Biofiltration

Presented by:

USFilter

RJ ENVIRONMENTAL / METITO

Georgios Ioannou, Product Manager

VEOLIA Environment

Vapor Phase Odor Control Processes

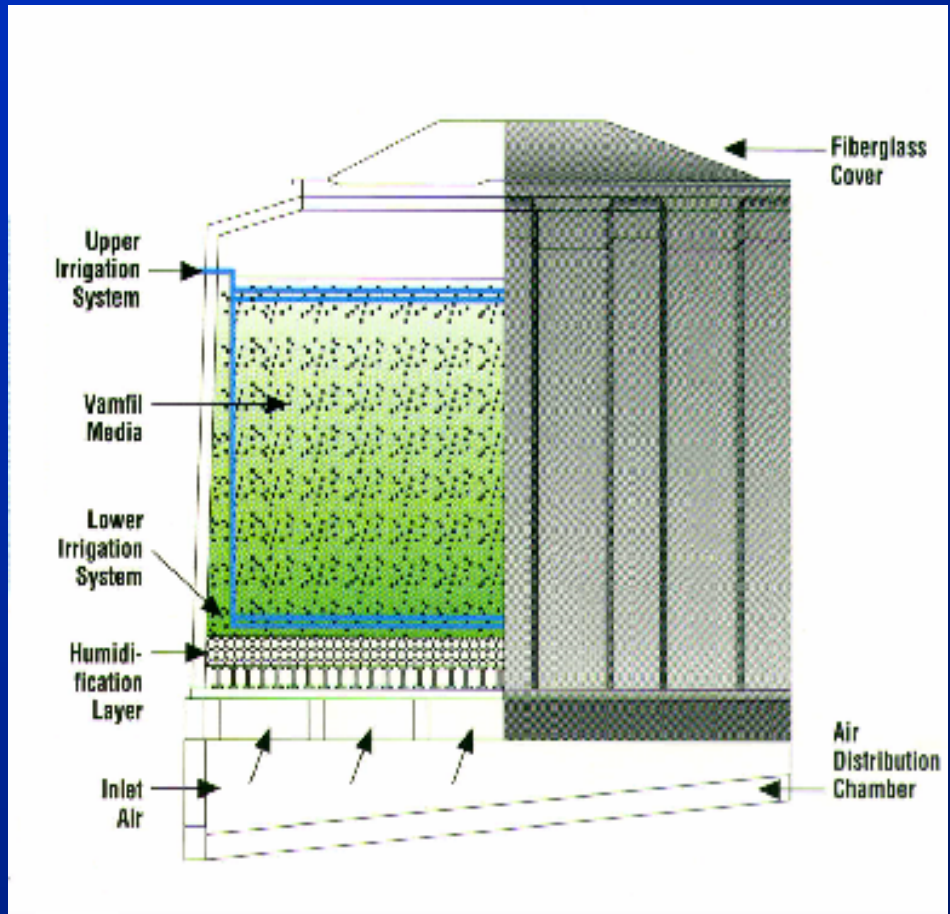
- Absorption (Chemical Reaction)
  - Single-Stage Wet Scrubbers
  - Multiple-Stage Wet Scrubbers
- Adsorption (Physical Process)
  - Carbon Adsorbers
  - **Biofilters**
- Incineration (Thermal Oxidation)
- Dilution

Biofiltration

- **Biofiltration is a relatively new pollution control technology. It consists of the REMOVAL AND OXIDATION OF COMPOUNDS from contaminated air using microorganisms**
- **Biofiltration can treat organic gases - *Volatile Organic Compounds (VOC's) or* inorganic air toxics - *hydrogen sulfide***

Biofiltration - What is it?

