

## **ODOR CONTROL TECHNOLOGY SUMMARY**

### **Technology: BIOSCRUBBERS**

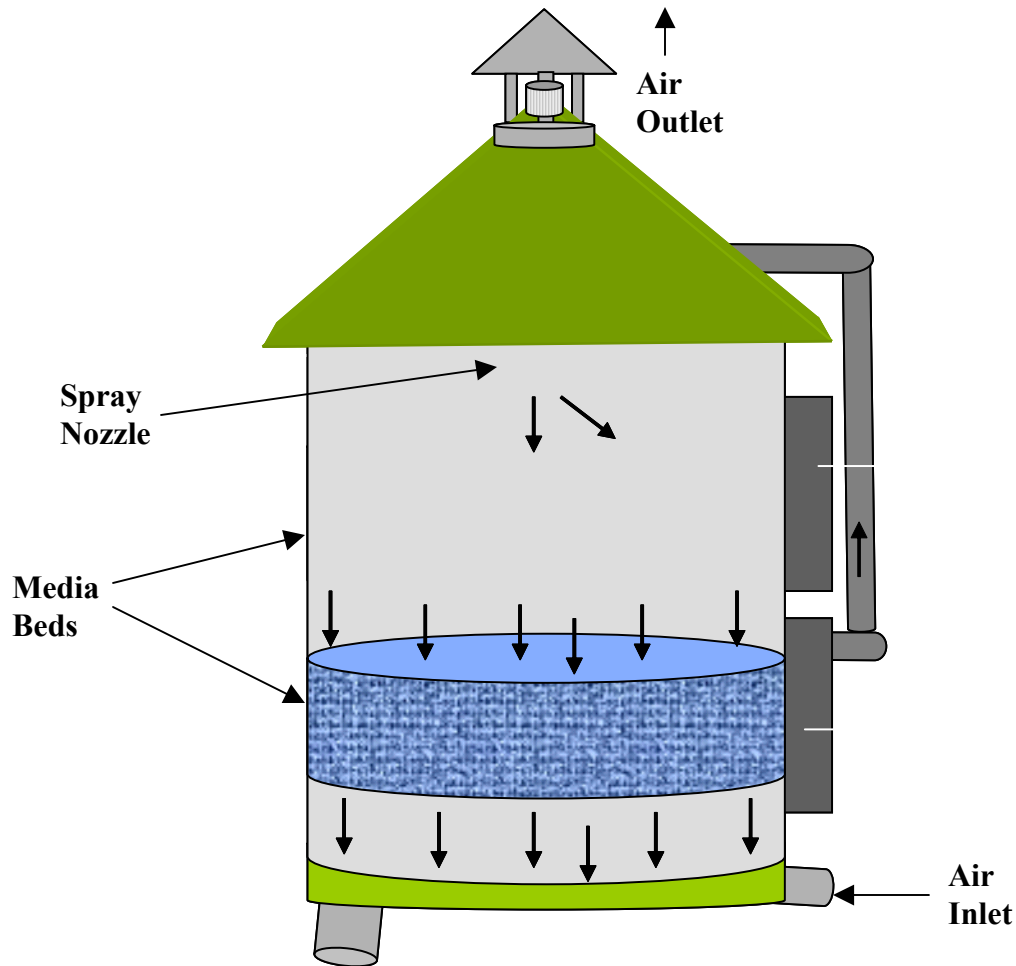
#### **Description:**

Bioscrubbers (and Biotrickling Filters) are an odor treatment technology that utilizes biological processes, as opposed to chemical processes as their treatment mechanisms. They are similar to biofilters in this regard. Bioscrubbers use artificial media and closed vessel construction, where biofilters often use natural media and open bed construction. Bioscrubbers are a relatively new technology in the U.S., but have proven effective in wastewater treatment plant applications, even for high strength odorous air streams. There are several bioscrubber manufacturers in the U.S.



### **Bioscrubbers (Biotrickling Filters)**

The process involves intermittent spraying or recirculating biologically active, nutrient-rich scrubbing solutions over an artificial media while odorous air is forced upward through the media bed. The process is similar to that used in wet scrubbers, except it involves biological treatment instead of chemical treatment. The media provide sites for biological colonization and promote mass transfer from the air to the water film on the biomass where the biological oxidation occurs.



**Bioscrubber Cutaway View**

Bioscrubbers fall into two categories, based on their biological population. Autotrophic organisms remove hydrogen sulfide and other inorganic compounds. Heterotrophic organisms remove volatile organic compounds (VOC's). The autotrophic organisms oxidize sulfides to either sulfate or elemental sulfur. The heterotrophic organisms remove the organic odors, but have little effect on hydrogen sulfide. The two systems may be combined into a two-stage system, where treatment of hydrogen sulfide and VOC's is required.

The systems use intermittent irrigation, with the biologically active solution trickled over the media bed to keep the biomass wet, to promote sloughing of the biomass, and to supply fresh nutrients to the biomass.

**Applicable Treatment Processes:**

All liquid treatment plant processes, sludge thickening, sludge dewatering.

### **Typical Design Criteria:**

Air flow rate	dependent on volumes to be treated
Loadings	40 - 100 cfm/sf (dependent on contaminant concentrations)
Contact time	10 - 15 seconds per stage
H <sub>2</sub> S removal efficiency	97 – 99%
VOC removal efficiency	70 – 85%

### **Major Design Considerations:**

a. Irrigation

The media must be kept moist, but if irrigation is too frequent, the biomass may be deprived of oxygen. If irrigation is too infrequent, the media can dry out and reduce effectiveness. A programmable timer may be used to properly time irrigation cycles.

b. Media

Media should possess high surface area to volume ratios, good adsorption characteristics, low pressure drop, and good sloughing characteristics. For organic compound treatment, media impregnated with adsorptive materials such as activated carbon may be used.

c. Nutrients

Nutrients must be kept fresh to maintain healthy biomass. Appropriate nutrients essential to the various bacteria in the bioscrubber should be identified. Wastewater treatment plant effluent is generally an excellent source for these nutrients. Nutrient mixes may also be purchased from manufacturers and mixed into the bioscrubber solution.

d. Construction materials

Corrosion-resistant materials such as FRP and HDPE should be used

e. Air distribution

Uniform air distribution through the media bed is important to efficient operation. Perforated FRP distribution plates have been used effectively to support the media bed and distribute the air flow uniformly.