**SCRUBBER With and Without CAM**

**Updated 3/30/2017, 1/30/19**

1. How many scrubber profile levels?
   1. Wet scrubber for control of gaseous pollutants (VOC, HAP, sodium bisulfite additive) – Packed Bed tower (all the ethanol plants)
   2. Wet scrubber for control of particulate matter (PM, PM10, PM2.5) – Venturi Scrubber/Adsorption Tower
2. ARM language – still need to break up for ARM language. See last table for Pressure Drop examples. There are many variations. Would like to be consistent if possible and agree upon standard language.

*GREEN: Standard profile language – no suggested change*

*PURPLE: Suggested additional language*

*BLACK: Notes*

*Highlighted area – would like to discuss*

*RED: optional language*

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **SCREEN** | **REQUIREMENT** | | **CITATION** | | **NOTEs/ comments** | **Guidance** | **Profile** |
|  | **CITATIONS**  **Consent Decree citation:** CAAA of 1990; Title I Condition: 40 CFR pt. <52><60>; Minn. Stat. Section 116.07, subds. 4a & 9; Minn. R. 7007.0100, subp. 7; Minn. R. 7007.0800, subps. 1 & 2. (10/27/15)  **Bulk Ag Rule (requirement to vent to controls):** Minn. R. 7011.1015  **BACT:** Title I Condition:40 CFR 52.21(j)(BACT) & Minn. R. 7007.3000  **PSD Modeling:** Title I Condition:40 CFR 52.21(k)(PSD model) & Minn. R. 7007.3000 [Would this citation be required on flexibility provisions? Currently am not including.]  **Title V Modeling:** Minn. R. 7007.0100, subp. 7(A), 7(L), & 7(M), Minn. R. 7007.0800, subp. 4, Minn. R. 7007.0800, subps. 1-2, Minn. R. 7009.0010-7009.0080, Minn. Stat. 116.07, subd. 4a, Minn. Stat. 116.07, subd. 9[Would this citation be required on flexibility provisions? Currently am not including.]  **Avoid PSD:** Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) & Minn. R. 7007.3000  **Avoid Part 70:** Avoid major source under 40 CFR 70.2 & Minn. R. 7007.0200  **Avoid NESHAPs:** Title I Condition: Avoid major source under 40 CFR 63.2 | | | | | |  |
| **STRU: Multiple Units with VOC/HAP Emissions venting to a SCRUBBER** | | | | | | |  |
|  | The Permittee shall vent emissions from any emission unit that vents to STRU # to a scrubber that meets the requirements of TREA # whenever any emission unit that vents to STRU # operates, and shall operate and maintain a scrubber that meets the requirements of TREA # at all times that any emissions vent to it. | | Not CAM  Avoid PSD  Avoid NESHAP  BACT/CAA/model (if PM) | |  | Include in all. Edit as needed.  *Written to accommodate flexibility* |  |
|  | *The Permittee shall vent emissions from [SI ID] to [SI ID for treatment SI] whenever [SI ID] operates, and operate and maintain [SI ID for treatment SI] at all times that any emissions are vented to [SI ID for treatment SI]. The Permittee shall document periods of non-operation of the control equipment [SI ID for treatment SI] whenever [SI ID] is operating. [Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000]* | | | | | |  |
|  | Sample profile language for stacks venting to Scrubbers  [..\Performance Testing\Ethanol Helpfile Performance Testing.docx](../Performance%20Testing/Ethanol%20Helpfile%20Performance%20Testing.docx)  [..\Flexibility Language\Ethanol Helpfile FLEXIBILITY.docx](../Flexibility%20Language/Ethanol%20Helpfile%20FLEXIBILITY.docx)  [..\Resources and Examples\Permit Examples\Permit Example Ethanol - Al-Corn 121916.docx](file:///\\x1600\public\Nelson_Bonnie.BN\Resources%20and%20Examples\Permit%20Examples\Permit%20Example%20Ethanol%20-%20Al-Corn%20121916.docx) | | | | | |  |
| **TREA: Multiple Units with VOC/HAP Emissions venting to a SCRUBBER** | | | | | | |  |
| text | The Permittee shall vent emissions from any emission unit that vents to STRU # to a scrubber that meets the requirements of TREA # whenever any emission unit that vents to STRU # operates, and shall operate and maintain a scrubber that meets the requirements of TREA # at all times that any emissions vent to it. The Permittee shall document periods of non-operation of the control equipment. | | Not CAM  Avoid PSD  Avoid NESHAP  CAA/BACT/Model | | Modified | Include in all. Edit as needed.  *Written to accommodate flexibility* | Both |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for Particulate Matter >= XX percent control efficiency. | | Not CAM  Avoid PSD  Avoid NESHAP  CAA/BACT/Model | | Profile Language  1/10/2019 | Include when control equipment is used to determine PTE (e.g., Title I). This requirement is standard for controls that are required by a permit (i.e., not CAM-specific).  Based on 100% capture.  Typically 95% - 98% for PTE  2002 Consent Decree >= 95% control |  |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for PM10 >= XX percent control efficiency. | | Not CAM  Avoid PSD  Avoid NESHAP  CAA/BACT/Model | |  |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for PM2.5 >= XX percent control efficiency. | | Not CAM  Avoid PSD  Avoid NESHAP  CAA/BACT/Model | |  |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for VOC >= XX percent control efficiency. | | Not CAM  Avoid PSD  Avoid NESHAP  CAA/BACT/Model | |  |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for acetaldehyde >= XX percent control efficiency. | | Avoid NESHAP | |  | The permit should specify a HAP efficiency to be used when back-calculating uncontrolled emissions during periods of scrubber downtime.  Consider making HAP group limit control efficiency reset with subsequent testing if you don’t have conservative value, or history of information to set. |  |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for formaldehyde >= XX percent control efficiency. | | Avoid NESHAP | |  |  |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for methanol >= XX percent control efficiency. | | Avoid NESHAP | |  |  |
|  | The Permittee shall operate and maintain control equipment such that it achieves a control efficiency for acrolein >= XX percent control efficiency. | |  | |  |  |  |
|  |  | |  | |  |  |  |
|  | **FLEXIBILITY LANGUAGE** | |  | |  |  |  |
|  | [S:\Nelson\_Bonnie.BN\Flexibility\_AOS and Bypass Language\FLEXIBILITY Plus! for ethanol facilities.docx](file:///S:\Nelson_Bonnie.BN\Flexibility_AOS%20and%20Bypass%20Language\FLEXIBILITY%20Plus!%20for%20ethanol%20facilities.docx) | |  | |  | Use most recent flexibility language |  |
|  |  | |  | |  |  | PM |
|  | **OPERATING LIMITS** | |  | |  |  | PM |
|  | The Permittee shall operate and maintain the control equipment in accordance with the Operation and Maintenance (O & M) Plan. The Permittee shall keep copies of the O & M Plan available onsite for use by staff and MPCA staff. | | Minn. R. 7007.0800, subp. 14 | | Profile language | This requirement is standard for controls that are required by a permit. |  |
| ARMNO  CAM | Water flow rate >= gallons per minute (Flow Rate Limit) [as determined during the [DATE] performance test], whenever emissions are venting to TREA XX, unless a new limit is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below.  The Permittee shall record the water flow rate at least once every 24 hours. If the recorded water flow rate is below the required limit, the emissions during that time shall be considered **uncontrolled** until the water flow rate is once again above the required limit. The period of time for which the flow rate is considered below the limit shall be reported as a **deviation**, as defined by Minn. R. 7007.0100, subp. 8a. | | NO CAM  Minn. R. 7017.2025  Avoid PSD  Minn. R. 7007.0800, subps. 4-5;  Avoid NESHAP | | 1/30/2019 | “outside the required range”  within the required range.  No averaging period if only measuring flow once per day. |  |
