Tank Emission Tracking Tools: A Comparative Analysis

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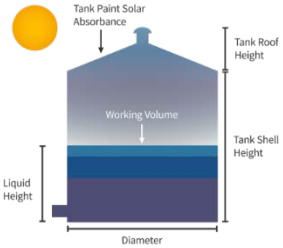
Tank Emission Tracking Software: A Comparative Analysis



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Things to consider when looking for a Tanks software:

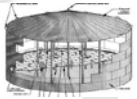
- Facility type
- Process type
- Tank type
- Type of material stored in tank
- Recordkeeping
- Are all Tanks programs created equally??

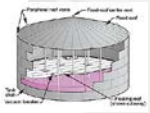
Industry/Process Types

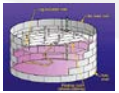
- **Oil Exploration** (Crude Oil, Water, Dehydrator, Gas Line)
- **Refinery** (Crude Oil, Distillation, Storage, Mix, Packaging, Loading)
- **Midstream** (Tank farm; Storage/Mix Tanks, Loading Racks; Tank truck, Rail car, and Barge loading)
- **Chemical plant** (Tank farm; Storage/Mix Tanks)
- **Industry/Manufacturing** (ex. Automotive plant: gasoline, methanol, engine oil, antifreeze storage tanks)

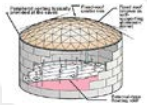
Tank Types

- Open top tank
- Horizontal tank
- Vertical fixed roof tank
- Internal floating roof tank
- External floating roof tank
- Domed external floating roof tank
- Mobile tank

