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DETECTION OF FLOW-INDUCED VIBRATION FROM WELLHEAD MEASUREMENTS

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Abstract

The underground solution-mined cavern storage industry has long recognized that at certain flow rates, flow-induced dynamic motion can occur that may result in impacts between the hanging string and the production casing. Some operators have physically noted such impacts by placing their hand on the wellhead while the well was flowing, others reported impacts large enough to be audible by the human ear near the wellhead.

Downhole instrumentation for monitoring tubing deflections was developed by the Pipeline Research International (PRCI) and has been deployed in several instances. That technology provides direct feedback on hanging string movements; however, it can be labor intensive and invasive to operations. The technology described in this paper relies on hanging string to impact casing detection via its acoustic signature, therefore it provides indirect information, but it is comparatively inexpensive, non-invasive, and can be performed during normal operation.

Wellhead acoustic impact monitoring has now been performed on a variety of caverns, including gas, crude oil, and LPG storage, as well as brine mining. The results suggest that the technology is at minimum a likely valuable compliment to downhole measurements for understanding of flow-induced hanging string behavior. The paper presents the technical background for field measurements, and provides some results from the various wellhead monitoring efforts.

Key words: Structure Borne Sound, Flow-Induced Vibration, Instrumentation, High Speed Data Acquisition, Signal Processing, Continuous Monitoring.