1. The cost-effectiveness of thermal incineration of negative photoresist emissions:

    a. $1,900 per ton.
    b. Between $1,500 and $2,500 per ton for carbon adsorption

2. The cost-effectiveness of reducing ROC emissions by installing covers on solvent cleaning stations:
   $40 (based on data from solvent degreaser studies).

Cost-effectiveness figures for Rule 358 should also be similar to the cost-effectiveness figures for Rule 321, Solvent Degreasers. According to the 1991 CARB Reasonably Available Retrofit Control Technology and Best Available Retrofit Control Technology determination for Organic Solvent Cleaning and Degreasing Operations:

1. Cost savings can occur when covers are used.
2. Raising the freeboard ratio from 0.75 to 1.0 would result in a cost-effectiveness of $200 per ton of ROC reduced.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: R-39.
- 1991 Air Quality Attainment Plan: R-SL-4.
- 1993 Rate-of-Progress Plan: N/A
- 1994 Clean Air Plan: R-SL-4.

- 1998 Clean Air Plan: R-SL-4.

References:

- Santa Barbara County Air Pollution Control District, Final Santa Barbara County 1989 Air Quality Attainment Plan - Federal Ozone Standard, South County, Appendix C, May, 1989.
- SCAQMD, Rules and Regulations, Rule 1164, Semiconductor Manufacturing.
- Bay Area AQMD Rules and Regulations, Regulation 8, Rule 30, Semiconductor Wafer Fabrication Operations.
- VCAPCD, Rules and Regulations, Rule 74.21, Semiconductor Manufacturing.
- CARB Reasonably Available Retrofit Control Technology and Best Available Retrofit Control Technology determination for Organic Solvent Cleaning and Degreasing Operations, July 18, 1991
- SBCAPCD, Further Study Report for Electronic Industry - Semiconductor Manufacturing, January 13, 2000.

B.3.5 Rule 333 (N-IC-1, N-IC-3) - Control of Emissions from Reciprocating Internal Combustion Engines (Revised)

Source Categories:

SCC# 2-01-002-02 ICE Electrical Generation Natural Gas - Reciprocating
SCC# 2-02-001-02 ICE Industrial - Distillate Oil/Diesel - Reciprocating
SCC# 2-02-002-02 ICE Natural Gas - Reciprocating - Industrial
SCC# 2-02-009-02 ICE Kerosene/Naphtha (Jet Fuel) - Reciprocating - Industrial
SCC# 2-03-001-01 ICE Commercial/Institutional - Distillate Oil/Diesel - Reciprocating
SCC# 2-03-002-01 ICE Natural Gas - Reciprocating - Commercl/Instutnl

Source Characteristics:

Rule 333 requires NO_x control techniques for spark-ignited (N-IC-1) and compression-ignited (N-IC-3) internal combustion engines. Spark-ignited combustion is typical of piston-type engines burning natural gas, field gas, waste gas, propane gas, or gasoline. There are primarily

two different types of spark-ignited engines: lean burn and rich burn. Different control methods are used for each of these types of spark-ignited engines.

Compression-ignited engines operate differently in that the combustion process is not initiated until the compression stroke where fuel is injected into the combustion chamber. Upon injection, the fuel mixes with the hot air and spontaneously burns (no spark is required). Operators use both types of engines to drive rotating equipment in remote locations and the engines range in size from less than 50 to over 1,000 brake horsepower (bhp).

Control Methods:

The existing Rule 333 applies to permitted spark-ignited and compression-ignited internal combustion engines that have a horsepower rating greater than or equal to 50 bhp. Table B.3.5-1 shows the control efficiencies from the Rule 333 control requirements for the different categories of engines.

TABLE B.3.5-1. RULE 333 CONTROL EFFICIENCIES FOR DIFFERENT ICE CATEGORIES

TYPE ENGINE	CONTROL EFFICIENCY (PERCENT)
Spark-Ignited, Rich Burn	90
Spark-Ignited, Lean Burn	80
Compression-Ignited	40

Engine owners and operators have complied with the requirements of Rule 333 by switching to electric motors, installing selective catalytic reduction equipment, nonselective catalytic reduction equipment, retarding diesel engine injection timing, lean-burn tuning of rich burn spark-ignited engines, retarding the ignition on spark-ignited engines, and using other combustion modification systems (e.g., pre-stratified charge, Spiral Spin Technology). These control techniques can be used to comply with the modified Rule 333.

The proposed revised Rule 333 will address USEPA concerns. On February 1, 1995, the USEPA proposed a limited approval and limited disapproval of a revision to the California State Implementation Plan (SIP) concerning the inclusion of Rule 333 into the SIP. The Federal Register (60 FR 6049) on this proposed rulemaking indicates:

[. . .] Although Rule 333, Control of Emissions from Reciprocating Internal Combustion Engines, will strengthen the SIP, the rule contains deficiencies related primarily to the lack of Federal enforceability. These deficiencies include inconsistent applicability cutoffs and exemptions, unenforceable provisions in definitions, inconsistent emission limit requirements, unenforceable alternative emission control plan provisions, and alternative compliance schedule provisions. A more detailed discussion of the sources controlled, the controls required, justification for why these controls represent RACT, and rule deficiencies can be found in the Technical Support Document (TSD) for Rule 333, dated November 1994.

Because of the above deficiencies, EPA cannot grant full approval of this rule under section 110(k)(3) and Part D. [. . .]

The November 1994 Technical Support Document for Rule 333 indicates:

[. . .] However, Rule 333 does contain several provisions that, unless corrected constitute deficiencies. These provisions are as follows:

Section A, B Applicability/Exemptions: Rule 333 applies to units with a rated brake horsepower of 50 or greater. Although Rule 333 is written as applicable to these size engines, SBCAPCD's Rule 202, which includes exemptions from permit requirements, exempts units rated below 100 brake horsepower. Rule 333 allows exemptions for units exempt from permit requirements. SBCAPCD has agreed to modify Rule 202 to ensure consistency with Rule 333. Therefore, the exemption provision in section B.1.b of Rule 333 should be deleted.

Section C, Definitions: The definition of "rated brake horsepower" is specified as the maximum revolutions per minute specified by the manufacturer. The definition also allows an "alternative" bhp rating to be set by a district-issued permit to operate. Under this alternative rating, engines can be operated at different levels such as maximum rating, continuous rating, or derated. Since engine ratings are crucial for determining

rule applicability, the provision in this section allowing alternative ratings should be deleted. EPA believes the definition should specify rating as output determined by the manufacturer and listed on the nameplate, regardless of any derating.

Section D.2 and D.4, Emission Limit Requirements: The provision specifying emission limits for diesel engines requires a limit of 8.4 g/bhp-hour be met. The corresponding concentration limit given as corrected to 15% oxygen is 797 ppm. These values do not correspond to one another. 8.4 g/bhp-hr converts to approximately 670 ppm assuming 35% efficiency. Due to the discrepancy, the rule allows the least stringent (797) ppm limit. This limit should be corrected to reflect the RACT level of 8.4 g/bhp-hr.

According to the definition given for lean-burn engines, (which includes diesel engines) it is unclear if diesel engines must comply with the 125 ppm limit given for lean burn engines or the 797 ppm limit. The rule should distinguish between lean burn and diesel engines so as not to cause ambiguity in which emission limits are applicable.

Section D.5, Emission Limit Requirements: Generally, alternative emission control plans (AECPs) are not approvable in rules unless the provisions meet the requirements of EPA's Emission Trading Policy Statement (ETPS) and Economic Incentive Program (EIP) requirements[1]. Rule 333 requires that AECPs must be submitted to SBCAPCD by March 9, 1992 and approved by the Control Officer, ARB, and EPA. There have been no AECPs submitted or approved and the option for submitting AECPs has expired. Thus, EPA is not evaluating this provision for approvability with the ETPS/EIP and does not consider it in this case a rule deficiency since it is no longer applicable. However, it is recommended that these provisions be deleted.

[1] The ETPS was published on December 4, 1986 in 51 FR 43814 and the EIP was published April 7, 1994 in 59 FR 16690 and 40 CFR Part 51, Subpart U, 51.490-51.494.

Section I, Compliance Schedule: Owners/operators of cyclic engines are allowed to comply with less stringent emission limits established by the Santa Barbara County Board of Supervisors through their public hearing process. This provision is intended to take into account additional information of a study proposed by industry to test the feasibility of the current rule emission limits in effect in Ventura County. Since no alternative limits were considered or established by the district's Board of Directors pursuant to section I.3., this provision is no longer applicable. However, it is recommended that these provisions be deleted. [. . .]

To address the USEPA-identified deficiencies, the APCD intends to take the following actions.

1. Change the Rule 202.F.1.e exemption cut-off from 100 bhp to engines less than 50 bhp. In addition, adjust the major source gatekeeper provision to apply to engines from 20 to less than 50 bhp and change the permitting threshold from the 500 bhp aggregate to a 25 tons per year potential to emit aggregate. Staff recommend that the revised text, in strike-out and underline format, be similar to the following:

F. Internal Combustion Engines

1. A permit shall not be required for internal combustion engines if any of the following conditions is satisfied:

[. . .]

e. Piston-type internal combustion engines with ~~a manufacturer's maximum rating of 100 brake horsepower (bhp) or less~~ a rated brake horsepower:

1). Less than 20.

2). Less than 50, provided the piston-type internal combustion engines in the 20 to 49.99 rated brake horsepower range at the same stationary source have a total potential to emit of nonattainment pollutants or their precursors that is less than 25 tons per year.

~~or gas turbine engines with a maximum heat input rate of 3 million British thermal units per hour or less at standard conditions, except if the total horsepower of individual piston-type internal combustion engines less than 100 bhp but greater than 20 bhp at a stationary source, as defined in Rule 102, exceeds 500 bhp in which case the individual engines are not exempt.~~ Piston-Type internal ~~Internal~~ combustion engines exempt under other provisions of Section F do not count toward the ~~500 bhp aggregate~~ 25 tons per year limit.

f. Gas turbine engines with a maximum heat input rate of 3 million British thermal units per hour or less at standard conditions.

[. . .]

Based on the 1999 inventory, the engines in Table B.3.5-2 would become subject to permitting and the engines in Table B.3.5-3 would become subject to Rule 333. Engines 50 bhp or greater listed in Table B.3.5-2, but not Table B.3.5-3, did not operate in excess of 200 hours per year in 1999 and are assumed to be exempt from Rule 333 control requirements (Section 333.B.2). Engine owners and operators qualifying for this exemption are required to maintain a log and install a nonresettable elapsed operating time meter.

TABLE B.3.5-2. ENGINES THAT WILL REQUIRE PERMITTING DUE TO THE RULE 202 CHANGES

STATIONARY SOURCE DESCRIPTION	FACILITY No.	FACILITY DEVICE No.	BHP	DEVICE NAME	MANUFACTURER	MODEL	SERIAL NO
Armelin	03736	0013	62	Generator/Water Pump			
Blair Lease - Oilwell Tech.	08673	0010	100	Field Gas			
City of Lompoc - Maintenance Operations	03201	0002	60	Hydroblaster		Slanzi DVA	
City of Lompoc - Maintenance Operations	03201	0004	75	Compressor	John Deere	John Deere 423DF	
City of Lompoc - Maintenance Operations	03201	0006	75	Compressor	John Deere	John Deere 4239DF	
City of Lompoc - Maintenance Operations	03201	0007	75	Sewer Flusher		Hate 3L40C	
City of Lompoc - Maintenance Operations	03201	0011	75	Compressor	John Deere	John Deere 4239DF	
Gato Corporation	03200	0002	30	Gc 154, Tog C-51	M Moline 605		
Gato Corporation	03200	0003	75	Pump: Gc 104, East Test	Waukesha	140	GC 104, EAST TEST
Gato Corporation	03200	0004	20	Gc 137, Tog S-9	Waukesha 135		
Gato Corporation	03200	0006	54	Gc 109, Tog C-315	Minneapolis Moline	425	GC 109, TOG C-315
Gato Corporation	03200	0011	60	Gc 115, Tog S-14	Minneapolis Moline	605	GC 115, TOG S-14
Gato Corporation	03200	0014	30	Gc 153, Tog C-317	Waukesha 605		
Gato Corporation	03200	0015	30	Gc 152, Tog C-337	M Moline 605		
Gato Corporation	03200	0017	30	Gc 151, Tog C-348	Waukesha 145		
Gato Corporation	03200	0018	100	Gc 126, Tog S-3	Waukesha	145	GC 126, S-3
Gato Corporation	03200	0020	54	Gc 130, Tog S-7	Minneapolis Moline	425	GC 130, TOG S-7
Gato Corporation	03200	0021	30	Gc 131, Tog C-318	Minneapolis Moline	M Moline 283	
Gato Corporation	03200	0023	30	Gc 136, Tog S-12	Minneapolis Moline	M Moline 605	
Gato Corporation	03200	0025	30	Gc 145, Tog C-336	Minneapolis Moline	M Moline 605	
Gato Corporation	03200	0027	30	Compressor: Gc 139	Minneapolis Moline	M Moline 605	
Gato Corporation	03200	0049	20	Gc___ Tog S-8	Minneapolis Moline	M Moline	
Jim Hopkins	03092	0008	49.6	Injection #3 (10990)	Waukesha WAK		
Jim Hopkins	03092	0009	48	#52-1 (12143)	M. Moline HD 800		
Jim Hopkins	03092	0010	49.5	#53-1 (11781)	Waukesha 145		

TABLE B.3.5-2. ENGINES THAT WILL REQUIRE PERMITTING DUE TO THE RULE 202 CHANGES

STATIONARY SOURCE DESCRIPTION	FACILITY No.	FACILITY DEVICE No.	BHP	DEVICE NAME	MANUFACTURER	MODEL	SERIAL NO
Jim Hopkins	03092	0011	48	#62-1 (12152)	M. Moline HD 800		
Jim Hopkins	03092	0012	49.5	Comp. (9845)	Waukesha 145		
Jim Hopkins	03092	0013	48.9	#72-1 (12213)	M. Moline 504		
Jim Hopkins	03092	0014	48	#73-1 (12147)	M. Moline HD 800		
Jim Hopkins	03092	0015	49.5	#82-1 (11505)	Waukesha 145		
Jim Hopkins	03092	0016	49.6	#293-1 (11477)	Waukesha F1197		
Jim Hopkins	03092	0017	49.5	Injection #1 (11547)	Waukesha 145		
Nuevo - Platform Habitat	08012	0043	50	Temporary			
Pacific Operators - Carpinteria	08001	0001	99	South Crane	Detroit Diesel	3-71	3A68303
Pacific Operators - Carpinteria	08002	0001	99	South Crane	Detroit Diesel	3-71 (N-60)	3A-72372
Phoenix Energy, Inc.	03062	0007	50	Gas Compressor	Waukesha		
Purisima Hills LLC - Blair Lease	02637	0007	25	#1 (Up #9310)			
Purisima Hills LLC - Blair Lease	02637	0008	33	#2 (Up #9340)			
Purisima Hills LLC - Blair Lease	02637	0009	25	#3 (Up #9350)			
Purisima Hills LLC - Blair Lease	02637	0010	33	#4 (Up #9360)			
Purisima Hills LLC - Blair Lease	02637	0011	25	#6 (Up #9380)			
Purisima Hills LLC - Blair Lease	02637	0012	25	#7 (Up #9390)			
Purisima Hills LLC - Blair Lease	02637	0013	33	#8 (Up #9400)			
Purisima Hills LLC - Blair Lease	02637	0023	52	#9 (Up #9460)			
Purisima Hills LLC - Blair Lease	02637	0024	50	#10 (Up #9410)			
Purisima Hills LLC - Blair Lease	02637	0025	33	#12 (Up #9430)			
Purisima Hills LLC - Blair Lease	02637	0026	25	#13 (Up #9440)			
Purisima Hills LLC - Blair Lease	02637	0027	55	#14 (Up #9450)			
Purisima Hills LLC - Blair Lease	02637	0029	25	#15 (Up #9370)			
Purisima Hills LLC - Blair Lease	02637	0038	33	#11 (Up #9420)			
Purisima Hills LLC- Barham Ranch	03777	0012	75	Natural Gas: #68680	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0013	75	Natural Gas: #87437-12	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0014	75	Natural Gas: #87437-N	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0015	75	Natural Gas: #484-U	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0016	75	Natural Gas: #77560	Waukesha	F817	