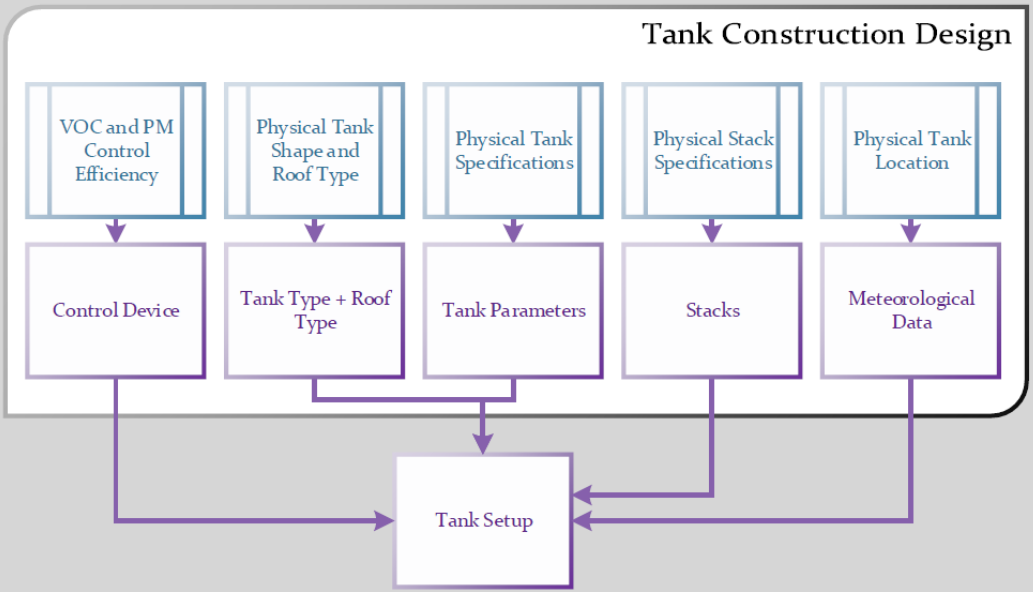








Tanks Process Flow



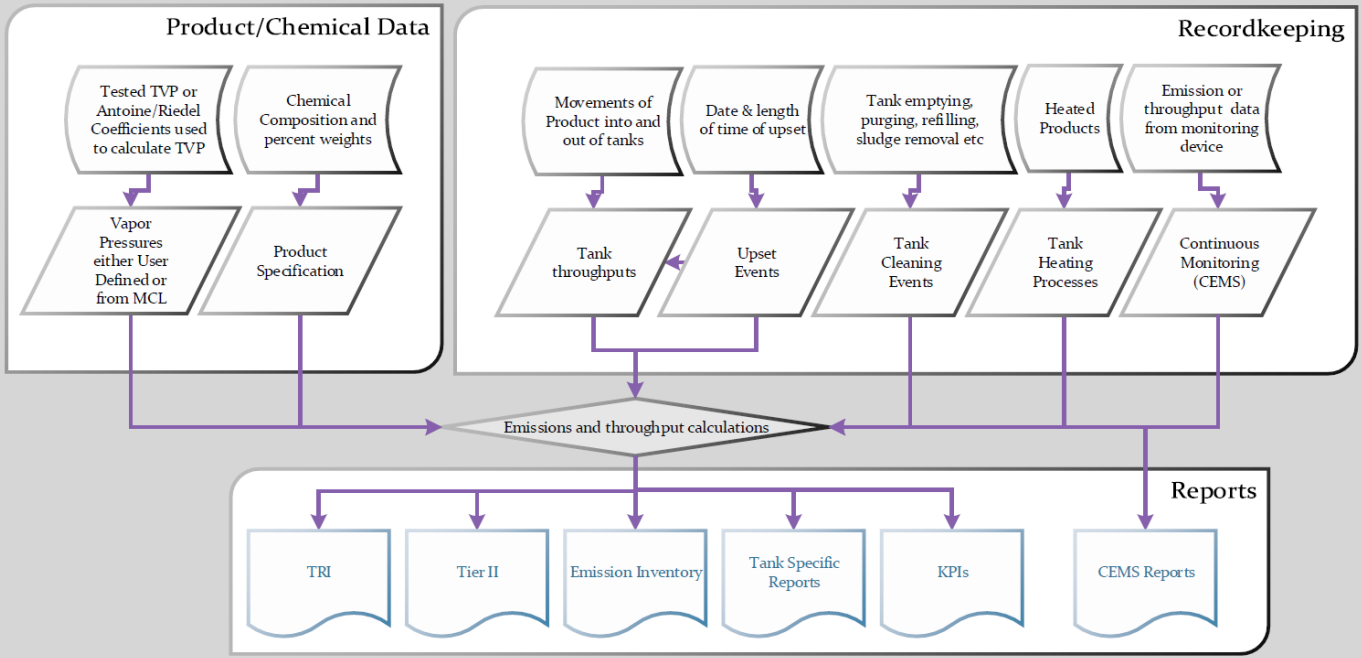
Materials & Calculations

- Some methods/tools only calculate certain situations:
  - Organic mixtures (ex. 20% Toluene 80% Benzene)
  - Petroleum (diesel, jet A, gasoline)
  - Petroleum standards (EPA/API)
  - Crude oil
  - Asphalt
  - Pure substances (100% methanol)
- Different approaches to calculations:
  - AP-42 calculations (American Petroleum Institute; API equations)?
  - Lab tested data?
  - Industry assumptions?

Record keeping

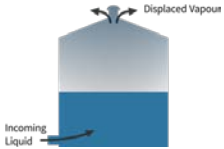
- Fixed annual throughput
- Monthly throughput
- Daily throughput
- Special events? (Cleaning, landing, heating, etc.)

Tanks Data Flow

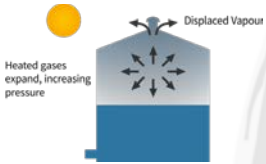


General Tank Emission

- **Working Losses**



- **Standing Losses**



- Material in Tanks exists in <u>two (2) phases</u>; a) **Liquid** b) gas (vapor)

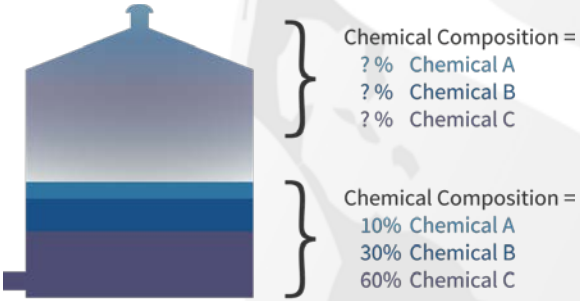
- The vapor pressure (VP) plays an important role in calculating Tank emissions

Calculation of True Vapor Pressure (TVP)

- True Vapor Pressure (TVP)
  - Distillation Slope
  - Molecular weight (liquid)
  - Molecular weight (vapor)
  - Reid Vapor Pressure (RVP)
  - Antoine Coefficients
  - Riedel Coefficients
  - Liquid compositions
  - Vapor compositions
  - Tested values

True Vapor Pressure (TVP)/Chemical Composition

- TVP can be one of the most challenging variables to calculate for materials stored in tanks
  - **Complete Speciation -** 100% known chemical composition
  - **Partial Speciation** - Chemical composition NOT 100% known



