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| --- | --- |
| Minnesota Pollution Control Agency (MPCA), 520 Lafayette Road North, St. Paul, MN 55155-4194 | Aerobic Sludge Digestion Review Checklist  NPDES/SDS Permit Program  National Pollutant Discharge Elimination System (NPDES)/ State Disposal System (SDS)  Doc Type: Plan/Specification Review Summary |

**Purpose:** This checklist is intended for use by design engineers, to assist Minnesota Pollution Control Agency (MPCA) review engineers in the efficient review of planning and design documents. The information requested is the minimum technical data necessary for MPCA staff to review proposed designs and to determine whether there is reasonable assurance that the treatment system, when constructed, will comply with permit conditions, regulations, and criteria of the MPCA.

**Instructions:** The information in this checklist is based on the ***Recommended Standards for Wastewater Facilities published by the Great Lakes Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (Ten State Standards) 2014 Edition,*** other accepted engineering references, and MPCA recommendations. Specific references, other than Ten State Standards, are listed where appropriate. The checklist is organized according to the numbering sequence found in Ten State Standards to allow for ease in locating the entire content and text of the recommendations.

The checklist is designed so that a “**yes**” answer indicates compliance with Ten State Standards et al.

A “**no**” answer indicates a deviation from Ten State Standards et al. Answering “no” to any question will require justification that can be provided at the end of the checklist and possibly supporting information, from wastewater treatment plant operational data, to demonstrate how the intent of the recommendation will be met. Additional information may be requested based on site specific conditions.

A “**N/A**” answer means not applicable because the equipment associated with the question is not included in the design.

Wastewater Treatment Facility information

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| --- | --- | --- | --- | --- |
| **Date** (mm/dd/yyyy): | |  | **MPCA Project No:** |  |
| **Title of project:** |  | | | |

Permittee information

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Facility name: | |  | | | | |
| Contact name and title: | | |  | NPDES/SDS Permit No: | MN |  |
| Email: |  | | | Phone number: |  | |

Design Engineer information

|  |  |  |  |
| --- | --- | --- | --- |
| Contact name: |  | Contact phone number: |  |
| Email: |  |  |  |

**Phase:**   Planning Phase  Design Phase

**Type of sludge:**  Primary  Secondary  Waste Activated  Combination

Influent Characteristics

|  |  |  |
| --- | --- | --- |
| **Solids concentration** |  | % |
| **Sludge flow per day** |  | gpd |
| **Volatile Suspended Solids (VSS) loading** (0.1 - 0.3 lbs VSS/cf/day (M&E 2014)) |  | lbs VSS/cf/day |

85. Aerobic Sludge Digestion

*(Only use a “NA” answer if the equipment associated with the question is not included in the design)*

| ***85.1 General*** | | **Yes** | **No** |
| --- | --- | --- | --- |
| Are provisions included for digestion, supernatant separation, sludge concentration and any necessary sludge storage? | |  |  |
| Are these provisions accomplished by separate tanks or processes, or in the digestion tanks? | |  |  |
| Identify type of tanks or processes: |  | | |
| Method of ultimate treatment and/or disposal: |  | | |
| Describe any anticipated problems with heavy metals, pH, toxics, etc.: |  | | |

