



Field Study using Ozone To Scrub Odors In a Sewage Lift Station

Presenter – Allan Finney

Ozone Generators

An Ozone generator(s)

Feed gas preparation (oxygen concentrator)

Ozone safety monitor (leak detector)

Contacting/Retention System

Provides mixing/retention

Gives time for Ozone reactions

Requires ozone-compatible materials

Ozone Generators/Oxygen Concentrators



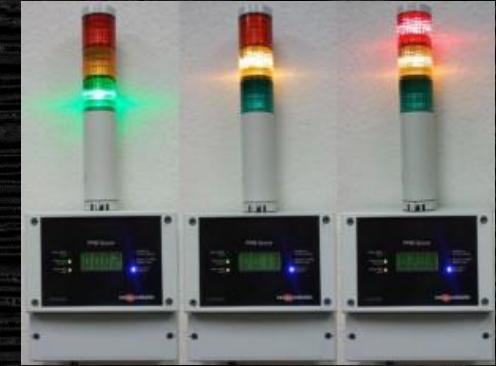
Ozone Contacting/Retention



Ozone Contacting/Retention



Ambient Ozone (leak) Detection



Alon Hagalil, Ha'solelim Pump Station

An Ozone Generating System

Contacting/Retention System (static mixing)

Carbon Scrubbing (EN13725 compliance)

Principle of Operation

Initial Oxidation of odors using Ozone

Retention for reaction kinetics

Carbon Scrubbing (regulatory)

System Flow - Pump Station



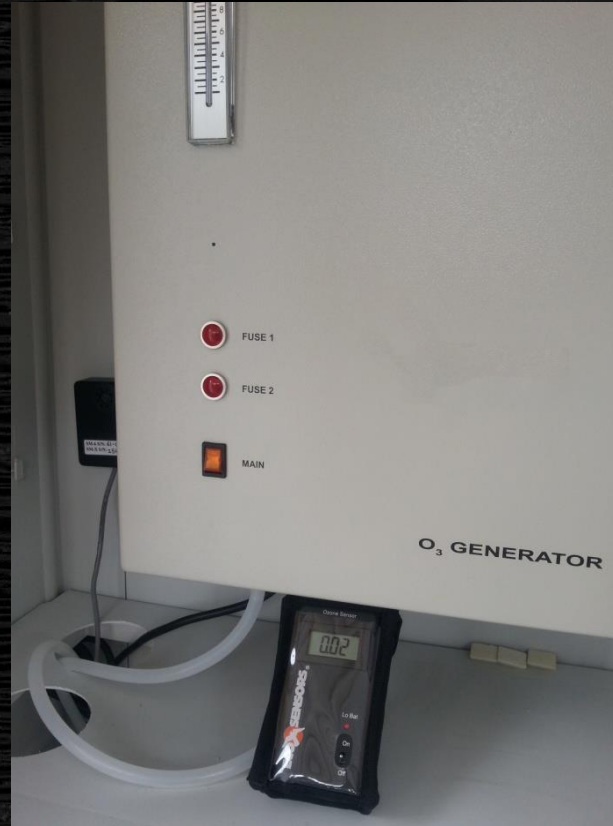
400 m³/day sewage (105,000 gallons) Airflow – 1,100 m³/hr (650 cfm)

Lift Station Overview



Waste flow direction

Ozone Generating Equipment



Contacting, Retention, Mixing



Results – EN13725 Stack Outlet

Sample 1 (low flow):

Entering – 8661 odor units/M3

Exit - 455 odor units/M3

Percent reduction: **94.87%**

Sample 2 (high flow):

Entering - 46,400 odor units/M3

Exit: 6,500 odor units/M3

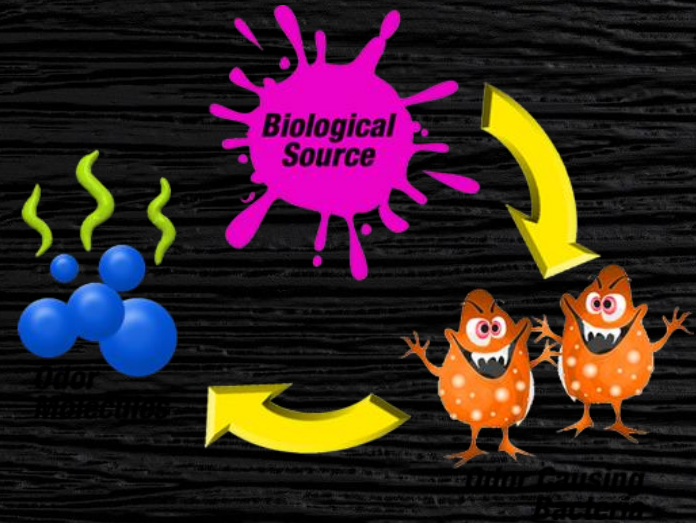
Percent reduction: **85%**

Hydrogen Sulfide:

