

Improvements in Completing and Testing Multi-Zone Open-hole Carbonate Formations
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Abstract

This paper presents a methodology for executing multi-zone well tests in an un-cemented open-hole completion. Hydraulic isolation between zones is achieved using casing annulus packers rather than cement. Sliding sleeve port collars provide a means of selective interval testing, when used with polished bore receptacles and seal stacks to allow well control and test string spacing.

The techniques described here eliminate cementing and perforating across reservoir intervals; therefore it is an improved method of testing multiple zones in fractured and low permeability carbonate reservoirs. Multiple zones can be individually tested and retested, in any order, on a single trip in the hole with drill stem test tools, representing a significant step change in well testing methodology.

Performing well tests on single zone wells can be done in open-hole or cased hole. Open-hole well tests are usually preferred because they exhibit lower skin damage and improved productivity, especially in low permeability, fractured carbonate reservoirs. For multiple zone testing, cementing and selectively perforating are more common.

A well test performed in an exploratory well in Qatar used the basis of this approach. Subsequent to this, well tests in China and Oklahoma, (USA), used this approach successfully. One common well test objective was to establish sufficient flow allowing the chosen reservoir to be evaluated, without the need to stimulate. Although stimulation was not entirely eliminated in this test case, a reduction in test time was achieved. The reduced number of trips in the hole also reduced HSE exposure. This last improvement was particularly important in one well as the well flow stream contained H₂S. Although some operational difficulties were encountered and overcome, the system was proven technically viable, and has the potential for significantly reducing completion and testing time for a multi-zone well, as well as mitigating HSE hazards.

[Complete paper](#)