TABLE B.3.5-2. ENGINES THAT WILL REQUIRE PERMITTING DUE TO THE RULE 202 CHANGES

STATIONARY SOURCE DESCRIPTION	FACILITY No.	FACILITY DEVICE No.	BHP	DEVICE NAME	MANUFACTURER	MODEL	SERIAL NO
Purisima Hills LLC- Barham Ranch	03777	0017	75	Natural Gas	Waukesha	F817	
Santa Barbara Sand & Top Soil – Ellwood	03695	0006	75	Diesel IC Engine	John Deere		
United States Navy - Santa Cruz Island	02784	0004	92	Cat 3304 D1 (Unit #5)(E-2)		3304DI	
United States Navy - Santa Cruz Island	02784	0005	92	Cat 3304 D1 (Unit #6)(E-3)		3304DI	
United States Navy - Santa Cruz Island	02784	0014	92	Cummins 4bt3.9-62 (Unit #2)(E-1)			
Venoco - Ellwood	00028	0039	65	IC Engine: Portable Air Compressor			
Venoco - Ellwood	03035	0003	94	IC Engine: Shipping Pump	Waukesha	Wauk 145	
Venoco - Ellwood	03035	0004	77	IC Engine	Minneapolis Moline	M. Moline 605	
Venoco - Ellwood	03105	0001	93	Diesel Crane		500	66066
Venoco - Ellwood Marine Terminal	03203	0002	89	Generator Engine (4-71)	Detroit Diesel	4V-71	
Vintage Petroleum, Inc. - West Cat Cyn	08713	0002	86	#B472	Minneapolis Moline	MM HD504-6A	
Williams Holding	03512	0019	65	IC Engine		WH #6 - MM425	
Williams Holding	03512	0021	65	IC Engine		Compressor - MM425	

TABLE B.3.5-3. ENGINES THAT WILL BECOME SUBJECT TO RULE 333 BECAUSE OF THE RULE 202 REVISION

STATIONARY SOURCE DESCRIPTION	FACILITY No.	FACILITY DEVICE No.	BHP	DEVICE NAME	MANUFACTURER	MODEL	SERIAL NO
Purisima Hills LLC - Blair Lease	02637	0023	52	#9 (Up #9460)			
Purisima Hills LLC - Blair Lease	02637	0024	50	#10 (Up #9410)			
Purisima Hills LLC - Blair Lease	02637	0027	55	#14 (Up #9450)			
United States Navy - Santa Cruz Island	02784	0004	92	Cat 3304 D1 (Unit #5)(E-2)		3304DI	
United States Navy - Santa Cruz Island	02784	0005	92	Cat 3304 D1 (Unit #6)(E-3)		3304DI	
United States Navy - Santa Cruz Island	02784	0014	92	Cummins 4bt3.9-62 (Unit #2)(E-1)			
Phoenix Energy, Inc.	03062	0007	50	Gas Compressor	Waukesha		
Venoco - Ellwood Marine Terminal	03203	0002	89	Generator Engine (4-71)	Detroit Diesel	4V-71	N/A
Santa Barbara Sand & Top Soil – Ellwood	03695	0006	75	Diesel IC Engine	John Deere		
Purisima Hills LLC- Barham Ranch	03777	0012	75	Natural Gas: #68680	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0013	75	Natural Gas: #87437-12	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0014	75	Natural Gas: #87437-N	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0015	75	Natural Gas: #484-U	Waukesha	F817	
Purisima Hills LLC- Barham Ranch	03777	0016	75	Natural Gas: #77560	Waukesha	F817	
Nuevo - Platform Habitat	08012	0043	50	Temporary			
Vintage Petroleum, Inc. - West Cat Cyn	08713	0002	86	#B472	Minneapolis Moline	MM HD504-6A	

2. Move the definition of *Rated Brake Horsepower (bhp)* to Rule 102, Definitions, and modify it to:

    a. Remove the reference to maximum revolutions per minute.

    b. Add language on the continuous rating being based on SAE test 1349 or a similar standard.

    c. Clarify that the *rated brake horsepower* for a derated engine is the maximum continuous brake horsepower rating certified by the engine manufacturer through dynamometer brake horsepower testing to industry standard procedures or other means approved by the Control Officer to demonstrate continuous compliance with the engine's maximum continuous brake horsepower rating. (The APCD will continue to allow engine derating.)

3. Add an exemption to Rule 333 indicating that an engine with a rated brake horsepower of 50 or greater equipped with a calibrated nonresettable fuel usage rate meter and a nonresettable elapsed operating time meter and having a maximum hourly heat input rating, based on the fuel's high heating value, less than the following rates is exempt from Rule 333:

    a. 0.37 million British thermal units per hour for turbocharged or supercharged compression-ignited engines;

    b. 0.39 million British thermal units per hour for naturally aspirated compression-ignited engines;

    c. 0.52 million British thermal units per hour for spark-ignited engines

These heat input thresholds represent the energy input needed for the different engine types to achieve the equivalent of 50 continuous brake horsepower work output.

4. Delete the 8.4 grams per brake horsepower provision and change the 797 limit to 700 ppmv NO_x at 15% oxygen. Staff believe the use of grams per brake horsepower units are useful when requiring engine manufacturers to meet limits, but impractical when performing on-site compliance verification. In addition, other Districts (e.g., San Diego APCD, Mojave Desert APCD) have 700 ppmv NO_x at 15% oxygen limit and there use of the limit constitutes RACT.

5. Revise the rule to clearly indicate emission limits for different engines. Table B.3.5-4 is an example of how the revised rule may depict the emission limits and possible limits for the different types of engines.

TABLE B.3.5-4. REASONABLY AVAILABLE CONTROL TECHNOLOGY EMISSION LIMITS

Engine Type	% Control[1]	or	ppmv at 15% O_2		
			NOx	ROC	CO
Spark-Ignited Engines					
Rich-Burn Rod-Pump Cyclic Engines (Non-Air Balanced Pumps)	40		300	750	4500
All Others					
Rich-Burn	90		50	250	4500
Lean-Burn	80		125	750	4500
Diesel or Dual-Fuel Engines	25		700	750	4500

6. Delete the provisions for alternative emission control plans (Section D.5) and for establishing less stringent emission limits for cyclic engines (Section I.3).

[1] For nitrogen oxides, either the percent control or the ppmv limit must be met by each engine. The percent control option applies only to engines using external exhaust controls. The percent control shall be determined by measuring the nitrogen oxides upstream and downstream of the exhaust control equipment.

Based on the 1999 inventory, the APCD estimates that the emission changes from adopting these changes will be:

- 8.4 tons per year of NO_x reduction
- 1.4 tons per year of ROC increase

Schedule:

The APCD anticipates adopting the proposed Rule 333 amendments during the 2001 to 2003 time frame with full implementation within one year from the date of rule adoption..

Emission Reduction Summary:

ROC Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.7579	0.5339	0.3817
Projected Emission Reductions	0.0008	0.0005	0.0003
Projected Emissions After Control	0.7571	0.5334	0.3814

NO_x Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.6697	0.4381	0.2796
Projected Emission Reductions	0.0123	0.0083	0.0056
Projected Emissions After Control	0.6574	0.4298	0.2740

[1]Emissions from on-shore sources only.

OCS - ROC Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0692	0.0692	0.0692
Projected Emission Reductions	0.0000	0.0000	0.0000
Projected Emissions After Control	0.0692	0.0692	0.0692

OCS - NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.1256	0.1256	0.1256
Projected Emission Reductions	0.0006	0.0006	0.0006
Projected Emissions After Control	0.1251	0.1251	0.1251

Control Measure Cost-Effectiveness:

Table B.3.5-5 shows the projected cost-effectiveness ranges for the engines that will become subject to the revised Rule 333 (i.e., engines listed in Table B.3.5-3).

TABLE B.3.5-5. PROJECTED COST-EFFECTIVENESS RANGES

TYPE ENGINE	COST-EFFECTIVENESS (Tons of NOx Reduced per Year)
Spark-Ignited	$1,500 to $3,000
Compression-Ignited	$23,000 to $48,000

The compression-ignited engine cost-effectiveness figures are greater than the spark-ignition figures because the engines used to calculate the figures have low operating capacities (ranging from 3% to 6%).

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-8, N-10.
- 1991 Air Quality Attainment Plan: N-IC-1, N-IC-3.
- 1993 Rate-of-Progress Plan: N/A
- 1994 Clean Air Plan: N-IC-1, N-IC-3.
- 1998 Clean Air Plan: N-IC-1, N-IC-3.

References:

- SBCAPCD, Final 1989 Air Quality Attainment Plan, Appendix C, Emission Controls, May 1990.
- SBCAPCD, Final 1991 Air Quality Attainment Plan, Appendix C, Stationary Source Emission Controls, December 1991.
- SBCAPCD, Staff Report for Proposed Rule 333, December 1991.

B.3.6 Rule 363 (N-IC-2) - Gas Turbines (New)

Source Categories:

SCC# 2-01-001-01 IC Eng, Electrical Generation, Distillate Oil (Diesel), Turbine
SCC# 2-01-002-01 IC Eng, Electrical Generation, Natural Gas, Turbine
SCC# 2-02-001-01 IC Eng, Industrial, Distillate Oil (Diesel), Turbine
SCC# 2-02-002-01 IC Eng, Industrial, Natural Gas, Turbine
SCC# 2-02-002-03 IC Eng, Industrial, Natural Gas, Turbine, Cogeneration
SCC# 2-03-001-02 IC Eng, Commercial/Institutional, Distillate Oil (Diesel), Turbine
SCC# 2-03-002-02 IC Eng, Commercial/Institutional, Natural Gas, Turbine

Source Characteristics:

A gas turbine is an engine that consists of a compressor, a combustor, and a power turbine. The compressor provides pressurized air to the combustor where fuel is burned. Hot combustion gases leave the combustor and enter the turbine section. In the turbine section, the gases expand across the power turbine blades to rotate one or more shafts. The shafts provide power for the compressor and the device (usually an electric generator) being powered by the gas turbine.

Control Methods:

The CARB RACT/BARCT determination recommends the use of the following control techniques:

- Water or steam injection
- Dry low-NO_x combustors

- Selective catalytic reduction and other post combustion technologies
- Methanol (This technique has not been used in normal operations. Staff do not anticipate that the methanol technique will be used to comply with the control measure. An analysis of compliance with the California Environmental Quality Act would be accomplished through an Authority to Construct permit process if a source proposed to use methanol fuel.)

The CARB RACT/BARCT determination limits are as follows:

Turbine Size (MW)	NO_x Limit (ppmv @ 15% O2)	
	Gas	Oil
RACT		
0.3 and greater	42	65
BARCT		
≥ 0.3 and < 2.9	42	65
≥ 2.9 and < 10	25[1]	65
≥ 10 w/o SCR	15[1]	42[1]
≥ 10 with SCR	9[1]	25[1]

Staff anticipate that Rule 363 will be similar to the San Joaquin Valley Unified APCD (SJVUAPCD) Rule 4703 and the Ventura County APCD Rule 74.23, both titled, "Stationary Gas Turbines." With two possible exceptions, the Rule 363 format should follow the model rule in the CARB RACT/BARCT determination for gas turbines. Staff identified the two possible exceptions as:

1. Including a 200 hours per year exemption that is independent from the gas turbine being an emergency standby unit. The need to include such an exemption stems from the Ellwood Generating Station's history and the facility not meeting the CARB definition of an emergency standby unit. If the Board adopts the rule with this concept, all the Ellwood Generating Station's operating hours would be tallied, regardless of the purpose of operation, to verify that the equipment does not exceed the 200 hours per year rule applicability threshold. The current Permit to Operate for the Ellwood Generating Station indicates there is no restriction on the operation schedule for emergency use.

[1] With adjustments for efficiency.

The Ventura County APCD Rule 74.23, Stationary Gas Turbines:

a) Exempts all units that operate less than 200 hours per year.

b) Exempts emergency standby units.

c) Restricts maintenance operation of emergency standby units to 104 hours per year, but does not restrict their operating hours during emergencies.

d) Incorporates the definition of emergency standby units specified in the RACT/BARCT determination.

Staff recommends that our District's proposed gas turbine rule be consistent with these Ventura County APCD Rule 74.23 provisions.

2. Including slightly higher NO_x ppmv limits (e.g., 42 ppmv at 15 percent oxygen) for the Allison 501-KB5 and 501-KC-5 gas turbines. Torch Operating Company currently operates these Allison models on Platform Harvest. The source tests for the engines indicate that the control efficiency needs to be increased in a range of 14 to 26 percent for different 501-KB5 engines to meet the CARB-proposed BARCT limit. For the 501-KC-5 engines, the control efficiency needs to increase 7 percent.

A more in-depth analysis performed during the rulemaking phase can substantiate the need for a special emission limit for these gas turbines. The San Joaquin Valley Unified APCD Rule 4703 provides special limits for:

a) General Electric Frame 7 with Quiet Combustors, and

b) Solar Saturn 1100 horsepower gas turbine powering centrifugal compressor

Torch Operating Company (or the equipment owner) may be able to increase the Allison gas turbines' control efficiencies by increasing the water to fuel ratio from 0.8 to 0.9. Other Allison gas turbine operators in Santa Barbara County (e.g., VAFB, Gaviota Oil & Gas Plant) using comparable models (501-KB) met the CARB-proposed limit.

Another engine that could be affected by a gas turbine rule is the Solar gas turbine engine located at the Bradley Lands/Bradley Consolidated Lease (FID 4103), currently owned by Vintage Petroleum, Inc. The rule would require this 1 MW gas turbine to meet a 42 ppmv NO_X limit. The equipment's permit application indicates that the engine emits 90 ppmv NO_x at 15 percent oxygen. The District does not have any source test emission data on this gas turbine. The last time Vintage Petroleum operated the equipment was 1996. The company may decide to remove the gas turbine in lieu of modifying it to comply with the gas turbine rule. Or, this may be another situation where the rule should have a higher limit because retrofitting the engine is not feasible and/or cost-effective.

It appears that all the other exiting gas turbines in Santa Barbara County will comply with the CARB-proposed BARCT limits.

Schedule:

The APCD anticipates adopting the proposed Rule 363 during the 2004 to 2006 time frame with full implementation within 3 years from the date of rule adoption..

Emission Reduction Summary:

NO_x Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.1723	0.1458	0.1275
Projected Emission Reductions	0.0000	0.0000	0.0000
Projected Emissions After Control	0.1723	0.1458	0.1275

[1]Emissions from on-shore sources only.

