

RESEARCH ARTICLE

The Impact of Colmatation On Well Gas Condensate Recovery

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Abstract

The article examines the influence of pore space colmatation on the gas condensate recovery of a well. Colmatation, arising from mechanical, chemical, and biological processes, leads to a decrease in reservoir permeability and deterioration of the formation's porosity and permeability properties. Special attention is given to the mechanisms of colmatation formation, methods for its diagnostics, and possible ways to minimize its negative impact. Experimental data and modeling are presented, confirming the need for a comprehensive approach to colmatation management to improve the efficiency of gas condensate reservoir development.

KEYWORDS

Colmatation, near-wellbore formation damage, enhancement of well gas condensate recovery.

INTRODUCTION

The cost-effective development of gas condensate fields depends critically on the reservoir properties (porosity and permeability) of the bottomhole zone (BHZ). Throughout the entire life cycle of a well—from initial drilling-in to repair-and-insulation work and routine production—the BHZ is subjected to intensive technogenic impact. This leads to the colmatation (clogging) of the pore space with dispersed particles, the swelling of clay minerals, and the degradation of the rock matrix. Physically, these processes manifest as an increase in the skin factor and a sharp decline in reservoir permeability.

The thermodynamic factor poses a particular challenge in the operation of gas condensate reservoirs. A drop in bottomhole pressure below the dew point (the pressure at which

condensation begins) triggers the fallout of heavy hydrocarbon fractions. The resulting "condensate bank" shifts the filtration process into a multiphase flow regime, creating a substantial additional barrier to gas inflow. Consequently, there is a need for a detailed analysis of BHZ contamination mechanisms. This paper examines the complex influence of technological and thermodynamic factors on gas condensate recovery and justifies the use of hydraulic fracturing (fracking) and hydrodynamic modeling to minimize hydrocarbon losses.

LITERATURE ANALYSIS AND METHODS

The reduction in the permeability of flow channels, numerically expressed through the skin factor, is a direct consequence of technogenic intervention and the clogging of the BHZ with

solid particles. These energy losses are particularly evident during well testing (WPT) under transient operating modes.

The process of colmatation (reservoir contamination) begins as early as the primary drilling-in stage. Not only do drilling mud filtrates penetrate the BHZ, but dispersed clay and cement particles also settle within the pore channels. Subsequently, colmatation can be exacerbated by the process of obliteration directly during the production phase.

A few key technological operations can be identified that provoke BHZ contamination:

- Primary drilling-in.
- Casing string cementing.
- Secondary completion (perforation).
- Hydraulic fracturing and repair-and-insulation work.
- Well killing and completion/workover.
- Direct well operation.

When the reservoir encounters fresh water or filtrates with differing mineralization, the thermodynamic equilibrium in the "clay – formation water – invaded filtrate" system is disrupted. This causes clay minerals to swell, obstructing the pore channels. Furthermore, during well killing or completion (especially in low-permeability reservoirs) using water-based fluids, silty deposits are formed. During production, the low mechanical strength of the reservoir leads to the destruction of the rock matrix: the produced sand settles at the bottom, forming a plug that partially or completely blocks the filtration system. Studies indicate that the combination of these factors can reduce the relative permeability of the BHZ by a factor of 5–6 [1].

CONCLUSION

The decline in the productivity of gas condensate wells is the result of a complex (mechanical, physicochemical, and thermodynamic) deterioration of BHZ properties. Colmatation, occurring during the construction and repair stages of the well, is significantly aggravated by the formation of a "condensate bank," which blocks gas inflow and leads to the loss of heavy fractions.

Radical methods are required to restore and intensify the inflow. The traditional and most effective solution is hydraulic fracturing (fracking). A fracking fracture allows for bypassing

the colmatation zone, increasing the contact area with the pristine reservoir, and substantially reducing local drawdown. This also alters the geometry of condensate dropout: it forms along the fracture and is effectively carried to the surface by the gas flow. However, to achieve maximum recovery factors and accurately predict the production profile, these multiphase processes in the "reservoir – fracture – well" system must be supported by precise hydrodynamic modeling.

REFERENCES

1. Ignatyev, A. E. (2011). "Modeling and study of the 'condensate bank' influence on the productivity of gas condensate wells with hydraulic fracturing." *Oil and Gas Business*, No. 9, pp. 19-24.
2. [Electronic resource]: Causes of bottomhole zone colmatation during primary drilling-in. Available at: <http://oilloot.ru>.