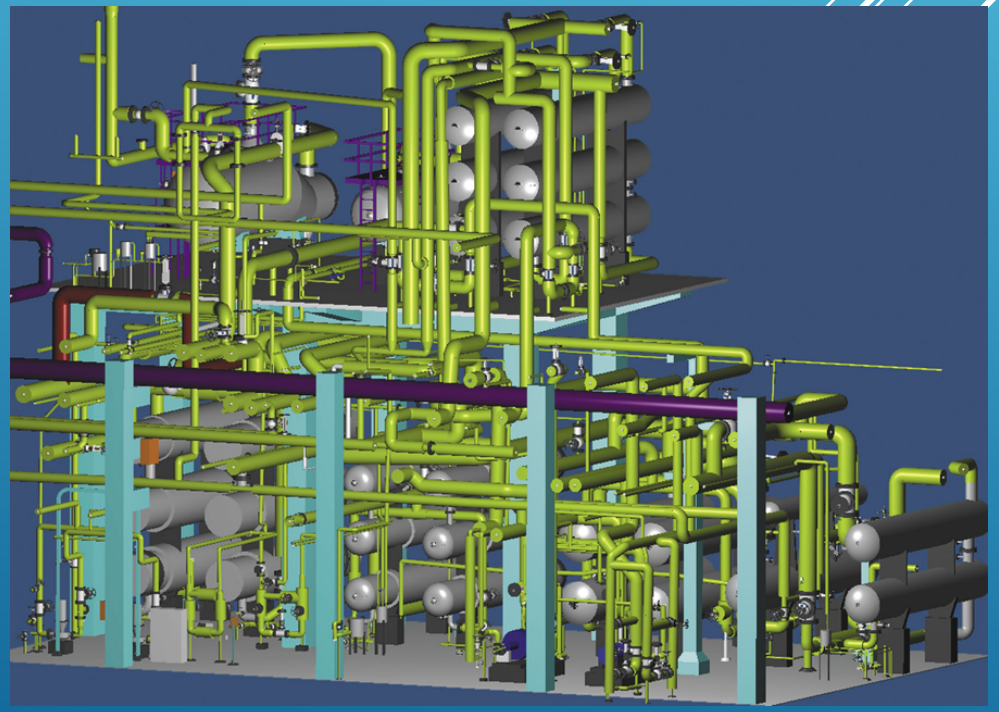
ESSENTIALS OF AIR PERMITTING FOR CHEMICAL PLANTS



Presented by:

Kevin Moin, P.E.

Principal

RECES Environmental Consulting

4C Conference – San Antonio, TX – April 2018

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Introduction

Kevin Moin

- Chemical Engineer – University of Houston
- Texas Registered P.E.
- 28 Years of experience in air quality consulting & Engineering
  - Radian Corporation: 1990-1998
  - Jacobs Engineering: 1998-2000
  - TRC Solutions: 2000-2003
  - RECES Environmental: 2003-Present

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Background:

RECES (Reliant Environmental Consulting & Engineering Services)

- Established 2003
- Houston, TX & Irvine, CA

Expertise:

- Air Permitting (NSR, Title V, PSD, PBR)
- Compliance & Recordkeeping
- Air Dispersion Modeling

Industries:

- Chemical & Petrochemical
- Upstream (O&G)
- Midstream (Transfer Operations)
- Downstream (Refining)
- 24 States

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WHAT TO ACHIEVE WITH AN AIR PERMIT

Operational flexibility

- Operational flexibility to handle existing chemicals
- Ability to introduce new chemicals (self authorize)
  - Permit Condition: Flexibility Clause

