

Polyethylene Tanks for Onsite Wastewater Treatment

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Presentation Overview

- Poly Tank History in the Onsite Market
- Education of Market and Care/Concern Issues
- Standards for Materials and Products
- Manufacturing Processes and QA/QC
- Installation Requirements
- Summary

Poly Tank History and Position

- Concrete tanks have dominated the market for decades
- Poly tanks 25-year history in the market only since 2000 have several new players emerged
- Early poly products left much to be desired
- 3 national manufacturers, several regional players
- Relegated to “Tank of Last Resort”
- Poly is less than 15% of the Market
- Material of the future –engineered resins
- Proper installation and application critical

Key Parameters for HDPE Resins

- Stress Crack Resistance
 - 150 Hours Minimum per ASTM D1693
- Tensile Strength
 - 2400 PSI Minimum per ASTM D638
- Flexural Modulus of Elasticity
 - 85,000 PSI per ASTM D790
- Above standards are almost meaningless for today's tanks due to different processes, design and material distribution

Nationally Recognized Standards

- ASTM Standards
 - Raw Material Characteristics
- IAPMO PS 1-2003c (International Association of Plumbing and Mechanical Officials)
 - Tanks and Risers
- CSA B66-00 (Canadian Standards Association)
 - Tanks and Risers
- Lack of a single accepted standard or consistency among standards hurts poly
- Vast differences among State Agencies
- Time component of testing

CSA Load Testing

21,000 pounds of top load

Manufacturing Processes – QA/QC

- In-plant tests and standards are not enough
- Typical QA measures involve material thickness, weight of part and vacuum/water testing
- Poly tanks are very susceptible to installation error or mis-application
- Education of all parties is critical...engineers, developers, regulators, contractors, inspectors
- A lot can happen between factory and the jobsite

Rotational Molding Construction

- Place polyethylene resin pellets in tank mold
- Place tank mold in open furnace and heat to time and temperature cycle
- Rotate mold to force material to the mold
- Remove mold from furnace and cool
- Process control very important
- Mold maintenance to avoid pinholes

Blow Molded Construction

- Resin is pneumatically conveyed to screws
- Resin extruded through accumulator head
- Tank mold encases resin “balloon”
- Compressed air forces material to the mold walls
- Process control for weight, material distribution
- Process by default tests every tank made

Field Tests and Inspections

- The regulating authority determines standards
- “Idiot-proofing” is not an option although improvements are always sought
- Installer education is the key
- Proper site assessment and product selection is critical
- All tanks should be field tested with water after installation

Installation Recommendations for Polyethylene tanks

- Follow the installation instructions precisely
- No shortcuts!
- Proper bedding
- No sharp objects in soil
- Free flowing backfill material
- Proper compaction and grading

INSTALLATION SEMINAR

SEPTEMBER 27, 2007

KEY INSTALLATION CONCEPTS

● **NO WATER** in tank during backfill

- FRALO tanks have extraordinary sidewall strength due to our molding process and require no water for internal support. The addition of water can bow sidewalls and draw the roof down.

● Install **BEDDING** to support belly and haunches of tank

- FRALO tanks are shaped like a large culvert pipe and require that bedding (pea gravel or sand) be installed to support the belly and haunch to prevent roof sag.

● Provide **COMPACTION** of backfill material in 6" lifts

- FRALO tanks rely on as much sidewall compression as can be provided to squeeze the sidewalls and “spring” the roof to support top loading.

Excavation Preparation

- Excavate hole at least 12" wider on each side and 18" longer at each end
- Level hole, remove large debris and add 3"-6" of pea gravel sand or similar native material for bedding
- Compact bedding material

Placing Tank in Excavation

- Center tank in excavation
- Ensure tank level and that the belly is supported with will
- DO NOT allow the tank to rest solely on the feet and the bottoms of the bulkheads

Initial Backfill with Pea Stone or Screened Material

- Add pea gravel or sand to excavation to support haunches and sidewalls of tank
- DO NOT ADD WATER to the tank during installation
- Distribute material evenly around body of the tank, starting at the mid-body of the tank

Haunch Support

- Note the flow of material under the haunches of the tank and up to the sidewall
- Rod, vibrate or shovel material to ensure that the haunch is completely supported and the corrugations are filled with material (between the ribs)
- Native material 1" or smaller

Backfilling Stages

- Distribute backfill material evenly around tank
- Compact backfill in 6" lifts, always working on the sides first and then the bulkheads (ends of tank)

Backfill to Top of Tank with Native Material

- Upon completion of backfill to support haunch and belly, begin final backfill
- Backfill material must flow freely and be free of debris and stones larger than 2"
- Backfill evenly around tank in 6" lifts, compacting after each lift
- NO CLAY, debris or rocks is permitted

Compaction of Backfill

- Continue to add fill and compact in 6" lifts
- Backfill should be evenly distributed around tank
- Native material must freely flow into corrugations to “key” tank into excavation for full structural integrity

Backfill Compaction Equipment

- Simply use a hand tamper to achieve sidewall compression through compacted backfill
- Mechanical compactors may be used if available on the site
- Sidewall compression is essential to allow the tank walls to push against once water is added

REVIEW OF KEY INSTALLATION CONCEPTS

- **NO WATER** in tank during backfill
 - FRALO tanks have extraordinary sidewall strength due to our molding process and do not require water for internal support. The addition of water can bow sidewalls and draw the roof down and may void the warranty
- Install **BEDDING** to support belly and haunches of tank
 - FRALO tanks are shaped like a large culvert pipe and require that bedding (pea gravel or sand) be installed to support the belly and haunch to prevent roof sag.
- Provide **COMPACTION** of backfill material in 6" lifts
 - FRALO tanks rely on as much sidewall compression as can be provided to squeeze the sidewalls and “spring” the roof to support top loading.

Summary

- Poly needs its' own standard which may be more complicated than concrete or fiberglass
- Many existing regulations do not adequately address poly or they try and force fit existing regulations
- Different processes and resins will demand a performance based standard
- FEA can greatly bridge test/field realities
- Until regulated, costs will drive decisions
- Forward movement rather than all-encompassing perfection should be the goal
- Jurisdictions requiring a PE stamp and engineered systems clearly rise above

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