|  |  |  |  |  |  |  |  |  |  |
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| ***85.2 Multiple Units*** | | | | | | | **Yes** | **No** | **N/A** |
| Are multiple digestion units capable of independent operation provided if the design average flow exceeds 100,000 gallons per day? The design average flow is the average of the daily volumes to be received for a continuous 12 month period expressed as a volume per unit time. | | | | | | |  |  |  |
| Number of units: | | | | | |  | | | |
| Are alternate sludge handling and disposal methods provided if the plant does not have multiple units? | | | | | | |  |  |  |
| Type of alternate sludge handling/disposal method: | | | | | |  | | | |
| ***85.3 Tank Capacity*** | | | | | | | | | |
| **85.31 Volume Required** | | | | | | | | | |
| Are the following digestion tank capacities used as a design basis assuming a solids concentration of 2 percent with supernatant separation performed in a separate tank? | | | | | | |  |  |  |
| |  |  | | --- | --- | | **Sludge Source** | **Volume/Population Equivalent** | | **ft3/P.E.** | | **Waste activated sludge – no primary settling** | **4.5\*** | | **Primary plus waste activated sludge** | **4.0\*** | | **Waste activated sludge exclusive of primary sludge** | **2.0\*** | | **Extended aeration activated sludge** | **3.0** | | **Primary plus attached growth biological reactor sludge** | **3.0** |   **\***These volumes also apply to waste activated sludge from single stage nitrification facilities with less than 24 hours detention time based on design average flow. | | | | | | | | | |
| If supernatant separation is performed in the digestion tank, is a minimum 25 percent additional volume provided? | | | | | | |  |  |  |
| Are these capacities, identified in the table above, provided unless sludge thickening facilities (refer to Section 83 of Ten State Standards) are utilized to thicken the feed solids concentration to greater than 2 percent? | | | | | | |  |  |  |
| If thickening is provided, have the digestion volumes been decreased proportionally? | | | | | | |  |  |  |
| Tank dimensions: |  | | | | feet | | | | |
| Tank volume: |  | | | | cubic feet | | | | |
| **85.32 Effect of Temperature on Volume** | | | | | | | | | |
| Are digester temperatures of 150C and a solids retention time of 27 days used as a basis for the volumes in Paragraph 85.31 above? | | | | | | |  |  |  |
| Is the solids retention time between 40 days at 200C and 60 days at 150C to meet PSRP requirements? (U.S. EPA July 2003 and M&E 2014) | | | | | | |  |  |  |
| Temperature: | |  | 0C | | | | | | |
| Solids retention time: | |  | | days | | | | | |
| Are the digestors covered to minimize heat loss for colder temperature applications? | | | | | | |  |  |  |
| Is additional volume or supplemental heat required if the land application disposal method is used in order to meet the applicable U.S. EPA requirements? | | | | | | |  |  |  |
| Are vector attraction reduction requirements of 40 CFR Part 503.33 of federal regulation met? (U.S. EPA July 2003 and M&E 2014) | | | | | | |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- |
| ***85.4 Mixing*** | | | | **Yes** | **No** | **N/A** |
| Are the aerobic digesters provided with mixing equipment than can maintain solids in suspension and ensure complete mixing of the digester contents? | | | |  |  |  |
| Is the total air capacity for mixing between 0.75 to 1.5 hp/1000 ft3? (M&E 2014) | | | |  |  |  |
| ***85.5 Air Requirements*** | | | | | | |
| Will sufficient air be provided to keep the solids in suspension and maintain dissolved oxygen between 1 mg/L and 2 mg/L? | | | |  |  |  |
| For minimum mixing and oxygen requirements, will an air supply of 30 cfm/1000 ft3 of tank volume be provided with the largest blower out of service? | | | |  |  |  |
| Type: |  | | | | | |
| Number of blowers: |  | | | | | |
| Total air capacity: |  | | cfm/1000 ft3 | | | |
| Are diffusers nonclog type and designed to permit continuity of service? | | | |  |  |  |
| Are at least two turbine aerators per tank provided to permit continuity of service? | | | |  |  |  |
| If freezing conditions will cause ice build-up on the aerator and support structures, is the use of mechanical aerators avoided? | | | |  |  |  |
| ***85.6 Supernatant Separation and Scum and Grease Removal*** | | | | | | |
| **85.61 Supernatant Separation** | | | | | | |
| Are facilities provided for effective separation or decanting of supernatant? | | | |  |  |  |
| If separate facilities are not provided for decanting of supernatant and it will be accomplished in the digestion tank, is there additional volume provided per Paragraph 85.3? | | | |  |  |  |
| Is the supernatant drawoff unit designed to prevent recycle of scum and grease back to plant process units? | | | |  |  |  |
| Are provisions made to withdraw supernatant from multiple levels of the supernatant withdrawal zone? | | | |  |  |  |
| Volume: |  | gallons | | | | |
| Supernatant point of discharge: |  | | | | | |
| Is a method of sampling and measuring supernatant provided? (M&E 2014) | | | |  |  |  |
| **85.62 Scum and Grease Removal** | | | | | | |
| Are facilities provided for the effective collection of scum and grease from the aerobic digester for final disposal, to prevent its recycle back to the plant process, and to prevent long term accumulation and potential discharge in the effluent? | | | |  |  |  |
| Location of final disposal: |  | | | | | |
| ***85.7 High Level Emergency Overflow*** | | | | | | |
| Is an unvalved high level overflow and any necessary piping provided to return digester overflow back to the head of the plant or to the aeration process in case of accidental overfilling? | | | |  |  |  |
| Do design considerations related to the digester overflow include waste sludge rate and duration during the period the plant is unattended, potential effects on plant process units, discharge location of the emergency overflow, and potential discharge of suspended solids in the plant effluent? | | | |  |  |  |
| Discharge location of emergency overflow: |  | | | | | |
| ***85.8 Aerobic Digestion Sludge Production*** | | | | | | |
| When calculating design sludge handling and disposal needs, are sludge production values from aerobic digesters based on a maximum solids concentration of 2 percent without additional thickening? | | | |  |  |  |
| Are the solids production values on a dry weight basis based on the following for the listed processes?  Primary plus waste activated sludge – at least 0.16 lbs/P.E./day | | | |  |  |  |

