Dangers of H₂S and manure agitation

- Findings from gypsum use in bedding study
- Dangers of H₂S
- Safety precautions when agitation manure

Manufacturing And Construction Waste ➔ Useful Agriculture Product

Agricultural benefits – ideal bedding for dairy cows

As bedding
- Moisture absorption
- Low bacteria counts
- Neutral pH

The presentation is archived at:
http://articles.extension.org/pages/21819/chronological-webcast-archive
Dairy Farmer’s Boys Have Close Call With Manure Gas

Gypsum (CaSO₄) bedding provides a sulfate source within the manure storage that reduces to form H₂S.

Hydrogen Sulfide Creates A Dangerous Environment Heavier Than Air

<table>
<thead>
<tr>
<th>Exposure Limit</th>
<th>H₂S Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible Exposure Limit (PEL) or Ceiling</td>
<td>20</td>
</tr>
<tr>
<td>Immediately Dangerous to life and Health (IDLH)</td>
<td>100</td>
</tr>
</tbody>
</table>

General Industry: 29 CFR 1910.1000 Table 2
Exposures shall not exceed 20 ppm (ceiling) with the following exception: if no other measurable exposure occurs during the 8-hour work shift, exposures may exceed 20 ppm, but not more than 50 ppm (peak), for a single time period up to 10 minutes.
Manure gases escape during agitation

**METHODS:** H₂S concentrations were measured during agitation events using portable meters.

![Industrial Scientific meters, Pittsburgh, PA](image)

<table>
<thead>
<tr>
<th>5 Non gypsum farms</th>
<th>6 Gypsum Farms</th>
<th>8 Gypsum farms treated</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Graph 1" /></td>
<td><img src="image" alt="Graph 2" /></td>
<td><img src="image" alt="Graph 3" /></td>
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</tbody>
</table>

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Personal monitoring devices provide effective awareness of exposure

14 out of 18 operators did not exceed 20 ppm H₂S exposure

Best management practices lower exposure risk
4 out of 18 operators were exposed to H₂S above 20 ppm

Operators with two highest H₂S readings were close to agitation

Concentrations 10 meters away from storages were measured

Elevated H₂S concentrations were observed at farms that use gypsum
Conclusions: H₂S Concentrations

- Increased gypsum application rate significantly increases cumulative H₂S concentrations.
- Manure moving-mixing-agitation creates safety concerns related to high gas levels.
- Safety practice’s lower risk of exposure.
- Risk of exposure present even at 10 meters downwind from storages that contain gypsum.

Recommendations During Manure Agitation

- Unnecessary people and animals should avoid being near manure storage area
- Operators should limit time near manure storage and avoid low lying areas
- Operators should be elevated and upwind when required to be near storage during agitation
- Wear personal monitoring devices!!!