

TECHNOLOGY- AND DESIGN-BASED ODOR REDUCTION MEASURES

The District encourages lead agencies to evaluate the specific needs and circumstances of a project to assure the proper application of odor reduction technology. This list provides a range of applicable odor reduction technologies or practices that can be implemented for different types of odor sources. It also provides sources of additional information about controlling odors from specific source types. The District recognizes that there is a vast range of odor-reducing technologies and does not consider this list to be comprehensive. The District also encourages lead agencies to develop other feasible engineering and design measures as needed.

WASTEWATER TREATMENT PLANTS

The following list provides current, in-practice mitigation measures to reduce odor emissions from wastewater treatment plants.

- Install activated carbon filters/carbon adsorption in primary clarifiers, headworks building, aeration basin influent channel, and/or all waste gas exhaust systems;
- Install biofiltration/bio trickling filters for all waste gas exhaust systems;
- Install fine bubble aerators to wastewater treatment tanks or ponds to increase treatment efficiency and dissolved oxygen to prevent odor-generating anaerobic activity;
- Install hooded enclosures on grit dumpsters and belt filter presses, primary clarifier weir covers, and/or channel seals;
- Install wet and dry scrubbers on waste gas exhaust systems from treatment tanks;
- Install caustic and hypochlorite chemical scrubbers on waste gas exhaust systems from treatment tanks;
- Install ammonia scrubber on waste gas exhaust from treatment tanks;
- Install energy-efficient blower system to increase treatment efficiency and dissolved oxygen levels;
- Install thermal oxidizer to oxidize all waste gas exhaust;
- Cap or cover storage basins and anaerobic ponds to avoid release of odorous compounds;
- Install mixed flow exhaust system to dilute waste gas exhaust; and

- Install SolarBee or similar technologies on storage basins and lagoons and anaerobic ponds to avoid fugitive release of odorous compounds.

Sources

[Bleth, J. 2009 \(January\). Odor Barrier Goes the Distance. *Water & Wastes Digest* 49\(1\).](#)

[Bleth, J., and Knud-Hansen, C. F. 2007 \(April 3\). The Potential of Solar-Powered Water Circulators to Help Solve Serious Water and Energy Problems in the U.S.](#)

[Gans, C. 2004 \(March\). Exhausting Odors. *Water & Wastewater News*.](#)

[Harshman, V. 2006 \(July\). Nowhere to Hide. *Water & Wastewater News*.](#)

[Hoover, M. 2008 \(January\). Scrubbing Out Odor. *Water & Wastes Digest* \(48\)1.](#)

[IDS-Environment: The Information Resource for Environment Industry. Air Pollution Control Equipment Solutions: Thermal Oxidizers and Catalytic Oxidizers.](#)

[Integra Engineering. Odor Control. \(NOTE: Dewberry acquired Integra Engineering November 2010, eliminating this reference link.\)](#)

[Tetley, P. A. 2001 \(September\). Managing Wastewater Treatment Odors: Mitigating Odors through Exhaust Dilution. *Chemical Processing*.](#)

[U.S. Environmental Protection Agency. 1999 \(September\). *Wastewater Technology Fact Sheet: Fine Bubble Aeration*. Washington, D.C.](#)

[Water Environment Research Foundation. 2003. *Identifying and Controlling Municipal Wastewater Odor: Phase I, Literature Search and Review*. Water Environment Federation. IWA Publishing, London, UK.](#)

Zabrocki, J., and Larson, P. L. Green Wastewater Treatment Plant combats excessive blower energy usage. Green Water Systems.

LANDFILL/RECYCLING/COMPOSTING FACILITIES

The following list provides current, in-practice mitigation measures and management practices for landfills, recycling facilities, and composting facilities.

- Install a passive gas collection system within the facility;
- Install an active gas collection system within the facility;
- Install a flare for treatment of methane gas prior to release;
- Install vegetation growth on landfill to cover intermediate and final portions of a landfill;

- Install a cover/cap on the landfill/recycling/compost facility that can be used to cover landfill/recycling/compost piles daily after operations cease;
- Apply an odor neutralizing spray to landfill or compost pile each day after operations cease;
- Install a negative and/or positive aeration system for compost facilities to control moisture and temperature and provide oxygen for microbial decomposition; and
- Determine the appropriate frequency of turning and mixing of compost piles, which may be a function of ambient temperature.

