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**PARTICULATE EMISSIONS FROM REFINERY FLUIDIZED CATALYTIC**  
**CRACKING UNITS**

(Adopted [Adoption Date])

**6-5-100 GENERAL**

**6-5-101 Description:** This rule limits the emissions of condensable particulate matter emissions from petroleum refinery fluidized catalytic cracking units (FCCUs) as well as emissions of precursors of secondary particulate matter. Regulation 6, Rule 1 addresses filterable particulate emissions from FCCUs. For the purposes of this rule, commingled ammonia, condensable particulate and sulfur dioxide emissions from an FCCU and one or more other sources from a single exhaust point shall all be considered to be FCCU emissions.

**6-5-110 EXEMPTIONS**

**6-5-111 Exemption, Emissions Abated by Wet Scrubber:** The emission limits in Section 6-5-301 shall not apply to emissions that are abated by a wet scrubber that is required to be operated by a District permit and that constitutes best available control technology (BACT) for any pollutant.

**6-5-112 Limited Exemption, Emissions during Startup or Shutdown Periods:** The requirements of Section 6-5-301 shall not apply to emissions during an FCCU startup or shutdown period. FCCU startup and shutdown periods shall be as defined in this rule, unless a different period is specified in a District Permit to Operate for an FCCU, in which case the Permit to Operate shall take precedence. This exemption is also applicable to a non-FCCU source with startup or shutdown provisions specified in a Permit to Operate, if that source is subject to the requirements of Section 6-5-301 because the source emissions are commingled with those of an FCCU at a single exhaust point; the startup or shutdown provisions specified in the Permit to Operate shall be the basis for this exemption. Whenever this exemption applies to any source, it shall apply to all sources with commingled emissions.

**6-5-113 Limited Exemption, Installation of Wet Scrubber:** The emission limit effective date for ammonia in Section 6-5-301 may be extended to a later date specified in a District Authority to Construct for an existing FCCU to be controlled with a new wet scrubber, but may not be extended by more than 36 months.

**6-5-114 Limited Exemption, FCCU without Nitrogen-Based Additives:** The emission limit for ammonia in Section 6-5-301 shall not apply to an FCCU where ammonia, urea or any other nitrogen-based additive is not used in a way that contributes to ammonia or condensable particulate FCCU emissions.

- 6-5-115 Limited Exemption, Ammonia Optimization:** The ammonia emission limit in Section 6-5-301 shall not apply to the owner/operator of a refinery that implements an optimization of ammonia and/or urea injection in accordance with Section 6-5-403.
- 6-5-200 DEFINITIONS**
- 6-5-201 Ammonia Slip:** Ammonia slip is the amount of unreacted ammonia emitted to the atmosphere from the FCCU, regardless of the source of the ammonia.
- 6-5-202 Catalyst Regeneration Unit (CRU):** A catalyst regeneration unit regenerates spent FCCU catalyst by burning off the coke that has deposited on the catalyst surface. The resulting CRU flue gas is the primary emission source addressed by this rule.
- 6-5-203 Condensable Particulate Matter:** Liquid droplets that coalesce, or gaseous emissions that condense to form liquid or solid particles. These liquid and/or solid particles are identified as condensable organic or condensable inorganic particulate matter using EPA Test Method 202.
- 6-5-204 Daily Average:** The arithmetic mean of the measured ammonia emissions subject to Section 6-5-301 on any calendar day that the FCCU operates.
- 6-5-205 FCCU Shutdown:** Unless otherwise specified in a District Permit to Operate, FCCU shutdown is a period which begins when fresh feed flow to the FCCU reactor stops and ends when the main blower for catalyst recirculation is shutdown.
- 6-5-206 FCCU Startup:** Unless otherwise specified in a District Permit to Operate, FCCU startup is a period not exceeding 120 hours which begins with the startup of the main blower for introduction of catalyst and ends after fresh feed is introduced to the FCCU reactor, when the process reaches steady state.
- 6-5-207 Fluidized Catalytic Cracking Unit (FCCU):** A fluidized catalytic cracking unit (FCCU) is a processing unit that converts heavy petroleum fractions, typically from crude oil distillation units, into lighter fuel intermediates by using a fine, powdered catalyst to promote a chemical reaction in which the heavy petroleum molecules are broken into smaller molecules. In addition to the cracking reactor, an FCCU includes a catalyst regeneration unit (CRU), ancillary equipment including blowers, and all equipment for controlling air pollutant emissions and recovering heat.
- 6-5-208 Petroleum Refinery:** An establishment that is located on one or more contiguous or adjacent properties that processes crude oil to produce more usable products such as gasoline, diesel fuel, aviation fuel, lubricating oils, asphalt or petrochemical feedstocks. Petroleum refinery processes include separation processes (e.g., atmospheric or vacuum distillation, and light ends recovery), petroleum conversion processes (e.g., cracking, reforming, alkylation, polymerization, isomerization, coking, and visbreaking) petroleum treating processes (e.g., hydrodesulfurization, hydrotreating, chemical sweetening, acid gas removal, and deasphalting), feedstock and product handling (e.g., storage, blending, loading, and unloading), auxiliary facilities (e.g., boilers, waste water treatment, hydrogen production, sulfur recovery plant, cooling towers, blowdown systems, compressor engines, and power plants).

**6-5-209 Primary Particulate Matter:** Material emitted to the atmosphere as filterable or condensable particulate matter.

**6-5-210 Secondary Particulate Matter:** Material emitted to the atmosphere in a gaseous form that will not coalesce or condense to a solid or liquid form at atmospheric temperature and pressure, but that may react in the atmosphere into a solid or liquid form. For the purposes of this rule, precursors of Secondary Particulate Matter shall include sulfur dioxide (SO<sub>2</sub>) and ammonia.