OCS - NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.5006	0.5006	0.5006
Projected Emission Reductions	0.0000	0.0000	0.0000
Projected Emissions After Control	0.5006	0.5006	0.5006

Control Measure Cost-Effectiveness:

The CARB RACT/BARCT determination listed the cost-effectiveness figures for the following control techniques:

- Water injection
  For 0.3 MW, controlled to 42 ppmv NO_x at 15% O2: $5000/ton
  For 2 MW and greater, controlled to 42 ppmv NO_x at 15% O2: $2000/ton
  For 4 MW, operating 1000 hours per year: $1800-$4000/ton

- Steam injection
  Controlled from 42 to 15 ppmv NO_x at 15% O2: $5000/ton.
  Controlling VOC and CO with an oxidation catalyst: $200-$400/ton

- Dry low-NO_x combustors
  New units: $30-$90/kW.
  Existing uncontrolled units, controlled to 42 ppmv NO_x at 15% O2: $200-$900/ton.
  Existing uncontrolled units, controlled to 25 ppmv NO_x at 15% O2: $200-$700/ton.

- Selective catalytic reduction and other post combustion technologies
  Controlling units 10 MW and greater units, operating continuously, to 9 ppmv NO_x at 15% O2: $1800-$5000/ton.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-9.
- 1991 Air Quality Attainment Plan: N-IC-2.
- 1993 Rate-of-Progress Plan: N/A
- 1994 Clean Air Plan: N-IC-2.
- 1998 Clean Air Plan: N-IC-2.

References:

- SBCAPCD, Final Santa Barbara County 1989 Air Quality Attainment Plan - Federal Ozone Standard, South County, Appendix C, May, 1989.
- SBCAPCD, Further Study Report for Gas Turbines, October 21, 1999.
- SBCAPCD, Further Study Report on the Ellwood Generating Station Gas Turbines, September 8, 2000.
- SJVUAPCD, Rules and Regulations, Rule 4703, Stationary Gas Turbines, October 16, 1997.
- VCAPCD, Rules and Regulations, Rule 74.23, Stationary Gas Turbines, October 10, 1995.
- CARB, Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology Determination for the Control of Oxides of Nitrogen from Stationary Gas Turbines, May 18, 1992.

B.3.7 Rule 360 (N-XC-2) - Large Water Heaters and Small Boilers, Steam Generators, and Process Heaters (75,000 British thermal units per hour [Btu/hr] to less than (<) 2 Million [MM] Btu/hr) (New)

Source Categories:

SCC# 1-02-006-03 External Combustion Boiler, Industrial, Natural Gas (<10 MMBtu/hr)

SCC# 1-03-005-01 External Combustion Boiler, Commercial-Institutional, Distillate Oil, No. 1 and No. 2

SCC# 1-03-006-03 External Combustion Boiler, Commercial-Institutional, Natural gas (<10 MMBtu/hr)

SCC#	3-05-002-06	Industrial Processes, Mineral Production, Asphalt Heater: Natural Gas
SCC#	3-10-004-04	Oil & Gas Production, Process Heaters, Natural Gas
SCC#	3-10-004-05	Oil & Gas Production, Process Heaters, Process Gas
SCC#	3-10-004-14	Oil & Gas Production, Steam Generators, Natural Gas
SCC#	3-10-004-15	Oil & Gas Production, Steam Generators, Process Gas
SCC#	3-99-900-03	Industrial Processes, Miscellaneous Manufacturing Industry, Natural Gas: Process Heater
CES#	47142	Industrial, Natural Gas Combustion (Unspecified)
CES#	47159	Commercial, Distillate Oil Combustion (Unspecified)
CES#	47167	Commercial, Natural Gas Combustion (Unspecified)
CES#	47183	Commercial, Residual Oil Combustion (Unspecified)
CES#	58727	Commercial, L.P.G. Combustion
CES#	58743	Commercial - Natural Gas Combustion - Water Heating
CES#	66795	Industrial, L.P.G. Combustion
CES#	66803	Industrial, Distillate Oil Combustion (Unspecified)
CES#	83071	Industrial, Residual Oil Combustion (Unspecified)

Source Characteristics:

Operators burn fossil fuels in boilers, steam generators, and process heaters to transfer heat from combustion gases to water or other fluids. The only significant emissions to the atmosphere from the units in normal operation, regardless of the fluid being heated or vaporized, are those resulting from the combustion of the fuel. Differences in design and operation of these devices can affect their production of air contaminants.

Commercial/industrial boilers and hot water heaters in the size range of 75,000 to 2,000,000 Btu per hour predominately burn natural gas and are used to heat water and raise steam. Typically, natural gas burns with air to release heat which is subsequently transferred to water confined in a jacket or tubes. Most of the units in this size range use the natural draft created by the combustion of the natural gas and air to transfer heat to the confined water and do not rely on

fans or blower to transport either air or combustion gases. These units are known as *atmospheric* and are simple in their operation.[1]

In general, units less than 300,000 Btu per hour are larger versions of residential water heaters and businesses use them to heat potable water. For such units, an annular tank holds the water. Hot flue gases flow vertically through the annulus thereby heating the water. Larger units (greater than 300,000 Btu per hour) are usually designed with a series of tubes placed somewhat perpendicular to the exhaust flow. As the hot gases flow around the tubes, the water is heated creating hot water or steam.

Industry and business use hot water and steam for a variety of purposes (e.g., potable hot water for domestic consumption in hotels, restaurants, factories, schools, and office buildings to process steam for micro-breweries, textile manufacturing, pharmaceutical production, and hospital sterilization). Due to the variety of uses, units larger than 300,000 Btu per hour are ubiquitous and located in most commercial and industrial buildings.

Most large water heaters and small boilers are atmospheric and have an overall thermal efficiency (ratio of heat contained in the natural gas to the amount of heat absorbed by the water) ranging from 65 percent to 75 percent.

The combustion of fuel and air in these units cause the formation of nitric oxide (NO). In uncontrolled units, the NO is emitted to the air along with other products of combustion in the flue gas. Smaller amounts of nitrogen dioxide (NO_2) form in the combustion process, and some NO oxidizes to NO_2 in the stack.

The formation of NO by combustion processes is governed primarily by (1) the chemically bound nitrogen content of the fuel, (2) the oxygen concentration of the flame, (3) the temperature of the flame, and (4) the length of time that the combustion gases are held at the flame temperature.

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[1] Parker Boiler Sales Brochure, Parker Boiler Company, L.A., CA, September 1994

Control Methods:

To reduce the formation of thermal oxides of nitrogen, manufacturers lower the unit's peak flame temperature or reduce the amount of air flowing to the burner. Manufacturers add fans to the units to provide better mixing of the air and fuel and to better control the amount of air. Reducing excess air and other low-NO_x strategies also improve fuel efficiency. This is due, in part, in a reduction in heat loss through the stack. By reducing the amount of combustion air, less air is heated and, therefore, less fuel is required.

Reducing peak flame temperature is a function of burner design. This is usually accomplished by limiting the amount of air in the immediate vicinity of the flame or to spread the flame out across a surface so that it burns cooler. Both of these design concepts are in operation today from manufacturers in units in the subject size range.

The two primary low-NO_x burner types are known as (1) forced draft low-NO_x, and (2) atmospheric low-NO_x burners. In the forced draft low-NO_x burner, air and fuel are delivered separately to the burner. Inside the burner, the combustion process is carefully controlled to provide for good mixing for complete combustion and to limit the amount of air immediately adjacent to the flame. This lowers peak temperature without compromising combustion integrity, as sufficient air is available to completely burn all of the natural gas.

For units between 75,000 and 400,000 Btu per hour, there are several atmospheric burner technologies available to meet the 40 nanograms of NO_x per joule limit. Such burners include radiant, two-stage, non-aerated, ribbon, and premix. These technologies work by limiting peak flame temperature and reducing the amount of air flowing to the burner. According to the August 1999, Ventura County APCD staff report for their large water heater and small boiler rule, " . . . many of these technologies will work well on larger equipment. Two manufacturers are currently marketing low-NO_x atmospheric burners. . . ."[1]

[1] Ventura County Air Pollution Control District, Staff Report for Rule 74.11.1, Large Water Heaters and Small Boilers, August 31, 1999.

In the power premix design, air and fuel are mixed external to the unit. A fan pushes air into the unit and the gas is mixed in the air pipe upstream of the burner. The combined air and fuel mixture is then combusted on a porous substrate that acts as a burner and serves to hold and stabilize the flame. The porous substrate can be supported metal or ceramic matrix or a perforated ceramic tile. This design controls the amount of air in the mixture and lowers peak flame temperature by distributing the flame more broadly across a surface. The majority of units in this size range that either advertise high efficiency or low-NO_x emissions use some variation of the power premix design.

The APCD anticipates that the proposed Rule 360 will be similar to the Ventura County APCD Rule 47.11.1 and the South Coast AQMD Rule 1146.2. For water heaters, boilers, steam generators, and process heaters between 75,000 and 2 MMBtu per hour, Rule 360 would require the manufacturer to install low-NO_x control techniques. The rule would be similar to Rule 352 and require that the manufacturers of such units test and certify that their units comply with the emission standards. In addition, the rule would require that the manufacturers label the units.

The rule should have the following emission limits for the different sized units.

- For units with a rated heat input capacity of greater than or equal to 75,000 Btu per hour and less than or equal to 400,000 Btu per hour, oxides of nitrogen emissions shall not exceed 40 nanograms per joule of heat output (93 pounds per billion Btu), or 55 parts per million (at 3 percent oxygen, dry).
- For units with a rated heat input capacity of greater than 400,000 Btu per hour and less than or equal to 2,000,000 Btu per hour, oxides of nitrogen emissions shall not exceed 30 parts per million (at 3 percent oxygen, dry) and carbon monoxide emissions shall not exceed 400 parts per million (at 3 percent oxygen, dry).

Schedule:

The APCD anticipates adopting the proposed Rule 360 in the 2001 to 2003 time frame with full implementation within one year from its adoption to allow for a sale-through clause.

Emission Reduction Summary:

NO_x Planning Emission Inventory[1]	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.3930	0.4062	0.4226
Projected Emission Reductions	0.0033	0.0068	0.0133
Projected Emissions After Control	0.3898	0.3994	0.4093

[1]Emissions from on-shore sources only.

OCS - NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0005	0.0005	0.0005
Projected Emission Reductions	0.0000	0.0000	0.0001
Projected Emissions After Control	0.0005	0.0005	0.0005

Control Measure Cost-Effectiveness:

According to the August 1999, Ventura County APCD staff report for their large water heater and small boiler rule:

> Over a range of sizes, the cost-effectiveness for gas-fired equipment varies from $5,333 to $13,393 per ton of NO_x reduced, with many results just under $10,000 per ton reduced. This is consistent with the APCD's cost-effectiveness guideline of $18,000 per ton of NO_x reduced.

In addition, the Ventura County APCD staff report shows the cost of low-NO_x burners (w/o cost savings from heat recovery) to be:

HEAT INPUT (MMBtu/hr)	ADDITIONAL COST
135,000	$865
150,000	$213
300,000	$2,131
400,000	$2,520
500,000	$3,167
750,000	$6,351

The South Coast AQMD staff report for their large water heater and small boiler rule indicates the cost of new burners for units in the 400,000 to 2 MMBtu per hour range is $4,000 per unit (1997 dollars).

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-3.
- 1991 Air Quality Attainment Plan: N-XC-2.
- 1993 Rate-of-Progress Plan: N/A
- 1994 Clean Air Plan: N-XC-2.
- 1998 Clean Air Plan: N-XC-2.

References:

- SBCAPCD, Final Santa Barbara County 1989 Air Quality Attainment Plan - Federal Ozone Standard, South County, Appendix C, May, 1989.
- SBCAPCD, Further Study Report for Large Water Heaters and Small Boilers, October 11, 2000.
- Parker Boiler Company, L.A., CA, Parker Boiler Sales Brochure, September 1994.
- VCAPCD, Staff Report for Rule 74.11.1, Large Water Heaters and Small Boilers, August 31, 1999.
- VCAPCD, Rules and Regulations, Rule 74.11.1, Large Water Heaters and Small Boilers, September 14, 1999.
- SCAQMD, Proposed Rule 1146.2, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers, December 12, 1997.
- SCAQMD, Rules and Regulations, Rule 1146.2, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers, January 9, 1998.

B.3.8 Rule 361 (N-XC-4) - Small Industrial and Commercial Boilers, Steam Generators, and Process Heaters (2 MMBtu/hr to < 5 MMBtu/hr)(New)

Source Categories:

SCC#	1-02-006-03	External Combustion Boiler, Industrial, Natural Gas (<10 million British thermal units per hour (Btu/hr))
SCC#	1-03-005-01	External Combustion Boiler, Commercial-Institutional, Distillate Oil, No. 1 and No. 2
SCC#	1-03-006-03	External Combustion Boiler, Commercial-Institutional, Natural gas (<10 MMBtu/hr)
SCC#	1-03-007-01	External Combustion Boiler, Commercial-Institutional, Process Gas, POTW Digester Gas-fired Boiler
SCC#	3-05-002-06	Industrial Processes, Mineral Production, Asphalt Heater: Natural Gas
SCC#	3-10-004-04	Oil & Gas Production, Process Heaters, Natural Gas
SCC#	3-10-004-05	Oil & Gas Production, Process Heaters, Process Gas
SCC#	3-10-004-14	Oil & Gas Production, Steam Generators, Natural Gas
SCC#	3-10-004-15	Oil & Gas Production, Steam Generators, Process Gas
CES#	58743	Commercial - Natural Gas Combustion - Water Heating
CES#	47142	Industrial, Natural Gas Combustion (Unspecified)
CES#	47159	Commercial, Distillate Oil Combustion (Unspecified)
CES#	47167	Commercial, Natural Gas Combustion (Unspecified)
CES#	47183	Commercial, Residual Oil Combustion (Unspecified)
CES#	58727	Commercial, L.P.G. Combustion
CES#	66795	Industrial, L.P.G. Combustion
CES#	66803	Industrial, Distillate Oil Combustion (Unspecified)
CES#	83071	Industrial, Residual Oil Combustion (Unspecified)

Source Characteristics:

Operators burn fossil fuels in boilers, steam generators, and process heaters to transfer heat from combustion gases to water or other fluids. The only significant emissions to the atmosphere from these units in normal operation, regardless of the fluid being heated or vaporized, are those

resulting from the combustion of the fuel. Differences in design and operation of these devices can affect their production of air contaminants.

The design of a boiler, steam generator, or process heater is similar. They consist of a burner, firebox, heat exchanger, and a means of creating and directing a flow of gases through the unit.

The combustion of fuel and air in these units cause the formation of nitric oxide (NO). In uncontrolled units, the NO is emitted to the air along with other products of combustion in the flue gas. Smaller amounts of nitrogen dioxide (NO_2) form in the combustion process, and some NO oxidizes to NO_2 in the stack.

The formation of NO by combustion processes is governed primarily by (1) the chemically bound nitrogen content of the fuel, (2) the oxygen concentration of the flame, (3) the temperature of the flame (thermal NO_x), and (4) the length of time that the combustion gases are held at the flame temperature.

Control Methods:

The same control techniques in use for equipment 5 MMBtu per hour or greater subject to Rule 342 emission limits will work for units less than 5 MMBtu per hour. The South Coast AQMD and Ventura County APCD have required NO_x controls for combustion equipment in this class since the early nineties.

The least costly NO_x emission control techniques for boilers, steam generators, and process heaters can be broken down into two methods: (1) retrofitting of low-NO_x emitting burners, (2) retrofitting of flue-gas-recirculation systems. These control methods are discussed below.