Ease of Compliance Demonstration

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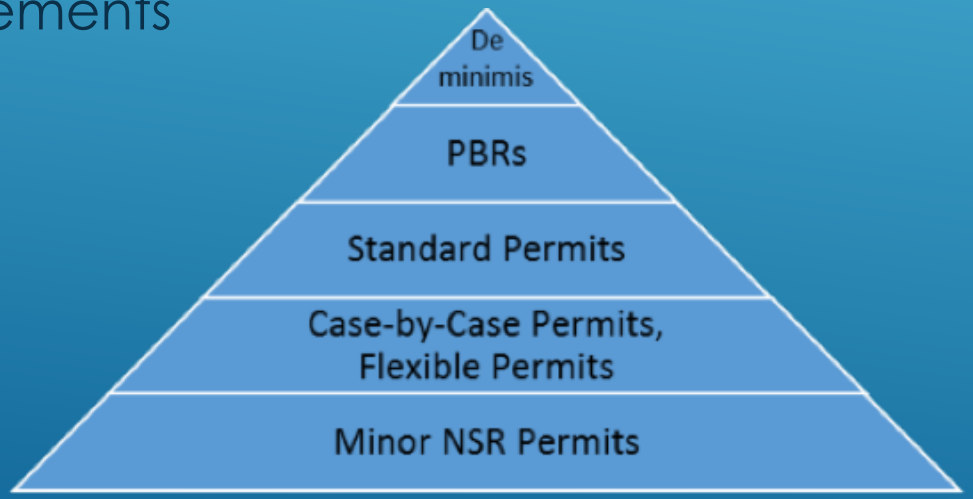
Addition of new chemicals:

- Create Master Chemical List (MCL)
  - Molecular weight (M)
  - Vapor pressures (P)
- Create Max MxP product group(s) from MCL
  - May have multiple groups of MxPs
- Calculate emissions based on this max MxP product
  - Establish an allowable emission rate (PTE)
- Create an annual not-to-exceed throughput rate for the entire plant

Maintain Minor Source status

- Remain below Title V major source thresholds, specifically for non-attainment areas
- Recent Re-Classifications: Opportunity to become minor for plants that are already major
    - Severe to Moderate
- Ability to add new chemicals without adding to overall PTE
- BACT Requirements



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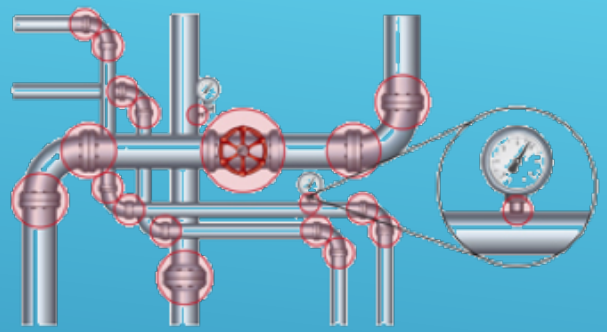
Fugitive Emissions



- LDAR Program to reduce fugitive emissions
  - Fugitive BACT Considerations
- Hassle-free compliance demonstration / record keeping

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Evaluate the need for emission controls

- BACT Requirements
- Further reduce PTE
- Stay out of Title V

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INFO NEEDS - DATA ACQUISITION

Products/Chemicals (raw materials and products)

- Chemical properties (molecular weight, vapor pressures)
  - SDS
  - Create MxP product for added flexibility
- Batch sizes and total batches per year

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INFO NEEDS - DATA ACQUISITION

- Total annual throughput to be permitted (per source)
  - IN: Storage tanks, reactors, blenders, etc
  - OUT: Tank trucks, drums, totes, etc
- Max hourly fill rates (gal/hr)

INFO NEEDS - DATA ACQUISITION

List of all equipment to be permitted

- Reactors and blenders
  - Vessel sizes
- Storage tanks
  - Number of tanks to be permitted
  - Capacity
  - Dimensions
  - Material, construction, color, etc
- Control devices, if necessary

