SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

RULE 1105.1 REDUCTION OF PM_{10} AND AMMONIA EMISSIONS FROM FLUID CATALYTIC CRACKING UNITS

(Adopted November 7, 2003)

(a) Purpose

The purpose of this rule is to reduce emissions of PM_{10} and ammonia from fluid catalytic cracking units.

(b) Applicability

This rule applies to all existing, new or modified fluid catalytic cracking units at petroleum refineries.

(c) Definitions

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

(1) AMMONIA SLIP is the amount of unreacted ammonia emitted from a control equipment such as electrostatic precipitator, selective catalytic reduction, or selective non-catalytic reduction process, as collected and measured pursuant to the applicable reference test method listed in subdivision (f).

(2) CONDENSABLE PM_{10} is the PM_{10} collected in the impingers of the applicable reference test method listed in subdivision (f).

(3) CONTACT MATERIAL is any substance formulated to remove metals, sulfur, nitrogen, or any other contaminants from petroleum derivatives.

(4) FILTERABLE PM_{10} is the PM_{10} collected on the cyclone exit, probe, and filter(s) of the applicable reference test method(s) listed in subdivision (f).

(5) FLUID CATALYTIC CRACKING UNIT (FCCU) is a process unit in which petroleum derivative feedstock is charged and fractured into smaller molecules in the presence of a catalyst; or reacts with a contact material to improve feedstock quality for additional processing; and the catalyst or contact material is regenerated by burning off coke and other deposits. The unit includes, but is not limited to, the riser, reactor, regenerator, air blowers, spent catalyst, and all equipment for controlling air pollutant emissions and recovering heat.

(6) FLUID CATALYTIC CRACKING UNIT REGENERATOR is the portion of the fluid catalytic cracking unit in which coke burn-off and catalyst regeneration occurs, and includes the regenerator combustion air blower(s).

(7) FRESH FEED is any petroleum derivative feedstock stream charged directly into the riser or reactor of a FCCU except for petroleum derivatives recycled within the FCCU.

(8) PETROLEUM REFINERY is any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking or other processes, as defined in the Standard Industrial Classification Manual as Industry No. 2911, Petroleum Refining.

(9) SHUT-DOWN is a period which begins when fresh feed is pulled from the FCCU reactor and ends when the main blower for catalyst recirculation is shutdown.

(10) START-UP is a period not to exceed one hundred twenty (120) hours which begins with the startup of the main blower for introduction of catalyst and ends when fresh feed is introduced to the FCCU reactor and the process reaches steady state

(d) Emission Limits

(1) The operator shall not operate the FCCU unless, by December 31, 2006, the operator complies with one of the PM_{10} emission limits that the operator has elected, and the ammonia slip limit shown below; and has demonstrated to the Executive Officer that the PM_{10} and ammonia emissions from the FCCU to the atmosphere, determined by the test methods listed in subdivision (f), are equal to or less than one of the following elected PM_{10} emission limits and ammonia limit:

(A) Filterable PM_{10}

(i) 3.6 pounds per hour, or

(ii) 0.005 grain per dry standard cubic foot of flue gas corrected to 3% O_2 dry, or

(iii) 2.8 pounds per thousand barrels of fresh feed.

(B) Ammonia slip - 10 ppmv corrected to 3% O_2 dry, averaged over 60 consecutive minutes.

(2) The operator may request an extension of the compliance date specified in paragraph (d)(1) up to December 31, 2008 for the purpose of synchronizing the installation of the PM_{10} control equipment with the FCCU turnaround provided that the operator submits a request in writing to the Executive Officer no later than July 1, 2006 and receives a written approval from the Executive Officer by December 31, 2006. For an FCCU turnaround starting before December 31, 2008 that cannot be completed by that date, the Executive Officer may approve an additional extension of the compliance date up to ninety (90) days after start-up of the FCCU for the operator to conduct performance testing for the required demonstration, so long as the FCCU operates with all necessary control equipment to meet the emission limits in paragraph (d)(1).

