Emission Model of Industrial Sources (EMIS)

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EMIS Flow Diagram

ChemCAD → EMIS → Emission Profile

Sensitivity Analyses

Transport & Diffusion Model

Emission Compliance Forms
Chemical Production Facility
ChemCAD Process Flow Diagram
Importing Process Data

- Thermodynamic simulation software, such as ChemCAD™ or Aspen Plus™, outputs a report summarizing basic operating conditions for the process.
- EMIS reads the report and extracts the information necessary for the emission calculations.
- Any additional process specific information is noted by the user (entered as ChemCAD™ Parameters) and saved along with the process data.
## Imported Process Data

<table>
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<th>#</th>
<th>CC#</th>
<th>Stream Name</th>
<th>Vapor Fraction</th>
<th>Mass Flow (lbs/hr)</th>
<th>Avg MW (mass)</th>
<th>Density (lbs/ft³)</th>
<th>Source Type</th>
<th>Storage Type</th>
<th>Emission Type</th>
<th>Case Name</th>
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“What-If” Parameters

- Emission controls
  - Scrubbing
    - global, per process step, or per source type

- Emission Factors
  - EPA/CMA Average, Leak/No-Leak, Stratified
  - ECVM
  - Failed Devices
  - Industry specific
  - Equipment specific
### Emission Factor Interface

#### EPA Emission Factors (lbs/hr)

- **Save for Emission Calc.**
- **Reset**

#### Options:
- Average Factors
- Leak/NoLeak Factors
- Leak/NoLeak Average Factors
- Stratified Factors

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Emission Estimations

- **Stack**
  - Mass flow taken directly from model simulation (ChemCAD) report.

- **Fugitive**
  - Utilizes an equipment configuration designed by the user, consisting of valves, flanges, etc.

- **Storage**
  - Minimal integration of the EPA’s TANK algorithm.
## Working & Breathing Loss Estimations

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Working & Breathing Losses Tank Editor

Tank Description

Tank Dimensions

Tank Characteristics

- Shell Height (ft): 20
- Shell Diameter (ft): 5
- Avg Liquid Height (ft): 15
- Max Liquid Height (ft): 18
- Turn Over per Hour: 1
- Heated Tank: TRUE

Tank Description

Tank Dimensions

Tank Characteristics

- Paint
- Shell Color/Shade: White/White
- Shell Condition: Good
- Roof
- Roof Type: Dome
- Roof Height (ft): 0
- Dome Roof Radius (ft): 5
- Cone Roof Slope (ft/ft): 0.062
Species Editor

ChemCAD™ Standard Components

ChemCAD™ User-Added Components

Other Process Simulation Programs

EMIS Standard Species List

Transport & Diffusion Model

Emission Compliance Forms

Sensitivity Analyses
Standardized Species List

- Built in tool for developing and maintaining a standard list of chemicals and properties including:
  - Name
  - Formula
  - Molecular Weight
  - CAS #
  - Alias (Other common names)
  - Link to chemical used in other programs, such as ChemCAD or T&D Model.

- Can be expanded to include additional physical properties or other relevant information.
## Species List Editor

### Table

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### Formatted Entry

**Name:** Ethene  
**Formula:** C2H4  
**CAS Number:** 74-85-1  
**Alias:** Acetone
Flexible graphical analysis tools

- Several displays were developed for specific analyses.
- Moving towards a more generic wizard format to increase flexibility.
- Current development includes break down of emissions by source type (point, fugitive, storage).
Sensitivity Analysis: Emission Factors

Emissions vs. Time for MTBE: Multiple Scenarios

Plot Data:
- MTBE
- MTBE Baseline
- PFM Baseline
- MTBE Baseline No leak factors (no scrubbing)
Hourly Emissions of MTBE Production
Export Emission Profiles

- Transport & Diffusion Model
- Federal and state regulation forms for emission inventory compliance.
Software Requirements

- Java - platform independent
- Oracle (limited functionality with Microsoft Access)
Current Capabilities

- Stack, fugitive, and storage emission estimations
- Import of process data from thermodynamic simulation software
- “What-if” parameters for emission controls and emission factors
- Standard species list
- Flexible graphical analysis tools
- Export of hourly emission rates to Transport & Diffusion Model
Future Development

- Automate export of emission profile to federal and state regulation forms for emission inventory compliance.
- Expand emission factors to include equipment & process specific factors.
- Expand emission estimation to include additional sources, such as waste ponds and research facilities.
- Enhance database management and query functionality.