| ARM  CAM | Operating Scenario 1: Water flow rate >= gallons per minute (Flow Rate Limit) <3-hour average> [as determined during the [DATE] performance test], whenever emission are venting to TREA XX, unless a new Flow Rate Limit is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below.  The Permittee shall read and record the water flow rate at least once every 24 hours when in operation. If the recorded water flow rate is below the required limit, the emissions during that time shall be considered **uncontrolled** until the water flow rate is once again above the required limit. The period of time for which the flow rate is considered below the limit shall be reported as a **deviation**, as defined by Minn. R. 7007.0100, subp. 8a. | | CAM  Minn. R. 7017.2025  Avoid PSD  40 CFR 64.3(a)(2) & Minn. R. 7017.0200;; Minn. R. 7007.0800, subps. 4-5; Minn. R. 7007.0800, subp. 11;  Avoid NESHAP | | 1/30/2019 | This requirement is standard for controls that are required by a permit (i.e., not CAM-specific). Most CAM plans require water flow rate and pressure drop as standard indicators. **Should measure flow rate hourly according to EPA guidance**. Add or delete indicators as needed. Edit citation as needed.  Sets indicator range for water flow rate when emissions are being vented to the control equipment. You must provide a minimum value that can be reset via a NOC. You may choose to set an upper end maximum to avoid flooding. This value should not be reset via a NOC. | PM |
| NO ARM  CAM | Operating Scenario 2: Water flow rate: ≤ 0 gallons per minute when no emissions are venting to the scrubber.  *\*facility may need a de minimus flow value. Keep at 0 w/o sig. digits to allow for this.* | | CAM  40 CFR 64.3(a)(2) & Minn. R. 7017.0200;;  Minn. R. 7017.2025  Avoid PSD  Minn. R. 7007.0800, subps. 4-5; Minn. R. 7007.0800, subp. 11;  Avoid NESHAP | | 1/30/2019 | Sets indicator range for water flow rate when emissions are not vented to the control equipment, and the control equipment is not operational. Since the CAM rules require a water flow rate reading every 24-hour period, this provides an option for the Permittee to list “0” without it being an excursion. | VOC |
|  | Consider using Visible emissions and/or pressure drop limits for PM control.  [CE - Fabric Filter w CAM other PSEU 032817.docx](CE%20-%20Fabric%20Filter%20w%20CAM%20other%20PSEU%20032817.docx) | | | | |  |  |
| ARM  NOT  CAM | Scrubber Additive Flow Rate: >= <milliliters per minute><gallons per hour><gallons per minute> (Additive Rate Limit) [as determined during the [DATE] performance test], whenever emission are venting to TREA XX, unless a new limit is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below.  <The Permittee must maintain the scrubber additive chemical type and solution concentration by weight equivalent or in excess of that utilized during the most recent performance test where compliance was demonstrated.>  The Permittee shall record the additive flow rate at least once every 24 hours <when emissions are vented to the scrubber>. If the recorded additive flow rate is below the required Additive Rate Limit, the acetaldehyde emissions during that time shall be considered uncontrolled until the additive flow rate is once again above the required Additive Rate Limit. The period of time for which the flow rate is below the limit shall be reported as a deviation, as defined by Minn. R. 7007.0100, subp. 8a. | | NOT CAM  Minn. R. 7007.0800, subps. 4-5;  Avoid PSD  Avoid NESHAP | | 1/30/2019  See Joe’s proposal to incorporate better language about solution concentration and makeup water. | Depending on the measurement method, a 3-hour average might not make sense. For example, if the measurement of additive rate consists of a single reading of the pump setting (once every day), the limit should apply as an instantaneous limit (not a 3-hour average limit). If they are subject to CAM and conduct hourly, or more frequent, readings, use 3-hour average.  Sets indicator range for Sodium Bisulfite additive feed rate when emissions are being vented to the control equipment. You must provide a minimum value that can be reset via a NOC. This additive may be used to reduce acetaldehyde (HAP) emissions from fermentation, verify if it was relied upon in the most recent test. |  |
| ARM | Operating Scenario 1: Scrubber: Additive Flow Rate >= <milliliters per minute><gallons per hour><gallons per minute> (Additive Rate Limit) [as determined during the [DATE] performance test], whenever emission are venting to TREA XX, unless a new limit is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below.  <The Permittee must maintain the scrubber additive chemical type and solution concentration by weight equivalent or in excess of that utilized during the most recent performance test where compliance was demonstrated.>  The Permittee shall record the water flow rate at least once every 24 hours. If the recorded additive flow rate is below the required limit, the acetaldehyde emissions during that time shall be considered uncontrolled until the additive flow rate is once again above the required Additive Rate Limit. The period of time for which the flow rate is below the limit shall be reported as a deviation, as defined by Minn. R. 7007.0100, subp. 8a, and is considered an excursion as defined by 40 CFR 64.1 | | CAM  40 CFR 64.3(a)(2) & Minn. R. 7017.0200;; Minn. R. 7007.0800, subps. 4-5; Minn. R. 7007.0800, subp. 11;  Avoid PSD  Avoid NESHAP | | 1/30/2019  See Joe’s proposal | Sets indicator range for Sodium Bisulfite additive feed rate when emissions are being vented to the control equipment. You must provide a minimum value that can be reset via a NOC. You may choose to set an upper end maximum to avoid flooding. This value should not be reset via a NOC. This additive may be used to reduce acetaldehyde (HAP) emissions from fermentation, verify if it was relied upon in the most recent test. |  |
| NO ARM | Operating Scenario 2 Sodium Bisulfite Material Usage: >= 0 gallons per minute when no emissions are venting to the scrubber.  *\*facility may need a de minimus flow value. Keep at 0 w/o sig. digits to allow for this.* | | CAM  40 CFR 64.3(a)(2) & Minn. R. 7017.0200;; Minn. R. 7007.0800, subps. 4-5; Minn. R. 7007.0800, subp. 11;  Avoid PSD  Avoid NESHAP | | 1/30/2019  See Joe’s proposal | Sets indicator range for Sodium Bisulfite additive feed rate (if applicable) when emissions are not vented to the control equipment, and the control equipment is not operational. Since the CAM rules require a flow rate reading every 24-hour period, this provides an option for the Permittee to list “0” without it being an excursion. |  |
|  | Recordkeeping of Water Flow Rate and Sodium Bisulfate Additive Rate: At least once <during every 24-hour period><each day of operation> the Permittee shall record the time and date of each water flow rate and additive flow rate reading, < the applicable Operating Scenario (whether or not emissions are being vented to the scrubber)> and whether or not the recorded values were within the indicator range specified in this permit. | | BOTH  40 CFR 64.3 and Minn. R. 7017.0200;  Avoid PSD  Minn. R. 7007.0800, subps. 4-5;  Minn. R. 7007.0800, subp. 11;  Avoid NESHAP | | 1/30/2019 | ***The daily recordkeeping requirements could be combined:***  *Daily Recordkeeping: At least once during every 24-hour period the Permittee shall record the pressure drop across the scrubber, the water flow rate to the scrubber and the sodium bisulfate additive feed rate. For each reading the Permittee shall record 1) the time and date of the recording, 2) the applicable Operating Scenario (whether or not emissions are being vented to the scrubber) and 3) whether or not the recorded water flow rate is within the range for the Operating Scenario specified in this permit. Recorded values outside the range specified in this permit are considered deviations as defined by Minn. R. 7007.0100, subp. 8a and are considered excursions as defined by 40 CFR 64.1* |  |
|  | Pressure Drop >= .0 and <= .0 inches of water, unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3, based on the values recorded during the most recent MPCA-approved performance test where compliance was demonstrated. The new range shall be implemented upon receipt of the Notice of Compliance letter granting preliminary approval. The range is final upon issuance of a permit amendment incorporating the change.   The Permittee shall read and record the pressure drop at least once every 24 hours when in operation. If the **recorded** pressure drop is outside the required range, the emissions during that time shall be considered uncontrolled until the pressure drop is once again within the required range. The period of time for which the pressure drop is considered out of range shall be reported as a deviation, as defined by Minn. R. 7007.0100, subp. 8a. | | [Avoid PSD, Avoid NESHAP, CAAA of 1990, Minn. R. 7017.2025**]** | | Why only cite 2025 and not subp. 3? |  |  |
