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# Oilfield Waste Disposal (OWD) Facilities Chapter 6, Section 2 Permitting Guidance Implementation



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# Overview

- ◆ WYPEC Tool
- ◆ Emission Estimation
  - New facilities
  - Existing facilities
- ◆ Implementation
  - New facilities
  - Existing facilities



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# WYPEC Tool

- ◆ AQD sponsored studies to establish relationship between VOC content of water at OWD facilities and air emissions.
- ◆ Resulted in development Wyoming Pond Emissions Calculator (WYPEC).
- ◆ Documents related to the study and model development are available on AQD's website.

# WDEQ-AQD Model Development Project

*Establish correlation between pond VOC content and airborne concentrations to estimate future emissions*

VOLUME II: CHAPTER 5  
**PREFERRED AND ALTERNATIVE METHODS FOR ESTIMATING AIR EMISSIONS FROM WASTEWATER COLLECTION AND TREATMENT**  
 Final Report  
 March 1997

5.1.3 Sample Calculation for Storage Impoundments  
 This section presents a step-by-step sample calculation for emissions from storage impoundments. The equations described in Section 5.1.1 are used with the model unit parameters given in Section 5.1.2 to estimate emissions from an aqueous waste containing 10 g/m<sup>3</sup> of benzene.  
 a. Calculate liquid-phase mass transfer coefficient,  $k_L$ . Use Spranger's model (see Table 5-11):  

$$\text{Effective diameter} = \frac{0.5}{\pi} \sqrt{\frac{0.5}{1.704}} \times 2 = 42.7 \text{ m}$$

$$F/D = \frac{\text{Effective diameter}/\text{depth}}{24.3} = \frac{42.7}{24.3}$$
 Wind speed = 4.47 m/s ( $V_{10} > 3.25 \text{ m/s}$ )  
 $F/D = 24.3$   

$$k_L = 12,400 \times 10^{-9} (F/D) + 1.277 \times 10^{-7} (V_{10})^2 \frac{D_p}{\text{meters}} = 0.47 \text{ m/s}$$
 where:  
 $V_{10}$  = wind speed = 4.47 m/s  
 $D_p$  =  $9.8 \times 10^{-7} \text{ cm}^2/\text{s}$  (benzene)  
 $D_{\text{water}}$  =  $2.0 \times 10^{-9} \text{ cm}^2/\text{s}$  (water)  
 $F/D = 24.3$

*Field-verified input data for Wyoming Disposal Pits*

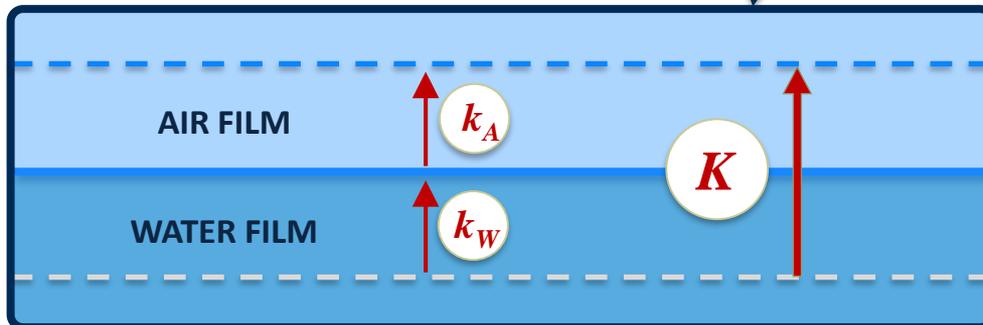
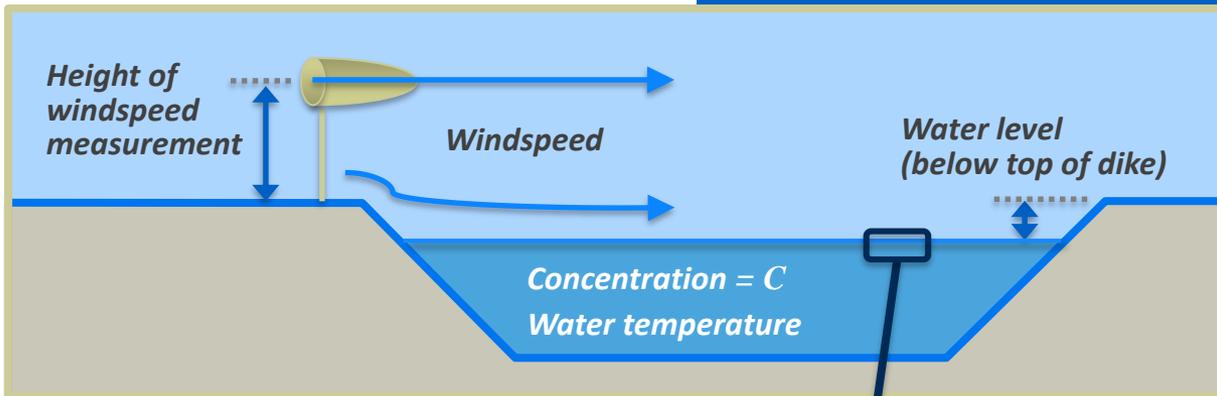


