Oregon State University Clean Water Conference

September 2020

FRESH-FRAC project for OSU's WET lab presents:

SETTLING TANK AND HEATING ZONE DESIGN IN A FRACKING WASTEWATER RECOVERY SYSTEM

DR. BAHMAN ABBASI, DR. XIANG ZHANG, MORGAN MESSER, HANNAH O'HERN, KYLE ANDERSON, ELNAZ NIKOOEI

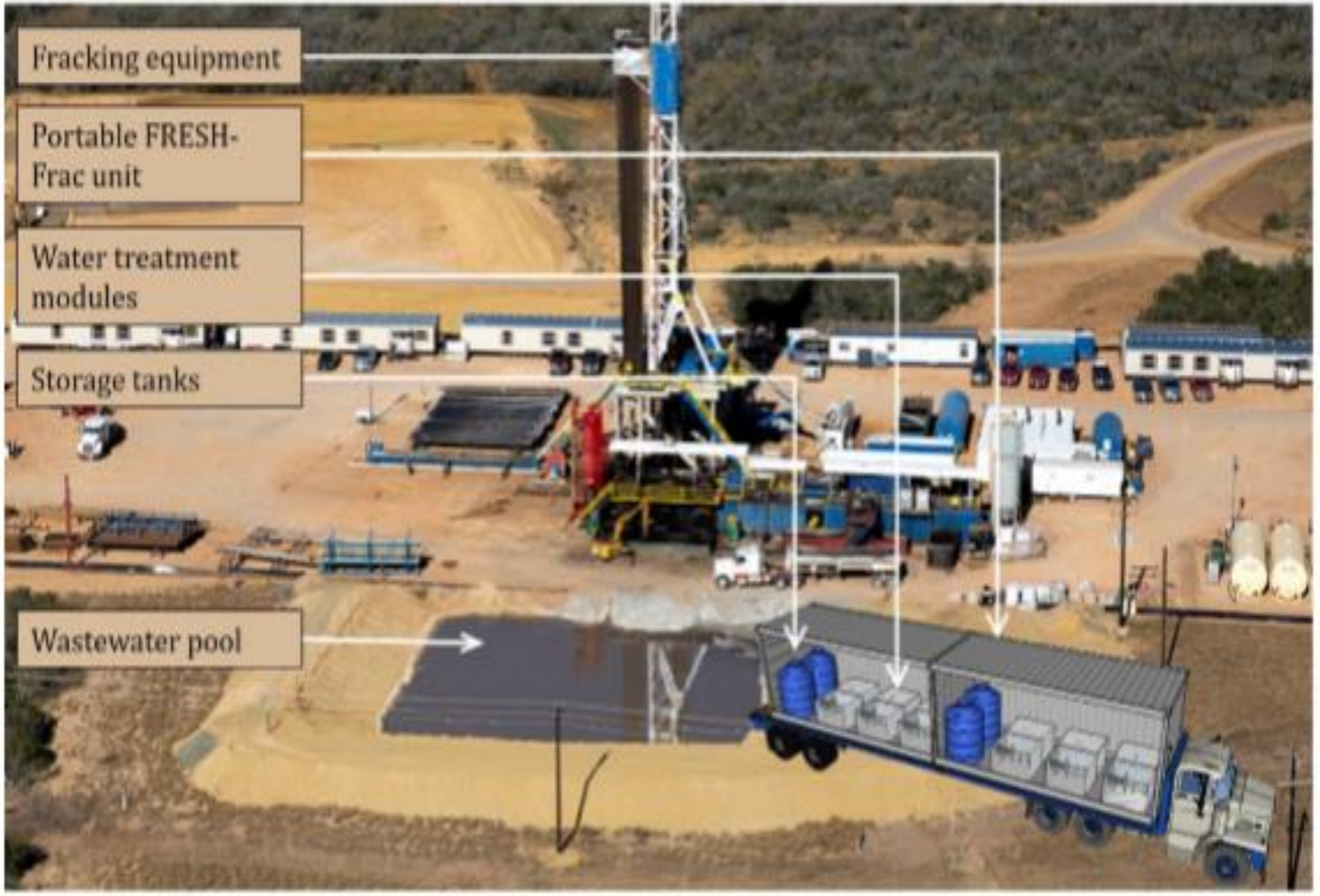
FRESH-Frac Project for OSU's WET Lab

Water & Energy Technologies

FRESH-FRAC Project for OSU's WET lab

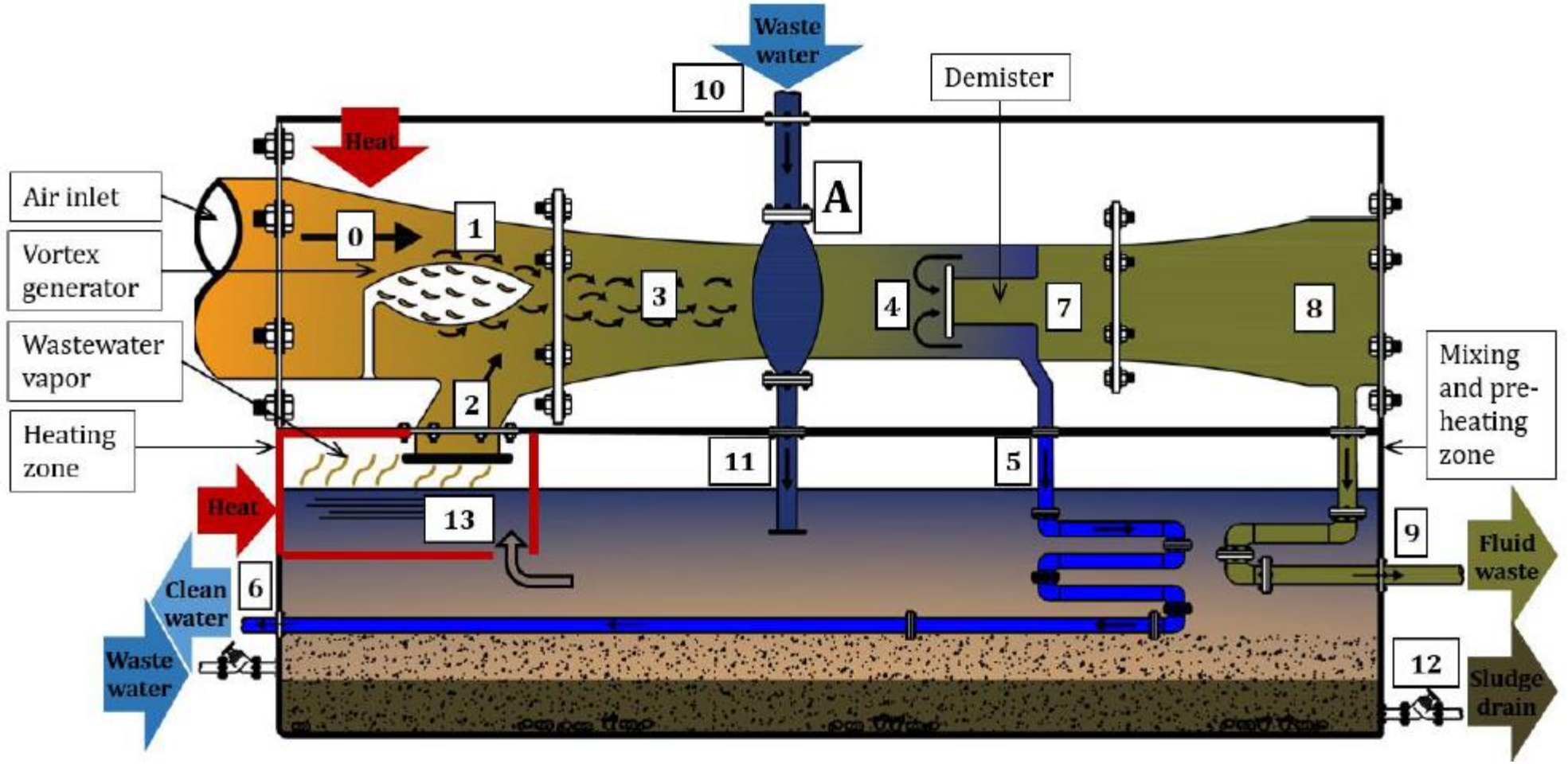
- ~7.5 million cubic meters of fracking wastewater are disposed in injection wells everyday in the US

