Odor Control
Tracking the Source of Odors

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Introduction

* Offsite odors are one the more noticeable effects facilities have on nearby communities

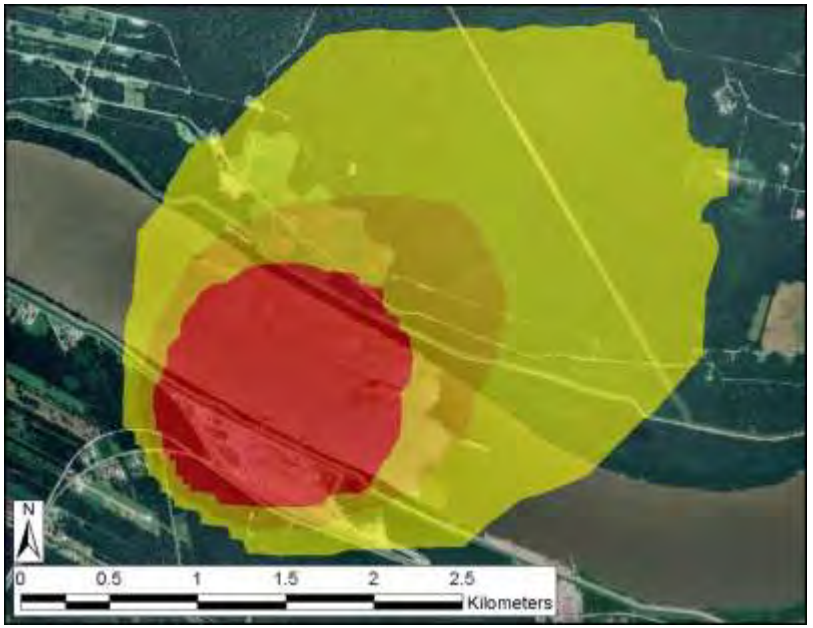
* Odors can be attributed to:
  1. Normal Operations
  2. Excess Emissions
  3. Incidents

Odor Causes

1. Normal Operations
   * Odorous product or feedstock
2. Excess Emissions
   * Fugitive Emissions
   * Turnaround
   * Poor Housekeeping Practices
3. Incidents
   * Spills
   * Releases
   * Poorly Maintained or Insufficient Control Equipment

Community Impact of Odors

* In 2014, LDEQ has received ~503 odor complaints to date
* LDEQ Inspectors investigate every complaint received
* When SPOC receives an unusual number of odor complaints, LDEQ Emergency Response (ER) will investigate