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| ***85.9 Digested Sludge Storage Volume*** | | | |
| **85.91 Sludge Storage Volume** | **Yes** | **No** | **N/A** |
| Is sludge storage provided in accordance with Section 89 to accommodate daily sludge production volumes and as an operational buffer for unit outage and adverse weather conditions? |  |  |  |
| Is the design such that it does not utilize increased sludge age in the activated sludge system as a means of storage? |  |  |  |
| **85.92 Liquid Sludge Storage** | | | |
| Are liquid sludge storage facilities based on the following values unless digested sludge thickening facilities are utilized to provide solids concentrations of greater than 2 percent? |  |  |  |

|  |  |
| --- | --- |
| **Sludge Source** | **Volume/Population Equivalent** |
| **ft3/P.E./day** |
| **Waste activated sludge – no primary settling, primary plus waste activated sludge, and extended aeration activated sludge** | **0.13** |
| **Waste activated sludge exclusive of primary sludge** | **0.06** |
| **Primary plus attached growth biological reactor sludge** | **0.10** |

|  |  |  |  |
| --- | --- | --- | --- |
| ***85.10 Autothermal Thermophilic Aerobic Digestion*** | **Yes** | **No** | **N/A** |
| Is thermophilic digestion temperature maintained between 500C and 700C? |  |  |  |
| Are systems either single or multiple stage? |  |  |  |
| Is the sludge thickened prior to treatment in the digestion tanks? |  |  |  |
| Are the digestion tanks suitably insulated to minimize heat loss? |  |  |  |
| Are systems either single or multiple stage? |  |  |  |
| Justification for all questions answered with a “no”: | | | |
|  | | | |
| Additional comments: | | | |
|  | | | |

**References**

GLUMRB (2014 Edition) *Recommended Standards for Wastewater Facilities* (Ten State Standards), Health Research, Inc., Health Education Services Division, Albany NY.

Metcalf & Eddy, Inc. (2014) *Wastewater Engineering, Treatment and Resource Recovery*, 5th ed., McGraw-Hill, New York. (M&E 2014)

U.S. EPA (Revised July 2003) *Environmental Regulations and Technology, Control of Pathogens and Vector Attraction in Sewage Sludge,* U.S. EPA Office of Research and Development, National Risk Management Research Laboratory, Center for Environmental Research Information, Cincinnati OH. (U.S. EPA July 2003)

**Acronym definitions**

C Celsius

cf cubic feet

cfm/ft3 cubic feet per minute per feet cubed

ft3 feet cubed

ft3/P.E./day feet cubed per population equivalent per day

gal gallon

gpd gallons per day

hp horsepower

lbs/P.E./day pounds per population equivalent per day

lbs VSS/cf/day pounds of Volatile Suspended Solids per cubic foot per day

mg/L milligrams per liter

PSRP Processes to Significantly Reduce Pathogens

VSS Volatile Suspended Solids