



# What are You Going to do Without TANKS 4.09D? Reassessing your Tank Emission Tools

Presented by ERM and Mitchell Scientific

November 13, 2018

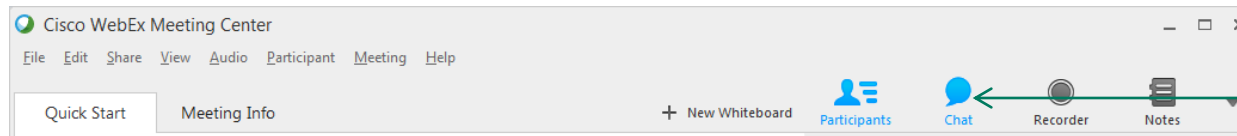
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*The business of sustainability*



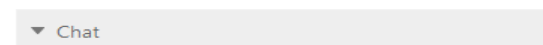
# Welcome

- This presentation will be recorded and all who registered will receive a follow-up email containing a link to the presentation within a week.
- Participants can ask questions throughout the presentation using the WebEx chat function and they will be answered during the last 15 minutes of the webinar in the order that they were received.



*Click on  
chat*

- Send your question to “Everyone” so that those answering the questions will be able to see them.



WebEx Chat box

*Type your question  
and send*

A screenshot of the WebEx Chat box input area. It features a dropdown menu labeled 'Send to:' with 'Everyone' selected. Below this is a text input field with the placeholder text 'Type your question here ...'. To the right of the input field is a 'Send' button. At the bottom of the chat box, there is a status bar that says 'Connected' with a green dot.

*Select  
“Everyone”*

# Today's Webinar



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01

Introduction & Background

02

Updates to AP-42 & Impacts  
of Changes

03

Where Do We Go From Here?

04

Q&A



# Introduction & Background

# End of Life for TANKS 4.09D

## TANKS 4.09D



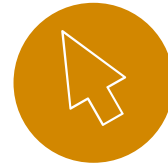
Used for decades to calculate emissions from thousands of tanks



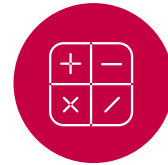
Windows based software package



As Operating Systems are updated the program will lose reliability and function



EPA no longer supports users of TANKS 4.09D, although program is still available on epa.gov website



AP-42 Chapter 7 provides the basis for the equations and algorithms for estimating VOC emissions from storage tanks



How will industry address the prescribed Chapter 7 equations to calculate storage tank emissions

# Updates to the Guidance Document - Timing

AP-42 Chapter 7.1 historically identified emissions estimating equations and methodologies to calculate working and breathing losses for fixed and floating roof tanks

Revisions to Chapter 7 proposed by EPA in July 2018

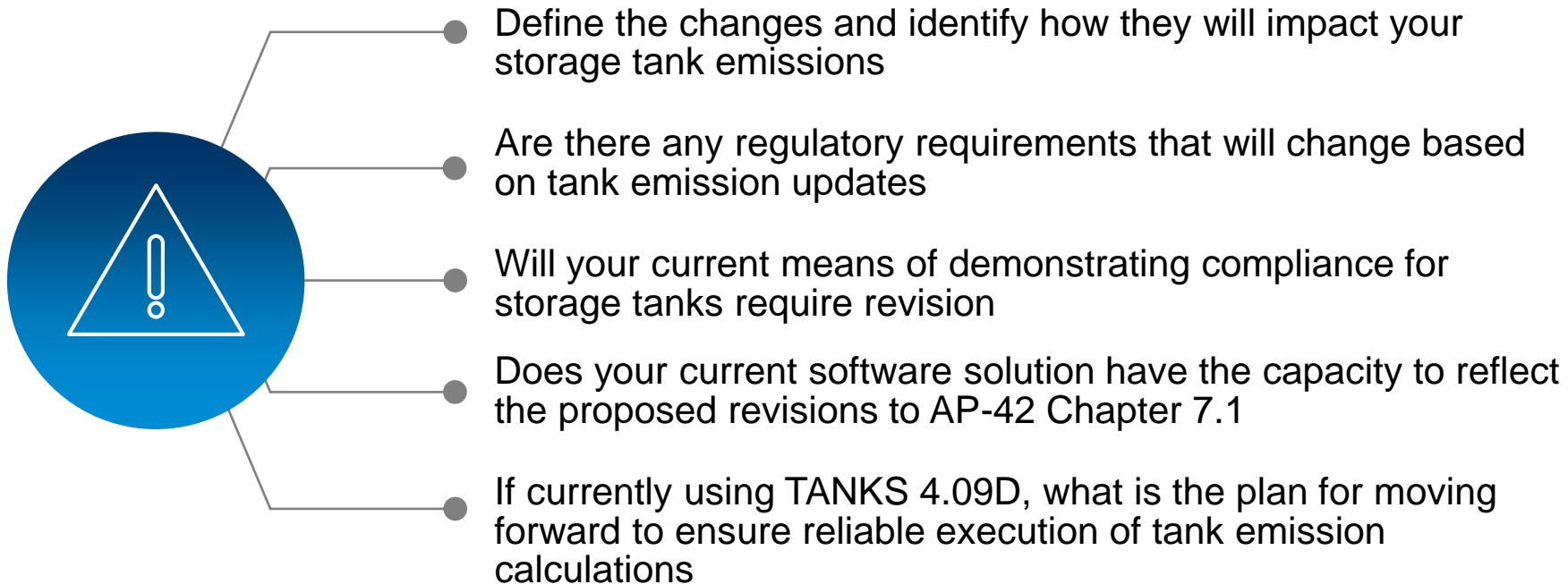
<https://www.epa.gov/air-emissions-quantification/proposed-revisions-ap-42-chapter-7-section-71-organic>