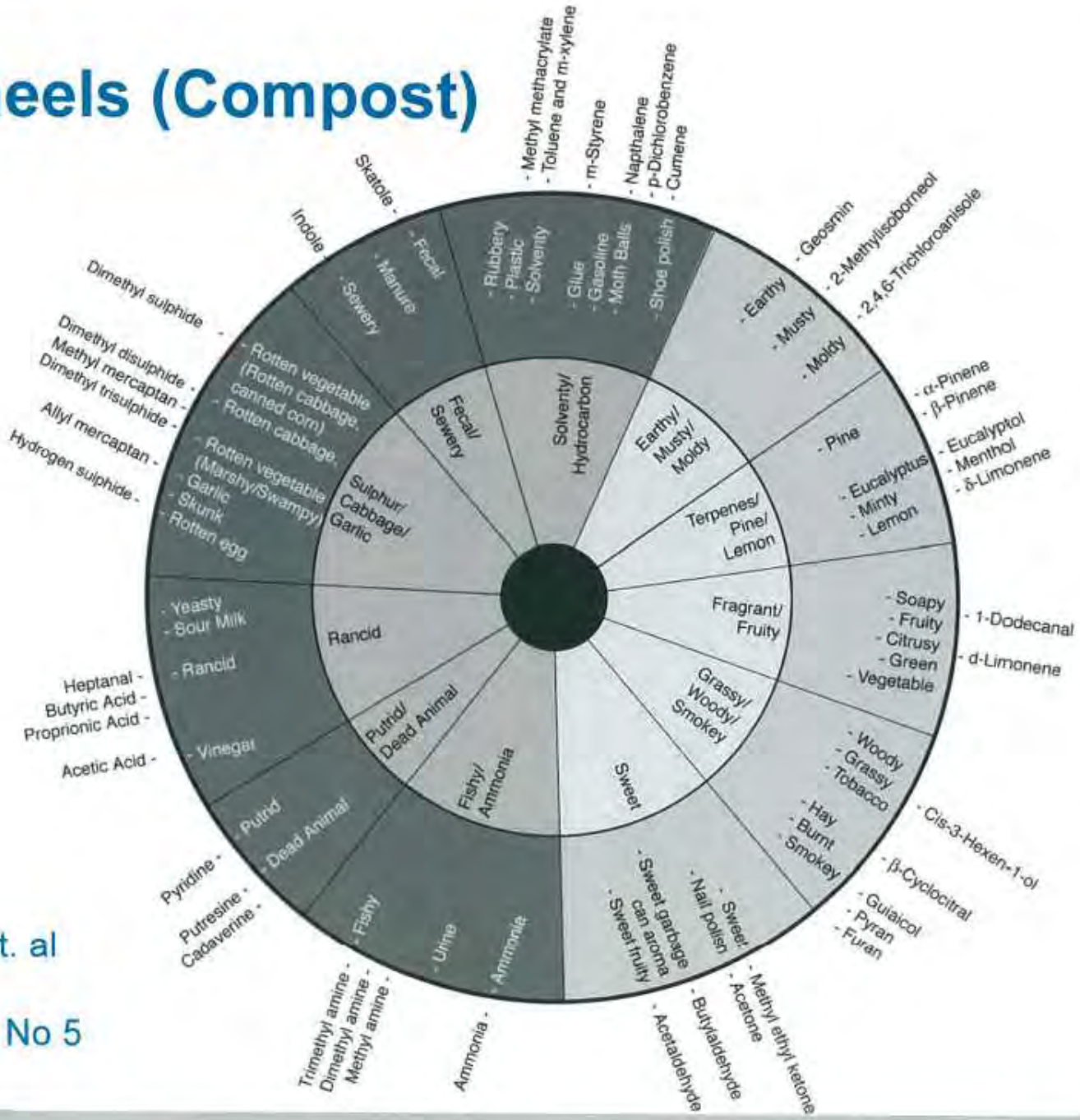
Louisiana Odor Regulations

* Unpermitted air emissions or incidents
  * LAC 33:III.501.C.4 – "*The source shall operate in accordance with all terms and conditions of the permit.*"
* Nuisance Odors
  * LAC 33:III.2901 – "*Limit on Odorous Substances at or beyond Property Lines*"
  * Various regulations prohibit "*a nuisance, or a danger to public health and safety*"
* City Ordinances
  * Odor ordinances
  * Operating licenses

Identifying the Source of Odors

Factors	Considerations
Complaint Details	Specific Location & Times
Weather Conditions	Wind Speed, Direction & Cloud Cover
Duration	Constant or Transient
Intensity	Local or Area
Odor Characteristics	What does it smell like? Used to identify potential compounds
Industries	What is nearby? Incidents in the area? What type of industries? Potential for odors to travel offsite?
Air Monitoring & Analysis	What compounds are detected?

Odor Wheels (Compost)



From Rosenfeld, et. al
Water Science &
Technology Vol 55 No 5
pp 345–357

Types of Air Monitoring Equipment

* "Handheld" Monitors
  * 5 Gas Meter, Jerome Meter
* Canister Samples
  * Grab Samples
  * Regulated Samples
* Mobile Air Monitoring Lab (MAML)
* LDEQ Ambient Air Station

Monitoring Considerations

* Impact to the Environment & Human Health
* Type of Analysis (Compounds Present)
* Equipment Detection Limits
* Mobility
* Location
* Duration
* Cost

Chalmette Refinery
WTF Flare Line Spill

* On 4/3/13 Orleans, Jefferson, St. Bernard & Plaquemines Parish EOCs received >100 odor complaints beginning at 1:30am
* LDEQ ER & USCG Initiated Investigation
  * Facilities, River Traffic, Reported Incidents
  * Followed the Odor
  * Variable winds, max 25 mph and rain made it difficult to isolate origin of the odor
  * Sulfur Odor very present and detected by DEQ
  * Air monitoring by DEQ ER throughout response showed no detections for VOCs, SO_2, H_2s within community and where noticeable odors were observed