|  | Monitoring Equipment: The Permittee shall install and maintain the necessary monitoring equipment for measuring and recording water flow and additive flow rate as required by this permit. The monitoring equipment must be installed, in use, and properly maintained when the monitored scrubber is in operation.  <The water flow monitoring device shall be set at a point no less than 1) the minimum water flow rate plus the margin of error of the monitoring device based on manufacturer specifications and as identified in the Operation and Maintenance Plan, or 2) the minimum water flow rate plus 2% of the water flow rate.>  <The additive flow monitoring device shall be set at a point no less than 1) the minimum additive flow rate plus the margin of error of the monitoring device based on manufacturer specifications and as identified in the Operation and Maintenance Plan, or 2) the minimum additive flow rate plus 2% of the additive flow rate.> | | 40 CFR 64.7(b), Minn. R. 7017.0200;  Minn. R. 7007.0800, subp. 4; | | Option “including maintaining the necessary parts for routine repairs of the monitoring equipment” - (in large PSEU ESP w/COMs)l | Edit the citation as needed, but must include CAM part of citation. If other indicator ranges or conditions are set, list here as well (e.g., water supply pressure, additive rate,…)  Air, Permitting, Individual Permits, Control Equipment, CAM, Other PSEU, Venturi Scrubber  ***Existing language:***  *Monitoring Equipment: The Permittee shall install and maintain the necessary monitoring equipment for measuring and recording pressure drop, water flow rate, and water supply pressure as required by this permit. The monitoring equipment must be installed, in use, and properly maintained when the monitored scrubber is in operation* | Both |
|  | The Permittee shall operate and maintain the scrubber in accordance with the O & M Plan. The Permittee shall keep copies of the O & M Plan available onsite for use by staff and MPCA staff. [Minn. R. 7007.0800, subp. 14] | |  | |  |  |  |
|  | Periodic Inspections: At least once per calendar quarter, or more frequently if required by the manufacturer specifications, the Permittee shall inspect the control equipment <external> components. The Permittee shall maintain a written record of these inspections. | | 40 CFR 64.3, Minn. R. 7017.0200; Minn. R. 7007.0800, subps. 4-5  7007.0800, subp. 14 | |  | Edit the citation as needed, but must include CAM part of citation. Include qualifier <external> if Permittee does not shut down the control equipment quarterly to perform internal inspections. Add annual internal inspection requirement. | Both |
|  | Annual Inspections: At least once per calendar year, or more frequently if required by the manufacturer specifications, the Permittee shall inspect the internal control equipment components not covered by the quarterly inspections. This includes, but is not limited to, components that are not subject to wear or plugging including structural components, housings, and hoods. The Permittee shall maintain a written record of theses inspections. | | 40 CFR 64.3, Minn. R. 7017.0200; Minn. R. 7007.0800, subps. 4&5 | | Would like to have both periodic and annual inspections. | Edit the citation as needed, but must include CAM part of citation.  Only use if Permittee conducts EXTERNAL quarterly inspections only. Permittee may not shut down equipment for quarterly inspection, then they would need annual inspection language. | VOC |
|  | Annual Calibration: The Permittee shall calibrate or replace with calibrated gauges at least once every 12 months and shall maintain a written record of any action resulting from the calibration or the replacement. | | 40 CFR Section 64.3; Minn. R. 7017.0200; Minn. R. 7007.0800, subps. 5 and 14 | | It would be good to add replace to all language. | Edit the citation as needed, but must include CAM part of citation. | Both |
|  | Corrective Actions: The Permittee shall take corrective action as soon as possible if any of the following occur:  1. the recorded flow rate is below the required rate; or  2. the scrubber or any of its components are found during the inspections to need repair.  Corrective actions shall return the water flow rate and/or additive flow rate to within the permitted range(s), and/or include completion of necessary repairs identified during the inspection, as applicable. Corrective actions include, but are not limited to, those outlined in the O & M Plan for the scrubber. The Permittee shall keep a record of the type and date of any corrective action taken for each scrubber. | | 40 CFR 64.7(d) and Minn. R. 7017.0200;  Minn. R. 7007.0800, subps. 5  Minn. R 7007.0800, subp. 14  7007.0800, subp. 2(A) | | The citation refers to “response to excursions” (see below). Implementing corrective actions would be a response to excursions. Are we using this in lieu of the language from the rule? | Edit monitoring if limiting other parameters. Edit the citation as needed, but must include CAM part of citation. | Both |
|  | <If the Permittee bypasses any scrubbers that vents to STRU xx, when emissions are venting to STRU xx, the Permittee must report a deviation. For each period of bypass greater than <15 minutes>, the Permittee must record:  1. The date.  2. The start time and end time, if known. If exact times are not known, identify the last known time that the scrubber was operational.  3. The facility operating conditions during the bypass.  For each period of bypass while emissions are venting to STRU xx, the Permittee shall conduct a root-cause failure analysis of the event and submit a report of the analysis to the Commissioner within 15 days. The emissions emitted during a bypass event shall be considered uncontrolled and shall be reported as a deviation.> | | Minn. R. 7007.0800, subp. 2(A)  Minn. R. 7007.0800, subp. 5  Minn. R 7007.0800, subp. 14 | | 2/12/2019 |  |  |
|  | <Accumulation of Deviations Report: If there is an accumulation of deviations greater than <5%> of the <scrubber> operating time during a six-month reporting period, the Permittee must develop and implement a quality improvement plan to address the deviations within 30 days following the six-month reporting period. <Deviations include missed readings and any readings outside of the indicator range.> If there is an accumulation of deviations greater than <3%> of the control equipment operating time during a subsequent six-month reporting period, the Permittee must revise the quality improvement plan, conduct a root-cause analysis of the failure of the quality improvement plan to address the deviations, and submit the quality improvement plan and the root-cause analysis report to the Commissioner within 30 days following the end of six-month reporting period. Implementation of a quality improvement plan does not excuse the Permittee from compliance with any applicable requirement.> | | Minn. R. 7007.0800, subp. 2(A)  Minn. R. 7007.0800, subp. 5 | |  | 5% is from CAM. This number could be adjusted based upon the required number of readings and case-by-case considerations.  I am finding that facilities are not identifying missed readings as “percent of readings indicating deviations”. |  |