Low-NO_x Burners

These burners are designed to control the combustion process with controlled air/fuel mixing and increased heat dissipation to minimize NO_x formation. The low-NO_x burners for atmospheric boilers actually prevent the formation of thermal NO_x. The low-NO_x burners for forced-draft units use a portion of the flue gas in a staged combustion process to decrease NO_x emissions.

Flue Gas Recirculation (FGR)

This is a combustion modification that involves introducing part of the flue gas into the combustion zone to limit oxygen and peak temperatures, thus lowering NO_x levels. Currently, FGR is the only technology available for reducing NO_x emissions from forced-draft burners. Manufacturers refer to the addition of external recirculation equipment to an existing unit as FGR. Replacement burners with internal or built-in flue gas recirculation capability are referred to as low-NO_x burners.

The District anticipates that most manufacturers already have low-NO_x burners available for newer equipment (i.e., less than 10 years old) and that these burners can be installed relatively easily. For older equipment, complete replacement with complying equipment may be less expensive than trying to retrofit the existing equipment.

Staff anticipate that Rule 361 will be similar to the South Coast AQMD Rule 1146.1. Concurrent with the Rule 361 adoption process, the Santa Barbara County APCD intends to modify the permit exemption (Rule 202.G.1) from less than 5 MMBtu per hour to less 2 MMBtu per hour. A Rule 202 amendment is necessary to ensure that the smaller units comply with Rule 361 through the permitting and reevaluation processes.

If the APCD adopts a rule similar to the South Coast AQMD 1146.1, owners or operators of low operating capacity equipment (emission units with annual heat inputs less than 1.8 billion British thermal units per year) can comply with Rule 361 by:

1. Installing a non-resettable, totalizing fuel meter for each fuel that demonstrates that the unit(s) operate with an annual heat input below 1.8 billion British thermal units

per calendar year; and

2. Operating the equipment in a manner that maintains stack-gas oxygen concentrations at less than or equal to 3 percent on a dry basis, or

3. Tuning the emission unit at least twice per year, (at intervals from 4 to 8 months apart) in accordance with the Rule procedure (to be described in Attachment 1 to the rule) or the unit manufacturer's specified tuneup procedure. If a different tuneup procedure from that described in the rule's attachment 1 is used then a copy of this procedure shall be kept on site. If the unit does not operate throughout a continuous six-month period within a calendar year, only one tuneup is required for that calendar year. The owner or operator of any unit(s) who chooses to comply with Rule 361 by following the tuneup requirements shall maintain a record for a period of two years verifying that the tuneup has been performed. No tune-up is required during a calendar year for any unit that is not operated during that calendar year; this unit may be test fired to verify availability of the unit for its intended use but once test firing is completed it shall be shutdown. Records of test firings shall be maintained for a period of two years, and shall be made accessible upon request from an authorized District representative; or

4. Meeting the emission limits specified below:

   No more than 30 ppm of NO_x emissions or 0.037 pound NOx per million Btu of heat input, as specified in the Permit to Operate, and no more than 400 ppm of carbon monoxide. For each unit, a selection must be indicated in the application for Authority to Construct and Permit to Operate between the ppm NOx or pounds of NO_x per million British thermal units heat input compliance option.

For high operating capacity units, the owner or operator shall demonstrate that the equipment does not exceed 30 ppm of NO_x emissions or 0.037 pound NOx per million Btu of heat input, as specified in the Permit to Operate, and no more than 400 ppm of carbon monoxide. For each unit, the owner or operator will choose between the ppm NO_x limit or pounds of NO_x per million

British thermal units heat input limit compliance option in the application for the Authority to Construct and Permit to Operate. The rule shall require an initial demonstration by a source test. Assuming the source test shows the unit complies with the emission limits, the rule would require only one initial source test.

Staff estimate that the number of boilers, steam generators, and process heaters that will be subject to Rule 361 will be approximately 300. Based on information from the South Coast AQMD staff, approximately 50 percent of the units complied with Rule 1146.1 by performing the biannual tuning and the others were retrofitted with complying burners. Table B.3.8-1 shows the units in the 1999 Santa Barbara County APCD stationary source inventory that could be affected by Rule 361.

TABLE B.3.8-1. COMBUSTION UNITS IN THE 1999 STATIONARY SOURCE INVENTORY THAT COULD BE AFFECTED BY RULE 361

COMPANY DESCRIPTION	FACILITY DESCRIPTION	DEVICE NAME	SIZE (MMBtu/hr)	ANNUAL FUEL CONSUMPTION (MMScf/yr)	NOx EMISSIONS (TPY)
ExxonMobil Production Company	Pacific Offshore Pipeline	Sulfinol Teg Reboiler (B-251)	2.10	5.53	0.28
Gato Corporation	Tognazzini Lease (Gato)	Heater Treater	3.50	4.19	0.21
Gato Corporation	Tognazzini Lease (Gato)	Boiler	4.25	12.60	0.63
Goleta Sanitary District	Goleta Sanitary District	Boiler #1	2.09	1.17	0.04
Goleta Sanitary District	Goleta Sanitary District	Boiler #2	2.09	15.23	0.46
Greka SMV, Inc.	Battles Lease, SMV Field	Heater Treater	3.00	6.38	0.3
Greka SMV, Inc.	Jim Hopkins Lease	Heater Treater	4.00	0.86	0.04
Greka SMV, Inc.	Bell Lease (Cat Canyon)	Boiler: H-117	4.00	6.47	0.35
Greka SMV, Inc.	Bell Lease (Cat Canyon)	Boiler: H-118	4.00	6.47	0.35
Greka SMV, Inc.	Union Sugar Lease	Heater Treater	4.00	20.30	1.16
Richards Oil Company	Peshine Lease/Tompkins	Boiler	4.25	11.92	0.64
Santa Maria Refining Company	Santa Maria Refining Company	Asphalt Heater: (Ah-1)	4.5	72.01	3.67
Santa Maria Refining Company	Santa Maria Refining Company	Asphalt Heater: (Ah-2)	4.5	72.22	3.68
Santa Maria Refining Company	Santa Maria Refining Company	Asphalt Heater: (Ah-3)	3.5	71.83	3.66

COMPANY DESCRIPTION	FACILITY DESCRIPTION	DEVICE NAME	SIZE (MMBtu/hr)	ANNUAL FUEL CONSUMPTION (MMScf/yr)	NOx EMISSIONS (TPY)
Santa Maria Refining Company	Dominion Lease	Heater Treater	2.00	7.85	0.43
Santa Maria Refining Company	Santa Maria Refining Company	Boiler: (B-4)	4.00	16.02	0.82
Santa Maria Refining Company	Santa Maria Refining Company	Boiler: (B-3)	4.00	56.65	2.89
Greka SMV, Inc.	Fullerton Lease	Boiler	4.88	10.09	0.5
Greka SMV, Inc.	Fullerton Lease	Boiler	4.95	0.39	0.02
Sierra Resources, Incorporated	Soladino Fee Lease	Steam Boiler	4.50	16.33	0.84
Southern California Gas Company	La Goleta	Heater: Hot Oil (Plant #14)	4.00	1.43	0.07
United States Penitentiary	Federal Correctional Inst. (Furn. Factory)	Fci Boiler #1	4.18	9.05	0.47
United States Penitentiary	Federal Correctional Inst. (Furn. Factory)	Fci Boiler #2	4.18	9.76	0.51
Venoco, Inc.	Ellwood O & G Processing Facility	Heater Treater (H-203)	4.40	0.98	0.07
Venoco, Inc.	Ellwood O & G Processing Facility	Heater Treater (H-201)	4.40	1.12	0.08
Venoco, Inc.	Carpinteria Gas Plant	Therminol Heater (C-81)	4.99	13.77	0.77
Vintage Petroleum, Inc.	Bradley Lands/Bradley Consolidated Lease	Heater Treater, O-7	2.00	1.81	0.09
Vintage Petroleum, Inc.	Chamberlin Lease	Tank Heater #2	2.51	2.31	0.12
Vintage Petroleum, Inc.	Chamberlin Lease	Tank Heater #3	2.51	2.31	0.12
Vintage Petroleum, Inc.	Davis Lease	Tank Heater #2	2.51	6.38	0.33
Vintage Petroleum, Inc.	Davis Lease	Tank Heater #3	2.51	6.38	0.33
Vintage Petroleum, Inc.	United California Lease	Heater Treater: UCAL2	3.00	8.19	0.41
Vintage Petroleum, Inc.	Los Flores Lease (Vintage)	Boiler/Tank Heater	3.75	1.55	0.08
Vintage Petroleum, Inc.	Los Flores Lease (Vintage)	Heater Treater	3.75	3.22	0.17
Vintage Petroleum, Inc.	Bradley Lands/Bradley Consolidated Lease	Heater Treater / Desander	4.00	2.41	0.12
Vintage Petroleum, Inc.	United California Lease	Heater Treater / Desander	4.00	6.12	0.31
Vintage Petroleum, Inc.	Bradley Lands/Bradley Consolidated Lease	Heater Treater / Desander	4.00	6.74	0.34
Vintage Petroleum, Inc.	United California Lease	Heater Treater / Desander	4.00	10.74	0.54
Vintage Petroleum, Inc.	Bradley Lands/Bradley Consolidated Lease	Boiler	4.25	2.62	0.13
Vintage Petroleum, Inc.	Bradley Lands/Bradley	Heater Treater	4.90	4.53	0.23

COMPANY DESCRIPTION	FACILITY DESCRIPTION	DEVICE NAME	SIZE (MMBtu/hr)	ANNUAL FUEL CONSUMPTION (MMScf/yr)	NOx EMISSIONS (TPY)
	Consolidated Lease				
Vintage Petroleum, Inc.	Chamberlin Lease	Heater Treater	4.91	6.49	0.34
Vintage Petroleum, Inc.	Davis Lease	Heater Treater	4.91	20.13	1.06
Vintage Petroleum, Inc.	United California Lease	Boiler	4.94	9.66	0.49
			TOTALS	552.20	28.15

In lieu of adopting a rule similar to the South Coast AQMD, the APCD could adopt a point-of-sale type rule. This approach would be similar to the existing Santa Barbara County APCD Rule 352, Natural Gas-Fired Fan-Type Central Furnaces and Residential Water Heaters. Manufacturers of equipment subject to Rule 352 are accustomed to getting their equipment certified because the South Coast AQMD, Bay Area AQMD, Ventura County APCD, and numerous other air districts also require that the equipment be certified. For larger units subject to Rule 361, there is no pre-existing certification program. Therefore, if the APCD takes this approach, staff would need to oversee an equipment certification program. The Santa Barbara County APCD plans to decide during the rulemaking process whether Rule 361 should be a point-of-sale or a retrofit type rule.

Schedule:

The APCD anticipates adopting the proposed Rule 361 during the 2007 to 2009 period with full implementation 2 years after the date of rule adoption.

Emission Reduction Summary:

NO_x Planning Emission Inventory[1]	**2005 (Tons/Day)**	**2010 (Tons/Day)**	**2015 (Tons/Day)**
Projected Baseline Emissions Before Control	0.4809	0.4963	0.5155
Projected Emission Reductions[2]	0.0000	0.0000	0.0028
Projected Emissions After Control	0.4809	0.4963	0.5127

[1]Emissions from on-shore sources only.

OCS - NO_x Planning Emission Inventory	2005 (Tons/Day)	2010 (Tons/Day)	2015 (Tons/Day)
Projected Baseline Emissions Before Control	0.0007	0.0007	0.0007
Projected Emission Reductions	0.0000	0.0000	0.0000
Projected Emissions After Control	0.0007	0.0007	0.0007

[2]Emission reductions are based on Rule 361 being a point-of-sale type rule.

Control Measure Cost-Effectiveness:

According to a May 11, 1993 Ventura County APCD Final Staff Report for Rule 74.15.1, Boilers, Steam Generators, and Process Heaters, the cost-effectiveness ranges from a cost savings of roughly $5,800 per ton of NO_x reduced to a cost of about $21,000 per ton of NO_x reduced.

The 1992 Santa Barbara County APCD staff report for Rule 342 indicates cost estimates for retrofitting and maintaining low-NO_x systems, guaranteed to meet the 30 ppmv standard for a 5 MMBtu per hour unit, is $26,000.

According to information from the Vandenberg Air Force Base ENVVEST program for two 4.25 MMBtu/hr boiler retrofits, the cost-effectiveness was about $6,000 per ton of NO_x reduced. In addition, data from the APCD's Innovative Technology Group's work on retrofitting nursery boilers in the 4 to 5 MMBtu/hr range indicates the cost-effectiveness ranged from about $3,000 to $4,000 per ton of NO_x reduced.

Control Measure Efficiency: Please refer to Section B.6.

Implementing Agency: SBCAPCD

Attainment Plan References:

- 1989 Air Quality Attainment Plan: N-5.
- 1991 Air Quality Attainment Plan: N-XC-4.
- 1993 Rate-of-Progress Plan: N/A

- 1994 Clean Air Plan: N-XC-4.
- 1998 Clean Air Plan: N-XC-4.

References:

- SBCAPCD, Final Santa Barbara County 1989 Air Quality Attainment Plan - Federal Ozone Standard, South County, Appendix C, May, 1989.
- VCAPCD, Final Staff Report for Rule 74.15.1, Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters, May 11, 1993.
- SBCAPCD, Staff Report for Rule 342, Control of Oxides of Nitrogen (NO_x) from Boilers, Steam Generators and Process Heaters, February 18, 1992.
- SBCAPCD, Further Study Report for Boilers, Steam Generators, and Process Heaters Equal to or Greater than 1 MMBtu/hr, But Less Than 5 MMBtu/hr, January 5, 2000.
- SBCAPCD, Cooperative Emission Reduction Program, 1998 – 2000.
- Tetra Tech, Inc., Final ENVVEST Boiler ERI & CF Study, November 25, 1997.

B.4. EMISSION CONTROL MEASURES FOR FURTHER STUDY

B.4.1 Rule 333 (N-IC-1) - Control of Emissions from Reciprocating Internal Combustion Engines (Further Study)

Source Characteristics:

The N-IC-1 control measure reduces NO_x emissions from permitted spark-ignited engines that have brake horsepower (bhp) ratings of 50 or greater. The Board adopted Rule 333 in 1991 to implement the N-IC-1 control measure. After the adoption of Rule 333, many engine owners derated their engines to be less than 50 bhp, thereby making the engines exempt from the Rule 333 control requirements. The APCD wants to perform a further study on engines rated less than 50 bhp under conditions typically found in Santa Barbara County to determine the feasibility of reducing NO_x emissions in a cost-effective manner.

Most of the Santa Barbara County's spark-ignited engines rated less than 50 bhp burn untreated field gas. In addition, many of these engines provide power to rod pumps (oil wells) that have cyclic (quickly varying) loads. The unstable fuel quality and/or cyclically-loaded operating modes may limit the types of control techniques available for these engines.

The 1999 APCD inventory indicates that engines in the 40 to 49.99 bhp range have the following characteristics and statistical information:

1. There is a total of 375 engines,
2. 360 engines are associated with oil and/or gas production,
3. 238 engines operated in excess of 200 hours per year,
4. 237 of the engines that operated in excess of 200 hours per year are associated with oil and gas production, they are all spark-ignited engines, and they caused NO_x emissions of approximately 511 tons per year.

Table B.4.1-1 shows additional details on the oil and gas production engines that operated in excess of 200 hours per year and on their possible emission reductions.