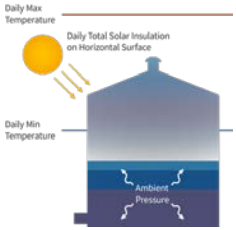
Complete Speciation

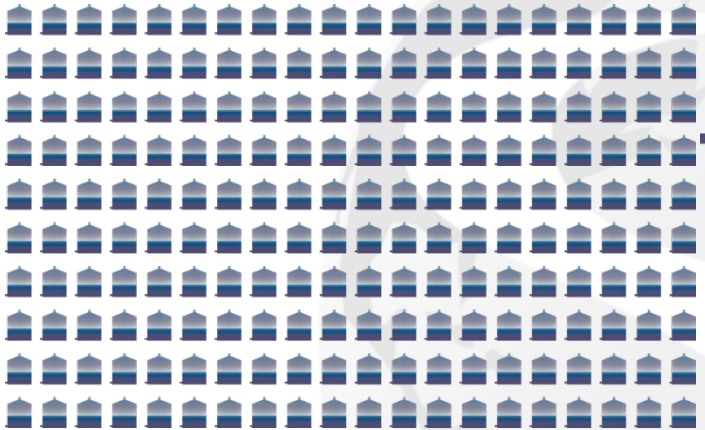
- ~100% chemical components of substance known (Antoine or Riedel coefficients per chemical)
  - This is not always the case for the Oil & Gas industry.
- **Process:**
  1. Use **Antoine** or **Riedel** coefficients to calculate the TVP per chemical
  2. Calculate TVP for mixture using the % by Weight data (from known chemical compositions)

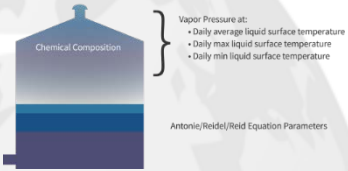
Partial Speciation

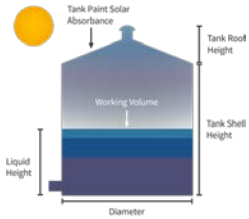
- How do you calculate TVP if you don't know the chemical composition of your substance?
  - Common example: **Crude Oil/Petroleum products**
- **TVP** of the product should be calculated using the 4 variables below:
  - The **Reid VP** of the mixture
  - **Distillation Slope**
  - **Molecular weight** of the **liquid**
  - **Molecular weight** of the **vapor**

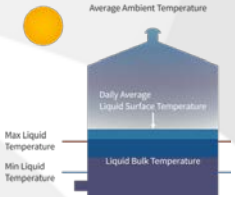
Managing large amounts of data
(How do you keep up?? What about 200 Tanks??)











Some available Tanks software/tools

- **EPA Tanks 4.09** (US Environmental Protection Agency)
- **E&P Tanks** (American Petroleum Institute; API)
- **Tanks ESP** (TGB; Rob Ferry)
- **ERA Tanks Module** (ERA Environmental Management Solutions)

- *note: (there are other Tank software/tools not listed in this presentation)

Functionality Analysis (Tank Type)

	Functionality/ supported dataset	TANKS 4.09	E&P	ESP	ERA
Tank type	Open top tank	●	●	●	●
	Horizontal tank	●	●	●	●
	Vertical fixed roof tank	●	●	●	●
	Internal floating roof tank	●	●	●	●
	External floating roof tank	●	●	●	●
	Domed external floating roof tank	●	●	●	●
	Mobile tank	●	●	●	●

Functionality Analysis (Tank Emission Types)

	Functionality/ supported dataset	TANKS 4.09	E&P	ESP	ERA
Emission Type	Heating	●	●	●	●
	Roof Landing	●	●	●	●
	Cleaning	●	●	●	●
	Evaporation (open top tanks)	●	●	●	●
	Standing	●	●	●	●
	Flashing	●	●	●	●
	Working	●	●	●	●
	Loading (mobile tanks)	●	●	●	●
Material Type	Organic liquid mixtures	●	●	●	●
	Petroleum distillates	●	restricted	●	●
	Crude oil	●	restricted	●	●
	Petroleum distillates (EPA standards)	●	●	●	●

Functionality Analysis (Tank Recordkeeping throughputs)

	Functionality/ supported dataset	TANKS 4.09	E&P	ESP	ERA
Recordkeeping - Daily	importing function	●	●	●	●
	manual entry	●	●	●	●
Recordkeeping - Weekly	importing function	●	●	●	●
	manual entry	●	●	●	●
Recordkeeping - Monthly	importing function	●	●	●	●
	manual entry	●	●	●	●
Recordkeeping - Annual	importing function	●	●	●	●
	manual entry	●	●	●	●
"Grouped" records	"Grouped" tank - automated distribution	●	●	●	●
	"Grouped" tank - archiving functionality	●	●	●	●
Material Revisions	Material revision tracking	●	●	●	●
Input - Liquid Composition	Full Speciation	●	●	●	●
	Partial Speciation	●	●	●	●
Input - Vapor Composition	Vapor Weight Speciation	●	●	●	●

*TANKS 4.09 and ESP confirmed the analysis performed by ERA. E&P results to the best of our knowledge and not confirmed.

Questions??
Thank You for attending this presentation.

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