(3) The operator shall submit a permit application to include one or more selected emission limit(s) to comply with subparagraph (d)(1)(A) at least thirty (30) calendar days prior to the compliance date. The operator shall also conduct a performance test pursuant to paragraph (e)(1) to demonstrate compliance with the selected emission limit(s). The emission limit(s) selected shall be specified in the permit. The operator may change the selected emission limit(s) at any time provided that the operator has submitted an application for permit revision, conducted a performance test to demonstrate compliance, and received a revised Permit to Operate from the Executive Officer.

(4) If the operator does not make a selection pursuant to paragraph (d)(3), the operator shall be deemed to have selected the emission limit of 3.6 pounds per hour.

(e) Monitoring, Reporting and Recordkeeping Requirements

(1) Performance Testing

(A) If the operator constructs a new FCCU or modifies the FCCU to meet the emission limit(s) specified in paragraph (d)(1), the operator shall conduct a performance source test for PM_{10} and ammonia in accordance with the applicable source test methods listed in subdivision (f) and subparagraph (e)(1)(D) no later than 180 calendar days after initial start-up of the equipment not to exceed the applicable time limits specified in paragraph (d)(1) or paragraph (d)(2).

(B) The operator with an existing FCCU that already meets the emission limit(s) specified in paragraph (d)(1) shall conduct a performance source test by July 1, 2006 to demonstrate compliance with the selected emission limit(s) in accordance with the applicable source test methods listed in subdivision (f) and subparagraph (e)(1)(D).

(C) The operator shall submit a source test protocol to the Executive Officer no later than sixty (60) calendar days before the proposed test date for the Executive Officer's approval. The operator shall include in the test protocol, at a minimum, the following information: the selected PM_{10} emission limit(s) to be complied with set forth in paragraph (d)(1), the selected operating parameters to be monitored for the control equipment to ensure compliance with the emission limit(s), the operating conditions of the FCCU, the identity of the testing lab, a statement from the testing lab certifying that it meets the criteria of Rule 304, and a description of all sampling and analytical procedures.

(D) The operator shall conduct the performance source test for PM_{10} emissions using SCAQMD Source Test Method 5.2 modified as in subparagraph (f)(1)(F) to determine the filterable PM_{10} emissions and the condensable PM_{10} emissions. The operator shall recover the PM captured in the cyclone and report the data for informational purposes only. The operator may elect to conduct a performance source test for PM emissions using SCAQMD Source Test Method 5.2, simultaneous with the performance source test for PM_{10} emissions to determine the ratio of filterable PM_{10} emissions to filterable PM emissions. Subject to the approval of the Executive Officer following an evaluation of a performace source test report, the operator may conduct subsequent annual compliance source tests for PM_{10} emissions using SCAQMD Source Test Method 5.2 and the above determined ratio. The operator shall conduct a performance source test for ammonia emissions concurrently with the performance source test for PM_{10} emissions.

(E) During the performance source test, the operator shall establish the operating levels for each parameter of the control equipment

to be monitored pursuant to paragraph (e)(3). The operator shall monitor and record, at a minimum, all operating data for each parameter, fresh feed rate, and flue gas flow rate and submit this data with the test report.

(F) The operator shall submit a complete test report to the Executive Officer no later than sixty (60) calendar days after completion of the source test.

(2) Compliance Testing

(A) The operator of any FCCU shall conduct, at a minimum, an annual compliance source test for PM_{10} and ammonia emissions in accordance with the test methods listed in subdivision (f) to demonstrate compliance with the selected emission limit(s) in subdivision (d). The operator shall conduct the compliance source tests for PM_{10} emissions concurrently with the compliance source test for ammonia emissions.

(B) During the annual compliance source test, the operator shall monitor and record, at a minimum, all operating data for the selected operating parameters of the FCCU control equipment, fresh feed rate and flue gas flow rate and submit this data with the test report.

(C) The operator shall conduct annual compliance source test(s) to determine the filterable and condensable PM_{10} emissions using SCAQMD Source Test Method 5.2 modified as in subparagraph (f)(1)(F). The operator may use SCAQMD Source Test Method 5.2 to determine the filterable PM emissions and estimate the filterable PM_{10} emissions using the ratio determined in the performance source test conducted pursuant to paragraph (e)(1).