| ARM | Protocol for Resetting the Water Flow Rate and Additive Flow Rate Limits: The Permittee shall conduct performance testing to measure the VOC as mass emission rate and VOC destruction efficiency as required elsewhere in this permit. If an established Flow Rate Limit is to be reset, the reset shall be based on the water and additive flow rate values recorded during the most recent MPCA-approved performance test where compliance was demonstrated.   During the performance test, the Permittee must continuously monitor the water flow rate and additive flow rate. The Permittee shall calculate the average flow rate for each individual compliant test run. ~~based on the average exhibited over all three compliant test runs.~~ Downtime of 15 minutes or more is not to be included as operating time.  The Minimum Water Flow Rate Limit and Additive Flow Rate Limit shall be reset as follows:  **- if the lowest 1-hour average flow rate recorded during a compliant test run is between 100% and 110% of the current limit, it shall not be reset and the established Flow Rate Limit remains unchanged; or**  **- if the lowest 1-hour average water flow rate recorded during a compliant test run is lower than the current limit it shall be reset as the lowest 1-hour average flow rate of a compliant test run; or**  **- if the lowest 1-hour average flow rate recorded during a compliant test run is 10% greater than the current limit it shall be reset as the lowest 1-hour average flow rate of a compliant test run.**  The new Flow Rate Limit shall be effective upon receipt of the Notice of Compliance letter that approves the test results and shall be incorporated into the permit when the permit is next amended. [Minn. R. 7017.2025, Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000] | |  | | 1/30/2019 | **Current ARM profile language is not appropriate for scrubbers. There is a team working on a fix. The draft language is in purple bold.** |  |
| ARM | The Permittee must apply for and obtain a major permit amendment if the Permittee wishes to deviate from the Protocol for Resetting the Water Flow or Additive Flow Rate Limit required by this permit. [Minn. R. 7007.1500, subp. 1] | |  | | 1/30/2019 |  |  |
| ARM | Notwithstanding the Protocol detailed above, the MPCA reserves the right to set operational limits and requirements as allowed under Minn. R. 7017.2025. If the MPCA sets limits, the new limits shall be implemented upon receipt of the Notice of Compliance letter that notifies the Permittee of preliminary approval. The limits set according to Minn. R. 7017.2025 are final upon issuance of a permit amendment incorporating the change. [Minn. R. 7017.2025] | |  | | 1/30/2019 |  |  |
|  | Continued operation. Except for monitoring malfunctions, associated repairs, and required quality assurance or control activities, the Permittee shall conduct all monitoring in continuous operation (or shall collect data at all required intervals) at all times that the pollutant-specific emissions unit is operating. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring to provide valid data. | | 40 CFR 64.7(c); Minn. R. 7017.0200 | | Not currently a general CAM requirement, but it seems like it should be. | CAM-specific requirement. Goes in ALL permits with CAM - do not edit. | Both |
|  | Response to excursions. Upon detecting an excursion or exceedance, the Permittee shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing the period of any startup, shutdown or malfunction and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion or exceedance. | | 40 CFR 64.7(d)(1); Minn. R. 7017.0200 | | Not currently a general CAM requirement, but it seems like it should be. | CAM-specific requirement. Goes in ALL permits with CAM - do not edit. | Both |
|  | ~~Determination of whether the Permittee has used acceptable procedures in response to an excursion or exceedance will be based on information available, which may include but is not limited to, monitoring results, review of operation and maintenance procedures and records, and inspection of the control device, associated capture system, and the process.~~ | | ~~40 CFR 64.7(d)(2)~~  Not currently in profiles | |  | This is the MPCA task to review the submittals and determine if they need a QIP. I’m assuming we’re not doing this. |  |
|  | Documentation of Need for Improved Monitoring: If the Permittee fails to achieve compliance with an emission limitation for which the monitoring did not provide an indication of a deviation while providing valid data, or the results of compliance or performance testing document a need to modify the existing indicator ranges, the Permittee shall promptly notify the MPCA and, if necessary, submit a permit amendment application to address the necessary monitoring change. | | Minn. R. 7007.0800, subp. 2(A)  NON-CAM version | | 1/30/2019  AC | *Gap-filling language to consider for scrubbers that only measure flow once per day.*  *Non-CAM version.* |  |
|  | Documentation of Need for Improved Monitoring: If the Permittee fails to achieve compliance with an emission limitation or standard for which the monitoring did not provide an indication of an excursion or exceedance while providing valid data, or the results of compliance or performance testing document a need to modify the existing [indicator ranges or designated conditions], the Permittee shall promptly notify the MPCA and, if necessary, submit a permit amendment application to address the necessary monitoring change. | | [40 CFR 64.7(e), Minn. R. 7017.0200] | |  | CAM-specific requirement. Goes in ALL permits with CAM. Edit the bracket text to match the parameter that is limited in your permit (e.g., combustion chamber temperature limit, opacity excursion value, etc.). | Both |
|  | As required by 40 CFR Section 64.9(a)(2), for the Semi-Annual Deviations Report required by this permit and/or the Notification of Deviations Endangering Human Health and the Environment required by this permit, as applicable, the Permittee shall include the following related to the monitoring identified as required by 40 CFR pt. 64: 1) Summary information on the number, duration, and cause of excursions or exceedances, as applicable, and the corrective action taken; and 2) Summary information on the number, duration, and cause for monitor downtime incidents. | | 40 CFR 64.9(a)(2) & Minn. R. 7017.0200 | |  | CAM-specific requirement. Goes in ALL permits with CAM - do not edit.  9/28/2015 | Both |
|  | The Permittee shall maintain records of monitoring data, monitor performance data, corrective actions taken, and other supporting information required to be maintained. The Permittee may maintain records on alternative media, such as microfilm, computer files, magnetic tape disks, or microfiche, provided that the use of such alternative media allows for expeditious inspection and review, and does not conflict with other applicable recordkeeping requirements. | | [40 CFR 64.9(b), Minn. R. 7017.0200] | |  | CAM-specific requirement. Goes in ALL permits with CAM - do not edit. | Both |
|  |  | |  | |  |  |  |
| QIP Plan – Optional CAM language | | | | | |  |  |
|  | Quality Improvement Plan (QIP) requirements. If there is an accumulation of <9> or more excursions during the six-month reporting period, the Permittee must develop and implement a QIP in accordance with 40 CFR 64.8(b). The QIP must be available for inspection. | 40 CFR 64.8; Minn. R. 7017.0200 | |  | | Optional CAM-specific requirement. Goes in permits where Permittee chooses to specify QIP triggers. | Both |
|  | If a QIP is required, the Permittee shall develop and implement the QIP as expeditiously as practicable and shall notify the MPCA if the period for completing the improvements contained in the QIP exceeds 180 days from the date on which the need to implement the QIP was determined. | 40 CFR 64.8(c); Minn. R. 7017.0200 | |  | | Optional CAM-specific requirement. Goes in permits where Permittee chooses to specify QIP triggers. | Both |
|  | Following implementation of a QIP, the Administrator or the MCPA may require that the Permittee make reasonable changes to the QIP if the QIP is found to have: (1) Failed to address the cause of the control device performance problems; or (2) Failed to provide adequate procedures for correcting control device performance problems as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions Following implementation of a QIP, the Administrator or the MCPA may require that the Permittee make reasonable changes to the QIP if the QIP is found to have: (1) Failed to address the cause of the control device performance problems; or (2) Failed to provide adequate procedures for correcting control device performance problems as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions | 40 CFR 64.8(d); Minn. R. 7017.0200 | |  | | Optional CAM-specific requirement. Goes in permits where Permittee chooses to specify QIP triggers. | Both |
|  | Implementation of a QIP shall not excuse the Permittee from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply. | 40 CFR 64.8(d); Minn. R. 7017.0200 | |  | | Optional CAM-specific requirement. Goes in permits where Permittee chooses to specify QIP triggers. | Both |