**END PRODUCT:**

Easy-to-use software tool to predict OWD pond emissions for AQD permitting and emissions inventory programs



# Two-Film Emission Models



$k_W$  and  $k_A$  depend on chemical species, meteorology, etc.

Emission flux is proportional to concentration:

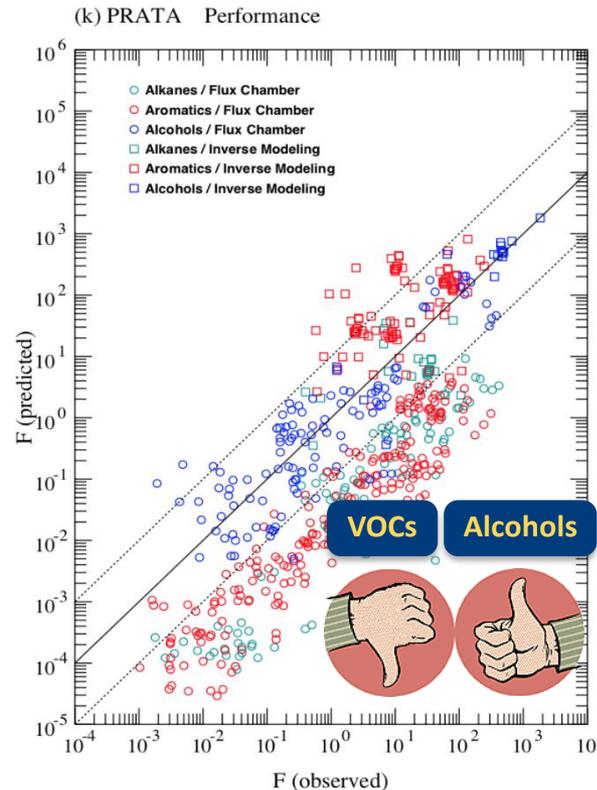
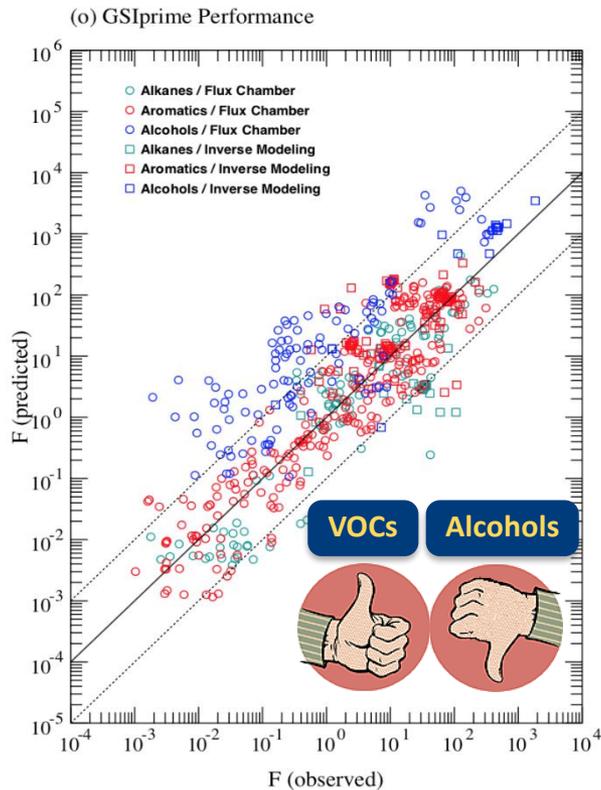
$$F = K \cdot C$$