Chalmette Refinery
WTF Flare Line Spill

* Chalmette Refinery discovered a spill from a pipeline leak at ~7am
* Leak was secured at 7:45am
* Chalmette Refinery notified LDEQ of a waste water spill at ~8am
* Simultaneously Chalmette Refinery was flaring a large amount of SO_2

Chalmette Refinery
WTF Flare Line Spill

* Spill was determined to be flare condensate
* Analysis showed released material was below Reportable Quantity (RQ) for H_2S and Benzene
* Contained 245ppm of mercaptans
  * Highly odorous reduced sulfur chemical used in natural gas as an odorizer (~3ppm)

Odorous Reduced Sulfur Chemicals

Compound	CAS No.	Reporting Limit PPBV	Character
Hydrogen Sulfide	7783-06-4	5.00	Rotten eggs
Carbonyl Sulfide	463-58-1	5.00	Pungent
Methyl Mercaptan	74-93-1	5.00	Rotten cabbage
Ethyl Mercaptan	75-08-1	5.00	Rotten cabbage
Dimethyl Sulfide	75-18-3	5.00	Decayed vegetables
Carbon Disulfide	75-15-0	2.50	Vegetable sulfide
Isopropyl Mercaptan	75-33-2	5.00	Skunk
tert-Butyl Mercaptan	75-66-1	5.00	Skunk
n-Propyl Mercaptan	107-03-9	5.00	Cabbage
Ethyl Methyl Sulfide	624-89-5	5.00	Sulfurous, garlic
Thiophene	110-02-1	5.00	Sweet
Isobutyl Mercaptan	513-44-0	5.00	Skunk
Diethyl Sulfide	352-93-2	5.00	Sharp, garlic
n-Butyl Mercaptan	109-79-5	5.00	Skunk
Dimethyl Disulfide	624-92-0	2.50	Putrid, decayed vegetables
3-Methylthiophene	616-44-4	5.00	
Tetrahydrothiophene	110-01-0	5.00	Sharp, pungent
2,5-Dimethylthiophene	638-02-8	5.00	
2-Ethylthiophene	872-55-9	5.00	
Diethyl Disulfide	110-81-6	2.50	
Dimethyl Trisulfide	3658-80-8	2.50	Rotten cabbage

* Source of many complaints received in LA
* Common with petroleum/ hydrocarbon processing
* Odor threshold is below detection limit of most equipment