**SCRUBBER (CE00x)**

Chilled water is commonly used to recover the ethanol, however, many of the VOC's (acetaldehyde, etheyl acetate, acrolein, and acetone) are highly insoluable in water and do not scrub out well.  Post processing is often required to meet emission limits, which adds costs.

<http://www.google.com/patents/WO2011159703A1?cl=en> Jun 14, 2011 Pinnacle Engineering Inc.

**Packed bed scrubber using a fusel oil solvent** Other issues arise with the control of acetaldehyde. To control the amount of acetaldehyde created and minimize hazardous air pollutants, sodium bisulfate or ammonium bisulfate has been used to increase the solubility of the acetaldehyde in the scrubber water. The addition of these substances has increased control from an initial 10%-30% solubility by up to 50%-70% solubility. The use of bisulfate additives in the C02 scrubber has been linked to high sulfate concentrations in the dehydrated ethanol. The sulfate concentration of dehydrated ethanol is limited by the customers of the dehydrated ethanol

Because of their physical properties, fusel oils can become trapped in the rectifier column 222 of the ethanol distillation process. Fusel oils need to be periodically tapped at various locations along the middle of the rectifier column 222, as indicated by valves 260. Four valves 260 are shown in Figure 2, but any number of valves may be used in order to be able to tap the trapped fusel oils. When fusel oils are tapped, water and ethanol are also removed. The present invention provides a use for this by-product in the distillation process.