A 60-day extension to the public comment period sets a new deadline of November 26, 2018 to provide comments on the proposed Chapter 7 revisions

Proposed revisions include items such as updated constants and equations, flashing emissions procedures, pressurized tanks, tank cleaning emissions, floating roof tank landing equations, etc.

Clearly states that TANKS 4.09D will not be updated to reflect the proposed revisions

# Why is This Important?





## Updates to AP-42 & Impacts of Changes



# Fixed Roof Storage Tanks

Total Losses

$$L_T = L_S + L_W$$

Standing Losses

$$L_S = 365 V_V W_V K_E K_S$$

Working Losses

$$L_W = V_Q K_N K_P W_V K_B$$

\*Variables in red will be impacted by proposed changes

# Average Vapor Temperature, $T_v$

(Impacts  $W_v$  and  $K_E$ )

Uninsulated Shell and Uninsulated Roof

$$\Delta T_v = \left(1 - \frac{0.8}{2.2(H_S/D)}\right) \Delta T_A + \frac{0.042\alpha_R I + 0.026 (H_S/D)\alpha_S I}{2.2 (H_S/D) + 1.9} \quad \text{Eq 1-6}$$

$$\Delta T_v = 0.7 T_A + 0.02 \alpha I \quad (\text{when } H_S/D = 0.5 \text{ and } \alpha_R = \alpha_S) \quad \text{Eq 1-7}$$

Insulated Shell & Uninsulated Roof

$$\Delta T_v = 0.6 T_A + 0.02 \alpha_R I \quad \text{Eq 1-8}$$

# Liquid Surface Temperature, $T_{LA}$

(Impacts  $W_V$  and  $K_E$ )

Fully insulated tank

$$T_{LA} = T_B$$

Eq 8-2

Partially insulated tank - roof not insulated

$$T_{LA} = 0.3 T_{AA} + 0.7 T_B + 0.005 \alpha_R I$$

Eq 1-29

Uninsulated tank

$$T_{LA} = \left( 0.5 - \frac{0.8}{4.4 (H_S/D) + 3.8} \right) T_{AA} + \left( 0.5 - \frac{0.8}{4.4 (H_S/D) + 3.8} \right) T_B + 0.005 \alpha I$$

Eq 1-27

$$T_{LA} = 0.44 T_{AA} + 0.56 T_B + 0.0079 \alpha I$$

(when  $H_S/D = 0.5$  and  $\alpha_R = \alpha_S$ )

Eq 1-28

\* applicable in all equations:  $T_B = T_{AA} + 0.003\alpha_S I$

# Q replaced with $V_Q$ - Net Working Throughput

## Normal Operation Case ( $V_Q = Q$ )



Fresh solvent is charged to the tank when the volume becomes low

## Alternate Operation Case ( $V_Q < Q$ )



Crude solvent is charged to the tank from the factory operation while the material is being sent for solvent recovery