**6-5-211 Wet Scrubber:** A device that removes air pollutants from gas streams by contacting the gas stream with a scrubbing liquid.

#### **6-5-300 STANDARDS**

**6-5-301 Fluidized Catalytic Cracking Unit (FCCU) Emission Limits:** The owner/operator of a Petroleum Refinery that includes an FCCU shall not cause emissions to the atmosphere from the FCCU that exceed the limits in Table 1 on or after the indicated effectiveness date:

<b>Pollutant</b>	<b>Emission Limit</b>	<b>Effective Date</b>
Ammonia	10 ppmvd at 3% O <sub>2</sub> as a daily average	January 1, 2018
Condensable Particulate Matter	[future]	[future]
Sulfur Dioxide (SO <sub>2</sub> )	[future]	[future]

#### **6-5-400 ADMINISTRATIVE REQUIREMENTS**

**6-5-401 Ammonia Control Plan and Permit Applications:** No later than January 1, 2017, the owner/operator of a Petroleum Refinery subject to the ammonia emission limit in Section 6-5-301 shall submit to the APCO a control plan detailing the measures, if any, to be taken in order to meet the requirements of Section 6-5-301, and also applications for all Authorities to Construct necessary for compliance with Section 6-5-301.

**6-5-402 Ammonia Monitoring Plan:** No later than January 1, 2017, the owner/operator of a Petroleum Refinery that includes an FCCU subject to the ammonia emission limit in Section 6-5-301 shall submit to the APCO a plan for the installation of a continuous ammonia monitoring system to perform monitoring as required by Section 6-5-501. This plan shall identify the proposed monitoring technique, monitoring equipment, installation details and installation schedule.

**6-5-403 Ammonia Optimization:** As an alternative to compliance with the ammonia emission limit of Section 6-5-301, the owner/operator of a refinery may instead establish an enforceable ammonia emission limit for the FCCU that results in the minimization of total FCCU PM<sub>2.5</sub> emissions (including all condensable particulate matter), as follows:

- 403.1 No later than March 1, 2016, the refinery owner/operator shall submit to the APCO an Optimization and Demonstration Protocol for the purpose of establishing the minimum rate of ammonia and/or urea injection necessary to minimize total PM<sub>2.5</sub> FCCU emissions (including all condensable particulate matter) while complying with all existing permit requirements, excluding permit requirements that are not based on District BACT requirements, on District prohibitory rule limits or on federal consent decrees. The Optimization Protocol shall include the ammonia and/or urea injection rates to be evaluated and the criteria for selecting these rates, and also the criteria for determining the Optimized Ammonia Emissions Concentration that minimizes total FCCU PM<sub>2.5</sub> emissions.
- 403.2 Within 60 days, the APCO shall either approve or disapprove the Optimization and Demonstration Protocol.
- 403.3 The refinery owner/operator shall commence and complete the Optimization and Demonstration Protocol, approved by the APCO, no later than December 31, 2016.
- 403.4 The refinery owner/operator shall report to the APCO the results of the Optimization and Demonstration Protocol and the proposed Optimized Ammonia Emissions Concentration no later than February 28, 2017. No later than this same date, the refinery owner/operator shall submit a District permit application to 1) establish the Optimized Ammonia Emissions Concentration as an enforceable permit requirement, and to 2) relax any existing permit conditions that are not based on District BACT requirements, on District prohibitory rule limits or on federal consent decrees to the extent necessary to minimize total FCCU PM<sub>2.5</sub> emissions.
- 403.5 Disapproval of an Optimization and Demonstration Protocol, or a failure to meet any requirement or deadline in this section shall not constitute a violation of this rule, but shall preclude the applicability of the limited exemption in Section 6-5-115.

**6-5-500 MONITORING AND RECORDS**

**6-5-501 Ammonia Monitoring:** The owner/operator of a Petroleum Refinery that includes an FCCU subject to the ammonia emission limit in Section 6-5-301 shall, no later than January 1, 2018, operate all of the following;

- 501.1 Continuous emission monitors that comply with District Regulation 1, Section 522 to continuously measure:

- 1.1 Oxygen concentrations downstream of the addition point of ammonia, urea or any other nitrogen-based additive into the emission stream; and,
- 1.2 NOx concentrations either:
  - 2.1 Upstream and downstream of the addition point of ammonia, urea or any other nitrogen-based additive into the emission stream, or;
  - 2.2 Downstream of the addition point of ammonia, urea or any other nitrogen-based additive into the emission stream, with the capability to measure NOx and NOx plus ammonia to obtain ammonia by difference, or;
- 1.3 Any other ammonia emission monitoring system approved in writing by the APCO.

501.2 Parametric monitors that comply with District Regulation 1, Section 523 to continuously measure the injection or addition rate (pounds per hour) of ammonia, urea or any other nitrogen-based additive into the emission stream.

**6-5-502 Ammonia Records:** The owner/operator of a Petroleum Refinery subject to the ammonia emission limit in Section 6-5-301 shall maintain records of the data required to be measured in Section 6-5-501. These records shall be kept for a period of at least five years and shall be made available to the APCO on request.

**6-5-600 MANUAL OF PROCEDURES**

**6-5-601 Compliance Determination:** All compliance determinations shall be made in the as-found operating condition. No compliance determinations shall be made during periods subject to the exemption in Section 6-5-112.

**6-5-602 Determination of Ammonia and Oxygen:** Determination of ammonia shall be by Regulation 1, Section 522 NOx monitors or other APCO approved ammonia monitoring system. Determination of oxygen shall be by Regulation 1, Section 522 oxygen monitor.