Another aspect is a method of recovering ethanol from fusel oils in an ethanol production process. The method includes the steps of fermenting a mashed feedstock, wherein the fermentation process produces a beer product and air pollutants and distilling the beer product into ethanol. The method further includes the steps of tapping fusel oils from the distillation step and using the tapped fusel oils in a first scrubber to remove the air pollutants produced during the fermentation step. The method also includes the step of recovering ethanol stripped in the first scrubber in a second scrubber using water.

Thanks to the provision of an ethanol production system and process in which a two stage scrubber system recovering ethanol is used, an increased efficiency of the ethanol production is obtained.

The present invention uses a two stage scrubber process with the first stage (230) removing the hazardous air pollutants and recovering the majority of the ethanol. The second stage (240) uses water as the scrubbing solvent to recover any residual ethanol that is stripped from the first stage (230).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ARM LANGUAGE  *Daily Recordkeeping: At least once during every 24-hour period the Permittee shall record the pressure drop across the scrubber, the water flow rate to the scrubber and the sodium bisulfate additive feed rate. For each reading the Permittee shall record 1) the time and date of the recording, 2) the applicable Operating Scenario (whether or not emissions are being vented to the scrubber) and 3) whether or not the recorded water flow rate is within the range for the Operating Scenario specified in this permit. Recorded values outside the range specified in this permit are considered deviations as defined by Minn. R. 7007.0100, subp. 8a and are considered excursions as defined by 40 CFR 64.1*  *Title I Condition: (as applicable)…; 40 CFR 64.1 and 64.3(b)(4); Minn. R. 7017.0200; Minn. R. 7007.0800, subps. 4 and 5; Add citation for Minn. R. 7007.0800, subp. 11 (for AOS)* | | | | Optional language – grouped together |  |
| ARM | Operating Scenario 1: Pressure Drop >= and <= inches of water(Pressure Drop Range Limit) ~~[as determined during the [DATE] performance test]~~ whenever emissions are venting to a scrubber that meets the requirements of TREA<>, unless a new range is set pursuant to Minn. R. 7017.2025, as detailed below. If the recorded pressure drop reading is outside the required range, the emissions during that time shall be considered uncontrolled until the pressure drop reading is once again within the required range. | 40 CFR 64.3 and Minn. R. 7017.0200; Minn. R. 7007.0800, subp. 11; Title 1 Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000 | ?AL: Can we just say most recent test? This date will get outdated. | This requirement is standard for controls that are required by a permit (i.e., not CAM-specific). Most CAM plans require water flow rate and pressure drop as standard indicators. Add or delete indicators as needed.  Sets indicator range for pressure drop when emissions are being vented to the control equipment. You need a lower-end number as well as an upper end - zero is not okay. That could mean that there is NO filter in place. Edit citation as needed. | Both |
| ARM | Operating Scenario 2: Pressure Drop: ≤ 0.0 inches of water column when no emissions are venting to the scrubber. | 40 CFR 64.3 and Minn. R. 7017.0200; Minn. R. 7007.0800, subp. 11; Title 1 Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000 |  | Sets indicator range for pressure drop when emissions are not vented to the control equipment, and the control equipment is not operational. Since the CAM rules require a pressure drop reading every 24-hour period, this provides an option for the Permittee to list “0” without it being an excursion. | Both |
| ARM | ETC for water flow and sodium bisulfite |  |  |  | Both/VOC |
|  | Protocol for Re-Setting the Pressure Drop Range Limit: The Permittee shall conduct performance testing to measure the [PM/PM10/PM2.5/VOC emission rate][PM/PM10/PM2.5/VOC collection efficiency] as required elsewhere in this permit. If the established Pressure Drop Range Limit is to be re-set, the re-set shall be based on the pressure drop values recorded during the most recent MPCA-approved performance test where compliance was demonstrated.  During the performance test, the Permittee must continuously monitor the pressure drop. The Permittee shall calculate the average pressure drop based on the average exhibited over all three compliant test runs. Downtime of 15 minutes or more is not to be included as operating time.  The established Pressure Drop Range Limit shall be re-set as follows:  - if the 3-hr average pressure drop recorded during the test is within the established range, it shall not be re-set and the established values remain the Pressure Drop Range Limit; or  - if the 3-hr average pressure drop is outside the range specified above, the range limit shall be re-set based upon the minimum and maximum pressure drop values exhibited during the performance test. The new minimum value for the range limit shall be half the lowest recorded reading and the new maximum value for the range limit shall be 1.5 times the highest recorded value. Ongoing compliance with the Pressure Drop Range Limit will be determined using the same data acquisition and reduction as was used during the performance test.  The new Pressure Drop Range Limit shall be effective upon receipt of the Notice of Compliance letter that approves the test results and shall be incorporated into the permit when the permit is next amended. | Minn. R. 7017.2025 Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000  40 CFR 64.3 and Minn. R. 7017.0200 | Profile language |  | Both – specific to pollutant for profile |
|  | Protocol for Re-Setting the Water Flow Rate: The Permittee shall conduct performance testing to measure the [PM/PM10/PM2.5/VOC emission rate][PM/PM10/PM2.5/VOC collection efficiency] as required elsewhere in this permit. If the established minimum water flow rate is to be re-set, the re-set shall be based on the water flow rate values recorded during the most recent MPCA-approved performance test where compliance was demonstrated.  During the performance test, the Permittee must continuously monitor the water flow rate. The Permittee shall calculate the average flow rate by based on the average exhibited over all three compliant test runs. Downtime of 15 minutes or more is not to be included as operating time.  The established minimum Water Flow Rate shall be re-set as follows:  - if the 3-hour average flow rate recorded during the test is within 10% of the current limit, it shall not be re-set and the established Water Flow Rate Limit remains unchanged; or  - if the 3-hour average water flow rate is greater than or less than 10% of the current limit, the limit shall be re-set as the average flow rate from the performance test. Ongoing compliance with the Water Flow Rate Limit will be determined using the same data acquisition and reduction as was used during the performance test.  The new Water Flow Rate Limit determined using this Protocol shall be effective upon receipt of the Notice of Compliance letter that approves the test results and shall be incorporated into the permit when the permit is next amended. | Minn. R. 7017.2025, Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000  40 CFR 64.3 and Minn. R. 7017.0200 | Profile language | May want to set a non-resettable maximum scrubber flow rate for scrubbers that can experience flooding. | Both – specific to pollutant for profile |
|  | The Permittee must apply for and obtain a major permit amendment if the Permittee wishes to deviate from the Protocol for Re-Setting the Pressure Drop Range Limit or the Protocol for Re-setting the minimum Water Flow Rate Limit required by this permit. | Minn. R. 7007.1500, subp. 1 | Profile language from here down. |  | Both |
|  | Notwithstanding the Protocol detailed above, the MPCA reserves the right to set operational limits and requirements as allowed under Minn. R. 7017.2025. If the MPCA sets limits, the new limits shall be implemented upon receipt of the Notice of Compliance letter that notifies the Permittee of preliminary approval. The limits set according to Minn. R. 7017.2025 are final upon issuance of a permit amendment incorporating the change. | [Minn. R. 7017.2025 |  |  | Both |