# Floating Roof Tanks

01

Guidance has been reorganized, however the calculation approach is largely consistent with the 2006 version of Chapter 7.1

02

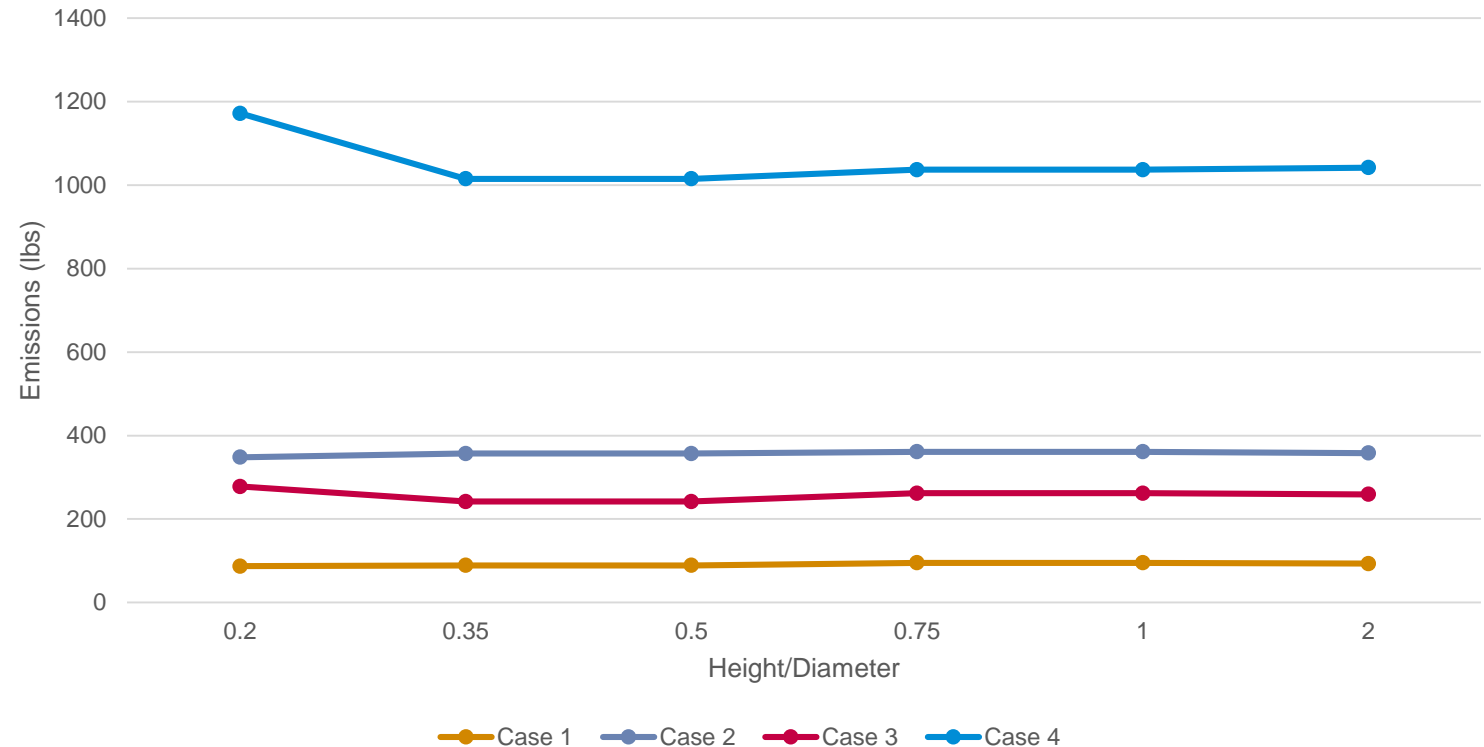
For all floating roofs, modifications have been made to more accurately account for heat conductance rather than using the same equations as are utilized for fixed roof tanks

- The impact of the change is most significant for darker colored external floating roof tanks
- The range of impacts is dependent on the vapor pressure curves for the liquids stored