TABLE B.4.1-1. STATISTICAL DATA ON OIL AND GAS PRODUCTION ENGINES IN THE 40 TO 49.99 BRAKE HORSEPOWER RANGE THAT OPERATED IN EXCESS OF 200 HOURS PER YEAR

ENGINE OPERATING MODE[1]		POTENTIAL NO_x EMISSION REDUCTIONS (TPY)[2]		
HEAVILY-LOADED	LIGHTLY-LOADED	HEAVILY-LOADED	LIGHTLY-LOADED	TOTAL
158	79	265.29	24.94	290.23

Based on the above statistical data, there is a significant potential for reducing NO_x emissions from these engines that are rated less than 50 bhp.

Control Methods:

Operators have controlled engines rated less than 50 bhp in the past (e.g., Unocal Corporation's Hearing Board Variance 28-93R). However, since that time, the Battles Gas Plant has shut down. Due to the shutdown of this facility, many engines that had been burning treated fuel gas from the Battles Gas Plant have burned untreated fuel gas. Operators claim that the burning of untreated fuel gas increases NO_x emissions and makes control of the cyclic and non-cyclic engines much more difficult, if not impossible, in a cost-effective manner. The APCD is unaware of any source test data that supports increasing the NO_x emission factor of 2000 pounds per million standard cubic feet of gas or the ROC factor of 300 pounds per million standard cubic feet of gas. These emission factors were established by the Hearing Board (Order 4-89).

[1] Staff assumed that engines having average fuel input rates that were at or above 80 percent of their maximum design fuel input rates were operating in a *heavily-loaded* mode and engines operating below 80 percent of their maximum design fuel input rates were operating in a *lightly-loaded* mode.

[2] The APCD used a 76.55% control efficiency factor for heavily-loaded engines; the same control efficiency factor that has been achieved by engines in the SCC 2-02-002-02 category. For lightly-loaded engines, staff used a 40% control efficiency factor based on anticipated percent control from lean-burn tuning of rich-burn engines. The calculations assumed that there would be an 80% compliance efficiency for heavily- and lightly-loaded engines.

Staff believe that reducing NO_x emissions from engines rated less than 50 bhp is feasible because sources have controlled such engines in the past and a manufacturer of prestratified control (PSC) systems markets PSC equipment for engines rated less than 50 bhp. In addition, Cal-Maria has demonstrated that the Spiral Spin Technologies (AKA Advanced Shielding Technologies) system reduces NO_x emissions from a cyclically-loaded engine (reference Petro Chem Environmental Services, Inc., May 18, 1993 Source Test).

The further study should explore whether the burning of untreated fuel gas increases NO_x and/or ROC emissions and the availability of cost-effective control techniques for cyclically and noncyclically-loaded engines that burn untreated fuel gas. In addition, staff anticipate that the further study will be performed on in-situ engines burning untreated fuel gas, under cyclic and noncyclic loads. The APCD will review the revised control measure's further study status during the 2003 update to the State's Comprehensive Plan.

B.4.2 Rule 345 (N-XC-12) - Direct-Fired External Combustion Units (Further Study)

Source Characteristics:

Direct-fired external combustion units burn fossil fuels and commingle the products of combustion with the material being heated. Examples of direct-fired external combustion units include kilns and furnaces used in diatomaceous earth processing plants and rotary dryers used in asphalt concrete batch plants. These units cause emissions to the atmosphere from fuel combustion and material processing. Differences in the design, operation, and the materials the units handle affects their production of air contaminants.

The combustion of contaminants in the feed material, fuel, and air in these units cause the formation of nitric oxide (NO). In uncontrolled units, the NO is emitted to the air along with other products of combustion in the flue gas. Smaller amounts of nitrogen dioxide (NO_2) form in the combustion process, and some NO oxidizes to NO_2 in the stack.

The formation of NO by combustion processes is governed primarily by (1) the chemically bound nitrogen content of the fuel and the feed material, (2) the oxygen concentration of the

flame, (3) the temperature of the flame, and (4) the length of time that the combustion gases are held at the flame temperature.

The typical dryer or calcining system adds feed material to the elevated end of a rotating, refractory-lined, cylindrical kiln. The feed gradually tumbles to the high-temperature end of the kiln and the main combustion zone, sometimes referred to as the *burn zone.* The tilted design of the kiln allows gravity to assist the motion of the material while hot exhaust gases move upward and exit the elevated end of the kiln.

The burn zone of the kiln requires very high temperatures. Low-NO_x burners reduce the thermal NOx by lowering the flame temperature through use of excess air, water injection, staged combustion, flue gas recirculation, or other modified flame designs. While these methods work well with indirect-fired units, there are only a few burner retrofits that are suited for direct-fired units and these were installed to meet Best Available Control Technology requirements on asphalt plant dryers.

Control Methods:

New technology that operators have installed on asphalt plant aggregate dryers employ low-NO_x burners using an internal zone of intense recirculation with staged fuel injection. APCD staff need to perform a further study to determine if the retrofitting of similar technology on the uncontrolled dryers, furnaces, and rotary kilns in Santa Barbara County is feasible and cost-effective. The APCD will review this control measure's further study status during the 2003 update to the State's Comprehensive Plan.

B.4.3 R-GN-2 - Wineries and Breweries

Staff investigated the feasibility of developing the R-GN-2 control measure. The findings of the investigation indicate:

1. Neither USEPA nor CARB have issued BACT, RACT, or BARCT determinations for controlling emissions from breweries or wineries.
2. The breweries in Santa Barbara County produce low volumes.

3. CARB has proposed that winery controls be applied only to fermentation tanks of 50,000 gallons capacity and over.
4. There are currently no wineries in the County with fermentation tanks that are 50,000 gallons capacity or greater.

The APCD recommends this control measure for deletion until such time that the USEPA and/or CARB propose controls for the equipment or there is a substantial proportion of wineries in the County using fermentation tanks of 50,000 gallons capacity or greater.

The Air Resources Board, however, has requested that staff retain this measure in the further study category in case emissions from these sources increase, or in response to control technology advancements. According to ARB, the growth of these industries suggests that the need for, and availability of additional controls should be reevaluated periodically.

Reference:

SBCAPCD, Further Study Report for Wineries and Breweries, July 24, 2000.

B.4.4 R-PM-4 - Pleasure Craft Fuel Transfer

Pleasure craft fuel transfer refers to fueling pleasure or recreational boats from gasoline storage tanks. Like the loading of land vehicle fuel tanks, filling boat fuel tanks with gasoline displaces gasoline vapors, which contain reactive organic compounds. Pleasure craft fuel transfer facilities use vapor recovery systems during the loading of the stationary gasoline storage tank (Phase I), but no controls when loading the craft's fuel tank (Phase II).

Staff investigations showed:

1. CARB has not certified any Phase II vapor recovery systems for boat fueling.
2. The requirement for a boat fueling vapor recovery system would probably require significant research and development and approval from the Fire Marshal and the Coast Guard.

3. Due to the need for long hoses to reach the boat's fuel tanks and the tank's fill tubes not being standardized, the feasibility of applying motor vehicle fueling vapor recovery system technology to boat fueling is questionable.

Until such time that the USEPA and/or CARB provide guidelines on controlling VOC emissions from boat fueling, the APCD recommends deleting control measure R-PM-4 from the CAP.

The Air Resources Board, however, has requested that staff retain this measure in the further study category in case emissions from these sources increase, or in response to control technology advancements. According to ARB, this measure should be retained pending technology development and ARB action in this category.

Reference:

SBCAPCD, Further Study Report for Pleasure Craft Fuel Transfer, June 20, 2000.

B.4.5 Revised Rule 320 (R-SL-1) - Petroleum Solvent Dry Cleaning

There are currently four petroleum solvent dry cleaning machines in Santa Barbara County. These machines have capacities ranging from 40 to 55 pounds per load. The USEPA New Source Performance Standard for petroleum solvent dry cleaning machines applies to machines that have a capacity of 84 pounds per load or greater. The USEPA had proposed development of a *maximum achievable control technology* (MACT) for this category. However, recent USEPA information indicates they may be delisting the petroleum solvent dry cleaning category from their MACT development work.

Staff analysis indicates that the minimal emissions from petroleum solvent dry cleaners in Santa Barbara County do not warrant revisions to Rule 320. Therefore, the APCD recommends that the control measure R-SL-1 language suggesting revisions to Rule 320 be deleted until such time that the use of the petroleum solvent dry cleaners increases in Santa Barbara County or ARB/CARB issue a guidance document suggesting that more strict requirements are appropriate.

The Air Resources Board, however, has requested that staff retain this measure in the further study category in case emissions from these sources increase, or in response to control technology advancements. According to ARB, portions of this industry currently using perchloroethylene may convert to petroleum solvents in an effort to reduce toxic emissions.

Reference:

- SBCAPCD, Further Study Report on Petroleum Dry Cleaners, July 24, 2000.

USEPA Information on the possible delisting of Petroleum Solvent Dry Cleaning from the MACT development process (http://www.epa.gov/ttn/uatw/mactupd.html), last updated November 8, 2000.

B.5. EMISSION CONTROL MEASURES RECOMMENDED FOR DELETION

B.5.1 R-GN-6 - Wastewater Treatment Facilities

The 1998 CAP indicated there were two ways of controlling ROC emissions from wastewater facilities [aka publicly owned treatment works (POTW)]:

1. Reducing the ROC content of wastewater influent before it reaches the wastewater treatment facilities.
2. Capturing the ROC at the wastewater treatment facilities and controlling them through the use of control equipment such as carbon adsorption or thermal oxidation.

Staff investigations indicated:

1. Reducing the presence of ROC in the wastewater is already accomplished through:
   a. The regulations on wastewater that are enforced by the wastewater treatment plant operators.

b. The reductions of ROCs in consumer products (e.g., caulks, paints, stains, and cleaning solvents) because product clean-up operations cause residual materials to be discharged to the sewers.

2. CARB has not developed a RACT/BARCT determination for POTW emissions.
3. There are no known control techniques for POTWs that have been achieved in practice.

Based on the lack of any substantive emission control techniques, the APCD recommends that the R-GN-6 control measure be deleted from the CAP.

Reference:

- SBCAPCD, Further Study Report for Wastewater Treatment Plants, November 8, 1999.

B.5.2 R-PG-2 - Process Turnarounds

Process turnaround is an industry colloquialism to describe the cycle of equipment shut down, maintenance, and restart. Operators of refineries and oil and gas processing facilities may depressurize and/or purge equipment during process turnarounds. When performing a process turnaround on equipment that handle ROCs, the operator may vent ROCs to atmosphere.

Staff found that the requirements in existing permit conditions; Rule 332, Petroleum Refinery Vacuum Producing Systems, Wastewater Separators and Process Turnarounds; and Rule 343, Petroleum Storage Tank Degassing, adequately cover most venting operations. In addition, the venting operations that are not covered by the aforementioned documents have insignificant emissions. Therefore, the APCD recommends deleting control measure R-PG-2 from the CAP.

Reference:

- SBCAPCD, Further Study Report for Process Turnarounds, June 19, 2000.

B.5.3 R-PM-5 - Liquid Natural and Petroleum Gas Truck Loading

Liquefied petroleum gas (LPG) contains reactive organic compounds that may be released during the loading and unloading of tanker trucks. This control measure would require balance systems to collect displaced vapors during truck loading and unloading.

The APCD analysis indicated there would be no ROC emission reductions from this control measure. This is because the facilities are already equipped with vapor balance systems as required by Title 58 of the National Fuel Gas Code. The APCD recommends deleting R-PM-5 from the CAP.

Reference:

- SBCAPCD, Further Study Report for Liquid Petroleum Gas Truck Loading Operations, January 3, 2000.

B.5.4 N-IC-7 - Lawn and Garden Equipment

Landscapers, gardeners, and residents use nonroad (federal term) or off-road (state term) engines to perform lawn and garden maintenance. Use of engines to power the equipment causes ROC emissions from storage, transfer, and spillage of the fuel and ROC, CO, NO_x, SO_x, and PM emissions from fuel combustion.

The APCD is preempted by state law from regulating mobile sources including lawn and garden equipment. However, in lieu of a rule, the APCD may want to consider sponsoring a lawn mower buyback program through the APCD's Innovative Technology Group.

Since state law preempts the APCD from adopting the N-IC-7 control measure, staff recommend that it be deleted from the CAP.

Reference:

- SBCAPCD, Further Study Report for Lawn and Garden Equipment, February 28, 2000.

B.5.5 N-IC-8 - Airport Ground Support Equipment

Control measure N-IC-8 should be deleted for two reasons. First, ground support equipment emissions are essentially minimal - the busiest airport in the County, the Santa Barbara Municipal Airport, is estimated to have 4 tons per year of ozone precursors from ground support equipment. Second, state law precludes the APCD from directing regulating ground support equipment. Controlling these sources is essentially limited to voluntary replacement programs that can most effectively be accomplished through the efforts of the APCD's Innovative Technology Group. Staff recommend that the APCD delete control measure N-IC-8 from the CAP.

Reference:

- SBCAPCD, Further Study Report for Airport Ground Support Equipment, May 2000.

B.5.6 N-XC-7 - Tail Gas Incinerators

Petroleum oil and gas refining and processing facilities use tail gas incinerators to oxidize low heating value tail gases from sulfur removal units. The oxidation process converts reduced sulfur compounds, primarily hydrogen sulfide and carbonyl sulfide, into sulfur oxides, (SOx), and also converts any trace hydrocarbon compounds in the tail gas into carbon dioxide (CO_2) and water.

Based on the lack of any substantive emission reductions from the N-XC-7 control measure for units in Santa Barbara County, staff recommends that the APCD delete the control measure from the CAP.

Reference:

- SBCAPCD, Further Study Report for Tail Gas Incinerators, December 9, 1999.

B.6. CONTROL MEASURE EFFICIENCY

Section B.6 provides a control measure efficiency for each *adopted* (Section B.2) control measure and each *proposed* (Section B.3) control measure. A control measure efficiency indicates the control measure's ability to achieve emission reductions. The higher the control measure efficiency, the more emission reductions it achieves.

Staff use control measure efficiencies when performing emission forecasts. The APCD relies on emission forecasts to determine compliance with the attainment demonstration and rate-of-progress requirements. Therefore, control measure efficiencies are of central importance to this 2001 CAP and the APCD.

Table B.6 presents control measure efficiency data for 1999, 2005, 2010, and 2015, broken down by SCC for stationary source emissions and CES for area-wide source emissions.

The APCD calculates the control measure efficiency by employing the following equation:

CNTRL MEAS EFF = (CNTRL EQ EFF)(1 - EX EQ)(IMP)(COMP EFF)

Where:

CNTRL MEAS EFF	=	Control Measure Efficiency (percent)
CNTRL EQ EFF	=	Control Equipment Efficiency (percent)
EX EQ	=	Exempt Equipment (percent)
IMP	=	Implemented (percent)
COMP EFF	=	Compliance Efficiency (percent)

The following provides details on each of the factors found in the above equation.

- **Control Measure Efficiency or CNTRL MEAS EFF (percent):** This derived value indicates the efficiency of a control measure. The higher the control measure efficiency, the more emission reductions the control measure achieves.

- **Control Equipment Efficiency or CNTRL EQ EFF (percent):** This figure is either the efficiency of an emission control program or the control equipment efficiency for a specific control measure.

- **Exempt Equipment or EX EQ (percent):** This figure represents the emissions sources that are exempt from the control measure. Many rules have de minimis operating or processing levels below which a subject emission source is exempt from some or all regulation.

