

Deployment of Thermoplastic Composite Pipe in Rich MEG Pipeline Applications

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Abstract: Led innovation in upstream pipeline systems by implementing advanced thermoplastic composite piping for onshore gas increment projects. This paper presents the first commercial onshore application of 6-inch fully bonded glass fiber polyethylene composite pipe (TCP) used for transporting rich monoethylene glycol (RMEG), a critical service fluid in gas processing systems. The project marks a strategic shift from traditional carbon steel piping by leveraging nonmetallic systems that offer immunity to corrosion, enhanced flow efficiency, and rapid installation. This development aligns with the initiative to adopt nonmetallic solutions for improved reliability, reduced life cycle costs, and support for sustainability goals.

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I. INTRODUCTION

In the evolving landscape of upstream oil and gas infrastructure, material integrity and system reliability remain critical challenges, particularly in aggressive service environments such as RMEG transport. Traditional carbon steel systems, while cost-effective and mechanically robust, are vulnerable to internal corrosion due to coating degradation, fluid impurities, and operational cycling. These issues often result in unplanned downtime, frequent maintenance, and increased operational complexity.

We have been actively developing and deploying nonmetallic piping systems such as thermoplastic composite pipe (TCP) and steel reinforced thermoplastic pipe (s-RTP) to address these challenges. These systems provide long-term corrosion resistance, simplified installation, and reduced life cycle costs. This paper highlights the first onshore commercial deployment of thermoplastic composite pipe demonstrating a practical and scalable solution for RMEG service.

II. PROJECT OVERVIEW

This project involved the design, procurement, and installation of a 6-inch thermoplastic composite pipeline for RMEG transport within a gas processing facility. The system was engineered to operate under elevated pressure and temperature conditions typical of MEG recovery and reinjection units.

III. MATERIAL AND SYSTEM DESIGN

The selected thermoplastic composite pipe consists of a melt-fused high-density polyethylene (HDPE) matrix reinforced with continuous glass fiber filaments. This construction provides High hoop strength and pressure resistance, Excellent flexibility for directional routing and reduced need for elbows, Full immunity to internal and external corrosion and smooth inner surface that minimizes pressure drop and flow restriction.

The pipe and steel end-fittings were qualified for compatibility with RMEG, including exposure testing to ensure long-term performance under cyclic thermal and chemical conditions.

IV. TECHNICAL AND ECONOMIC BENEFITS

The thermoplastic composite pipe system significantly reduced field construction time. Installation completed in 50–70% of the time required for equivalent steel systems, Minimal manpower and equipment needed and no need for welders, coating applicators, or inspection teams and No post-installation NDT required, further accelerating project timelines.

The nonmetallic nature of the system provides Zero risk of internal or external corrosion, eliminating the need for coating systems or corrosion inhibitors, No pigging required, reducing operational complexity and downtime, A design life of 20+ years with no planned interventions,

based on accelerated aging tests and field performance of similar systems.

The economic benefits of the system are substantial 35–65% lower installed cost compared to traditional welded steel systems and Lower carbon footprint due to reduced material usage and transportation requirements.

V. ALIGNMENT WITH STRATEGY AND PAST EXPERIENCE

This project builds on a growing body of experience in deploying nonmetallic piping systems. The current initiative with thermoplastic composite pipe and electrofusion couplers aligns with the company's goals to Standardize nonmetallic systems for upstream applications, Reduce life cycle costs and unplanned downtime and Support sustainability through material efficiency and lower emissions.

VI. FIELD PERFORMANCE AND MONITORING PLAN

The system will be commissioned successfully with no anomalies during startup. A comprehensive monitoring plan has been established. Initial flow testing confirmed optimal hydraulic performance with no pressure restrictions or flow anomalies, Periodic inspections will be conducted using inline monitoring tools and visual checks at accessible points and Performance data collection will include flow rates, pressure drop, temperature profiles, and joint integrity indicators.

VII. CONCLUSION AND FUTURE OUTLOOK

This project marks a significant milestone toward more sustainable, reliable, and cost-effective piping solutions. The successful deployment of thermoplastic composite pipe in RMEG service demonstrates The technical viability of nonmetallic systems in aggressive service environments, economic and operational benefits of simplified installation and long-term corrosion resistance and alignment with corporate strategy to expand the use of non-metals in upstream infrastructure.

Going forward, similar systems are being evaluated for deployment in other gas processing units, water injection systems, and offshore applications. Continued collaboration with vendors and internal departments will support the standardization and localization of these technologies.

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