# Impact of Aspect Ratio on Tank Emissions

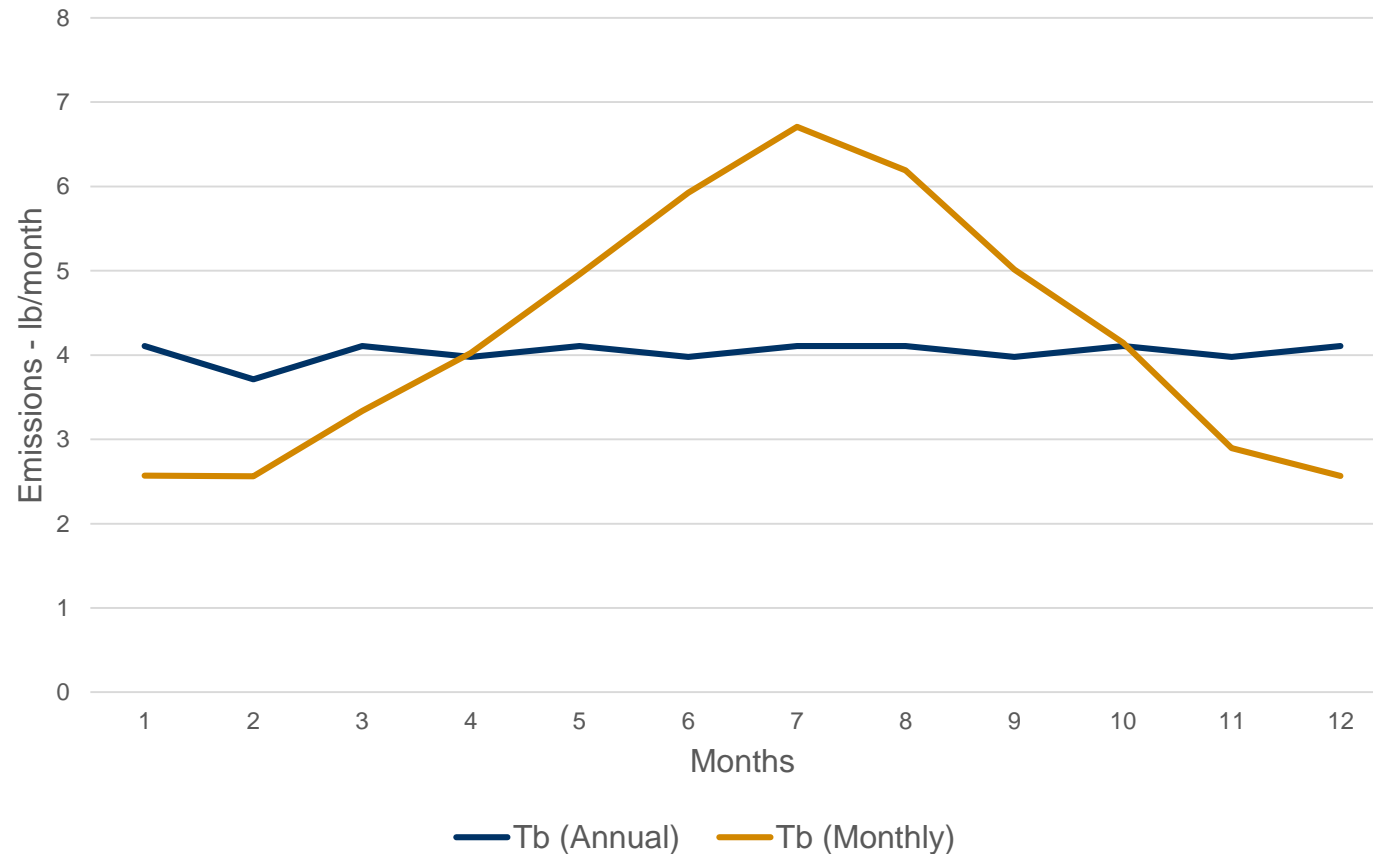
Consequential changes to how the calculation of liquid surface temperature ( $T_{LA}$ ) are included in the update.