- Challenges
  - Variety of chemicals
  - Portability
  - Energy consumption and cost
  - Fouling



System Schematic for FRESH-Frac Design

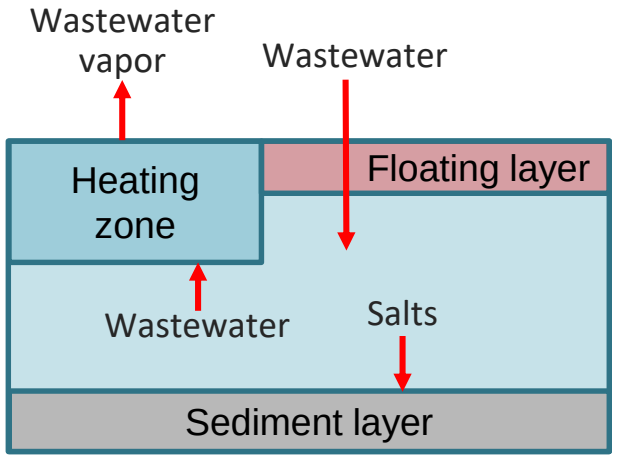
Water & Energy Technologies



Settling Tank Design

- Purpose
  - Allows some contaminants to settle
  - Consistent contaminant mixture
- Design parameters for sedimentation tank
  - Settling velocity
  - Settling time
  - Specific gravity
  - Volumetric flow rates
  - Wastewater properties (viscosity, temperature, density)

