TAM INTERNATIONAL

Preventing Annular Gas Flow in Conjunction with 2 Stage Cementing

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Abstract

The most important purpose of primary cementing is to seal the annulus in order to eliminate communication between subterranean zones and the surface. Drilling through gas formations poses unique risks such as annular gas flow. Annular flow related to poor cementing of large diameter surface casing has been identified as one of the most frequent causes of well control incidents. Many primary cementing jobs fail to stop inter-zonal communication, and poor cement bonding has been credited with the most significant cause of annular casing pressure in outer casing strings. Statistics worldwide indicate there are thousands of wells with sustained casing pressure that potentially lose hydrocarbon reserves, or leak gas at the sea floor.

Annular gas flow during, and after, cementing is a frequent problem in areas where oil and gas reservoirs are the primary producing reservoirs, shallow gas formations are present, and leak-off tests are not regularly performed. When zonal isolation in gas wells is not achieved, gas can migrate behind the casing, thus charging shallower formations, which become a costly problem when they are drilled into unexpectedly. Several techniques are currently used to control annular gas migration with each delivering varying degrees of success.

These methods involve drilling processes, cementing systems, and mechanical barriers. This paper focuses on the use of an inflatable casing annulus packer (CAP) to seal the annulus in conjunction with a cementing port collar (PC) above the gas migration source. If the primary cement job does not achieve the required displacement efficiencies, and satisfactory results, a second stage cementing option using the port collar is still a possibility.

As an ongoing development to allow for the reduction of the number of casing strings in a well, integration of a metal-to-metal (MTM) sealing cementing port collar and CAP in a premium production casing string, with MTM sealing connectors, is used. This light architecture well design effectively reduces overall well costs in addition to improving HSE issues.

By utilizing this approach no gas migration has been detected to date in over 357 wells completed using casing annulus packers and port collars. Based on prior experiences and costs associated with remediation of a well with annular gas flow, the mechanical control technique has effectively reduced the overall well costs in addition to drastically improving HSE issues.

Complete paper