



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**

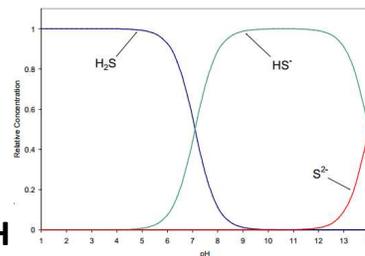


Hydrogen Sulfide Is Deadly



“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?



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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.



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**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."**



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- **Serious injury or worse**



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- **Expenses associated with assessment of the problem**



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- **Public image to the local community**





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- **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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