



South Carolina Department of Health and Environmental Control
Promoting and Protecting the Health of the Public and the Environment

Hydrogen Sulfide Gas at Class 2 Landfills:

A regulatory perspective

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Overview

- **November last year all Class 2 landfills should have received an informational letter from DHEC about Hydrogen Sulfide (H₂S) generation at Class 2 landfills**



- **Due to the rainy year we had in 2013, H₂S generation became a concern at some of our landfills**

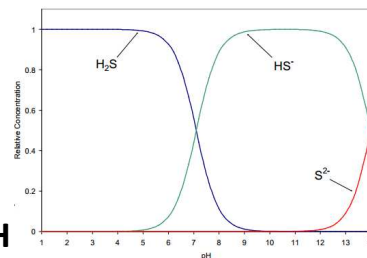


Hydrogen Sulfide Is Deadly



“Who”- Hydrogen Sulfide

- Gas that is colorless, flammable, hazardous, rotten egg smell- Ability to smell can be lost instantly
- LEL 4% (40,000ppm)
- IDLH is 100ppm
- Highly Soluble
- Production slowed by high pH





Where- Is this an issue

- Natural or industrial settings
- Air monitoring on one landfill showed hydrogen sulfide levels ranging from 1 to 7,000 ppb.
- Air monitoring data from a **residential neighborhood surrounding the landfill** ranged from 0 to 160 ppb. The residential monitoring data was collected from both inside and outside people's homes



How- Is it formed

- Gypsum disposal in wet conditions- SOURCE/FOOD
- Organic waste located around gypsum disposal- BACTERIA
- Anaerobic conditions
- Low pH (less than ~8)
- The formation of H_2S is an exothermic reaction- potential for landfill fires





Why- Should I be concerned

- Irritant and asphyxiate
- Low concentrations can cause irritation of eyes, nose, throat, lungs
- Repeated or prolonged exposures may cause eye inflammation, headache, fatigue, irritability, insomnia, digestive disturbances and weight loss



Why- Should I be concerned

- Heavier than air (can concentrate at ground level)
- Critical on hot humid days with no wind
- **BEWARE: Trenches/low topography**
- There have been confirmed instances of H₂S exposures producing negative health effects from landfills, even in SC





When- Can this be a problem



- Cleanup of hurricane or flood debris can result in substantial quantities of saturated wallboard being sent to landfills (or after heavy rains)
- Significant sources of sulfur:
 1. Gypsum/ Drywall
 2. Pulp and paper mill waste
 3. Sludges from wastewater treatment plants



What- Can I do about it

- Control water infiltration and ponding
- Additional cover and/or regrading slopes
- Add lime/fine concrete... something to raise pH
- Decrease sulfate containing waste/ dispose of in area away from organic material





What- Can I do about it

- **Minimize the breakup of gypsum/drywall**
- **Train employees to recognize and mitigate hazards**
- **Use a H₂S meter to monitor around LF**
- **But what if we already have a problem after disposal?**



OK, so now that we know what H₂S is and what causes it to be generated at a Class 2 Landfill, what is SC DHEC's perspective on it?



Should there be a problem with H₂S at the Landfill, the Department's primary concern is to prevent harm to any persons who work at the site, visit the site, or live or work near the site.



Tips for heading off a problem with H₂S



Tips for heading off a problem with H_2S

- **Self-conducted inspections**



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Tips for heading off a problem with H₂S

- Self-conducted inspections
- Be mindful of large rain events



Tips for heading off a problem with H₂S

- Self-conducted inspections
- Be mindful of large rain events
- Inspect loads for large amounts of drywall. Proper waste management is key. Lack of positive drainage increases likelihood of H₂S generation.



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**Communicate, communicate,
communicate!**



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**So you have a suspected H₂S problem.
What's next??**



So you have a suspected H₂S problem. What's next??

- Site visit by Department staff



So you have a suspected H₂S problem. What's next??

- Site visit by Department staff

- Barhole survey





So you have a confirmed H₂S problem. What's next??



So you have a confirmed H₂S problem. What's next??

Corrective Action Plan (CAP) can be requested which may involve use of a contractor to design a remediation, mirroring that of Methane remediation at Class 3 Landfills.

However, if you have a serious problem do not wait on a DHEC response if there is an immediate danger. Act quickly!



So you have a confirmed H₂S problem. What's next??

**Can SC DHEC require gas monitoring at a Class
2 Landfill?**



So you have a confirmed H₂S problem. What's next??

**Can SC DHEC require gas monitoring at a Class
2 Landfill?**

**Regulation R. 61-107.19 Part IV Subpart C.21
states: "A gas monitoring system shall be
designed and installed as required on a case-
by-case basis to ensure that gas generated at
the landfill will not create a hazard to health,
safety, or property."**



What are some consequences of a H₂S problem?



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- **Serious injury or worse**



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- Serious injury or worse
- Expenses associated with assessment of the problem



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- Expenses associated with assessment of the problem
- Public image to the local community





What are some consequences of a H₂S problem?

- **Serious injury or worse**
- **Expenses associated with assessment of the problem**
- **Public image to the local community**
- **Other costs such as lost time spent handling this issue and increased financial assurance due to need for a monitoring and/or removal system**



What are some consequences of a H₂S problem?

- **Serious injury or worse**
- **Expenses associated with assessment of the problem**
- **Public image to the local community**
- **Other costs such as lost time spent handling this issue and increased financial assurance due to need for a monitoring system**
- **Enforcement actions (a last step)**



References/ Additional Information

- https://www.osha.gov/OshDoc/data_Hurricane_Facts/hydrogen_sulfide_fact.pdf
- <http://www.cdc.gov/niosh/topics/hydrogensulfide/>
- <http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=389&tid=67>
- <http://www.maine.gov/dep/waste/publications/documents/hydrogensulfidefactsheet.pdf>



Recap

- **Hydrogen Sulfide (H₂S) gas is generated when Gypsum (drywall) comes into contact with organic material and water in anaerobic conditions**
- **Can be a health and environmental problem**
- **Can result in Injury or worse, along with financial burdens**
- **Preventable through proper landfill operation and management**



Questions??



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