



Advanced Biological Odor Control for Municipal WWTP COMBINATION SYSTEMS

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Outline

1. Performance Requirements
2. Traditional Odor Control Technology
3. Combined Biological Odor Control Technology
4. Guiding Principles & Selection Criteria
5. Case Studies

Performance Requirements

The goal is to eliminate public nuisance complaints and meet regulations by improving technology.

- H₂S design considerations
 - INLET: up to 300 PPM_v
 - OUTLET: H₂S < 0.025 PPM_v (Hawaii standard)
- Nuisance odor design considerations
 - INLET: up to 200,000 OU/m³
 - OUTLET: 95% removal OR < 300 OU/m³

Traditional Methods

Traditional technologies do NOT satisfy the performance requirements.

- **Chemical Scrubbing:**

- Residual *chemical odor*
- Odor and H₂S removal *performance declines overtime*
- **OTHER CONSIDERATIONS:**
 - *Chemical hazards*
 - *Transportation cost of consumables*
 - *Consumable costs*
 - *Extensive maintenance requirements*

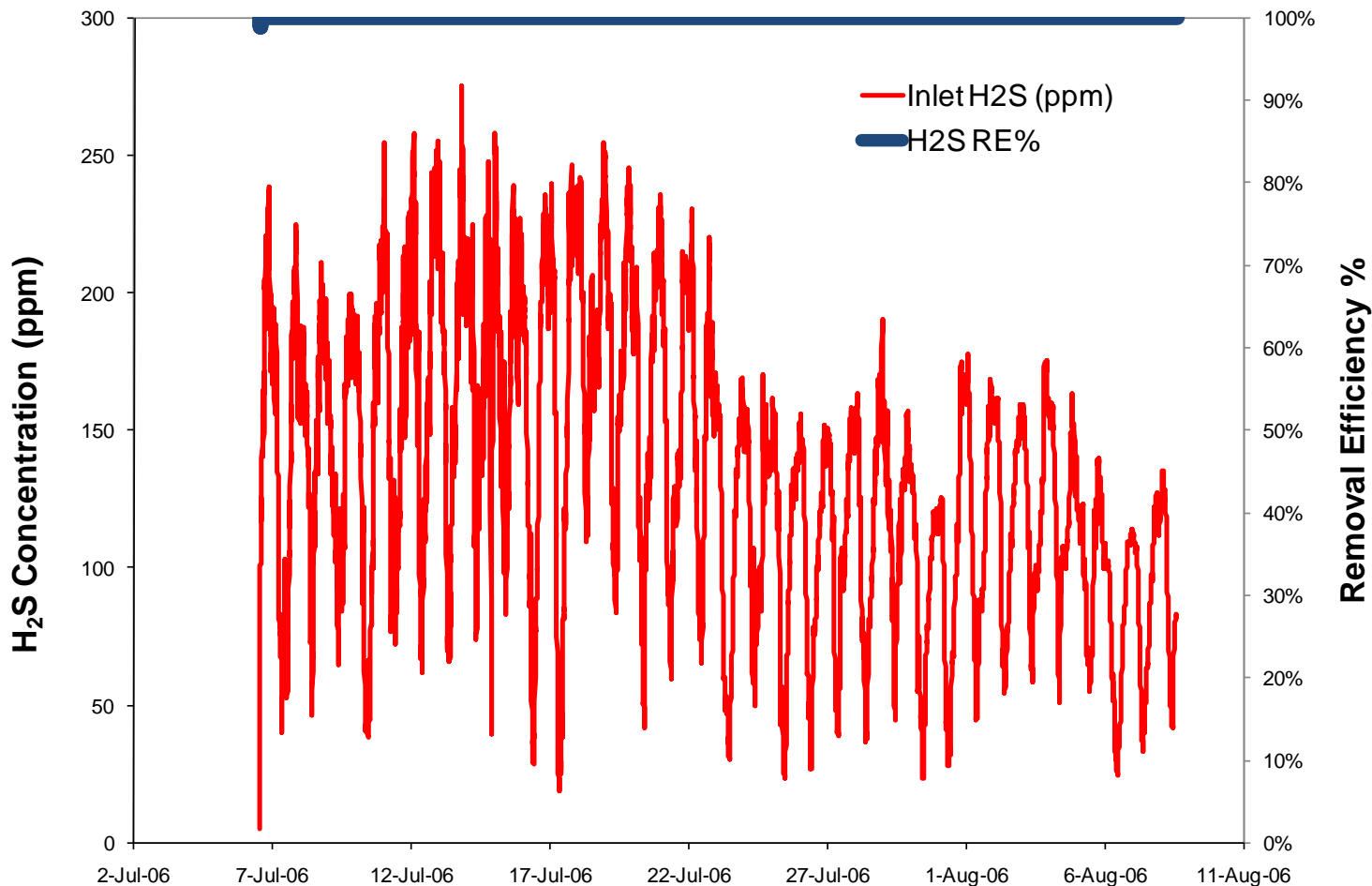
Traditional Methods Cont'd

- **Carbon Adsorption:**
 - Performance is *short lived*. Short useful life of 6-12 months
 - Carbon is *compound specific* for total odor removal
 - Requires *regular monitoring* for break-through of target compounds/odor
 - *Other Considerations*
 - Carbon replacement cost
 - Disposal costs

- **Organic Media Biofilters:**

- The *useful life is <3-years* until media replacement is required
- The *operating costs increase with age* as the media degrades to compost and pressure drop increases
- Residual *outlet odors are musty/earthy* and are above the design outlet concentrations
- System *footprints are large*
- Other considerations:
 - Media replacement & disposal cost
 - Moisture control
 - Organic media product consistency

Organic Media Performance



INLET Concentration [OU]

10000

OUTLET Concentration [OU]

2900

ODOUR REMOVAL EFFICIENCY (%)

71%

Combination Systems

Chemical Scrubber + Carbon Adsorber
OR
Biotrickling Filter + Carbon Adsorber

Low capital cost but....

- *High maintenance cost*
- *Hazardous consumables*
- *Disposal cost of consumables*
- *Poor adaptability to changing process conditions*
- *Unreliable performance*

Combination Systems

Biotrickling filter + Biofilter

OR

Biotrickling filter + Biofilter + Carbon Adsorber(sacrificial)

