Use of Biotrickling Filters for Total Odor Control at Two Municipal WWTPs

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ABSTRACT

Over the last several years, the Mount Holly Municipal Utilities Authority (MHMUA) in New Jersey has undergone an extensive expansion project. The treatment capacity of its existing wastewater treatment plant was increased, and a new 3 Mgd plant was constructed. As part of the expansion program, MHMUA incorporated an extensive odor management program to meet its NJ DEP permit requirements and to minimize the impact on nearby residents, businesses, and travelers.

MHMUA selected BioAir Solutions’ EcoFilter biotrickling filter technology as the desired odor control solution after an extensive review of the odor control products available on the market. The biotrickling filters use plastic, structured synthetic media that represents the latest in biotrickling filter technology, capable of removing both organic and inorganic odors. The EcoFilter technology combines the sustainability and low operating cost associated with biological treatment with the durability and acid-resistance of synthetic material, which eliminates media maintenance and replacement cost.

The MHMUA project represents the largest biotrickling filter installation in the state of New Jersey. It consists of five biotrickling filters that are installed at various locations at the treatment plants, treating odors from sources such as the grit and screenings building, sludge storage tank, surge tank, rotary drum thickener, gravity thickener, drain pump station, screw conveyor, and headworks.

This paper provides an overview of the project along with performance data for the odor control systems installed at the various locations at the MHMUA wastewater treatment plants.

KEYWORDS

Biotrickling filter, H₂S Removal, odor removal, biological odor control
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Background

Mount Holly Municipal Utilities Authority (MHMUA)

• Accepts wastewater from Mt. Holly and portions of Eastampton, Hainesport, Lumberton, Westampton, and Moorestown
• New developments within service area required additional 1 MGD capacity
• Aging plant (Rancocas Road WWTP) not meeting design capacity of 5 MGD
Rancocas Road WWTP

- Located in populated, high-traffic area
- No room for expansion
- Closely surrounded by Rancocas Road, Rancocas Creek, wetlands, and adjacent properties
Rancocas Road WWTP

- Odor complaints from traffic on Rancocas Road
- Development proposed across the street
Rancocas Road WWTP
MHMUA Solution

• Expansion of Rancocas Road WWTP
• New 3 MGD plant – Maple Ave WWTP
Odor Control Solutions

• Both plants required odor control
• RRWWTP required air discharge permits from NJDEP
• MHMUA explored various technologies
• EcoFilter® Biotrickling filters selected
  • Long media life (> 10 years) / no media change out
  • Low operating cost - no chemicals or consumables
  • Low maintenance requirements
Biotrickling Filter Process

- Microorganisms grow on the media
  - Structured material
  - High surface area
  - Long life
- Odorous air passes upward through media and is discharged from top stack
- Irrigation water trickles down through media bed and drains from bottom
Biotrickling Filter Process

Heterotrophic Oxidation:
VOC + O₂ → CO₂ + H₂O (+ H₂SO₄)

Autotrophic Oxidation:
H₂S + 2 O₂ → H₂SO₄
Mount Holly MUA Project

- **Rancocas Road WWTP**
  - Headworks Area: 1 x EcoFilter EF124
  - Sludge Storage Tank and Surge Tank #2: 1 x EcoFilter EF124

- **Maple Avenue WWTP**
  - Headworks: 2 x EcoFilter EF62
  - Drain Pump Station: 1 x EcoFilter EF62

- **Performance Guarantee**
  - 99% H₂S Removal
  - 99% Ammonia Removal
  - 95% Odor Removal
Odor Control Systems Provided

Rancocas Road Headworks Area – 1 x EcoFilter EF124

- Odor Sources: Gravity Sludge Thickener, Rotary Drum Thickener, Headworks/Bar Screens
- Airflow: 4800 cfm
- Designed for H₂S, Ammonia, and Organic Odor Removal
Odor Control Systems Provided

Rancocas Road Sludge Tank – 1 x EcoFilter EF124

- Odor Sources: Sludge Storage Tank / Surge Tank No. 2
- Airflow: 4000 cfm
- Designed for H₂S, Ammonia, and Organic Odor Removal
Odor Control Systems Provided

Maple Ave Headworks – 2 x EcoFilter EF62

- Odor Source: Headworks
- Airflow: 1030 cfm
- Designed for H₂S and Organic Odor Removal
Odor Control Systems Provided

Maple Ave Drain Pump Station – EcoFilter EF62

- Odor Source: Plant Drain Pump Station
- Airflow: 515 cfm
- Designed for \( \text{H}_2\text{S} \) and Organic Odor Removal
Mount Holly - Maple Ave Headworks - BioAir EcoFilter startup - Mar 2-9, 2011

Inlet and Outlet H2S Concentration (ppmv)

Inlet H2S
Unit 1 Outlet H2S
Unit 2 Outlet H2S

Inlet and Outlet H2S Concentration (ppmv)

- Inlet H2S
- Unit 2 Outlet H2S
- Unit 1 Outlet H2S
Mount Holly - Maple Ave
Headworks - BioAir EcoFilter acclimation - Mar 2-Apr 7, 2011

Inlet and Outlet H2S Concentration (ppmv)

- Inlet H2S
- Unit 1 Outlet H2S
- Unit 2 Outlet H2S
Performance Summary
Maple Avenue Headworks

Inlet \( \text{H}_2\text{S} \) concentration (avg.) = 5.35 ppmv

Unit 1 outlet \( \text{H}_2\text{S} \) (avg.) = 0.0003 ppmv
Unit 1 \( \text{H}_2\text{S} \) removal efficiency (avg.) = 99.994%

Unit 2 outlet \( \text{H}_2\text{S} \) (avg.) = 0.0014 ppmv
Unit 2 \( \text{H}_2\text{S} \) removal efficiency (avg.) = 99.975%
Mount Holly - Rancocas Rd Surge/Sludge Tanks

Inlet and Outlet H2S Concentration (ppmv)

Inlet H2S  Outlet H2S
Odor Removal – RR Sludge Tank

Inlet
- DT: 3300 OU
- RT: 1600 OU
- Hedonic Tone: -4.4

Outlet
- DT: 270 OU
- RT: 120 OU
- Hedonic Tone: -0.2
Project Results

Rancocas Road WWTP

• Elimination of odor complaints from drivers and residents along Rancocas Road
• Safer and more pleasant working conditions for plant employees in Headworks Building

Maple Ave WWTP

• New plant online with little impact on nearby neighborhoods
Contact Information

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Questions?