Sources

[Agency for Toxic Substances and Disease Registry. 2001. *Landfill Gas Primer - An Overview for Environmental Health Professionals*. Chapter 5, Landfill Gas Control Measures. Atlanta, GA.](#)

[California Integrated Waste Management Board. 2008. *Climate Change and Solid Waste Management: Landfill Methane Capture Strategy*.](#)

PETROLEUM REFINERIES

The following list provides current, in-practice mitigation measures for petroleum refinery facilities.

- Install water injection system to hydrocracking process;
- Install a vapor recovery system in loading and unloading areas and for influent treatment areas;
- Inject masking odorants into process streams;
- Install flare meters and controls for process gas exhaust; and
- Install SolarBee for aerated ponds.

Sources

[Industrial WaterWorld. 2005 \(November\). *Wastewater Circulators Solve Noxious Odors at Shell Oil Martinez Refinery*.](#)

CHEMICAL PLANTS

The following list provides current, in-practice mitigation measures for chemical plants.

- Install wet scrubbers to treat process gas exhaust;
- Install catalytic oxidation to treat process gas exhaust;

- Install thermal oxidation to treat process gas exhaust; and
- Install carbon adsorption to treat process gas exhaust.

Sources

National Academy of Sciences. 1979. Odors from Stationary and Mobile Sources. Assembly of Sciences National Research Council. Washington, D.C.

FOOD SERVICE FACILITIES

Typical odor emissions associated with food service providers include char broilers, deep-fryers, and ovens. However, food waste associated with food service providers can putrefy if not managed properly. Lead Agencies should evaluate the specific needs and circumstances of a project to assure the proper level and type of odor mitigation measures are implemented.

- Install integral grease filtration system or grease removal system in kitchen exhaust system;
- Install baffle grease filters in kitchen exhaust system to remove grease particles;
- Install electrostatic precipitator to kitchen exhaust system to remove odorous particulates from kitchen gas exhaust;
- To treat exhaust stack effluent from the building install disposable pleated or bag filters, activated carbon filters, oxidizing pellet beds, an incineration system to treat exhaust stack effluent; a catalytic conversion system to treat exhaust stack effluent; and
- Maintain proper packaging and frequency of food waste disposal to avoid generation of odiferous compounds.

Sources

D'Antonio, P. C. 2008. Grease Removal and Kitchen Exhaust Systems. Heating/Piping/Air Conditioning Engineering. HPAC Engineering.

AGRICULTURE AND LIVESTOCK OPERATIONS

The following list provides current, in-practice mitigation measures and management practices for agricultural land uses and livestock operations.

- Use geomembrane covers for manure storage;
- Use biocovers for manure storage;
- Install mechanical or gravity solid separation for lagoons;
- Install fine bubble aerator for lagoons;

- Install biofilters for ventilation of manure management buildings;
- Develop a diet manipulation program to minimize generation of odorous compounds from livestock manure;
- Install activated sludge treatment in lagoons and manure storage;
- Install wet scrubbers on livestock building exhaust; and
- Install air dilution system on livestock building exhaust.

Sources

[Peterson, T., and J. Lorimor. 1998. Try a Biocover to Reduce Odor. *Odor and Nutrient Management*.](#)

[Nebraska Department of Environmental Quality. 2005. Best Management Practices for Odor Control.](#)

RENDERING PLANTS

Odiferous compounds generated by rendering plants tend to be highly offensive to the public. The main sources of odors from rendering plants include exhaust gas from within the facility and process wastewater. The following list provides current, in-practice mitigation measures to reduce the release of odors from rendering plants.

- Install a multi-stage wet scrubber on facility process exhaust;
- Install biofilters on facility process exhaust;
- Install venturi scrubbers or similar technology to remove particulate matter from facility process exhaust prior to treatment by scrubbers and biofilters;
- Install boiler incinerators to treat facility process exhaust;
- Install direct flame incineration or catalytic incineration to treat facility process exhaust;
- Maintain negative pressure within the rendering facility to minimize the release of fugitive odor emissions.
- Use chemical coagulation and dissolved air flotation (DAF) to remove proteins, fats, and oils from facility wastewater.
- Use activated sludge treatment to remove dissolved fraction of waterborne pollutants.

Sources

Hesler, J.C. 1972. Smoke, Grease Aerosol and Odor Control in Meat Processing Plants.

Hydro Solutions, Inc. 2009. Rendering Division.

U.S. Environmental Protection Agency. 1995 (September). AP 42 Fifth Edition Compilation of Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 9.5.3 Meat Rendering Plants.

Woodard & Curran. 2006. Industrial Waste Treatment Handbook Second Edition.