Detection Limits for Sulfur Compounds

Approximate Detection Limits

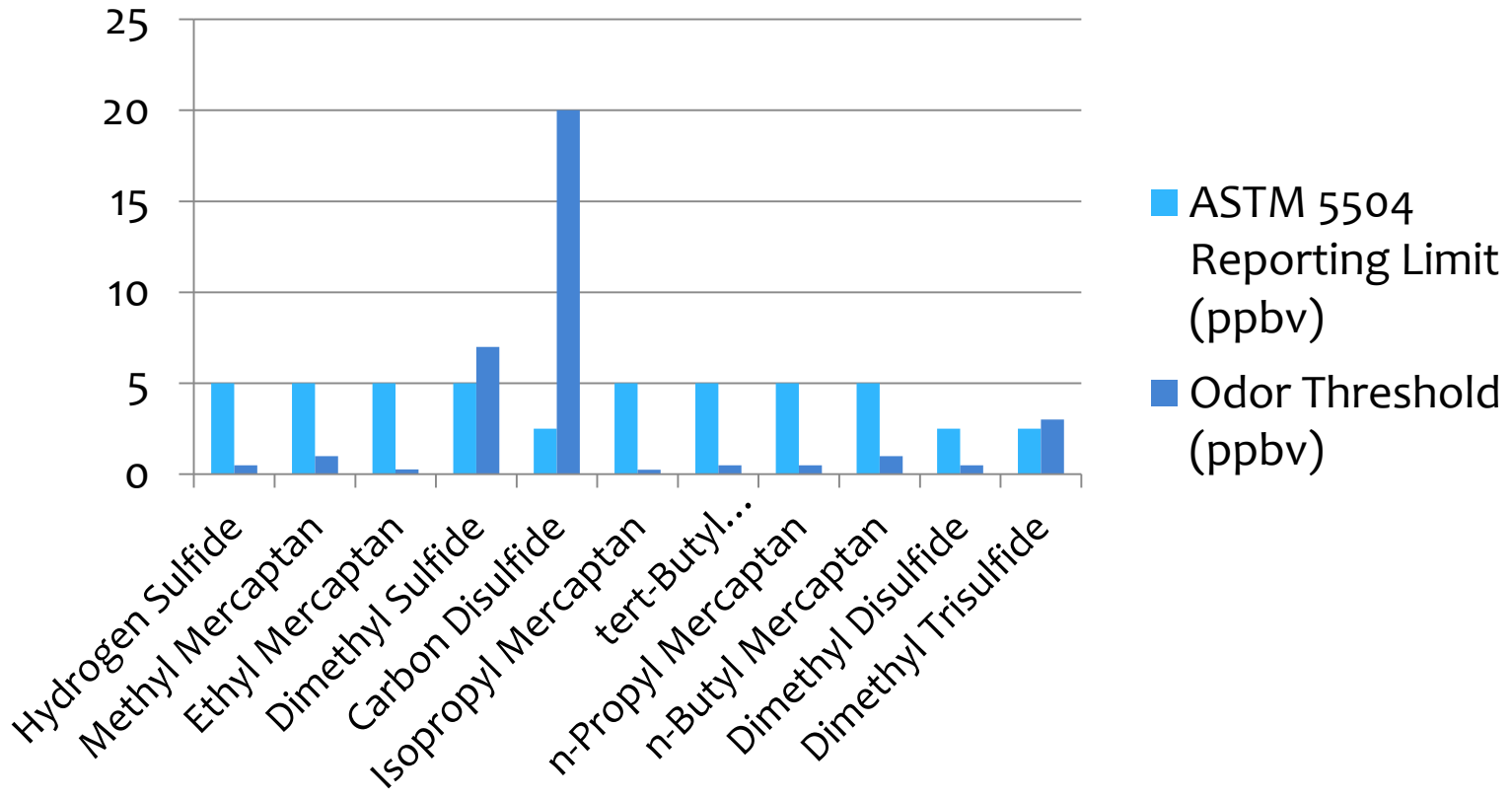
Compound	AreaRae	Jerome	MAML AA Analyzers	ASTM 5504-12	EPA TO-15
H2S	0.1 ppm (100 ppb)	4 ppb	0.4 ppb	5 ppb	NA
SO2	0.1 ppm (100 ppb)	NA	0.4 ppb	NA	3 ppb ^
VOC*	0.1 ppm (100 ppb)	NA	0.01 ppm **	NA	.2 - 25 ppb ***

**Benzene is included as VOCs, **detection limit is for NMOC,*

**** VOCs have varying detection limits in ppb range.*

^ Detected as a TIC (Tentatively Identified Compound)

Odor Threshold vs Detection Limits Reduced Sulfur Compounds



Federal Exposure Guidelines for Sulfur Compounds

CDC ATSDR MRLs						
*CDC ATSDR MRL	HYDROGEN SULFIDE	Inh.	Resp.	Acute	70	ppb
*CDC ATSDR MRL	HYDROGEN SULFIDE	Inh.	Resp.	Int.	20	ppb
*CDC ATSDR MRL	SULFUR DIOXIDE	Inh.	Resp.	Acute	10	ppb

*Exposure Durations:

MRLs are derived for acute (1 - 14 days)

Intermediate (>14 - 364 days)

Chronic (365 days and longer)

EPA NAAQS			
Sulfur Dioxide	Time	Level	
primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year
No EPA NAAQS for H2S			

- EPA NAAQS = Federal Ambient Air Quality **Regulations**
- CDC ASTDR MRLs = Federal Exposure **Guidelines**

Scarsdale Drainage Pump Station

* Hurricane Isaac flooded the area with up to 12 feet of water
* Parish officials brought in additional temporary drainage pumps
* On 9/11/12 workers at temporary pumps station experienced nausea, headache, eye and respiratory inflammation, and strong offensive odors
* LDEQ ER and State Police responded
* As pumps were turned off, H_2S readings declined
* Incident raised awareness of previously unknown hazard