**Comparison of PRESSURE DROP LANGUAGE pulled from all of the existing profiles.**

1. Do we want to include performance test dates?

2. Do we want to discuss that emissions are uncontrolled if outside the range?

3. Do we state that outside the range is a deviation, or an excursion?

4. Do we state the recording time frame in this requirement (versus the daily recordkeeping requirement)?

5. Do we want to specify where the reading takes place (e.g., across the condenser), or leave generic?

|  |  |  |  |
| --- | --- | --- | --- |
| **A – ARM, CAM** | **B – No ARM, CAM** | **C – No ARM, CAM** | **D – No ARM, no CAM** |
| Pressure Drop >= and <= inches of water (Pressure Drop Range Limit) [as determined during the [DATE] performance test], unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below. If the recorded pressure drop is outside the required range, the emissions during that time shall be considered uncontrolled until the pressure drop is once again within the required range. The period of time for which the pressure drop is considered out of range shall be reported as a deviation. | Pressure Drop >= and <= inches of water, unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3 based on the values recorded during the most recent MPCA-approved performance test where compliance was demonstrated. The new range shall be implemented upon receipt of the Notice of Compliance letter granting preliminary approval. The range is final upon issuance of a permit amendment incorporating the change. The Permittee shall record the pressure drop at least once every 24 hours. | Pressure Drop >= and <= inches of water, unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3 based on the values recorded during the most recent MPCA-approved performance test where compliance was demonstrated. The new range shall be implemented upon receipt of the Notice of Compliance letter granting preliminary approval. The range is final upon issuance of a permit amendment incorporating the change. | Pressure Drop >= and <= inches of water, across the condenser, [as determined during the [DATE] performance test], unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3 based on the values recorded during the most recent MPCA-approved performance test where compliance was demonstrated. The new range shall be implemented upon receipt of the Notice of Compliance letter granting preliminary approval. The range is final upon issuance of a permit amendment incorporating the change. If the recorded pressure drop is outside the required range, this shall be reported as a deviation. [Minn. R. 7007.0800, subps. 2, 4, 5 |
| **E – No ARM, no CAM** | **F – ARM, no CAM** | **G – ARM (wrong language), no CAM** | **H – No ARM, No CAM** |
| Pressure Drop >= and <= inches of water across the filter, [as determined during the [DATE] performance test], unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3 based on the values recorded during the most recent MPCA-approved performance test where compliance was demonstrated. The new range shall be implemented upon receipt of the Notice of Compliance letter granting preliminary approval. The range is final upon issuance of a permit amendment incorporating the change. If the recorded pressure drop is outside the required range, this shall be reported as a deviation. [Minn. R. 7007.0800, subps. 2, 4, 5 | Pressure Drop >= and <= inches of water (Pressure Drop Range Limit) across the condenser [as determined during the [DATE] performance test], unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below. If the recorded pressure drop is outside the required range, this shall be reported as a deviation. [Minn. R. 7007.0800, subp. 14, Minn. R. 7007.0800, subp. 2, Minn. R. 7017.2025] | Pressure Drop >= and <= inches of water [as determined during the [DATE] performance test], unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3 based on the values recorded during the most recent MPCA-approved performance test where compliance was demonstrated. The new range shall be implemented upon receipt of the Notice of Compliance letter granting preliminary approval. The range is final upon issuance of a permit amendment incorporating the change. The Permittee shall record the pressure drop at least once every 24 hours when in operation. [Minn. R. 7011.0080, Minn. R. 7017.2025, Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000] | Pressure Drop >= and <= inches of water [as determined during the [DATE] performance test], unless a new range is set pursuant to Minn. R. 7017.2025, subp. 3 based on the values recorded during the most recent MPCA-approved performance test where compliance was demonstrated. The new range shall be implemented upon receipt of the Notice of Compliance letter granting preliminary approval. The range is final upon issuance of a permit amendment incorporating the change. The Permittee shall record the pressure drop at least once every 24 hours when in operation. [Minn. R. 7011.0080, Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000] |

|  |  |  |
| --- | --- | --- |
| **All profiles begin with Air, Permit, Individual Permits, Control Equipment, …** |  |  |
| … CAM, Large PSEU, Cyclone, ARM for Pressure Drop | A | [Minn. R. 7017.2025, Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000] |
| …CAM, Large PSEU, Cyclone, No ARM for Pressure Drop | B | [Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000] |
| … CAM, Large PSEU, Fabric Filter, ARM for Pressure Drop | A |  |
| … CAM, Large PSEU, Fabric Filter, No ARM for Pressure Drop | B |  |
| … CAM, Other PSEU, Fabric Filter, ARM for Pressure Drop | A |  |
| … CAM, Other PSEU, Venturi Scrubber, ARM | A |  |
| … CAM, Other PSEU, Venturi Scrubber, No ARM | C |  |
| … No CAM, Condenser, No ARM | D |  |
| … No CAM, Condenser, No ARM | E | Duplicate? |
| … No CAM, Condenser, ARM | F |  |
| … No CAM, Fabric Filter - w/ Control Equip Rule, ARM for Pressure Drop | G |  |
| … No CAM, Fabric Filter - w/ Control Equip Rule, No ARM for Pressure Drop | H |  |
| … No CAM, Fabric Filter - w/o Control Equip Rule, ARM for Pressure Drop | A |  |
| … No CAM, Fabric Filter - w/o Control Equip Rule, No ARM for Pressure Drop | B |  |