Entering - 6 mg/ M³

Exiting: 0.962 mg/ M³

Percent reduction: **84%**



Odors = Pathogens in Air

25th Ave. Pump Station – Regina, SK



System Installed – Spring 2018

25th Ave. Pump Station – Regina, SK



NO contacting/retention

25th Ave. Pump Station – Results



“Over the past 5 years from April to October we would get continuous complaints from the local neighbours about the odour leaving our lift station,” - City of Regina Project Manager Sean Hauglam.

“One neighbour repeatedly said on some evenings it was so bad they could not enjoy relaxing in their backyard.”

“Since we installed the ozone unit in Spring 2018, we have had no odour complaints from that lift station,” he said.

City of Regina - Options



Carbon – requires modifications to blower, replace carbon intermittently (unscheduled maintenance, on-going costs, carbon disposal)

Biofilter – not feasible at this size.

Chemical Scrubber – not feasible at this size.

Regenerative Thermal Oxidizer – not feasible \$'s

Ozone Systems – maintenance issues. Resolved with 5th generation (flushable) systems.

City of Regina – Due Diligence

- Two Choices – Carbon or Ozone
- City of Regina evaluated costs Carbon vs. Ozone
- Total ownership costs evaluation
- Operating Costs – 800 Watts @ \$0.10/KWH = \$0.08/hr – only input is electricity
- Routine Maintenance – 2 hrs/year
- Ozone System can last for decades

Ozone Odor Control Systems

- Systems are Scalable and economical
- Footprint is small compared to biofilters
- Avoids caustic chemicals and chlorine (scrubbers)
- “Green” Technology using only electricity
- Maintenance issues are now resolved
- Installed systems ranging from slaughterhouses to fish processing plants to mushroom composting
- Initial work was done on pig barns

Conclusions – Sewage Odors Lift Station

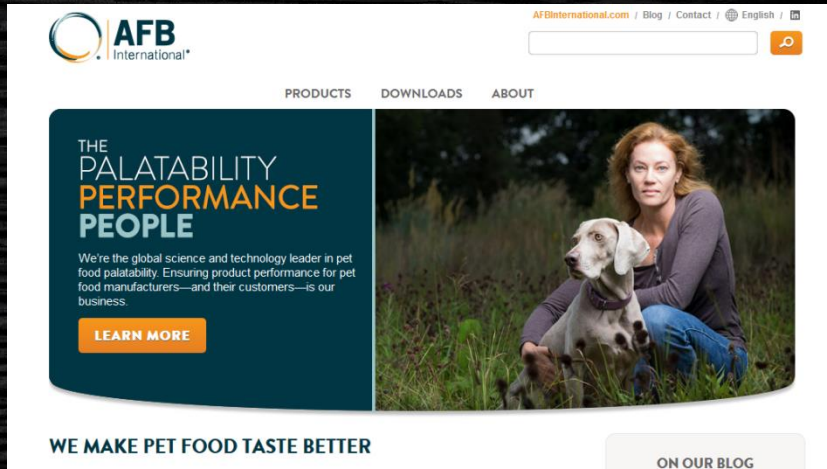
- Ozone is Effective at Mitigating Odors
- Total Lifetime Ownership Costs Favorable (City of Regina)
- Ozone Systems are Low-maintenance
- No Specialized Skills Required
- Can be combined with other technologies
- Only Input is Electrical
- Minor Modifications to Existing Site
- Completely Safe

Scalability - Adena Beef, Ft. McCoy, Florida



6,200 sq m 66,000 sq. ft. 150,000 m³/hr 88,000 CFM

AFB International - U.S.