- Aspect ratio (Height/Diameter) included as a variable rather than a standardized input
- Impact of changes in most cases is <10%

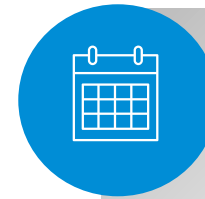


Case	Throughput (gal)	Liquid Bulk Temperature (°F)	Aspect Ratio (H/D)					
			0.2	0.35	0.5	0.75	1	2
1	1,297,800	60	87	89	89	95	95	93
2	12,978,000	60	348	357	357	361	361	358
3	1,297,800	120	278	242	242	262	262	259
4	12,978,000	120	1172	1015	1015	1037	1037	1042

# T<sub>B</sub> Monthly Versus Annual



Potentially impacts ozone season emissions as well as short-term emission rates



Annual Emissions  $\Sigma$

- Annual T<sub>B</sub> – 48.4 lbs
- Monthly T<sub>B</sub> – 50.9 lbs

*AP-42 Chapter 7 (2006) , Example #2 with Dome Style Tank*

# Tank Landings

Clarifications and best practice recommendations have been added including:

## Pro-rating idle losses for partial days

Now specifically called out as reasonable

## Clingage factors for tank bottoms

No longer the same as for the vertical shell of a tank (as used in the calculation of working losses)

- A factor of 0.15 bbl/1000 ft<sup>2</sup> should be used for all tank bottoms
- Potential emissions increase of about 25%

## When distillate flushing is utilized...

The properties of the new mixture can be used starting with the day following the flush operation



## 7.1.3.4 Tank Cleaning – New Section

Operation	Emission Calculation
Normal Pumpout	None
Standing Idle	Standard Standing Loss Calculations
Preparing for Access	$L_{VF} = L_P + L_{CV}$
Vapor Space Purge	$L_P = \left( \frac{P_{VA} V_V}{R T_V} \right) M_V S$
Continued Force Ventilation	$L_{CV} = 60 Q_V n_{CV} t_V C_V \left( \frac{P_a M_{CG}}{R T_V} \right)$
Remain Clean	None
Refilling	Normal Working Losses

# Other Tank Operations

## Variable vapor space tanks

## Flashing – New category addressed in this version

Multiple methods of estimating flashing emissions are presented in the new guidance. Those methods include:

- Direct Measurement - **Preferred**
- Laboratory GOR
- Vasquez-Beggs equation
- Computer simulation modeling

## Tanks utilizing closed vent systems

EPA is allowing for a default reduction of 5% to account for the use of closed vents on floating roof tanks in lieu of performing operation specific calculations

# Additional Updates



**Expanded table of Paint Solar Absorptance values**



**Revised physical properties for selected petroleum stocks - Will this make a difference?**



**Emissions from storage of boiling liquids and sparged tanks are specifically excluded by the guidance document**

Table 7.1-6 Paint Solar Absorptance

Surface Color	Shade or Type	New	Average	Aged
White		0.17	0.25	0.34
Aluminum	Specular	0.39	0.44	0.49
Aluminum	Diffuse	0.6	0.64	0.68
Beige/Cream		0.35	0.42	0.49
Black		0.97	0.97	0.97
Brown		0.58	0.62	0.67
Gray	Light	0.54	0.58	0.63
Gray	Medium	0.68	0.71	0.74
Green	Dark	0.89	0.9	0.91
Red	Primer	0.89	0.9	0.91
Rust	red iron oxide	0.38	0.44	0.5
Tan		0.43	0.49	0.55
Aluminum	mill finish, unpainted	0.1	0.12	0.15



**Where Do We Go From Here?**

# Emission Master Tanks

- ▶ Intuitive software using Chapter 7 equations
- ▶ Imports TANKS 4.09D equipment records
- ▶ Reports - TANKS 4.09d style, emission summary & others
- ▶ Handles ideal & non-ideal mixtures
- ▶ Control devices
- ▶ Creates model from Excel data

# Where Are You?



Have you evaluated the proposed changes to AP-42 to understand which will apply to you?



Are you commenting on the proposal?



Do you have a viable alternative to TANKS 4.09D?



How much will new tank emission calculations change your emissions reporting, health risk assessments, compliance tracking, rule applicability, existing permits and new projects?



Have you assessed these gaps? Do you have a plan to fill them?

# What to Do?

Simple (?) 3 Step Plan:

01

## Evaluate gaps

- Will current systems/tools work?
- Consistency across sites
- Emission reporting
- Existing permits
- New permits
- New or changed regulatory applicability

02

## Need a new tool?

- Update what you have?
- Consider alternatives
- Selection

03

## Implement

- Emission Tool: Convert existing or populate new
- Organized plan & schedule for:
  - Agency communications/acceptance
  - Resolving compliance implications
  - Phase in for emission reporting
  - Phase in for existing permits and new applications
- Audit / Improve



**Q&A**





# Thank you

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