

NEW DIRECT-CONTROL GAS STORAGE SAFETY VALVE

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ABSTRACT

Subsurface safety valves for large-completion, gas-cavern storage systems must comply with the economic, safety, and regulatory restraints required by industry standards in addition to satisfying the demanding environmental restraints imposed by gas wells with significantly high flow potentials. In addition, location of the valve and all protected systems must also be given careful consideration in completion design since this type of well is prohibitively expensive to kill if workover is required.

previously were associated with high-flow-rate closures in applications of this type.

A direct-control subsurface safety valve has now been developed to meet these stringent requirements. The valve, which can be installed in the tailpipe below the packer, can be expended into the cavern, if necessary, and has the capability to provide efficient operation with minimal pressure loss at anticipated high flow rates.

This paper will discuss the history and field testing of the earlier prototypes of this valve and how the unique design criteria of the new design address the problems of valve mechanism damage that are generally attributed to high-flow-rate closures. An actual case history from a storage facility in Germany will demonstrate the advantages that the newly-designed valve can provide.

At present, two valves have been installed, with one being used to conduct long-term evaluations. All closures have been as predicted. The new valve design has demonstrated excellent reliability in a demanding, high-flow-rate environment and maintains structural integrity during high-energy valve closures. Elimination of a hydraulic control system also allows unrestricted setting depths. Design analyses, surface testing, field testing, and wireline applications all indicate that poppet-closure mechanisms can be combined with "up-to-set" and "down-to-set" lock mandrels to successfully address the problems that