Using Flexible Steel Pipe For Supercritical Carbon Dioxide Transportation

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Abstract

Objectives/Scope: This presentation highlights the supercritical CO2 compatibility with steel-reinforced thermoplastic pipe (flexible steel pipe). Case studies are presented to demonstrate the successful use of flexible steel pipe in carbon capture and storage (CCS) and Enhanced-Oil-Recovery (EOR) applications.

Methods, Procedures, Process: With minimal capital investment and interruption to production, flexible steel line pipe is ideally suited for CCS and EOR applications. Flexible steel line pipe consists of a high-density polyethylene (HDPE) liner and cover that isolate the steel reinforcement from the corrosive elements found in both the environment and production fluid. With pipe diameters ranging from 2-inch through 10-inch and pressures ratings up to 3,000 psi, flexible steel pipe is available in pressures commonly specified to transport CO2 in the supercritical fluid phase.

Results, Observations, Conclusions: Qualification testing of flexible steel pipe has proven compatibility for CO2. Flexible steel line pipe combines the strength and durability of steel with the performance, flexibility, and ease of installation offered by spoolable plastic pipes. The smooth HDPE liner provides excellent flow capacity and limits potential corrosive mechanisms when compared to traditional stick steel pipe. Existing pipeline infrastructure can be rehabilitated by pulling flexible steel line pipe through the old pipeline to restore full pressure capability and accommodate change of service. The high-strength steel reinforcement enables long pull distances with minimal disruption to the right of way. Flexible steel pipe's unique product design allows the operators to employ a dual-containment design while implementing real-time continuous annulus monitoring on multiple interfaces, effectively reducing environmental risk.

Novel/Additive Information: Flexible steel pipe is a robust non-metallic pipeline solution offering the highest pressure and diameter combinations in the industry. Using flexible pipes for supercritical CO2 conveyance results in performance and cost advantages in comparison to conventional welded steel pipes while also mitigating major corrosion concerns. Case studies using flexible steel pipe for CCS and EOR applications demonstrate the successful use of flexible steel pipe in multiple applications.