Systematic Approach To Enhance Wells Deliverability Through High-pressure Acid Jetting In Highly Fractured Carbonate Reservoir

Author Block: A. Al Adawi, Petroleum Development Oman; S. Yahmadi, Y. Ramidhi, Y. Hadhrami, PDO; A. Charushin, S. Al balushi, NESR; S. Saqri, A. Shuely, PDO; H. Al Hooti, Nadhira TTS

Abstract

Objectives/Scope: A group of multi-layered, highly fractured carbonate reservoirs were characterized and selected to be part of an oil recovery campaign in one of the operating oilfields in Oman. The main objective of the campaign was to maximize the oil recovery from a oil rim in a highly fractured reservoir under Gas Oil Gravity Drainage (GOGD). The paper describes the screening of candidates and implementation of selective acid stimulation through selective & high-pressure jetting technique. This resulted in significant improvement in well deliverability thus reducing production decline.

Methods, Procedures, Process: The campaign took place across a period of 2 years. The first challenge was to screen well candidates that were still within matrix of the highly fractured formation. The reservoir data logs and drilling history was utilised for this purpose. Once the candidates were identified the second part was to carry out acid stimulation. The campaign took place in stages until the highest production enhancement was reached. The first stage consisted of “high jetting stimulation” where a special high-pressure jetting tool was used to pump an acid-based treatment at a pre-studied spacing interval to initiate the perpendicular washed channels. The second stage consisted of “dual stage acid matrix intervention” where, thief zones were injected with a chemical diverter to enable the stimulation of the remaining zones. The third stage consisted of “adding a matrix acid treatment” following the high-pressure jetting stimulation, to ensure deeper penetration of the acid treatment.

Results, Observations, Conclusions: The main challenge was to identify well candidates that existed in matrix area of the highly fractured reservoir that were not impacted by injected gas or short circuited into gas cap via faults/fractures. Following the unsatisfactory results of conventional coiled Tubing Acid Stimulation using normal Jetting means, “high-pressure acid jetting” with a selective interval stimulation was developed. This procedure helped establish connectivity with background fractures via wormhole placements which in turn allowed the acid to penetrate deeper into the formation thus resulting in sustained production enhancement. The high-pressure jetting stimulation was carried out in more than 35 wells. The campaign has successfully resulted in up to 80% net oil production improvement where the overall success rate of implementation was 90%.

Novel/Additive Information: The campaign of oil recovery through “high Jetting dual stage acid stimulation” provided the opportunity to enhance well productivity in complex fractured reservoir under the influence of GOGD recovery. This technique can be replicated in other such complex environments where recovery could be challenging.