- Involves passing a contaminated air stream through a media bed that is porous and moist
- As the air passes through the media, the contaminants are adsorbed into the water within the media
- Bacteria that are present within the media continuously consume the absorbed contaminants



Biofiltration Applications

- **Odor Control - removes hydrogen sulfide and other related sulfur based odor compounds**
- **Emission Control - removes many VOC’s**

Comparison of Biofiltration Technology

- **Benefits:**
  - **Low Operating Cost**
  - **Does not require chemicals**
- **Drawbacks:**
  - **Break-through can occur if air flow or concentration is not consistent**
  - **Does not remove ammonia or amines**
  - **Relatively large footprint required**
- **Requirements:**
  - **Requires continuous air flow**
  - **Requires consistent loading**
  - **Requires a humid and warm air stream**
  - **Often requires an acclimation period for the media**

Biofiltration Medias

- Bacteria are naturally existing and will acclimate on the media when energy is present (i.e. hydrogen sulfide).
- In some cases, such as for VOC control, engineered bacteria are used.
- The media is selected to aid the mass transfer from the air to the liquid phase and is selected to support the acclimation of the bacteria

- **Simple Media**
  - Peat, Compost, Mulch, Wood Chips, etc.
  - Low Initial Cost
  - Prone to Settling, Erratic Performance

- **Engineered Media**
  - Specific Composition and Preparation Process
  - Higher Initial Cost
  - Superior Physical Characteristics
  - Superior, Consistent Performance

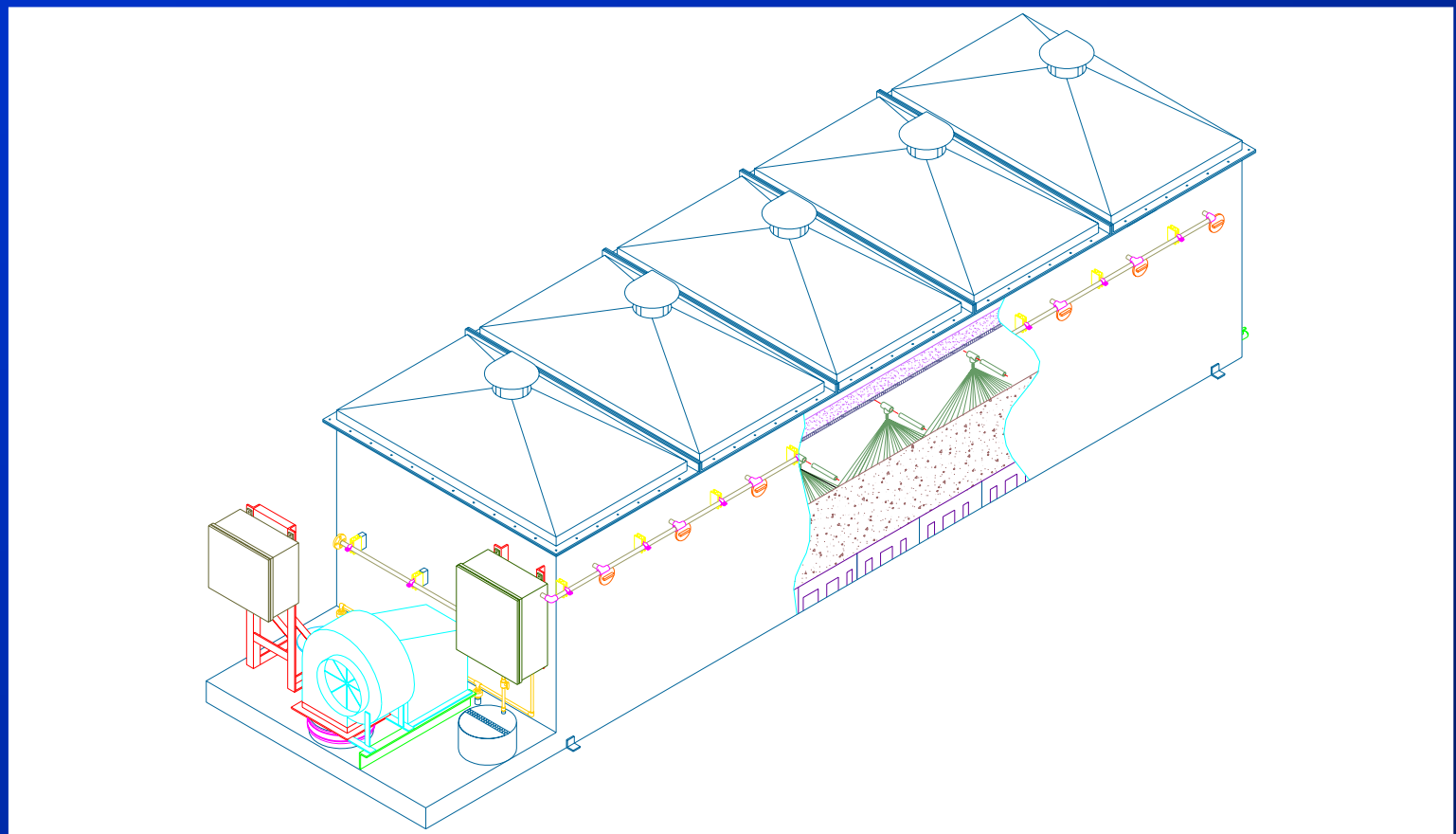
Parameters that need to be maintained while the biofilters are in operation