(D) The operator shall conduct the first annual compliance source test in accordance with the approved source test protocol within sixty (60) calendar days after the compliance date specified in subdivision (d). For the first annual compliance source test, the operator shall submit a source test protocol to the Executive Officer no later than sixty (60) calendar days prior to the proposed test date for the Executive Officer's approval. The operator shall include in the test protocol the same information as required in subparagraph (e)(1)(C). The operator may use the performance

source test as the first annual compliance source test if the performance source test is conducted within 180 calendar days from the compliance date specified in subdivision (d). The operator need not submit a source test protocol for a subsequent annual compliance source test if the subsequent annual compliance source test will be conducted using the previously approved protocol.

(E) The operator shall conduct subsequent annual source tests within twelve (12) calendar months but no sooner than nine (9) calendar months from the date of completion of the previous annual source test.

(F) The operator shall submit a complete test report for any annual source test to the Executive Officer no later than sixty (60) calendar days of completion of the source test.

(G) Subject to the Executive Officer's approval, the operator may synchronize the timing of testing and submitting the test report required under subparagraphs (e)(2)(D) and (e)(2)(F) with the Relative Accuracy Test Audit (RATA) required under Rule 2011, *Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Sulfur (SO_x) Emissions*, and Rule 2012, *Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NO_x) Emissions*, of Regional Clean Air Incentives Market (RECLAIM) program.

(3) Monitoring

(A) No later than May 7, 2004, the operator shall submit a plan, for Executive Officer approval, specifying the operating parameters to be monitored, the range of operating levels of each proposed parameter, and the frequency of monitoring and recording, for the control equipment of the FCCU installed and operated before November 7, 2003.

(B) With the application for permit to construct or modify the FCCU, the operator shall submit a plan, for Executive Officer approval, specifying the operating parameters to be monitored, the range of operating levels of each proposed parameter, and the frequency of monitoring and recording, for the control equipment of the FCCU constructed or modified after November 7, 2003.

(C) The operator shall select the operating parameters and frequency of monitoring and recording specified in Attachment A, or as an alternative, the operator may propose other appropriate substitute parameters and frequencies for Executive Officer approval.

(D) The operator shall not be required to comply with the monitoring or recording requirements during a malfunction period or a planned routine maintenance period of the monitoring or recording device provided that:

(i) The malfunction period or the planned routine maintenance period of the monitoring or recording device does not exceed ninety-six (96) consecutive hours;

(ii) The monitoring or recording device has been either shutdown for a planned routine maintenance and the operator has provided a written notification to the Executive Officer at least two calendar weeks in advance; or by a mechanical or electrical failure or fire caused by circumstances beyond the operator's control; and

(iii) The operator has submitted a report to the Executive Officer within ninety-six (96) hours after the monitoring or recording device(s) returns to normal operation. Such written notification and report shall include information as prescribed by the Executive Officer including at a minimum the cause of the shutdown, the time the monitoring or recording device(s) became non-operational, the time or estimated time the monitoring or recording device(s) returned to normal operation, the maintenance performed or corrective and preventive actions taken to prevent future non-operational conditions

(4) Reporting

The operator shall report filterable PM_{10}, condensable PM_{10} and ammonia emissions measured according to the test method specified under subdivision (f) on an annual basis pursuant to paragraph (e)(2).

(5) Recordkeeping

The operator shall maintain all information required to demonstrate compliance in a manner approved by the Executive Officer for a period of at least five years and made available to the Executive Officer upon

request.

(f) Source Test Methods and Calculation

(1) The operator shall use the following source test methods, as applicable, to determine the PM_{10} and ammonia emission rates. All source test methods referenced below shall be the most recent version issued by the respective organization.