- **Implemented or IMP (percent):** This figure reflects the degree of rule implementation. Rather than require immediate compliance for all sources, some rules have phased-in requirements. This parameter reflects anticipated phase-in provisions.

- **Compliance Efficiency or COMP EFF (percent):** This factor reflects the percent of the time that the equipment operates in compliance with the rule provisions. Due to a number of reasons (e.g., equipment failure, lack of maintenance), the control equipment may not achieve the minimum efficiency required by the rule. The compliance efficiency factor reflects the fact that pollution control equipment will not always be working as designed 100 percent of the time. Except for rare instances, the APCD assumes the compliance efficiency to be 80 percent in conformance with the recommendation of the USEPA contained in the post-1987 ozone/CO policy. USEPA recommends that a baseline assumption of 80 percent rule effectiveness be applied to all regulated source categories in the inventory until a local source-specific evaluation can be completed to ascertain the actual effectiveness of the measure. The APCD has completed an actual compliance effectiveness for control measures R-PM-1, R-PM-2, and R-PM-3 (Rule 316, Storage and Transfer of Gasoline).

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
RULE 316	**STORAGE AND TRANSFER OF GASOLINE**											
R-PM-1	46466	Bulk Plants/Terminals - Breathing Losses	ROC	89.98	0.00	100	100	100	80	71.98	71.98	71.98
R-PM-1	46482	Bulk Plant Tank Car and Truck Working Losses	ROC	94.05	0.00	100	100	100	80	75.24	75.24	75.24
R-PM-2	46474	Bulk Plants/Terminals - Working Losses	ROC	95.36	0.00	100	100	100	80	76.29	76.29	76.29
R-PM-2	46532	Gasoline Dispensing Tanks - Working Losses	ROC	98.89	5.00	100	100	100	80	75.16	75.16	75.16
R-PM-2	46557	Gasoline Dispensing Tanks - Breathing Losses	ROC	96.46	5.00	100	100	100	80	73.31	73.31	73.31
R-PM-3	46540	Vehicle Refueling - Vapor Replacement	ROC	91.19	5.00	100	100	100	80	69.30	69.30	69.30
R-PM-3	46565	Vehicle Refueling – Spillage	ROC	31.14	0.00	100	100	100	80	24.91	24.91	24.91
RULE 320	**PETROLEUM SOLVENT DRY CLEANERS**											
R-SL-1	46797	Dry Cleaning - Petroleum Solvent	ROC	5.00	0.00	100	100	100	80	4.00	4.00	4.00
RULE 321	**SOLVENT CLEANING OPERATIONS**											
R-SL-2	4-01-002-99	Degreasing - Other Not Classified: Open-top Vapor Degreasing	ROC	52.00	5.00	100	100	100	80	39.52	39.52	39.52
R-SL-2	4-01-003-98	Cold Cleaning/Stripping	ROC	52.00	5.00	100	100	100	80	39.52	39.52	39.52
R-SL-2	4-01-003-07	Degreasing - Cold Cleaning (Batch, Conveyor, Spray Gun) - Isopropyl Alcohol	ROC	52.00	5.00	100	100	100	80	39.52	39.52	39.52
R-SL-2	83667	Cold Cleaning (Batch, Conveyor, Spray Gun) - Alcohols	ROC	55.00	5.00	100	100	100	80	41.80	41.80	41.80
R-SL-2	83675	Cold Cleaning (Batch, Conveyor, Spray Gun) - Chlorofluorocarbons	ROC	55.00	5.00	100	100	100	80	41.80	41.80	41.80
R-SL-2	83683	Cold Cleaning (Batch, Conveyor, Spray Gun) - Glycol Ethers (Unspecified)	ROC	55.00	5.00	100	100	100	80	41.80	41.80	41.80
R-SL-2	83691	Cold Cleaning (Batch, Conveyor, Spray Gun) - Ketones (Unspecified)	ROC	55.00	5.00	100	100	100	80	41.80	41.80	41.80
R-SL-2	83717	Cold Cleaning (Batch, Conveyor, Spray Gun) - Terpenes (Unspecified)	ROC	67.00	5.00	100	100	100	80	50.92	50.92	50.92
R-SL-2	83725	Cold Cleaning (Batch, Conveyor, Spray Gun) - Toluene/Xylene	ROC	67.00	5.00	100	100	100	80	50.92	50.92	50.92

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
R-SL-2	83741	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Pure Solvents	ROC	55.00	5.00	100	100	100	80	41.80	41.80	41.80
R-SL-2	83758	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Solvent Blend	ROC	55.00	5.00	100	100	100	80	41.80	41.80	41.80
R-SL-2	83766	Vapor Degreasing (Batch, Conveyor) - Chlorofluorocarbons	ROC	52.00	5.00	100	100	100	80	39.52	39.52	39.52
R-SL-2	83774	Vapor Degreasing (Batch, Conveyor) - Dichlorofluoroethane	ROC	52.00	5.00	100	100	100	80	39.52	39.52	39.52
R-SL-2	83824	Vapor Degreasing (Batch, Conveyor) - Misc. Solvent Blend	ROC	52.00	5.00	100	100	100	80	39.52	39.52	39.52
RULE 323	**ARCHITECTURAL COATINGS**											
R-SC-1	46763	Oil Based (general)	ROC	38.61	1.00	100	100	100	21	8.00	8.00	8.00
R-SC-1	85399	Oil Based Primers – Sealers	ROC	16.15	1.00	100	100	100	50	8.00	8.00	8.00
R-SC-1	85407	Oil Based Quick Dry - Primers, Sealers, And Undercoaters	ROC	21.89	1.00	100	100	100	37	8.00	8.00	8.00
R-SC-1	85464	Oil Based Stains – Semitransparent	ROC	39.58	1.00	100	100	100	20	8.00	8.00	8.00
R-SC-1	85472	Oil Based Stains – Opaque	ROC	17.61	1.00	100	100	100	46	8.00	8.00	8.00
R-SC-1	85506	Oil Based Quick Dry – Enamels	ROC	38.20	1.00	100	100	100	21	8.00	8.00	8.00
R-SC-1	85514	Oil Based Lacquer – Clear	ROC	43.42	1.00	100	100	100	19	8.00	8.00	8.00
R-SC-1	85530	Oil Based Flat Coatings	ROC	50.47	1.00	100	100	100	16	8.00	8.00	8.00
R-SC-1	85555	Oil Based Medium Gloss	ROC	42.06	1.00	100	100	100	19	8.00	8.00	8.00
R-SC-1	85597	Oil Based Dry Fog Coatings	ROC	6.53	1.00	100	100	100	80	5.17	5.17	5.17
R-SC-1	85654	Oil Based Industrial Maintenance	ROC	28.27	1.00	100	100	100	29	8.00	8.00	8.00
R-SC-1	85670	Oil Based Roof Coatings	ROC	9.10	1.00	100	100	100	80	7.21	7.21	7.21
R-SC-1	85688	Oil Based Swimming Pool	ROC	42.04	1.00	100	100	100	19	8.00	8.00	8.00
R-SC-1	85712	Oil Based Wood Preservatives - Semitransparent	ROC	31.87	1.00	100	100	100	25	8.00	8.00	8.00
R-SC-1	85811	Water Based Varnish – Clear	ROC	24.78	1.00	100	100	100	33	8.00	8.00	8.00
R-SC-1	85852	Water Based Flat Coatings	ROC	50.48	1.00	100	100	100	16	8.00	8.00	8.00

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
RULE 325	**CRUDE OIL PRODUCTION, SEPARATION & STORAGE**											
R-PT-2	3-06-005-03	Pet. Ind. - Wastewater (WW) Treatment - Process Drains and Wastewater Separators	ROC	95.00	16.67	100	100	100	80	63.33	63.33	63.33
R-PT-2	3-10-001-32	Oil/Gas Prod. - Crude Oil Prod. - Atmospheric Wash Tank (2nd Stage of Gas-Oil Separation): Flashing Loss	ROC	95.00	0.00	100	100	100	80	76.00	76.00	76.00
R-PT-2	3-10-005-06	Oil/Gas Prod. - Liquid Waste Treatment - Oil-Water Separation Wastewater Holding Tanks	ROC	95.22	55.40	100	100	100	80	33.98	33.98	33.98
R-PT-2	4-03-010-10	Fixed Roof Tanks - Crude Oil RVP5 - 67K BBL - Breathing Loss	ROC	95.07	14.29	100	100	100	80	65.19	65.19	65.19
R-PT-2	4-03-010-12	Fixed Roof Tanks - Crude Oil RVP 5: Working Loss (Tank Diameter Independent)	ROC	95.10	16.22	100	100	100	80	63.74	63.74	63.74
R-PT-2	46458	Fugitive Losses - Tanks	ROC	56.00	0.00	100	100	100	80	44.80	44.80	44.80
RULE 326	**STORAGE OF REACTIVE ORGANIC COMPOUND LIQUIDS**											
R-PT-2	4-03-010-10	Fixed Roof Tanks - Crude Oil RVP5 - 67K BBL - Breathing Loss	ROC	95.07	14.29	100	100	100	80	65.19	65.19	65.19
R-PT-2	4-03-010-12	Fixed Roof Tanks - Crude Oil RVP5 - Working Loss	ROC	95.10	16.22	100	100	100	80	63.74	63.74	63.74
R-PT-2	4-03-011-09	Floating Roof Tank - Crude Oil - Standing Loss (67,000 bbls tank size)	ROC	93.00	0.00	100	100	100	80	74.40	74.40	74.40
R-PT-2	4-03-011-10	Floating Roof Tank - Crude Oil - Standing Loss (250,000 bbls tank size)	ROC	98.12	0.00	100	100	100	80	78.50	78.50	78.50
R-PT-2	4-03-011-17	Floating Roof Tank - Crude Oil - Withdrawal Loss	ROC	98.83	0.00	100	100	100	80	79.07	79.07	79.07
R-PT-2	4-03-011-18	Floating Roof Tank - Jet Naphtha (JP-4) - Withdrawal Loss	ROC	99.81	0.00	100	100	100	80	79.85	79.85	79.85
R-PT-2	4-03-011-42	Floating Roof Tank - Crude Oil - Standing Loss - Ext. Secondary Seal	ROC	99.19	0.00	100	100	100	80	79.35	79.35	79.35
R-PT-2	46458	Fugitive Losses - Tanks	ROC	56.00	0.00	100	100	100	80	44.80	44.80	44.80
RULE 329	**CUTBACK & EMULSIFIED ASPHALT PAVING MATERIALS**											
R-SL-3	46870	Asphalt Paving - Cutback Asphalt	ROC	76.00	0.00	100	100	100	80	60.80	60.80	60.80
R-SL-3	46888	Asphalt Paving – Road Oils	ROC	72.00	0.00	100	100	100	80	57.60	57.60	57.60

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
RULE 330	**SURFACE COATING OF METAL PARTS & PRODUCTS**											
R-SC-2	4-02-001-01	Organic Solvent - Surface Coating Paint - General	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
R-SC-2	4-02-001-10	Organic Solvent - Surface Coating - Solvent Base	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
R-SC-2	4-02-020-01	Organic Solvent - Surface Coating - Metal Furniture	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
R-SC-2	4-02-025-01	Organic Solvent - Surface Coating of Misc. Metal parts	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
R-SC-2	4-02-025-02	Solvent Surface Coating - Misc. Metal Parts: Clean/Pretreatment	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
R-SC-2	4-02-999-98	Organic Solvent - Surface Coating - Miscellaneous	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
R-SC-2	46748	Industrial Coating - Unspecified	ROC	80.00	93.10	100	100	100	80	4.42	4.42	4.42
R-SC-2	66662	Industrial Coating Metal Parts & Products	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
RULE 331	**FUGITIVE EMISSIONS INSPECTION AND MAINTENANCE**											
R-PG-1	3-06-008-01	Petroleum Ind. - Fugitive HC - Pipeline: Valves/Flanges	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-02	Petroleum Ind. - Fugitive HC - Vessel Relief Valves	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-04	Petroleum Ind. - Fugitive HC - Compressor Seals	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-05	Petroleum Ind. - Fugitive HC - Miscellaneous: Sampling/Non-Asphalt Blowing/Purging/etc.	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-06	Petroleum Ind. - Fugitive HC - Pump Seals with Controls	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-11	Petroleum Ind. - Fugitive HC - Pipeline Valves: Gas Streams	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-13	Petroleum Ind. - Fugitive HC - Pipeline Valves: Heavy Liquid Streams	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-15	Petroleum Ind. - Fugitive HC - Open-ended Valves: All Streams	ROC	95.00	0.00	100	100	100	80	76.00	76.00	76.00
R-PG-1	3-06-008-16	Petroleum Ind. - Fugitive HC - Flanges: All Streams	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-17	Petroleum Ind. - Fugitive HC - Pump Seals - Pump Seals: Light Liquid/Gas Streams	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-18	Petroleum Ind. - Fugitive HC - Pump Seals - Heavy Liquid Stream	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-19	Petroleum Ind. - Fugitive HC - Compressor Seals: Gas Streams	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-06-008-21	Petroleum Ind. - Fugitive HC - Drains: All Streams	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
R-PG-1	3-06-008-22	Petroleum Ind. - Fugitive HC - Vessel Relief Valves: All Streams	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-10-001-01	Oil and Gas Production - Crude Oil Production - Complete Well: Fugitive Emissions	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-10-001-03	Oil and Gas Production - Crude Oil Production - Wells: Rod Pumps	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	3-10-002-07	Oil and Gas Production - Natural Gas Production - Valves: Fugitive Emissions	ROC	80.00	7.50	100	100	100	80	59.20	59.20	59.20
R-PG-1	46425	Oil Production Fugitive Losses - Unspecified	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
RULE 333	**CONTROL OF EMISSIONS FROM RECIPROCATING INTERNAL COMBUSTION ENGINES**											
N-IC-1	2-01-002-02	ICE Electrical Generation Natural Gas - Reciprocating	NOx	96.02	37.50	100	100	100	80	48.01	48.01	48.01
N-IC-1	2-01-002-02	ICE Electrical Generation Natural Gas - Reciprocating	ROC	52.24	37.50	100	100	100	80	26.12	26.12	26.12
N-IC-1	2-02-002-02	ICE Natural Gas - Reciprocating - Industrial	NOx	89.21	40.45	100	100	100	80	42.50	42.50	42.50
N-IC-1	2-02-002-02	ICE Natural Gas - Reciprocating - Industrial	ROC	-312.90	40.45	100	100	100	80	-149.07	-149.07	-149.07
N-IC-1	2-03-002-01	ICE Natural Gas - Reciprocating - Commercl/Instutnl	NOx	90.20	0.00	100	100	100	80	72.16	72.16	72.16
N-IC-1	2-03-002-01	ICE Natural Gas - Reciprocating - Commercl/Instutnl	ROC	-207.25	0.00	100	100	100	80	-165.80	-165.80	-165.80
N-IC-3	2-02-001-02	ICE Industrial - Distillate Oil/Diesel - Reciprocating	NOx	42.59	64.55	100	100	100	80	12.08	12.08	12.08
N-IC-3	2-02-001-02	ICE Industrial - Distillate Oil/Diesel - Reciprocating	ROC	-11.05	64.55	100	100	100	80	-3.14	-3.14	-3.14
N-IC-3	2-02-009-02	ICE Kerosene/Naphtha (Jet Fuel) - Reciprocating - Industrial	NOx	25.00	100	100	100	100	80	0.00	0.00	0.00
N-IC-3	2-02-009-02	ICE Kerosene/Naphtha (Jet Fuel) - Reciprocating - Industrial	ROC	-11.05	100.00	100	100	100	80	0.00	0.00	0.00
N-IC-3	2-03-001-01	ICE Commercial/Institutional - Distillate Oil/Diesel - Reciprocating	NOx	40.03	71.05	100	100	100	80	9.27	9.27	9.27
N-IC-3	2-03-001-01	ICE Commercial/Institutional - Distillate Oil/Diesel - Reciprocating	ROC	4.90	71.05	100	100	100	80	1.14	1.14	1.14
RULE 337	**SURFACE COATING OF AIRCRAFT OR AEROSPACE VEHICLE PARTS AND PRODUCTS**											
R-SC-2	4-02-024-01	Organic Solvent - Surface Coating - Large Aircraft - Primer	ROC	62.50	0.00	100	100	100	80	50.00	50.00	50.00
R-SC-2	4-02-024-02	Organic Solvent - Surface Coat. Large Aircraft-Clean/pretreatment	ROC	62.50	0.00	100	100	100	80	50.00	50.00	50.00

