ارامكو السعودية
Saudi Aramco

NONMETALLIC TECHNOLOGIES FOR WATER UTILITY SERVICES

Vincenzo Savino
Mauyed S. Mehdi

SAWEA Workshop 2010
Innovative Water and Wastewater Network Systems

FEBRUARY 2010

OUTLINE

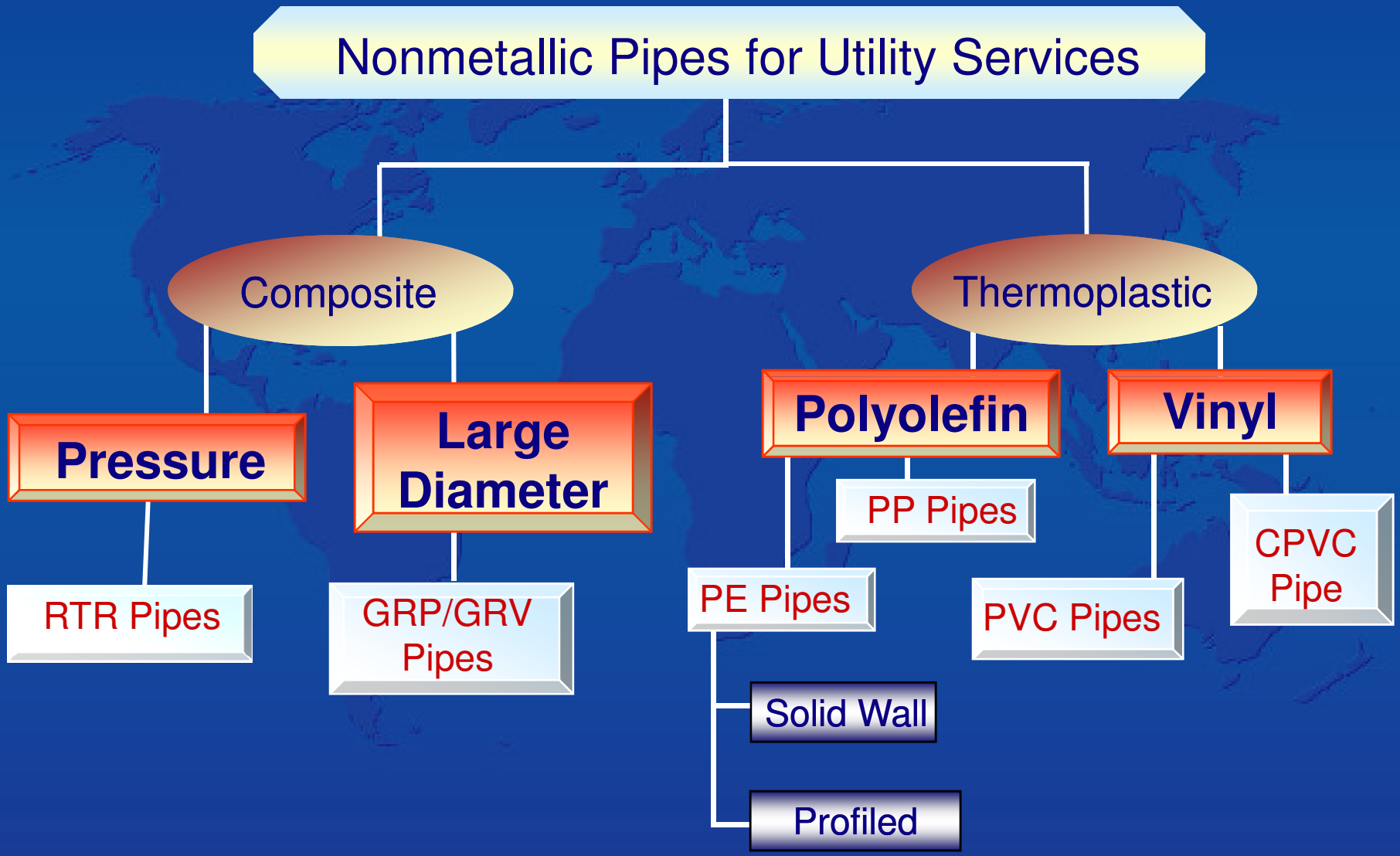
- Obj
- Nor
  Ser
  - ✓ I
  - ✓ I
  - ✓ T
  - ✓ V
  - ✓ C tructures
- Cor

COOLING TOWERS AND SECONDARY STRUCTURES

OBJECTIVE

Discuss cost-effective commercially available nonmetallic technologies for applications in utility water services, which includes portable water supply, water treatment, drains, and sewer systems.

