FGI Webinar: Case Studies in Water Containment & Floating Covers

Presented by:
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Host:
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Introduction & Background

This webinar focused on practical applications of flexible geomembranes and liners for water containment in reservoirs and above-ground storage tanks (ASTs). Speakers highlighted large-scale projects in California, Texas, and Australia, detailing the materials, installation methods, project challenges, and long-term performance. The presentations emphasized the importance of prefabrication, factory testing, chemical resistance, UV stability, and design considerations for large and irregularly shaped water containment structures.

Upper Jiquita Reservoir (CA, USA) – Brian Fraser

- **Project Context:** 275-million-gallon potable water reservoir serving ~200,000 families. Built in Santa Margarita Water District; steep slopes of 2:1 to 3:1, 120 ft deep. First large municipal water reservoir in decades.

- **Geosynthetics:**

    - Underdrain: 865,000 sq ft of tri-laminate geocomposite for drainage and leak detection.

    - Liner: 865,000 sq ft of 60-mil reinforced polypropylene (RPP) liner. Panels prefabricated 36 ft wide, seamed with 3-inch thermal wedge welds.
    - Floating Cover: 900,000 sq ft, 60-mil CSPE 3-ply synthetic rubber, prefabricated 36 ft wide panels. Tension trough design for stability and UV/chemical resistance.
- **Challenges:**
    - Extreme wet winters, dewatering up to 12 pumps.
    - Steep slopes, irregular geometry, erosion requiring removal of 200,000 sq ft of liner.
    - Coordination of earthworks, liner, and floating cover installation.
- **Installation Methods:**
    - Earth bench (14 ft wide) provided safe platform and slope alignment.
    - Panels deployed from crest, cabled down, welded at lower sections.
    - Floating cover tested under positive inflation for leak detection.
- **Outcomes:**
    - Project completed in 15 months, on time and budget, zero safety incidents.
    - Cover and liner inspected 13–14 years later, material performing well.
    - Total cost: ~$0.22 per gallon, ~20% of comparable concrete reservoirs.
    - CSPE material offers 30-year weathering warranty; proven 43-year service life in similar applications.

Above-Ground Storage Tanks (ASTs) – Ron McKenzie

- **Industry Context:** Oil & gas hydraulic fracturing and environmental compliance required high-quality liners for temporary storage.

- **Tank Design:** Steel wall segments bolted to create rings, no permanent floor; liners are critical for containment.

- **Liner Types:**

    - Bucket Liners: Wall sections joined to floor via radii welds. Single potential failure point at weld.

    - Tapered Liners: Flat sheets assembled to cover floor and walls, factory-fabricated; multiple welded panels reduce failure risk.

- **Installation Considerations:**

    - Uniform wrinkle distribution critical.

    - Subgrade compaction ensures correct load transfer.

    - Partially filling tank with water before clamping avoids bridging/failure at load points.

    - Empty tanks susceptible to shifting from wind or thermal expansion.

- **Materials:**

    - HDPE: High chemical/UV resistance, thick sheets, but limited flexibility and field-fabrication required.

    - LLDPE: Non-reinforced, flexible, chemically resistant, suitable for factory fabrication and testing, ideal for temporary AST containment.

    - Reinforced hybrids: High-strength, multi-polymer blends, factory-fabricated, suitable for short-term or specialized applications.

- **Conclusions:**

    - Factory-fabricated tapered liners reduce installation risks and field errors.

- Chemical compatibility, durability, and proper installation procedures are key for long-term performance.

- Collaboration among producers, installers, fabricators, and FGI ensures environmental compliance.

Sydney Reservoir Floating Cover (Australia) – Josh Flynn

- **Project Context:** Major reservoir supplying Sydney CBD. Original open basin (1880s) upgraded to floating cover system in 1999–2000 for water quality compliance.

- **Scale & Materials:** 360,000 m² of geosynthetics in four layers. Largest floating cover in southern hemisphere.

- **Design Considerations:**

  - Material selection for UV stability, chemical resistance, and potable water standards.

  - Layered geosynthetic system ensures durability, structural performance, and long-term containment.

- **Construction & Installation:**

  - Phased installation to accommodate reservoir geometry and ongoing operations.

  - Prefabrication and factory testing emphasized to reduce field risk and ensure seamless integration.

- **Outcome:**

  - Achieved regulatory compliance for potable water.

  - Demonstrated practical advantages of large-scale, prefabricated floating covers in urban water supply systems.

Key Takeaways from Webinar

- Prefabrication and factory QA/QC improve installation quality and reduce risk.
- Material selection is critical: UV, chemical, and thermal resistance determine long-term success.
- Geosynthetics solve complex containment problems in both municipal and industrial water systems.
- Floating covers and liners provide cost-effective alternatives to traditional reservoirs and tanks.
- Collaboration between engineers, manufacturers, and installers is essential for project success.