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
R-SC-2	4-02-024-03	Organic Solvent Surface Coating Large Aircraft Mixing	ROC	62.50	0.00	100	100	100	80	50.00	50.00	50.00
R-SC-2	4-02-024-05	Surface Coating - Large Aircraft - Equipment Clean	ROC	80.00	0.00	100	100	100	80	64.00	64.00	64.00
R-SC-2	4-02-024-06	Organic Solvent - Surface Coating - Large Aircraft - Topcoat	ROC	62.50	0.00	100	100	100	80	50.00	50.00	50.00
RULE 339	**MOTOR VEHICLE & MOBILE EQUIPMENT COATING OPERATIONS**											
R-SC-4	4-02-004-10	Organic Solvent - Surface Coating - Lacquer - General	ROC	38.90	0.00	100	100	100	80	31.12	31.12	31.12
R-SC-4	4-02-006-10	Organic Solvent - Surface Coating - Primer - General	ROC	38.90	0.00	100	100	100	80	31.12	31.12	31.12
R-SC-4	4-02-016-06	Organic Solvent - Surface Coating - Autos/Light Truck - Topcoat	ROC	38.90	0.00	100	100	100	80	31.12	31.12	31.12
R-SC-4	4-02-999-98	Organic Solvent - Surface Coating - Miscellaneous	ROC	38.90	0.00	100	100	100	80	31.12	31.12	31.12
R-SC-4	46789	Commercial Coating - Automobile Refinishing	ROC	43.70	31.77	100	100	100	80	23.85	23.85	23.85
RULE 341	**MUNICIPAL SOLID WASTE LANDFILLS**											
R-GN-1	57281	Municipal Waste Disposal - Biodegradation	ROC	58.8	22.4	100	100	100	80	36.5	36.5	36.5
RULE 342	**BOILERS, STEAM GENERATORS AND PROCESS HEATERS**											
N-XC-5	1-02-005-01	Extcomb. boiler - Distillate Oil - No. 1 and No. 2	NOx	83.33	0.00	100	100	100	80	66.67	66.67	66.67
N-XC-5	1-02-006-02	Extcomb. boiler - Natural gas 10-100 million (MM) British thermal units per hour (Btu/hr)	NOx	70.00	0.00	100	100	100	80	56.00	56.00	56.00
N-XC-4	1-02-006-03	Extcomb. Boiler - Natural Gas <10 MMBtu/hr	NOx	70.00	40.00	100	100	100	80	33.60	33.60	33.60
N-XC-4	1-03-005-01	Extcomb Boiler - Commercial/Institl - Distillate oil - #1, #2	NOx	83.33	40.00	100	100	100	80	40.00	40.00	40.00
N-XC-5	1-03-006-02	Extcomb Boiler - Commercl/Inst - Nat Gas - 10-100 MMBtu/Hr	NOx	70.00	0.00	100	100	100	80	56.00	56.00	56.00
N-XC-4	1-03-006-03	Extcomb. Boiler Commercl/Instutn - Natural Gas <10 MMBtu/hr	NOx	50.00	40.00	100	100	100	80	24.00	24.00	24.00
N-XC-6	3-05-002-06	Industrial Processes, Mineral Production, Asphalt Heater: Natural Gas	NOx	80.71	40.00	100	100	100	80	38.74	38.74	38.74
N-XC-6	3-06-001-03	Process Heaters - Oil Fired - Petroleum Refining	NOx	83.33	0.00	100	100	100	80	66.67	66.67	66.67
N-XC-6	3-06-001-05	Process Heaters - Natural Gas fired - Petrol. refining	NOx	70.00	0.00	100	100	100	80	56.00	56.00	56.00
N-XC-6	3-10-004-04	Process Heaters - Natural Gas - Oil & Gas Production	NOx	70.00	40.00	100	100	100	80	33.60	33.60	33.60

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
N-XC-6	3-10-004-05	Process Heaters - Process Gas - Oil & Gas Production	NOx	70.00	40.00	100	100	100	80	33.60	33.60	33.60
N-XC-5	3-10-004-14	Steam Generators - Natural Gas - Oil & Gas Production	NOx	70.00	40.00	100	100	100	80	33.60	33.60	33.60
N-XC-5	3-10-004-15	Steam Generators - Process Gas - Oil & Gas Production	NOx	70.00	40.00	100	100	100	80	33.60	33.60	33.60
N-XC-5	47142	Industrial - Natural Gas Combustion (Unspecified)	NOx	58.82	50.00	100	100	100	80	23.53	23.53	23.53
N-XC-5	47167	Commercial - Natural Gas Combustion (Unspecified)	NOx	57.50	50.00	100	100	100	80	23.00	23.00	23.00
N-XC-5	58727	Commercial - L.P.G. Combustion	NOx	83.33	50.00	100	100	100	80	33.33	33.33	33.33
N-XC-5	66795	Industrial - L.P.G. Combustion	NOx	83.33	50.00	100	100	100	80	33.33	33.33	33.33
RULE 343	**PETROLEUM STORAGE TANK DEGASSING**											
R-PT-1	4-03-888-01	Petroleum Storage - Fugitive Emissions (tank cleaning)	ROC	90.00	0.00	100	100	100	80	72.00	72.00	72.00
RULE 344	**PETROLEUM SUMPS, PITS & WELL CELLARS**											
R-PP-1	3-10-001-04	Crude Oil Sumps	ROC	80.00	7.20	100	100	100	80	59.39	59.39	59.39
R-PP-1	3-10-001-05	Crude Oil Pits	ROC	80.00	6.80	100	100	100	80	59.65	59.65	59.65
R-PP-1	3-10-001-08	Well Cellars (SCC created by District)	ROC	70.00	0.00	100	100	100	80	56.00	56.00	56.00
RULE 346	**LOADING OF ORGANIC LIQUID CARGO VESSELS**											
R-PP-9	4-06-001-32	Tank Cars/trucks - Crude Oil - Submerge Load Normal SVC	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84
R-PP-9	4-06-001-35	Pet. Marketing - Tank Cars/Trucks - Dist. Oil: Submerged/Normal	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84
R-PP-9	4-06-001-37	Pet. Marketing - Tank Cars/Trucks - Crude Oil: Splash/Normal	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84
R-PP-9	4-06-001-42	Petro Mrkt - Tnk Cars/Trucks - Crude Oil-Submrg - Load-Bal	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84
R-PP-9	4-06-001-45	Tank Cars/Trucks - Crude Oil - Splash Load Balance SVC	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84
R-PP-9	4-06-001-48	Pet. Marketing - Tank Cars/Trucks - Crude Oil: Submerged/Clean	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84
R-PP-9	4-06-001-49	Petro Mrkt - Tnk Cars/Trucks - Jet Naphtha - Clean Tank	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84
R-PP-9	4-06-001-61	Pet. Marketing-Tank Cars/Trucks - Dist. Oil: Submerged/Clean	ROC	90.00	78.00	100	100	100	80	15.84	15.84	15.84

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
RULE 349	**POLYESTER RESIN OPERATIONS**											
R-SL-5	74674	Fiberglass Impregnation and Fabrication	ROC	12.90	0.00	100	100	100	80	10.32	10.32	10.32
RULE 351	**SURFACE COATING OF WOOD PRODUCTS**											
R-SC-5	4-02-019-01	Surface Coating - Wood Furniture - Coating Operation	ROC	65.00	50.00	100	100	100	80	26.00	26.00	26.00
R-SC-5	66670	Industrial Coating - Wood Furniture and Fixtures	ROC	44.80	50.00	100	100	100	80	17.92	17.92	17.92
RULE 352	**NATURAL GAS-FIRED FAN-TYPE CENTRAL FURNACES AND RESIDENTIAL WATER HEATERS**											
N-XC-1	54577	Residential - Natural Gas Water Heating	NOx	7.00	0.00	70	85	100	80	3.92	4.76	5.60
N-XC-3	54569	Residential - Natural Gas Space Heating	NOx	28.50	0.00	35	40	45	80	7.98	9.12	10.26
N-XC-3	58735	Commercial - Natural Gas Combustion - Space Heating	NOx	28.50	0.00	35	40	45	80	7.98	9.12	10.26
RULE 353	**ADHESIVES & SEALANTS**											
R-SL-9	4-02-007-01	Solvent-Surface Coating-Adhesive	ROC	63.30	10.00	100	100	100	80	45.58	45.58	45.58
R-SL-9	4-02-007-10	Organic Solvent - Surface Coating - Adhesive – general	ROC	63.30	10.00	100	100	100	80	45.58	45.58	45.58
R-SL-9	83030	Adhesive and Sealant - Solvent Based	ROC	63.30	10.00	100	100	100	80	45.58	45.58	45.58
RULE 354	**GRAPHIC ARTS - LETTER/OFFSET PRINTING**											
R-SL-7	4-05-003-07	Printing/publishing - Ink Thinning Solvents - Naphtha	ROC	22.00	95.00	100	100	100	80	0.88	0.88	0.88
R-SL-7	66829	Printing	ROC	22.00	95.00	100	100	100	80	0.88	0.88	0.88
RULE 323	**ARCHITECTURAL COATINGS - REVISED (NEAR TERM)**											
R-SC-1	46763	Oil Based (general)	ROC	38.61	1.00	100	100	100	21	8.00	8.00	8.00
R-SC-1	85399	Oil Based Primers - Sealers	ROC	13.94	1.00	100	100	100	80	11.04	11.04	11.04
R-SC-1	85407	Oil Based Quick Dry - Primers, Sealers, And Undercoaters	ROC	30.58	1.00	100	100	100	80	24.22	24.22	24.22
R-SC-1	85431	Oil Based Waterproof Sealers - Clear	ROC	36.11	1.00	100	100	100	80	28.60	28.60	28.60
R-SC-1	85449	Oil Based Waterproof Sealers - Opaque	ROC	36.11	1.00	100	100	100	80	28.60	28.60	28.60
R-SC-1	85456	Oil Based Stains - Clear	ROC	16.45	1.00	100	100	100	80	13.03	13.03	13.03

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CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
R-SC-1	85464	Oil Based Stains - Semitransparent	ROC	16.45	1.00	100	100	100	80	13.03	13.03	13.03
R-SC-1	85472	Oil Based Stains - Opaque	ROC	16.45	1.00	100	100	100	80	13.03	13.03	13.03
R-SC-1	85506	Oil Based Quick Dry - Enamels	ROC	44.20	1.00	100	100	100	80	35.01	35.01	35.01
R-SC-1	85514	Oil Based Lacquer - Clear	ROC	41.20	1.00	100	100	100	80	32.63	32.63	32.63
R-SC-1	85522	Oil Based Lacquer - Opaque	ROC	41.20	1.00	100	100	100	80	32.63	32.63	32.63
R-SC-1	85530	Oil Based Flat Coatings	ROC	17.38	1.00	100	100	100	80	13.76	13.76	13.76
R-SC-1	85555	Oil Based Medium Gloss	ROC	15.70	1.00	100	100	100	80	12.43	12.43	12.43
R-SC-1	85563	Oil Based Low Gloss	ROC	6.36	1.00	100	100	100	80	5.04	5.04	5.04
R-SC-1	85597	Oil Based Dry Fog Coatings	ROC	6.53	1.00	100	100	100	80	5.17	5.17	5.17
R-SC-1	85654	Oil Based Industrial Maintenance	ROC	37.63	1.00	100	100	100	80	29.80	29.80	29.80
R-SC-1	85670	Oil Based Roof Coatings	ROC	9.10	1.00	100	100	100	80	7.21	7.21	7.21
R-SC-1	85688	Oil Based Swimming Pool	ROC	60.00	1.00	100	100	100	80	47.52	47.52	47.52
R-SC-1	85712	Oil Based Wood Preservatives - Semitransparent	ROC	31.87	1.00	100	100	100	25	8.00	8.00	8.00
R-SC-1	85811	Water Based Varnish - Clear	ROC	24.78	1.00	100	100	100	33	8.00	8.00	8.00
R-SC-1	85852	Water Based Flat Coatings	ROC	50.48	1.00	100	100	100	16	8.00	8.00	8.00
RULE 321	**SOLVENT DEGREASERS - REVISED (MID-TERM)**											
R-SL-2	4-01-002-99	Degreasing - Other Not Classified: Open-top Vapor Degreasing	ROC	80.00	5.00	0	100	100	80	39.52[A]	60.80	60.80
R-SL-2	4-01-003-07	Degreasing - Cold Cleaning (Batch, Conveyor, Spray Gun) - Isopropyl Alcohol	ROC	85.00	5.00	0	100	100	80	39.52[A]	64.60	64.60
R-SL-2	4-01-003-98	Cold Cleaning/Stripping	ROC	75.50	5.00	0	0	100	80	39.52[A]	57.38	57.38
R-SL-2	83667	Cold Cleaning (Batch, Conveyor, Spray Gun) - Alcohols	ROC	85.00	5.00	0	100	100	80	41.80[A]	64.60	64.60
R-SL-2	83675	Cold Cleaning (Batch, Conveyor, Spray Gun) - Chlorofluorocarbons	ROC	85.00	5.00	0	100	100	80	41.80[A]	64.60	64.60
R-SL-2	83683	Cold Cleaning (Batch, Conveyor, Spray Gun) - Glycol Ethers (Unspecified)	ROC	85.00	5.00	0	100	100	80	41.80[A]	64.60	64.60
R-SL-2	83691	Cold Cleaning (Batch, Conveyor, Spray Gun) - Ketones (Unspecified)	ROC	85.00	5.00	0	100	100	80	41.80[A]	64.60	64.60
R-SL-2	83717	Cold Cleaning (Batch, Conveyor, Spray Gun) - Terpenes (Unspecified)	ROC	85.00	5.00	0	100	100	80	50.92[A]	64.60	64.60