NONMETALLIC PIPES



NONMETALLIC PIPES

RTR PIPE

- Also known as GRE or FRP pipes.
- Matrix is typically epoxy, vinylester or polyester resin, depending on the service.
- Diameter; 25 mm - 1,000 mm (1” - 40”).
- Pressure up to 35 Bar (500 psi).
- MAOT; 99 ℃ (210 ℉).
- Applications: Potable water, seawater, water treatment, firewater systems, etc.

Photo Courtesy of Bondstrand/Amiantit

NONMETALLIC PIPES

GRP/GRV PIPE

- GRP Pipe; Polyester resin based matrix for nonaggressive service.
- GRV Pipe; Vinylester resin matrix for more demanding conditions.
- Diameter; 80 mm - 4,000 mm (3” - 158”).
- Low-pressure or gravity system.
- MAOT; 60 ℃ (140 ℉).
- Applications: Seawater, sewer system, portable water systems, etc.

Photo Courtesy of Future Pipe Industries

NONMETALLIC PIPES

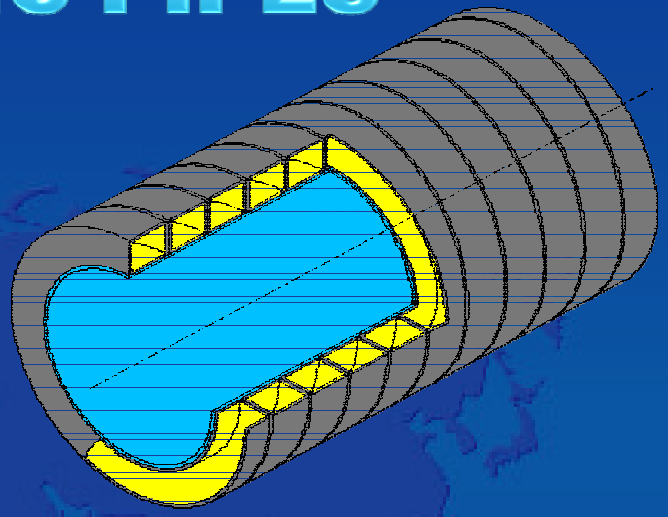
PE – SOLID SINGLE WALL

- High density PE100 or Medium density PE 80.
- Diameter; 16 mm - 2,000 mm (1/2” - 80”).
- Pressure up to 24 Bar (350 psi).
- MAOT; 60 ℃ (140 ℉).
- New technology for high working temperatures, PE-X and PP, up to 90 ℃ (195 ℉).
- Applications: Potable and sea water, industrial and chemicals fluid, fire water systems, etc.

NONMETALLIC PIPES

PE – PROFILED

TWIN AND TRIPLE WALL



- High density PE100 or Medium density PE 80.
- Diameter; 400 mm - 3,600 mm (15” - 142”).
- Gravity drains.
- MAOT; 60 ℃ (140 ℉).
- Overflow, drains, sewer and gravity systems, etc.

Photo Courtesy of AJ Pipe

NONMETALLIC PIPES

PVC/CPVC PIPES

- Diameter: 8 mm - 630 mm (1/8” - 24”).
- Pressure pipes up to 500 psi.
- MAOT; PVC, 49 ℃ (120 ℉) CPVC , 71 ℃ (160 ℉).
- Potable and seawater, drains, sewer, effluents, etc.

CPVC Piping

NONMETALLIC LINERS

THERMOPLASTIC LINED FOR REHABILITATION OF EXISTING PIPES

- High Density PE100.
- Typically used in rehabilitation of existing underground pipes; carbon steel, cement, masonry, etc.
- Smooth and groove liners.
- Diameter: 63 mm - 1,300 mm (2” - 52”).
- Pressure; host pipe.
- MAOT; 60 ℃ - 80 ℃ (140 ℉ - 175 ℉).
- All water, crude and gas services.