**TECHNICAL INFORMATION**

Ethanol Group Meeting minutes 1/8/2019, with follow-up dated 1/10/2019

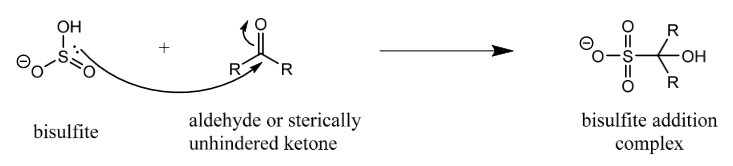
1/10/2019

After discussions with Bonnie, I’ve decided to change course with the scrubber additive dosage rate limits I plan to put into the reissuance permit for Green Plains Otter Tail. While Bonnie and I both agreed that scrubber chemistry is important and something that should be given due consideration in our permits, we decided that setting a fixed scrubber additive dosage rate limit (e.g. 0.40 gallons per hour) is the most practical approach for both compliance purposes and for ARM purposes. Since the scrubbers are not typically operated at significantly higher flow rates than what was tested, the concentration of scrubber additive isn’t expected to change much when operating at the fixed dosage rate limit.

**Joseph D. Carlson** | Engineer

* 1. **Scrubber Additive Dosage Rate (Joe)**

Typically, many fermentation and distillation process scrubbers at ethanol facilities use a bisulfite salt (typically either ammonium bisulfite or sodium bisulfite) for improved control of aldehyde compounds. The following is the chemical reaction mechanism between the bisulfite anion and the aldehyde compound:



Simply put, the reaction converts an aldehyde compound such as acetaldehyde (which has low solubility in water) into a sulfonic acid (with high water solubility). As is the case with most chemical reactions, increased concentration of the reactants leads to increased production of the reaction products.

In a scrubber, there are two primary variables that affect scrubber bisulfite concentration:

1. Bisulfite mass dosage rate; and
2. Freshwater feed rate

There are a few things that must be considered when setting a scrubber additive dosage rate limit. First off, we typically have been writing permit conditions where we only specify a minimum scrubber additive volumetric dosage rate limit (e.g. Scrubber Additive Material Usage ≥ 0.40 gph). Since the bisulfite mass dosage rate is really the key variable, we must take the additive concentration into account when setting the limit. It might be helpful to specify “based on a solution concentration of [XX weight % ammonium bisulfite]/[XX weight % sodium bisulfite]” after the scrubber additive dosage rate limit. If the Permittee changes the concentration of their scrubber additive (either by diluting it onsite or as a result of changing their chemical supplier), they should be adjusting their dosage rate to compensate.

The second thing to consider is that as freshwater feed rate is increased, the scrubber becomes more dilute, reducing the concentration of bisulfite in the scrubber water. Just as is the case with a chemical reactor, a decrease in concentration leads to fewer molecular interactions between the reactants, thus producing less of the desired reaction product (in this case, fewer aldehyde molecules would be reacted with bisulfite to form the desired sulfonic acid compound). In order to maintain the same concentration (mol/L) of bisulfite in the scrubber water as was present during the performance test, the dosage rate must be increased proportionally as scrubber freshwater feed rate is increased. For Green Plains Otter Tail, I am planning to include the following scrubber additive dosage rate limits in their permit:

|  |  |  |  |
| --- | --- | --- | --- |
| **TREA 22** | CE027 | CO2 (Fermentation) Scrubber |  |
|  |  |  | Operating Scenario 1: Scrubber Additive Material Usage >= 0.412 gallons of ammonium bisulfite (ABS) solution per 1000 gallons of freshwater supplied to the scrubber, based on a solution concentration of 68% ABS by weight (Scrubber Additive Rate Limit) whenever emissions are venting to a scrubber that meets the requirements of TREA 22 unless a new limit is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below.  When the scrubber freshwater feed rate is measured in gallons per minute (gpm) and the scrubber additive material used is 68% ABS solution by weight, the applicable Scrubber Additive Rate Limit in gallons per hour (gph) may be determined using the following formula:  Additive Rate Limit (gph) = 0.0247 x Freshwater Rate (gpm)  (unless a new limit is set pursuant to Minn. R. 7017.2025, subp. 3)  If the recorded additive rate is below the applicable Scrubber Additive Rate Limit, the emissions during that time shall be considered uncontrolled until the additive rate is above the applicable Scrubber Additive Rate Limit. The period of time for which emissions are considered uncontrolled shall be reported as a deviation. [40 CFR 64.3(a)(2), Minn. R. 7007.0800, subp. 11, Minn. R. 7007.0800, subps. 4-5, Minn. R. 7017.0200, Minn. R. 7017.2025, Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000, Title I Condition: Avoid major source under 40 CFR 63.2] |
|  |  |  |  |
| **TREA 23** | CE028 | Vent Gas (Distillation) Scrubber |  |
|  |  |  | Operating Scenario 1: Scrubber Additive Material Usage >= 0.207 gallons of ammonium bisulfite (ABS) solution per 1000 gallons of freshwater supplied to the scrubber, based on a solution concentration of 68% ABS by weight (Scrubber Additive Rate Limit) whenever emissions are venting to a scrubber that meets the requirements of TREA 23 unless a new limit is set pursuant to Minn. R. 7017.2025, subp. 3, as detailed below.  When the scrubber freshwater feed rate is measured in gallons per minute (gpm) and the scrubber additive material used is 68% ABS solution by weight, the applicable Scrubber Additive Rate Limit in gallons per hour (gph) may be determined using the following formula:  Additive Rate Limit (gph) = 0.0124 x Freshwater Rate (gpm)  (unless a new limit is set pursuant to Minn. R. 7017.2025, subp. 3)  If the recorded additive rate is below the applicable Scrubber Additive Rate Limit, the emissions during that time shall be considered uncontrolled until the additive rate is above the applicable Scrubber Additive Rate Limit. The period of time for which emissions are considered uncontrolled shall be reported as a deviation. [40 CFR 64.3(a)(2), Minn. R. 7007.0800, subp. 11, Minn. R. 7007.0800, subps. 4-5, Minn. R. 7017.0200, Minn. R. 7017.2025, Title I Condition: Avoid major source under 40 CFR 52.21(b)(1)(i) and Minn. R. 7007.3000, Title I Condition: Avoid major source under 40 CFR 63.2] |
|  |  |  |  |

Here is the associated additive dosage rate vs. freshwater feed rate curve for each scrubber at Green Plains Otter Tail, which I plan to include in the TSD: