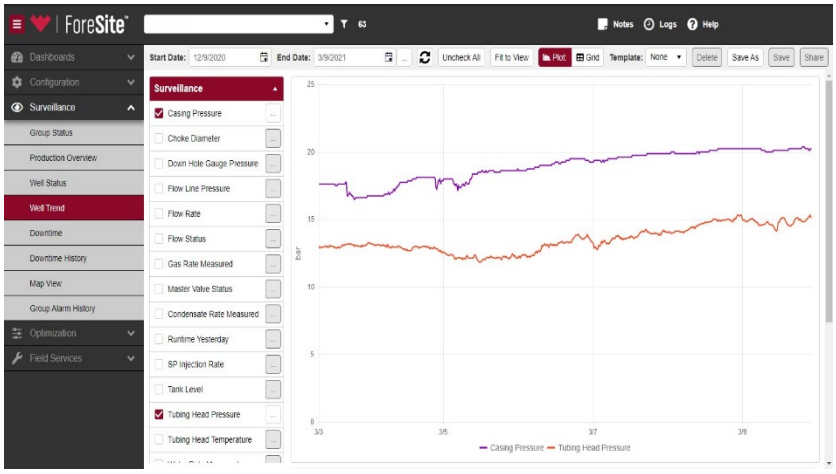
Continuous Foamer Injection Via Capillary Line

Retrofitted in 60+ Wells Increased Average Gas Production by 20%, Eliminated Liquid Loading Issues



An image from the ForeSite software platform: Monitoring casing pressure (purple) and tubing head pressure (orange) and optimizing production through surfactant dosing rate.

Objectives

- Optimize liquid loading gas wells to a regime where they produced continuously rather than intermittently. Gas wells in the field were experiencing liquid loading and intermittent production as they depleted.
- Reduce carbon footprint by minimizing gas flaring.
- Perform installations without the requirement of a rig, reducing cost and carbon emissions.
- Customize the solution by adapting to various downhole environments. Parameters that varied well to well included depths, water/condensate ratios, downhole temperatures, and water mineralization levels.

Our Approach

- As part of a 10-well trial project, Weatherford engaged with the customer and performed a comprehensive production modeling study using the WellFlo® design and analysis software.
- The wells were not completed with chemical injection lines, so continuous injection of a foamer was not possible with the existing completion. Weatherford proposed a unique capillary-conveyed solution for retrofitting a chemical injection line through the existing production tubing without the requirement for a workover. The retrofitted chemical injection line allowed for the continuous injection of a foamer as per the model proposed by Weatherford engineers to optimize production.

LOCATION
Ukraine

WELL TYPE
Gas

HOLE SIZE AND ANGLE
Vertical

DOWNHOLE TEMPERATURE
266°F (130°C)

AMBIENT TEMPERATURE (WINTER)
-22°F (-30°C)

DEPTH
up to 16,404 ft (5,000 m)

PRODUCTS/SERVICES
- WellFlo software
- Capillary services
- Chemical injection valves
- WellPilot® Deliquification System
- ForeSite platform
- CygNet platform
- Foaming surfactants
- Salt inhibitors
- Demulsifier

Weatherford®

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Our Approach (continued)

- Weatherford's experts established a solution-based approach that included a joint operational team with the customer to control the preparation, design, deployment processes, and share the knowledge and experience in both directions.
- The collaboration between the customer and Weatherford:
  - Conducted a well-by-well review and design in the WellFlo software to identify and recommend the optimal well candidates
  - Produced fluid sample analysis for reaction with surfactants for each well, elaborating recommendations for concentrations, dosing rates, and injection points
  - Designed the installation of the capillary strings for each well using file-transfer-protocol (FTP) software
  - Performed rig-less injection valve and capillary string installation without stopping or killing wells
  - Designed, assembled, and installed chemical injection skids with solar panels, controllers, and pressure sensors for monitoring well behavior
  - Brought wellsite sensor data through mobile communication and CygNet® SCADA production-optimization platform to the ForeSite® production optimization platform, enabling the customer to monitor well performance and perform distant adjustments of chemical injection rates in real time
- The production results and seamless execution of the 10-well trial project justified the extension of the solution to 60 wells.

Value to Customer

- By optimizing well performances and reducing technological losses of the gas, the Weatherford solution realized an average increase of sales gas production over 20%.
- The CygNet and ForeSite platforms provided remote, real-time capability for understanding well performances.
- Operational trips and associated safety exposures of the customer's personnel (on some wells requiring a daily visit for well purging cycle) were significantly reduced, allowing more time to focus on other work tasks.
- The entire 70-well operation (10-well trial and 60-well extension) delivered safe, rigless, and in-time work deployments with zero nonproductive time (NPT).