Photo Courtesy of FWEA

NONMETALLIC LINERS

CURED-IN-PLACE THERMOSET LINERS

- Glass-fiber reinforced polyester sleeve.
- Typically used in rehabilitation of sewage systems.
- For demanding conditions, vinylester and epoxy system can be used.
- Diameter: 100 mm - 1,500 mm (4” - 60”).
- Typically gravity.
- MAOT; 60 ℃ (140 ℉).
- Sewer and water mains.

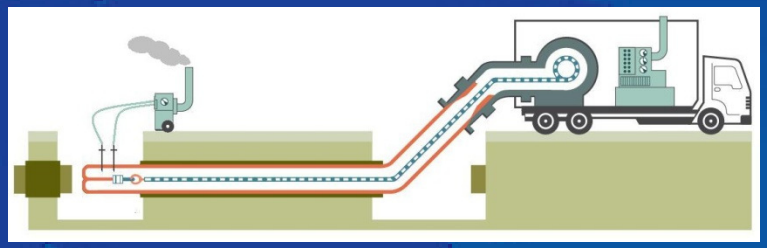


Photo Courtesy of Water Management System

NONMETALLIC LINERS

THERMOPLASTIC LINED PIPEWORK

- Fluoropolymers (PTFE) and Polypropylene liners.
- Highly corrosive fluids, such as strong acid and base.
- Diameter; 16 mm - 600 mm (1/2” - 24”).
- Design pressure; Class 300 pipe (~ 700 psi).
- MAOT; 200 ℃ (392 ℉).
- Main applications; aggressive chemicals in water treatment plants.

NONMETALLIC TANKS

- Tanks:
  - ✓ Atmospheric pressure.
  - ✓ MAOT; 99 ℃ (210 ℉).
  - ✓ Under and aboveground.
  - ✓ Vertical and horizontal.
  - ✓ Tanks, ducts, reactors.
  - ✓ Dual laminate containers.


Water Storage Tank


Hypochlorite Tank

NONMETALLIC VALVES

- Matrix
  - ✓ Thermoplastic
  - ✓ Composite
- Features
  - ✓ MAOT; up to 99 ℃ (210 ℉)
  - ✓ Pressure; up to 150 psi
  - ✓ Typically 2” - 12” (up 24”)
- Types
  - ✓ Ball
  - ✓ Butterfly
  - ✓ Check Valves
  - ✓ Automated Valves
- Applications

  Potable, seawater, effluents water treatment chemicals, firewater systems, etc.

NONMETALLIC PUMPS

- Features
  - ✓ Pressure up to 250 psi
  - ✓ MAOT; 120 ℃ (250 ℉)
  - ✓ Fluid: Aggressive Chemicals
  - ✓ Flow: up to 5,000 gpm
  - ✓ Speed: up to 3,500 rpm
- Types
  - ✓ Horizontal
  - ✓ Vertical
  - ✓ Mag Drive
  - ✓ Self-Priming
- Applications

  Potable, seawater, effluents, water treatment chemicals, firewater systems, etc.

Photo Courtesy of Fybroc

NONMETALLIC COOLING TOWERS

- Components Include:
  - ✓ Fans
  - ✓ Beams and Columns
  - ✓ Walls
  - ✓ Desk
  - ✓ Shields
- Modular Towers
- Shop and Site Built Towers

NONMETALLIC SECONDARY STRUCTURES

- Gratings
- Handrails
- Cable trays and cable ladders
- Stairs and steps
- Ladders and gauges
- Rebars
- Applications; water treatment plants, offshore structures, etc.

Photo Courtesy of Strongwell

CONCLUDING REMARKS

FEATURES AND ADVANTAGES

High Chemical Resistance

High Specific Strength/Stiffness

Low Friction Coefficient

MAIN ADVANTAGES

No Corrosion

Minor Maintenance Cost

Reduced Weight

Low Installation Cost

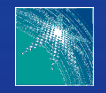
Increased Flow

LOW LIFE CYCLE COST

CONCLUDING REMARKS

- Large numbers of reliable commercially available nonmetallic products exist in the market that are suitable for water utility services.
- Correct design and supervised installation, would certainly result in maintenance free systems. Expected cost saving throughout the 50 years of service life is around 50% - 75% compared to steel.

Thank you



ارامكو السعودية
Saudi Aramco