

# Effective Operations of Geotextile Container Dewatering Systems in Freezing Temperatures

WEDA

2014 Midwest Chapter Meeting

Randy Wilcox, P.E., WaterSolve, LLC

April 11, 2014



## Introduction

# Freezing Temperatures Effects on...

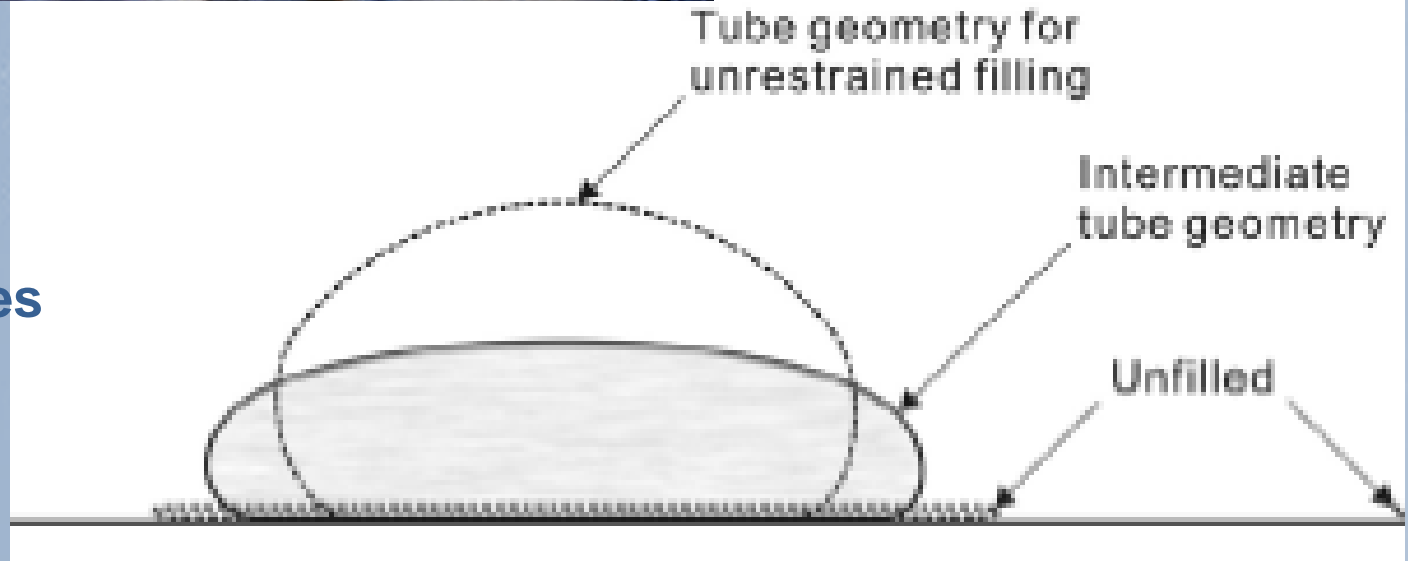
- **Geotextile Containers**
  - Freezing and Thawing
  - Fabric Stresses
- **Piping and Manifold Systems**
  - Draining Pipes
  - Valve Selection
- **Chemical Feed System**
  - Heated Enclosure Required
  - Polymer Efficiency
  - Polymer Make-down
  - Polymer Freezing
- **Filtrate Management**
  - Gravity Drainage Preferred
  - Pumping considerations
- **Working Conditions and Safety**
  - Slips, Trips and Falls
  - Personal Health Concerns
- **Recommendations**
- **Conclusion**

# Geotextile Containers



**Freezing and Thawing**

**Fabric Stresses**



# Piping and Manifold Systems

- Draining Pipes
- Valve Selection



# Chemical Feed System

- Heated Enclosure Required
- Polymer Efficiency
- Polymer Make-down
- Polymer Freezing



# Polymer Efficiency

## 1. Settling Rate

**STOKE'S LAW:**  $v = 2Gr^2 (\rho - \rho_o) / 9\eta$

$v$  = SETTLING RATE  
 $G$  = GRAVITATIONAL CONSTANT  
 $r$  = RADIUS OF PARTICLE  
 $\rho$  = DENSITY OF PARTICLE  
 $\rho_o$  = DENSITY OF LIQUID  
 $\eta$  = VISCOSITY OF LIQUID