$$Vel\_settling = \sqrt{\frac{4 * g}{3 * Cd} * (s_g - 1) * d}$$

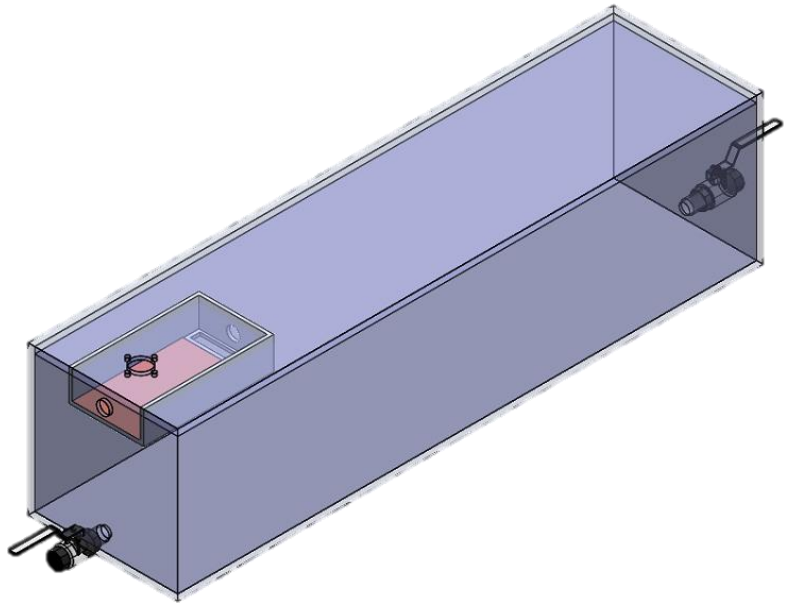


Vel_settling equation from: T. Lemmer and Cg. du Toik, "MODELLING OF RECTANGULAR SEDIMENTATION TANKS," Water Research Commission.

Settling Tank Design

- Length
  - Sized for current components total length
- Height
  - Settling velocity
  - Specific gravity
  - Wastewater properties (viscosity, density)
- Width
  - Volumetric flow rate
  - Settling velocity
  - 1:4 width to length ratio

Settling tank dimensions	
Length	0.90 m
Width	0.23 m
Height	0.25 m

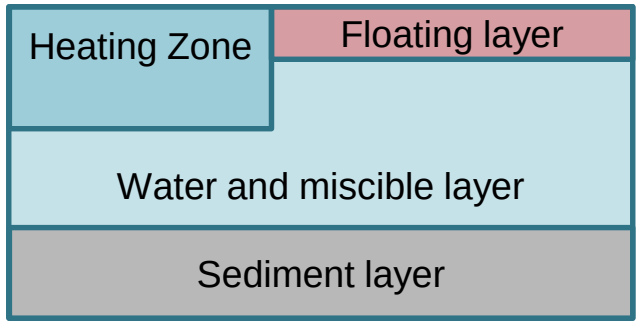


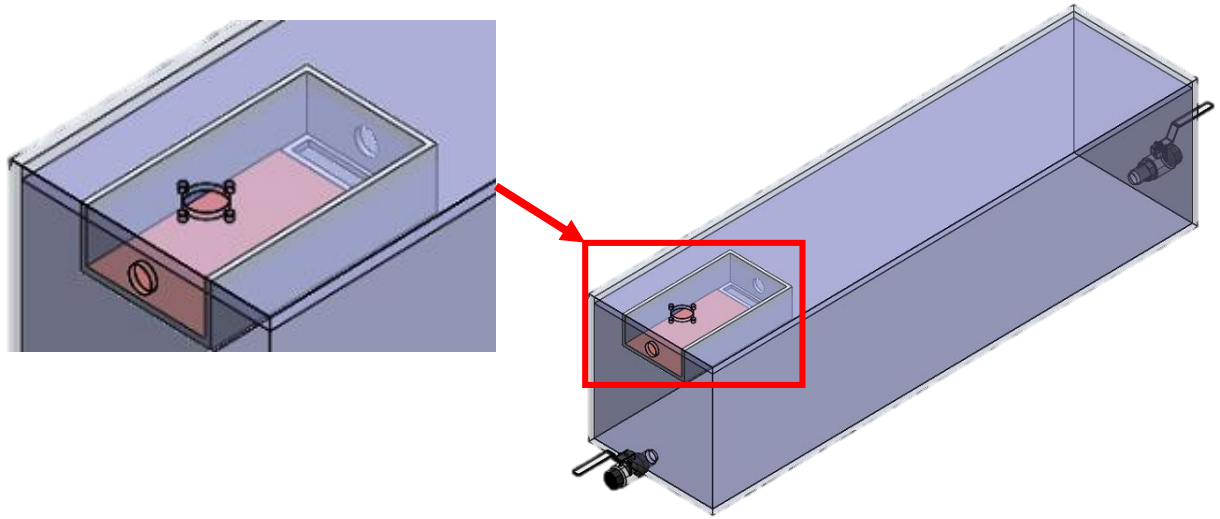
Heating Zone Design

- Height
  - Volume per contaminant in saturated mixture
  - Density of each contaminant

- Length and Width
  - Liquid volume and flow rate
  - Vapor volume and flow rate

Heating zone dimensions	
Length	0.20 m
Width	0.12 m
Height	0.05 m





Future Work

- Settling Tank
  - Experimental validation
  - Sludge and floating layer removal
- Heating Zone
  - Experimental validation
  - Further energy analysis