(A) SCAQMD Source Test Method 1 – *Velocity and Sample Traverse Points*;

(B) SCAQMD Source Test Method 2 – *Stack Gas Flow Rate*;

(C) SCAQMD Source Test Method 3 – *Stack Gas Density*;

(D) SCAQMD Source Test Method 4 – *Stack Gas Moisture*;

(E) SCAQMD Source Test Method 5.2 - *Determination of Particulate Matter Emissions from Stationary Sources Using Heated Probe and Filter*;

(F) SCAQMD Source Test Method 5.2 modified to use an in-stack PM_{10} cut cyclone and operated at a constant sampling rate to sample PM_{10}, as specified in U.S. EPA Source Test Method 201A - *Determination of PM_{10} Emissions - Constant Sampling Rate Procedures*, 40 CFR Part 51, Appendix M. Analyses and calculations shall be performed according to SCAQMD Source Test Method 5.2, including those for the determination of the condensable PM_{10} portion;

(G) SCAQMD Source Test Method 207-1 - *Determination of Ammonia Emissions from Stationary Sources*;

(H) SCAQMD Source Test Method 10.1 - *Carbon Monoxide, Carbon Dioxide and Oxygen*; and

(I) SCAQMD Source Test Method 100.1 - *Nitrogen Oxides, Sulfur Dioxide, Carbon Monoxide, and Oxygen.*

(J) EPA Source Test Method 5 may be used in lieu of SCAQMD Method 5.2 modified.

(2) Source tests for PM and PM_{10} shall be taken and the average of the samples shall be used to determine the applicable emission rate in accordance with the following requirements:

(A) Simultaneous duplicate samples shall be obtained unless the operator demonstrates to the satisfaction of the Executive Officer

that it is not physically feasible to do so, in which case the operator shall take sequential triplicate samples;

(B) All samples must have minimum sampling volume of 120 cubic feet or a minimum filterable PM and PM_{10} catch of 6 milligrams per sample shall be collected;

(C) For duplicate samples, the source test shall be deemed invalid if the difference between the two samples is greater than 35% of the average of the two samples in the applicable units specified in subparagraph (d)(1)(A) and if the difference between the filterable sample catches normalized to the average sampling volume is greater than 3.5 milligrams. If the source test is deemed invalid, the test shall be repeated; and

(D) For triplicate samples, if the operator can demonstrate to the satisfaction of the Executive Officer that the process conditions, including but not limited to the throughput, the quantity, type, and quality of all feedstock to the FCCU, and the emission control equipment conditions have not changed throughout the sequential test period, then the operator may apply the Dixon outlier test at the 95% significance level to check for and discard one outlier, and shall use the average of the two remaining samples to determine filterable PM and PM_{10} emissions.

(3) The operator may use alternative or equivalent source test methods, as defined in U.S. EPA 40 CFR 60.2, if they are approved in writing by the Executive Officer, the California Air Resources Board, and the U.S. Environmental Protection Agency.

(4) The operator shall use a test lab approved under the SCAQMD Laboratory Approval Program for the source test methods cited in paragraph (f)(1) if such approved lab exists. If there is no approved lab, then approval shall be granted by the Executive Officer on a case-by-case basis.

(5) Any particulate emissions from existing CO boilers located downstream of existing electrostatic precipitators, existing as of November 7, 2003, may be excluded for the purpose of demonstrating compliance with the PM_{10} limit of paragraph (d)(1).

(g) Exemptions

(1) The operator shall not be required to comply with the emission limits

specified under paragraph (d)(1) during planned startup and shutdown periods related to the FCCU process turnaround provided that the operator utilizes the control equipment during these periods to the maximum extent possible, as demonstrated to the satisfaction of the Executive Officer, to minimize the PM_{10} emissions including drying, energizing the electrostatic precipitators, and using the electrostatic precipitators prior to filling the FCCU regenerator with catalyst, if applicable and considering the safe operation of the equipment. Each startup or shutdown period shall not exceed one hundred twenty (120) hours. The operator shall provide written notification to the Executive Officer at least two calendar weeks in advance of the beginning of the startup and shutdown period.

(2) The operator of control equipment designed and installed prior to November 7, 2003 meeting the emission limits specified under paragraph (d)(1) shall not be required to comply with the emission limits under paragraph (d)(1) during routine maintenance periods of the electrostatic precipitators provided that the maintenance period does not occur more than once per any twelve month consecutive period for a duration of not more than ten (10) consecutive days. The operator shall provide written notification to the Executive Officer at least two calendar weeks in advance of the maintenance period. The operator may extend the routine maintenance period to more than ten (10) consecutive days provided that the operator pays a mitigation fee of $8,800 per day for each day in excess of ten (10) days. The mitigation fee shall be submitted within ninety (90) calendar days after the end of the routine maintenance period.