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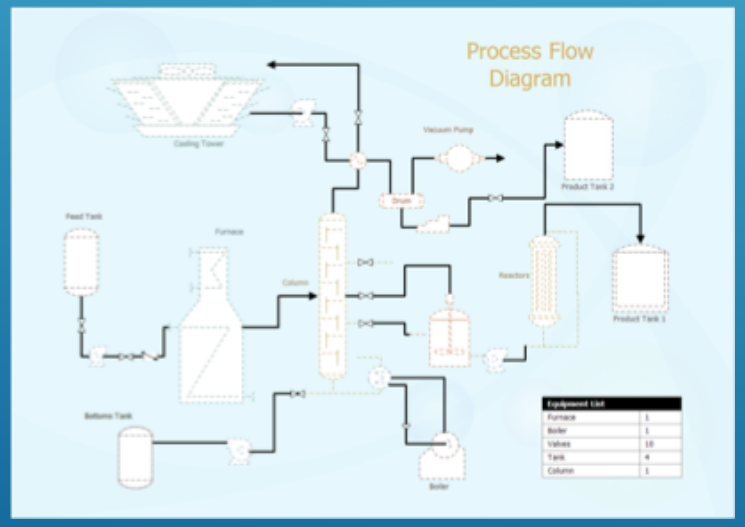
INFO NEEDS - DATA ACQUISITION

Fugitive component counts for process equipment

- LDAR program to be instituted across the entire plant

INFO NEEDS - DATA ACQUISITION

- Process description
- Process flow diagram
- EPNs (Stack Parameters and Locations)
- Plot Plan
  - List of all equipment, EPNs, buildings, property lines, etc
- Drawings
  - PIDs of equipment



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INFO NEEDS - DATA ACQUISITION

- MSS Activities
  - Vessel cleanings, Degassing, line purgings, etc

PERMIT APPLICATION

- Latest version of TCEQ Forms
  - PI-1
  - Equipment tables
  - Table 2 (Material Balance)
  - Table 30 (Application Fee)

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PERMIT APPLICATION

Emissions calculations/methodology

- MxP Product – generic VOC product
  - Best used for plants with a large master chemical list (i.e 1,000 +)
  - Use MxP Product to calculate PTE based on proposed throughputs
- May have multiple MxP groups to keep PTE down

PERMIT APPLICATION

- Regulatory Requirements
  - State
  - Federal

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PERMIT APPLICATION

- BACT Analysis
- Submittal
  - DRAFT Review and revisions
  - FINAL Submittal
    - Complete permit application
    - Permit application fee

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POST-SUBMITTAL

- 1st 30-day Public Notice
- Technical Review Processes
- TCEQ Notice of Deficiency (NOD)
  - Address any issues with representations, methodologies, etc.
  - Opportunity to incorporate any changes at this time
  - MERA request

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POST-PERMIT APPLICATION SUBMITTAL

Health Effects Review – Air Dispersion Modeling

- Off-site Impacts determination
- NAAQS Analysis
- Model post-processing
- Air Quality Analysis (AQA) report

POST-PERMIT APPLICATION SUBMITTAL

- DRAFT Conditions Issued
  - Review and request any changes to conditions at this time
- 2nd 30-day Public Notice

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CHEMICAL FLEXIBILITY CLAUSE

Incorporated into permit

- Allows self authorization of new chemicals
  - Does not add to PTE
  - Does not require type of permit authorization
    - Clause can authorize the proposed chemical immediately
- Unit impact multipliers from modeling include in clause
  - Readily Evaluate if proposed chemical will "pass"
  - Requires site-wide modeling

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PERMIT ISSUED

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Life after permit…

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RECORD KEEPING

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Create a streamlined process to maintain and demonstrate compliance with the permit

- Develop a 12-month rolling spreadsheet to demonstrate the plant is operating below the permitted PTE
- Based on the same methodologies used in the permit application

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RECORD KEEPING

Minimize burden to maintain compliance

- Use single spreadsheet workbook
- Only required input would be monthly throughputs
- Automatically calculate emissions
- Automatically compare calculated emissions to PTE
  - Alerts when approaching PTE limit in order to avoid exceedances