- **Moisture Content - The moisture content is essential for the biofilter to work at the best of its efficiency. Microorganisms need a moist environment. Media has a tendency to dry out because of the air flow. It is very important to moisture the gas before it reaches the media.**
- **Temperature - Microorganisms operate best between 30 degrees C and 40 degrees C. In some places for better efficiency would be useful to include methods for controlling temperature level.**
- **Oxygen Level - The oxygen level is very important in a biofiltration proces. Most of degradations are aerobic. Oxygen is not used directly in the gas form but the microorganisms use the oxygen present in dissolved form in the media.**
- **PH - For better results must maintain a pH where the microorganisms are the most efficient.**

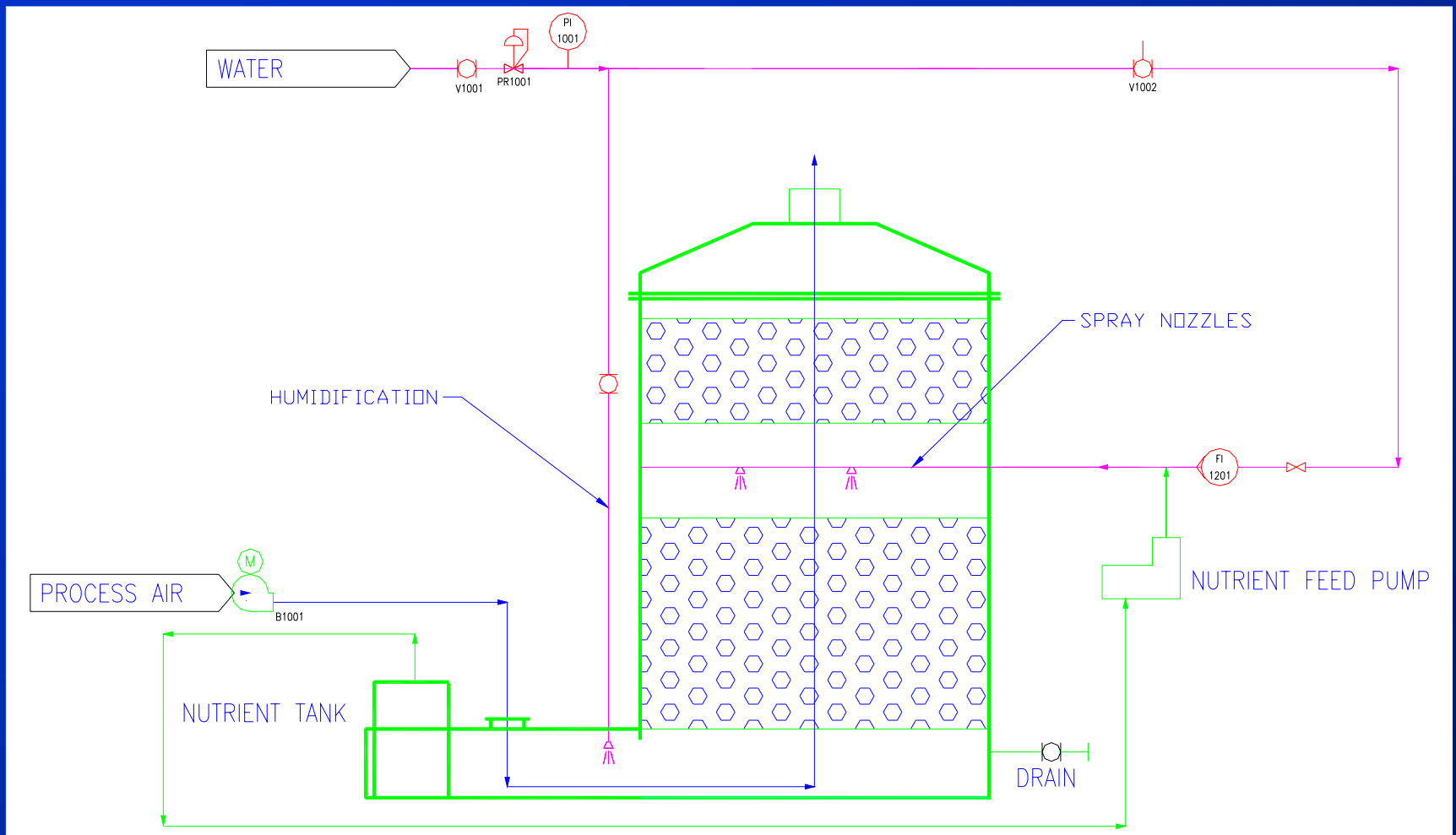
Biofilter Designs

	Biofilter Designs	Description	Feature	Velocity
First Generation	Piles and Pits	Compost mixed with wood chips	Erratic Performance	3-4 cfm/ft2
Second Generation	Enclosed Vessels	Similar media as used in "Piles and Pits" but included enclosures around all sides of the biofilter. Better irrigation and better flow into media	Improved Performance, Difficult Expansion and Maintenance	10 cfm/ft2