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
R-SL-2	83725	Cold Cleaning (Batch, Conveyor, Spray Gun) - Toluene/Xylene	ROC	85.00	5.00	0	100	100	80	50.92[A]	64.60	64.60
R-SL-2	83741	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Pure Solvents	ROC	85.00	5.00	0	100	100	80	41.80[A]	64.60	64.60
R-SL-2	83758	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Solvent Blend	ROC	85.00	5.00	0	100	100	80	41.80[A]	64.60	64.60
R-SL-2	83766	Vapor Degreasing (Batch, Conveyor) - Chlorofluorocarbons	ROC	80.00	5.00	0	100	100	80	39.52[A]	60.80	60.80
R-SL-2	83774	Vapor Degreasing (Batch, Conveyor) - Dichlorofluoroethane	ROC	80.00	5.00	0	100	100	80	39.52[A]	60.80	60.80
R-SL-2	83824	Vapor Degreasing (Batch, Conveyor) - Misc. Solvent Blend	ROC	80.00	5.00	0	100	100	80	39.52[A]	60.80	60.80
RULE 362 SOLVENT CLEANING OPERATIONS (USE OF LOW-ROC OR AQUEOUS SOLVENTS) - NEW (MID-TERM)												
R-SL-2	4-05-003-14	Printing: Flexographic: Propyl Alcohol Cleanup	ROC	10.00	5.00	0	100	100	80	0.00	7.60	7.60
R-SL-2	83659	Cold Cleaning (Remote Reservoir)- Petroleum Solvents	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83832	Handwiping -Petroleum Solvents	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83840	Handwiping, Alcohols	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83857	Handwiping, Chlorofluorocarbons	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83865	Handwiping, Dichlorofluoroethane	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83873	Handwiping, Glycol Ethers	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83881	Handwiping, Ketones	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83899	Handwiping, Methylene Chloride	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83907	Handwiping, Perchloroethylene	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83915	Handwiping, Terpenes	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83923	Handwiping, Toluene/Xylene	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83931	Handwiping, Trichloroethane	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83949	Handwiping, Trichloroethylene	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
R-SL-2	83956	Handwiping, Misc. Pure Solvents	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10

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R-SL-2	83964	Handwiping, Misc. Solvent Blends	ROC	80.40	5.00	0	100	100	80	0.00	61.10	61.10
RULE 358	**ELECTRONIC INDUSTRY - SEMICONDUCTOR MANUFACTURING - NEW (LONG-TERM)**											
R-SL-4	4-01-002-99	Degreasing - Other Not Classified: Open-top Vapor Degreasing	ROC	80.00	5.00	0	0	100	80	39.52[B]	60.80[C]	60.80
R-SL-4	4-01-003-07	Degreasing - Cold Cleaning (Batch, Conveyor, Spray Gun) - Isopropyl Alcohol	ROC	85.00	5.00	0	0	100	80	39.52[B]	64.60[C]	64.60
R-SL-4	4-01-003-98	Other Not Classified, Gallons Solvent Consumed	ROC	75.50	5.00	0	0	100	80	39.52[B]	57.38[C]	57.38
R-SL-4	3-13-065-05	Semiconductor Manufacturing - Photoresist Operations: General	ROC	90.00	5.00	0	0	100	80	0	0	68.40
R-SL-4	83659	Cold Cleaning (Remote Reservoir) - Petroleum Solvents	ROC	80.40	5.00	0	0	100	80	0	61.10[D]	61.10
R-SL-4	83667	Cold Cleaning (Batch, Conveyor, Spray Gun) - Alcohols	ROC	85.00	5.00	0	0	100	80	41.80[B]	64.60[C]	64.60
R-SL-4	83675	Cold Cleaning (Batch, Conveyor, Spray Gun) - Chlorofluorocarbons	ROC	85.00	5.00	0	0	100	80	41.80[B]	64.60[C]	64.60
R-SL-4	83683	Cold Cleaning (Batch, Conveyor, Spray Gun) - Glycol Ethers (Unspecified)	ROC	85.00	5.00	0	0	100	80	41.80[B]	64.60[C]	64.60
R-SL-4	83691	Cold Cleaning (Batch, Conveyor, Spray Gun) - Ketones (Unspecified)	ROC	85.00	5.00	0	0	100	80	41.80[B]	64.60[C]	64.60
R-SL-4	83717	Cold Cleaning (Batch, Conveyor, Spray Gun) - Terpenes (Unspecified)	ROC	85.00	5.00	0	0	100	80	50.92[B]	64.60[C]	64.60
R-SL-4	83725	Cold Cleaning (Batch, Conveyor, Spray Gun) - Toluene/Xylene	ROC	85.00	5.00	0	0	100	80	50.92[B]	64.60[C]	64.60
R-SL-4	83741	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Pure Solvents	ROC	85.00	5.00	0	0	100	80	41.80[B]	64.60[C]	64.60
R-SL-4	83758	Cold Cleaning (Batch, Conveyor, Spray Gun) - Misc. Solvent Blend	ROC	85.00	5.00	0	0	100	80	41.80[B]	64.60[C]	64.60
R-SL-4	83766	Vapor Degreasing (Batch, Conveyor) - Chlorofluorocarbons	ROC	80.00	5.00	0	0	100	80	39.52[B]	60.80[C]	60.80
R-SL-4	83774	Vapor Degreasing (Batch, Conveyor) - Dichlorofluoroethane	ROC	80.00	5.00	0	0	100	80	39.52[B]	60.80[C]	60.80
R-SL-4	83824	Vapor Degreasing (Batch, Conveyor) - Misc. Solvent Blend	ROC	80.00	5.00	0	0	100	80	39.52[B]	60.80[C]	60.80
R-SL-4	83832	Handwiping -Petroleum Solvents	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83840	Handwiping, Alcohols	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83857	Handwiping, Chlorofluorocarbons	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10

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R-SL-4	83865	Handwiping, Dichlorofluoroethane	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83873	Handwiping, Glycol Ethers	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83881	Handwiping, Ketones	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83899	Handwiping, Methylene Chloride	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83907	Handwiping, Perchloroethylene	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83915	Handwiping, Terpenes	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83923	Handwiping, Toluene/Xylene	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83931	Handwiping, Trichloroethane	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83949	Handwiping, Trichloroethylene	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83956	Handwiping, Misc. Pure Solvents	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
R-SL-4	83964	Handwiping, Misc. Solvent Blends	ROC	80.40	5.00	0	0	100	80	0.00	61.10[D]	61.10
RULE 333	**STATIONARY IC ENGINES - REVISION (NEAR-TERM)**											
N-IC-1	2-01-002-02	ICE Electrical generation Natural Gas - Reciprocating	NOx	96.02	37.50	100	100	100	80	48.01	48.01	48.01
N-IC-1	2-01-002-02	ICE Electrical generation Natural Gas - Reciprocating	ROC	52.24	37.50	100	100	100	80	26.12	26.12	26.12
N-IC-1	2-02-002-02	ICE Natural Gas - Reciprocating - Industrial	NOx	76.55	28.89	100	100	100	80	43.55	43.55	43.55
N-IC-1	2-02-002-02	ICE Natural Gas - Reciprocating - Industrial	ROC	-261.43	28.89	100	100	100	80	-148.72	-148.72	-148.72
N-IC-1	2-03-002-01	ICE Natural Gas - Reciprocating - Commercl/Instutnl	NOx	90.20	0.00	100	100	100	80	72.16	72.16	72.16
N-IC-1	2-03-002-01	ICE Natural Gas - Reciprocating - Commercl/Instutnl	ROC	-207.25	0.00	100	100	100	80	-165.80	-165.80	-165.80
N-IC-3	2-02-001-02	ICE Industrial - Distillate Oil/Diesel - Reciprocating	NOx	40.94	62.73	100	100	100	80	12.21	12.21	12.21
N-IC-3	2-02-001-02	ICE Industrial - Distillate Oil/Diesel - Reciprocating	ROC	-11.05	62.73	100	100	100	80	-3.30	-3.30	-3.30
N-IC-3	2-02-009-02	ICE Kerosene/Naphtha (Jet Fuel) - Reciprocating - Industrial	NOx	25.00	0.00	100	100	100	80	20.00	20.00	20.00
N-IC-3	2-02-009-02	ICE Kerosene/Naphtha (Jet Fuel) - Reciprocating - Industrial	ROC	-11.05	0.00	100	100	100	80	-8.84	-8.84	-8.84
N-IC-3	2-03-001-01	ICE Commercial/Institutional - Distillate Oil/Diesel - Reciprocating	NOx	40.03	71.05	100	100	100	80	9.27	9.27	9.27
N-IC-3	2-03-001-01	ICE Commercial/Institutional - Distillate Oil/Diesel - Reciprocating	ROC	4.90	71.05	100	100	100	80	1.14	1.14	1.14

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
RULE 363 GAS TURBINES - NEW (MID-TERM)												
N-IC-2	2-01-001-01	IC Eng, Electrical Generation, Distillate Oil (Diesel), Turbine	NOx	50.00	100.00	0	100	100	80	0.00	0.00	0.00
N-IC-2	2-01-002-01	IC Eng, Electrical Generation, Natural Gas, Turbine	NOx	50.00	100.00	0	100	100	80	0.00	0.00	0.00
N-IC-2	2-02-001-01	IC Eng, Industrial, Distillate Oil (Diesel), Turbine	NOx	50.00	100.00	0	100	100	80	0.00	0.00	0.00
N-IC-2	2-02-002-01	IC Eng, Industrial, Natural Gas, Turbine	NOx	50.00	100.00	0	100	100	80	0.00	0.00	0.00
N-IC-2	2-02-002-03	IC Eng, Industrial, Natural Gas, Turbine: Cogeneration	NOx	50.00	100.00	0	100	100	80	0.00	0.00	0.00
N-IC-2	2-03-001-02	IC Eng, Commercial/Institutional, Distillate Oil (Diesel), Turbine	NOx	50.00	100.00	0	100	100	80	0.00	0.00	0.00
N-IC-2	2-03-002-02	IC Eng, Commercial/Institutional, Natural Gas, Turbine	NOx	50.00	100.00	0	100	100	80	0.00	0.00	0.00
RULE 360 LARGE WATER HEATERS AND SMALL BOILERS, STEAM GENERATORS, AND PROCESS HEATERS (75,000 Btu/hr to < 2 MMBtu/hr) - NEW (NEAR-TERM)												
N-XC-2	1-02-006-03	External Combustion Boiler, Industrial, Natural Gas (<10 million (MM) British thermal units per hour (Btu/hr))	NOx	80.71	73.6	5	10	15	80	0.85	1.70	2.56
N-XC-2	1-03-005-01	External Combustion Boiler, Commercial-Institutional, Distillate Oil, No. 1 and No. 2	NOx	80.71	73.60	5	10	15	80	0.85	1.70	2.56
N-XC-2	1-03-006-03	External Combustion Boiler, Commercial-Institutional, Natural gas (<10 MMBtu/hr)	NOx	80.71	73.60	5	10	15	80	0.85	1.70	2.56
N-XC-2	3-05-002-06	Industrial Processes, Mineral Production, Asphalt Heater: Natural Gas	NOx	80.71	73.60	5	10	15	80	0.85	1.70	2.56
N-XC-2	3-10-004-04	Oil & Gas Production, Process Heaters, Natural Gas	NOx	80.71	73.60	5	10	15	80	0.85	1.70	2.56
N-XC-2	3-10-004-05	Oil & Gas Production, Process Heaters, Process Gas	NOx	80.71	73.6	5	10	15	80	0.85	1.70	2.56
N-XC-2	3-10-004-14	Oil & Gas Production, Steam Generators, Natural Gas	NOx	80.71	73.60	5	10	15	80	0.85	1.70	2.56
N-XC-2	3-10-004-15	Oil & Gas Production, Steam Generators, Process Gas	NOx	80.71	73.60	5	10	15	80	0.85	1.70	2.56
N-XC-2	3-99-900-03	Industrial Processes, Miscellaneous Manufacturing Industry, Natural Gas: Process Heater	NOx	80.71	73.60	5	10	15	80	0.85	1.70	2.56
N-XC-2	47142	Industrial, Natural Gas Combustion (Unspecified)	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
N-XC-2	47159	Commercial, Distillate Oil Combustion (Unspecified)	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
N-XC-2	47167	Commercial, Natural Gas Combustion (Unspecified)	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
N-XC-2	47183	Commercial, Residual Oil Combustion (Unspecified)	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
N-XC-2	58727	Commercial, L.P.G. Combustion	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
N-XC-2	58743	Commercial - Natural Gas Combustion - Water Heating	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
N-XC-2	66795	Industrial, L.P.G. Combustion	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
N-XC-2	66803	Industrial, Distillate Oil Combustion (Unspecified)	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
N-XC-2	83071	Industrial, Residual Oil Combustion (Unspecified)	NOx	51.00	67.00	5	10	15	80	0.67	1.35	2.02
RULE 361 SMALL INDUSTRIAL AND COMMERCIAL BOILERS, STEAM GENERATORS, AND PROCESS HEATERS (2 MMBtu/hr to < 5 MMBtu/hr) - NEW (LONG-TERM)												
N-XC-4	1-02-006-03	External Combustion Boiler, Industrial, Natural Gas (<10 million (MM) British thermal units per hour (Btu/hr))	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	1-03-005-01	External Combustion Boiler, Commercial-Institutional, Distillate Oil, No. 1 and No. 2	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	1-03-006-03	External Combustion Boiler, Commercial-Institutional, Natural gas (<10 MMBtu/hr)	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	1-03-007-01	External Combustion Boiler, Commercial-Institutional, POTW Digester Gas-fired Boiler, Process Gas (<10 MMBtu/hr)	NOx	81.50	0.00	0	0	5	80	0.00	0.00	3.26
N-XC-4	3-05-002-06	Industrial Processes, Mineral Production, Asphalt Heater: Natural Gas	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	3-10-004-04	Oil & Gas Production, Process Heaters, Natural Gas	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	3-10-004-05	Oil & Gas Production, Process Heaters, Process Gas	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	3-10-004-14	Oil & Gas Production, Steam Generators, Natural Gas	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	3-10-004-15	Oil & Gas Production, Steam Generators, Process Gas	NOx	81.50	86.40	0	0	5	80	0.00	0.00	0.44
N-XC-4	58743	Commercial - Natural Gas Combustion - Water Heating	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55
N-XC-4	47142	Industrial, Natural Gas Combustion (Unspecified)	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55
N-XC-4	47159	Commercial, Distillate Oil Combustion (Unspecified)	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55
N-XC-4	47167	Commercial, Natural Gas Combustion (Unspecified)	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55
N-XC-4	47183	Commercial, Residual Oil Combustion (Unspecified)	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55
N-XC-4	58727	Commercial, L.P.G. Combustion	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55
N-XC-4	66795	Industrial, L.P.G. Combustion	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55

TABLE B-6
CONTROL MEASURE EFFICIENCY

Measure Number	CES/SCC Number	Affected Category Description	ROC/ NOx	Cntrl Eq Eff (%)	Exempt Eq (%)	Implemented (%) 2005	2010	2015	Compl Eff (%)	Cntrl Meas Eff (%) 2005	2010	2015
N-XC-4	66803	Industrial, Distillate Oil Combustion (Unspecified)	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55
N-XC-4	83071	Industrial, Residual Oil Combustion (Unspecified)	NOx	81.50	83.00	0	0	5	80	0.00	0.00	0.55

FOOTNOTES FOR TABLE B-6:

[A]The control measure efficiency figure shown is from Rule 321 before it is revised. Rule 321 will stay in force and apply to this category until it is revised concurrent with the Rule 362 adoption.
[B]The control measure efficiency figure shown is from Rule 321 before it is revised. Rule 321 will stay in force and apply to this category until Rule 358 is adopted.
[C]The control measure efficiency figure shown is from Rule 321 after it is revised. Rule 321 will stay in force and apply to this category until Rule 358 is adopted.
[D]The control measure efficiency figure shown is from Rule 362. Rule 362 will apply to this category until Rule 358 is adopted.