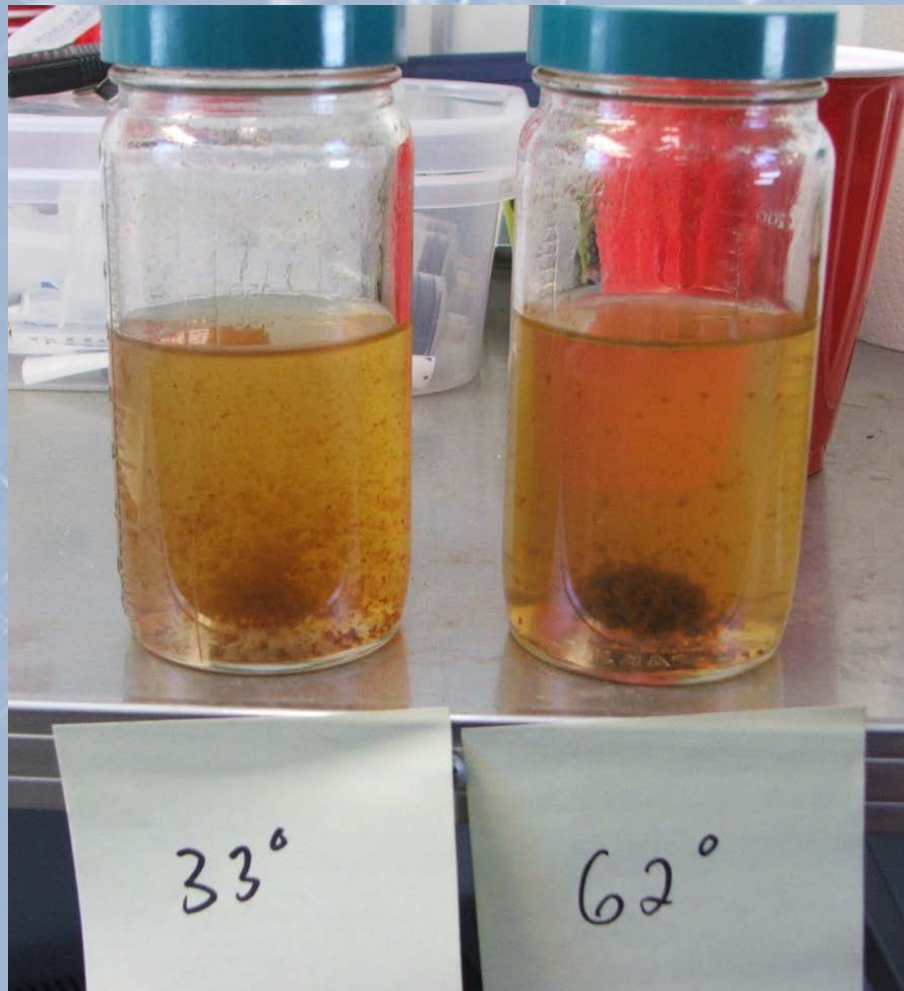
HIGHER  $\rho$ , MEANS SLOWER SETTLING  
IF  $\rho > \rho_o$

HIGHER  $\eta$  MEANS SLOWER SETTLING  
OR SLOWER FLOTATION



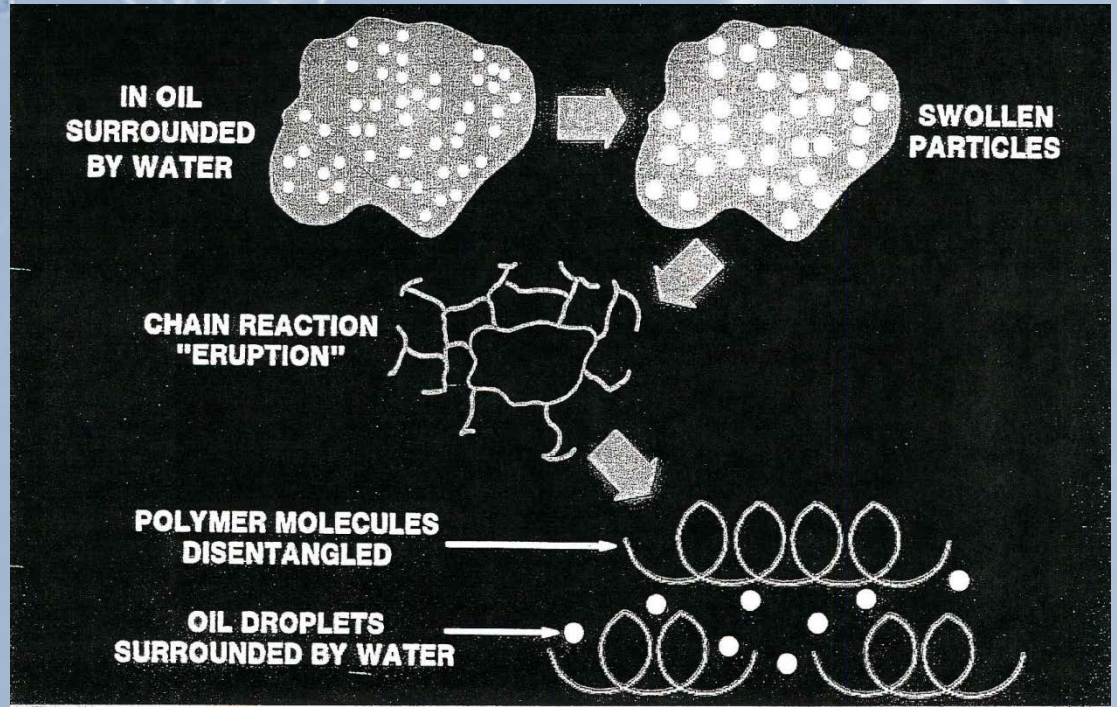
# Polymer Efficiency

## 2. Adsorption Rate and Activity



# Polymer Make-down

- Dissolution Rates of Polymer in Water Slower
- $> 10^{\circ}\text{C}$  Recommended for Emulsions
- $30^{\circ}\text{C}$  Recommended for Dry Products



# Polymer Freezing

- Emulsion Polymers Should be Protected From Freezing
- May Coagulate During Thawing
- Shipping Should Include Protection



# Filtrate Management

- Gravity Drainage Preferred
- Pumping Considerations



# Working Conditions and Safety

- Slips, Trips and Falls
- Personal Health Concerns



## Winter Operation Recommendations



- ▶ Operations need to be staged and planned
- ▶ Cannot fill a tube with solids that are frozen, if the solids height is more than  $\frac{1}{3}$  of the tube capacity
- ▶ During Winter months, may need to use several tubes, then top them off in the spring and summer months
- ▶ Use a heated structure
- ▶ Take extra time to work safely

## **Conclusion**

**Dredging and geotextile container dewatering operations in freezing temperatures are inherently difficult, but can be completed effectively and safely with the proper precautions and procedures.**

# Questions?

## WaterSolve, LLC

5031 68<sup>th</sup> Street, SE

Caledonia, MI 49316

(616) 575-8693

(616) 575-9031 (fax)

[www.gowatersolve.com](http://www.gowatersolve.com)

[www.geotube.com](http://www.geotube.com)