Existing wet scrubber converted
to Ozone



SagaFisk – Cod Processing, Norway

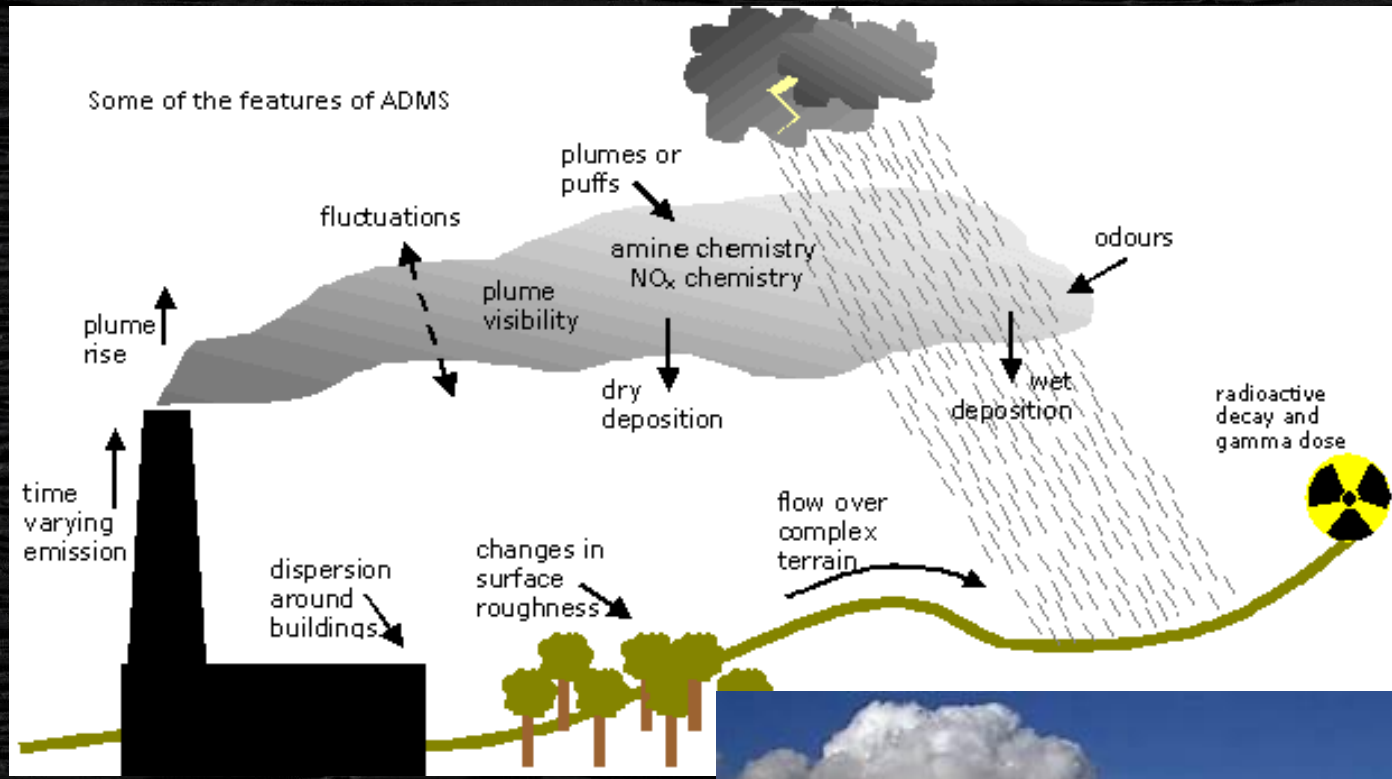


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EN13725 vs Odor Measurement/Ozone



Ozone Travels With Plume



Ozone System Design Guidelines

- Ozone demand test (large scale)
- Contacting/Retention system design
- Ozone Generators (low maintenance)
- Ozone system redundancy (critical applications)
- Ozone Generator clean room (electronics)
- System safety – ambient ozone monitor (controls system integration)

Odor Control Systems Using Ozone

- City planners, designers rely on Engineers
- Engineers design what they've been taught
- Chemical Scrubbers, Biofilters entrenched technology
- Municipal, civic buyers are very conservative
- Looking for widely used (safe) technology
- Commercial operations – market not as conservative

Modern Ozone Generating System

- Scalable – rack mounted generators
- Systems can be maintained by relatively unskilled labor
- Oxygen concentrators are self-contained
- Provides “off the shelf” solutions