$K$  depends on Henry's Law and combination of mass transport coefficients across a water film,  $k_W$ , and air film,  $k_A$

$$\frac{1}{K} = \frac{1}{k_W} + \frac{1}{Hk_A}$$

# 2019 Oilfield Waste Disposal Pond Model Analysis

## Best-Performing Models for Different Chemical Classes



# WYPEC – Refined Hybrid Model (2019)

## Measurements vs. Predictions

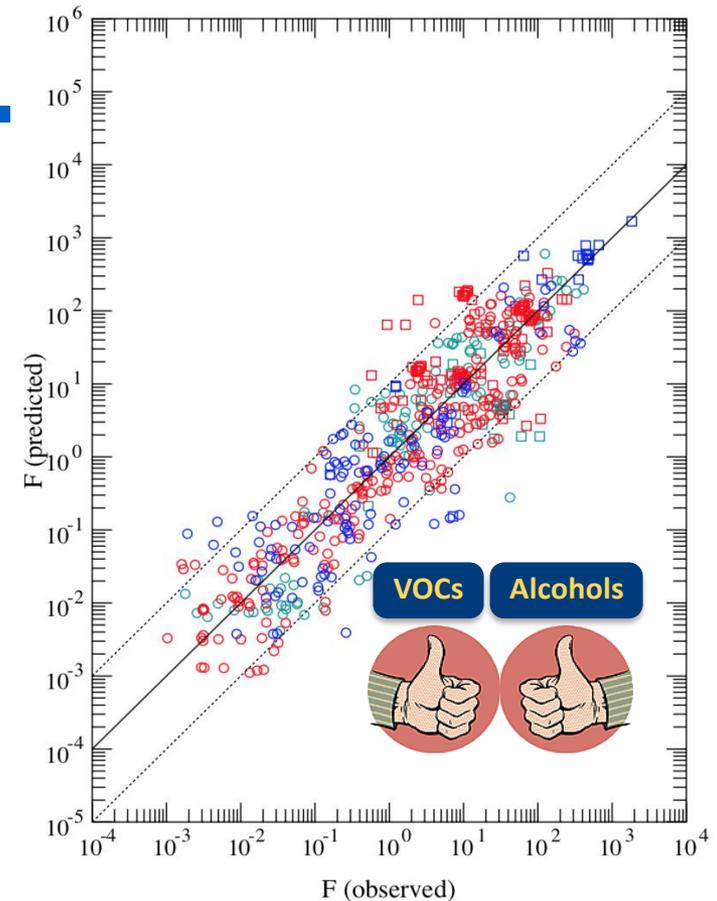
<b>Alkanes</b>	Methane, ethane, propane, n-butane
<b>Aromatics</b>	Benzene, toluene, o-xylene, m- & p-xylene, ethylbenzene, 1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene
<b>Alcohols</b>	Methanol, ethanol, isopropanol



Parameter	Model
$k_A$	PRATA
$k_W$	GSI-prime



WYPEC performance with bias correction





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# WYPEC Tool

- ◆ Draft Chapter 6, Section 2 OWD Facilities Permitting Guidance describes input methodology for modeling emissions from ponds at new and existing OWD facilities.
- ◆ Guidance applies to ponds/pits/basins at OWD facilities, but not other emissions units (i.e. engines, tanks, flares, etc.).



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# WYPEC Tool

- ◆ The implementation of the proposed guidance does not preclude the use of other pond emissions estimation methods.
- ◆ WYPEC results are just one part of a complete permit application, emissions inventory submission, or compliance demonstration.



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# Emission Estimation

- ◆ Key Guidance Features for Existing and New Facilities
  - WYPEC guidance provides the parameters the Division expects all applicants to address, regardless of the calculation method chosen.
  - Guidance is designed to be flexible and accommodate a variety of data input methodologies.



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# Implementation

- ◆ Guidance addresses three scenarios
  - Existing Facilities
    - Currently without permits for ponds
    - With Permits (have sampling conditions)
  - New Facilities



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## Title V

- ◆ If 12 months of sampling data indicates the facility is a major source under Chapter 6, Section 3, contact the Title V program immediately.
- ◆ Once NSR permit acknowledging Title V status is issued, a complete application should be submitted to Title V within 1-year.



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# Next Steps

- ◆ Division has taken comment from industry (making revisions to guidance)
- ◆ The Division will then advertise for public input on the proposed guidance.
- ◆ It is not necessary to wait for the guidance to be issued to submit an application.

# Contacts

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