(h) Alternative Compliance Provision

In lieu of complying with the PM_{10} emission limit in clause (d)(1)(A)(ii), the operator may comply with the emission rate of 0.006 grain per dry standard cubic foot of flue gas, corrected to 3% O_2 dry, provided that the operator has a compliance plan approved by the Executive Officer that demonstrates equivalent PM_{10} emission reductions commencing December 31, 2006 through the use of alternative compliance method(s). The operator shall submit a complete compliance plan by June 15, 2004. Equivalent PM_{10} emission reductions between 0.006 grain/dscf and 0.005 grain/dscf shall be determined as follows.

$$E_{pm10} = (0.006 - 0.005 \text{ grain/dscf})(F)(CF_{pm10})$$

where:

E_{pm10} = Equivalent PM_{10} emission reductions per year between 0.006 grain/dscf and 0.005 grain/dscf, tons/yr;

F = Maximum design exhaust flue gas flow rate, dscfm; and

CF_{pm10} = Conversion factor from grains per minute to tons per year = 0.038.

The Executive Officer shall approve or deny the compliance plan, or any amendments to the compliance plan, within 180 calendar days from the date the plan is deemed complete. The operator shall, at a minimum, submit a compliance plan that includes:

(A) A precise description of the alternative compliance method(s), including but not limited to, a listing of equipment that are the source of PM_{10} emissions, operation schedule and modes of operation of such equipment, control techniques for PM_{10} emissions, documents to support the control efficiency used in the plan, a quantification of emission reductions from each of the alternative compliance method(s), and date when such reductions are to be achieved;

(B) A demonstration that the emission reductions are surplus, enforceable, real, and sustainable. Surplus means that the emission reductions are not required by the control options identified in the most recent Air Quality Management Plan approved by the District Governing Board, and are not used by the operator to meet any other regulatory requirements. Enforceable means that the alternative compliance method(s) to achieve emission reductions can be verified by the Executive Officer. Real and sustainable means that the emission reductions can be measured by appropriate source test methods approved by the District, CARB and U.S. EPA, and sustainable during the implementation time frame of the alternative compliance method(s) as specified in the compliance plan;

(C) A demonstration that at least 50% of the required equivalent PM_{10}

emission reductions are obtained within five (5) kilometers from the outer boundaries of the facility; and

(D) A demonstration that the overall PM_{10} emission reductions provided by the alternative compliance method(s) are comprised of at least an 80% emission reduction in $PM_{2.5}$.

Attachment A

Operating Parameters and Frequency of Monitoring and Recording [1]

Operating Parameters	Monitoring Frequency	Recording Frequency
Dry (or Wet) Electrostatic Precipitators		
Flue gas inlet temperature to ESP	Continuously [2]	Hourly [3]
Flue gas flow rate	Continuously [2]	Hourly [3]
Voltage and current across ESP (or total power input)	Continuously [2]	Hourly [3]
Ammonia injection rate	Continuously [2]	Hourly [3]
Wet Scrubbers (or Wet Electrostatic Precipitators)		
Flue gas flow rate	Continuously [2]	Hourly [3]
Type of scrubbing liquid and average pH	Daily [4]	Daily [4]
Scrubbing liquid flow rate	Continuously [2]	Hourly [3]
SO_2 Reducing Catalyst Additives		
Type of SO_2 reducing catalyst	Once and when change occurs	Once and when change occurs
Addition rate of SO_2 reducing catalyst	Daily [4]	Daily [4]
Pickup factor (i.e. lbs SO_2 reduced per lbs of additives)	Once and when change occurs	Once and when change occurs
Baghouses		
Flue gas flow rate	Continuously [2]	Hourly [3]
Pressure drop	Continuously [2]	Hourly [3]
Flue gas inlet temperature	Continuously [2]	Hourly [3]

Note:

1. Monitoring and recording as shown in this attachment shall not be required during periods of routine maintenance and malfunction of monitoring and recording devices.
2. "Continuously Monitoring" means monitoring at least once every 15 minutes.
3. "Hourly Recording" means recording at least one measurement every hour.
4. "Daily Monitoring" and "Daily Recording" means monitoring and recording at least one measurement every day.