New Chemical Authorization (NCA) Tool

- Reflected in permit special condition regarding chemical flexibility
  - Ability to self authorize proposed chemicals
- Spreadsheet automatically evaluates off-site impacts without further modeling
  - Determines if chemical will "pass"
  - Alter spreadsheet to allow chemical to "pass"
    - Reduce loading rates
    - Reduce simultaneous loading spots
- Authorization to handle chemical, as long as…
  - Remain below PTE
  - Remain below MxP Product
  - Impact below ESL

HEALTH EFFECTS REVIEW
AIR DISPERSION MODELING

Complete MERA to determine what is to be modeled

- Effort to reduce the mass quantity of chemicals to be modeled
- Site-wide modeling vs increase only modeling
- ESL Requests

Modeling Protocol

- Project description
- Identifies sources and source types to be modeled

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HEALTH EFFECTS REVIEW
AIR DISPERSION MODELING

Proposed model and modeling options

- AERMOD
- Default options
- Averaging periods
- Receptor Grid
- Downwash
- BPIP
- Meteorological data
- AERSURFACE

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HEALTH EFFECTS REVIEW
AIR DISPERSION MODELING

Modeling Data Needs

- Locations, parameters and modeled emission rates for each stack (EPN)
- Locations and heights of building and structures (downwash)
- Location of property line

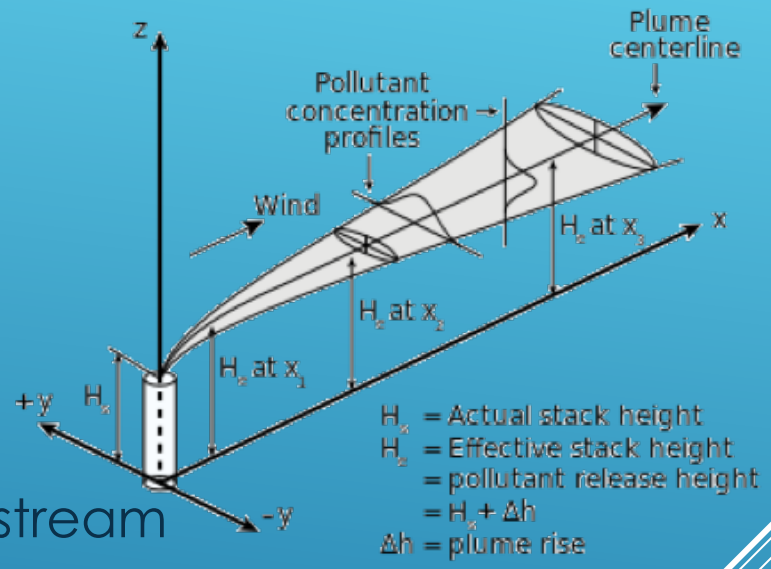
HEALTH EFFECTS REVIEW
AIR DISPERSION MODELING

AERMOD Runs

- Generate receptor grid
- Generate property line receptors

- BPIP
  - Determines building/structure downwash
  - Downwash to be included in AERMOD runstream

- AERSURFACE
  - Determines meteorological data set



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Unit emission rate modeling (short-term and long-term)

- Initially based on chemical flexibility across the entire plant
- 1 gr/sec emission rate
  - Best for modeling large number of chemicals
  - Post-processing
  - Determine unit emission rate impacts
    - Unit impacts x actual ER of each chemical
  - Compare impacts ESLs for each chemical

Chemical Specific Modeling

- Chemicals that do not pass unit emission rate modeling
- Compare chemicals specific impacts to applicable ESL
- Determine exceedances for those chemicals with impacts above 2xESL
- Impose restrictions and limitations, as necessary
- Multiple iterations of modeling

NAAQS Modeling (if applicable)

- Model emissions for products of combustion (SO_2, NOx, CO, PM)
- Determine emission rates for each averaging periods
- DeMinimis analysis to determine if full NAAQS is required. If so…
  - Determine background concentrations
  - Run AERMOD
  - Compare to applicable NAAQS

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AQA Report

- Details what was modeled
- List all modeling options used
- Summarizes results of all modeling performed
- List all operational restrictions taken

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