Third Generation	Modular Systems	Moved from organic medias to inorganic medias. Since media is no longer water soluable, longer media life and more aggressive irrigation systems used, improved mass transfer	Redundancy, Easy Installation and Expansion, Easy Media Replacement, Less Footprint	25 cfm/ft2

Modular Biofilter Systems



Modular Biofilters - Typical Process Flow



Key Features

- High air flow rate (~25 ft/min, compared to 3 to 10 ft/min for conventional organic biofilters)
- Inorganic media biofilter → long media life, preferential development of autotrophic bacteria
- Quick acclimation → specialized media adsorbs odors during acclimation period, for immediate H_2S removal
- Targets inorganic (H_2S) and organic odors
- Compact Footprint
- Skid mounted for easy, low cost installation
- Competitive Price
- Low Operating Cost

Benefits

- All Components Pre-Installed
- Factory Assembled to Greatest Extent Possible
- Ease of Installation
- Start-up Simplicity
- System Responsibility
- Guaranteed Performance (99.0%+ H_2S Removal)

USFilter's ZABOCS Biofilter System

- **The ZABOCS system is an inorganic media biofilter**
- **ZABOCS Models are available to treat air flows up to 5,000 cfm**
- **Guaranteed 99.0%+ removal efficiency**

Advantages:

- **High velocity and small footprint**
- **Zero Acclimation Period**
- **Long media life (no compaction or degradation)**
- **No hazardous chemicals**
- **Low Operating costs**


USFilter

QUESTIONS ?

RJ ENVIRONMENTAL / METITO

THANK YOU