Advantages:

- Smaller combined footprint
- Ability to buffer process air peaks
- Total odor control (>95% odor removal)
- Ability to provide instantaneous odor removal
- A variety of vessel configurations

Combination Systems

Biological odor control resolves the downfalls of traditional odor control technologies by:

1. Low operating cost
2. Long media life (<10 years)
3. Predictable and sustained performance (manufactured media)
4. Small footprint
5. No hazardous consumables
6. Removal of a broad spectrum of compounds.....**TOTAL ODOR REMOVAL**

Combination Systems

Combining two technologies create a system with greater total odor removal. The type and amount of media can be customized for the specific application.

- **Biotrickling filters – Focused on H₂S removal**
 - Random Packed
 - PUF media
 - Permanent Synthetic
 - LWE by BIOREM
- **Biofilters – Focused on other odor compounds (VOCs and Mercaptans)**
 - Permanent Synthetic
 - BIOSORBENS[®] by BIOREM
 - XLD by BIOREM

Biosorbens[®] Media



XLD Media



PUF Media



Guiding Principles

Understanding the application is key to employing optimized solutions for demanding odor control applications

1. **Source of Odors** – headworks or biosolids
2. **Flow rate** – system size
3. **Contaminant Type & Concentrations** – H₂S, RSC, both
4. **Required Performance** – RSC removal, total odor removal
5. **Proximity of Neighbors** – total odor removal consideration

EXAMPLES.....

Examples

Understanding the process and composition of the odiferous air is of paramount importance.

HEADWORKS

- Inlet Concentration
 - $\text{H}_2\text{S} = 100 \text{ PPM}$
 - $\text{RSC} = 1 \text{ PPM}$
 - $\text{Odor} = 15,000 \text{ OU/m}^3$
- System Design : Biotrickling Filter (**10sec** - LWE) + Biofilter (**15sec** - XLD)

BIOSOLIDS & RESIDUALS

- Inlet Concentration
 - $\text{H}_2\text{S} = 50 \text{ PPM}$
 - $\text{RSC} = 5 \text{ PPM}$
 - $\text{Odor} = 30,000 \text{ OU/m}^3$
- System Design : Biotrickling Filter (**6sec** - LWE) + Biofilter (**20sec** - XLD)

Case Study - Preston

Preston, ON, CANADA

Odor Source(s): primary clarifiers

Technology: BTF – LWE media

BF – XLD media

EBRT: 2sec LWE / 8sec XLD

ODOUR_{IN}: 35,000 OU (>95% RE)

H₂S_{IN}: 15 PPM (>99% RE)

TRS_{IN}: 0.5 PPM

Case Study – Palm Coast

Palm Coast, FL, USA

Odor Source(s):

