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# Two-Phase Flow Impairment in Gas Gathering Systems: Problems, Detection and Solutions for Stripper Well Systems

## PUBLIC EXECUTIVE SUMMARY

The optimum operation of the surface production system is one of the key elements needed for the successful operation of gas stripper well facilities. Unwarranted losses in the surface gathering system invariably lead to inability to produce stripper wells at their full potential, when at all possible. Therefore, optimizing conditions at the surface production system becomes an important goal and challenge for operators. One of the major stumbling blocks in this pursuit is the detrimental effect of liquids on gas production performance. Liquids, water in special, are the major culprits of excessive losses not only in the wellbore but throughout the surface production system. In surface gathering systems handling production from gas stripper wells, the presence of liquids such as water can reduce gas deliverability below economic limits and kill production from wells feeding the gathering system. The most insidious feature about the water problem is that, even after successful removal of free water at wellhead conditions, natural gases entering the surface gathering system are water-saturated and thus liquids tend to reappear at different locations of the surface network system. Early detection and removal of this water can become a real challenge for operators. This work will focus primarily on developing, testing, deploying and demonstrating an analytical tool that would serve the primary purpose of increasing throughput capacity and improving operational reliability of natural gas gathering network infrastructure. This will be done by developing a comprehensive model for single-phase gas and multiphase (gas and liquid water) movement in the gas pipeline system anchored on good fluid dynamics science. This model will have the capability to answer some fundamental questions about gas deliverability and two-phase flow impairment or water interference, to which there is lack of accurate answers that have severely limited the industry operator's ability to control the fate of the gas delivery system, which is central to economic outlook as well as profitability of operation. The answers to these questions have direct and significant impact on deliverability and operational efficiency of the pipeline system, and the integrity of the salient peripheral equipment. The proposed water-tracking research effort aims at utilizing fundamental thermodynamic and transport phenomena principles for the mapping of pressure, temperature, and fluid distribution inside a gas gathering networks and the definition of how liquid drop-out defines new preferential flow paths for the gas and liquid phases.