Difficulties During Odor Investigations

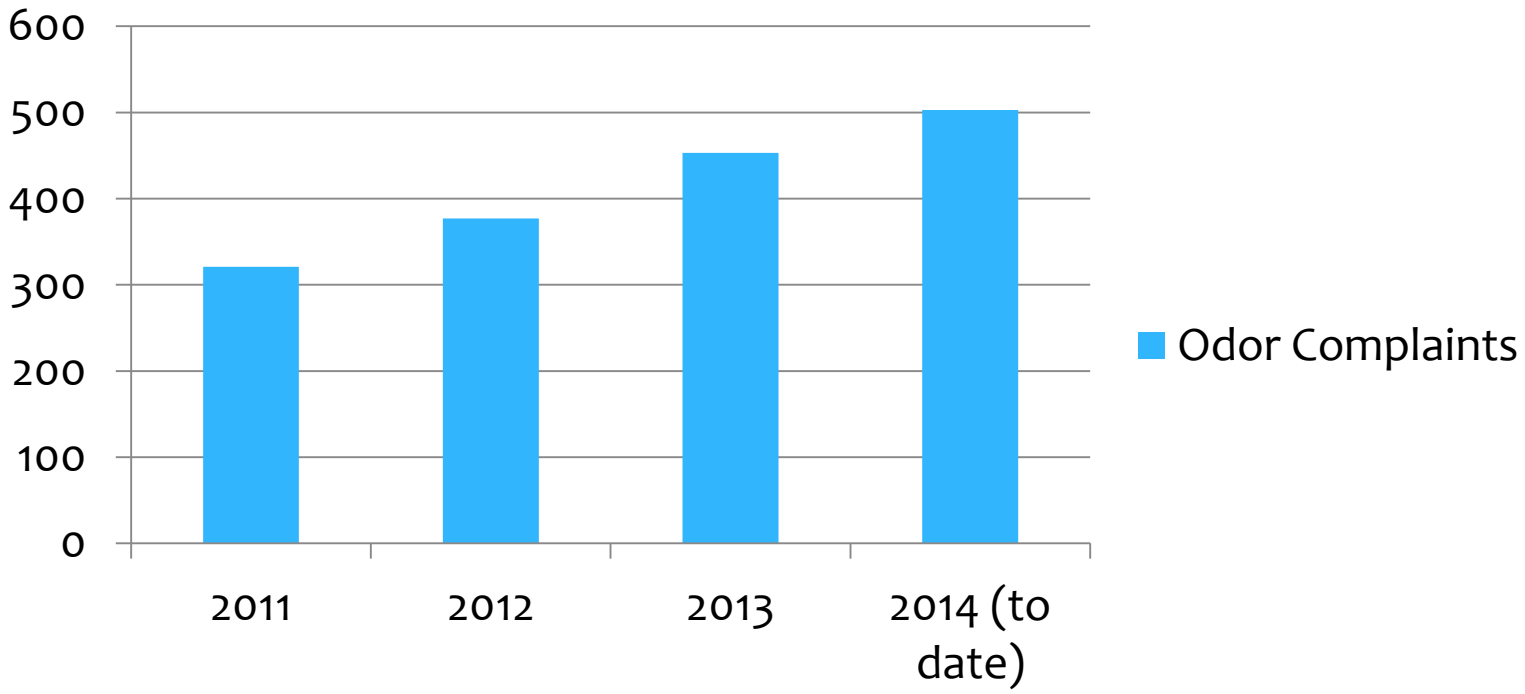
* “Normal” Odor vs Nuisance Odor
* Subjective
* Vague complaints from citizens
* Vague incident reports from industry
* Difficult to quantify
* Difficult to determine source
* Often not from a permitted emission point
* Multiple contiguous facilities

Communicating with the Community During Odor Incidents

Lessons Learned

* Problems
  * Louisiana has a many neighborhoods and major metropolitan areas in close proximity to industrial activities
  * Odors commonly misperceived to be indicative of toxic chemical releases
  * Potential health effects not understood by or communicated to impacted communities
* Solutions
  * Up to date, clear communication of information
    * Hotline setup by Responsible Party (RP), press releases
  * Additional community monitoring
    * Data compared to exposure guidelines

Odor Complaints Received by LDEQ



Summary

* 503 complaints have been received by LDEQ 1/1/2014 - 10/28/2014
* Need for better incident reporting and communication with DEQ regional office
* Air monitoring data is the only quantitative information available to satisfy community concerns

Questions?

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