Residuals and Biosolids

Technology:

BTF – LWE media

BF – BIOSORBENS

EBRT:

8sec LWE

35sec BIOSORBENS[®]

ODOUR_{IN}:

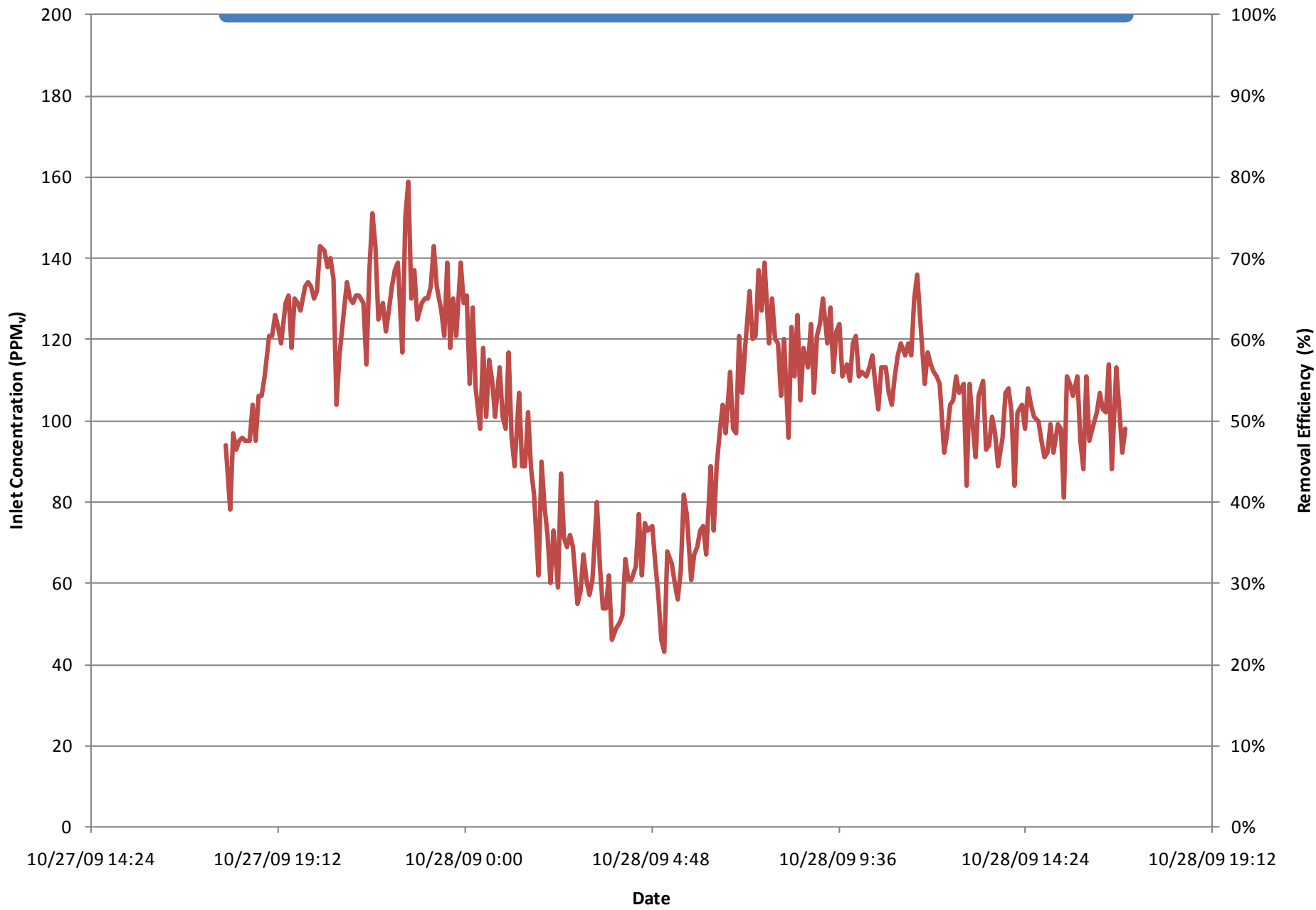
96,000 D/T (>96% RE)

H₂S_{IN}:

100 PPM (>99% RE)

TRS_{IN}:

6.6 PPM



— Inlet H2S Concentration — RE





Conclusion

- Traditional odor control systems do NOT provide the required total odor removal
- Advanced combined biological odor control systems provide much better performance in a smaller space
- A large variety of combinations are available to suit any application
- Long system performance and reliability

Thank you for your time

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