

Review of the Scientific Advisor for the dissertation thesis submitted on the Requirements for the Degree of Doctor of Philosophy (Ph.D.) in Petroleum Engineering (8D07202) Satbayev University by Durmagambetov Berik Oralovich titled "Hydraulic fracturing efficiency study and optimization of reservoir performance at the Arystan field"

"Mr. Durmagambetov, a doctoral student, has met all the necessary requirements for obtaining a Ph.D. degree. His research work titled "Hydraulic fracturing efficiency study and optimization of reservoir performance at the Arystan field" has been successfully completed

The relevance of the work

The technique of Hydraulic fracturing (HF) is considered a highly effective method for boosting well productivity in Arystan field and several other oil and gas fields globally. However, Mr. Durmagambetov's dissertation highlighted that the success of HF relies on various reservoir conditions, such as Kh values, formation pressure, and thermobaric conditions, which can trigger scale and corrosion issues. If these conditions are unfavorable, the efficacy of HF may be restricted, and the flow rates of producing wells may decline despite repeated hydraulic fracturing attempts. Through his research, Mr. Durmagambetov has shed light on these factors and their impact on well productivity decline, and his dissertation can help enhance the efficiency and effectiveness of HF, leading to greater oil recovery and improved reservoir management. Moreover, the practicality of the findings suggests their applicability in the field, making them valuable to both operators and researchers.

The research results, their scientific novelty, and practical value

The dissertation's primary focus on utilizing advanced techniques of fracture analysis and sensitivity studies through an integrated approach highlights its scientific and research-oriented nature, making it a valuable contribution to the production stimulation industry in Kazakhstan and beyond. The integration of laboratory

experiments, numerical modeling, and field measurements has resulted in improved comprehension of hydraulic fracturing processes and optimized fracture design. The use of sophisticated fracture geometry analysis techniques and fracture parameter sensitivity studies have shed light on the intricate mechanisms involved in hydraulic fracturing and identified the key factors affecting fracture growth and propagation. The Ph.D. student has implemented a Lagrangian approach-based Multiphysics hydraulic fracturing modeling software that has enabled more accurate and realistic modeling of the hydraulic fracturing process while considering various physical and mechanical factors. This has led to the provision of more precise and effective fracture designs, resulting in increased well productivity and resource optimization. Overall, the Ph.D. student's work demonstrates a high level of scientific research that contributes to the collective knowledge of the global community of petroleum engineers. The research meets the requirements for the Ph.D. thesis, and I recommend that the author, Berik Durmagambetov, be permitted to defend his thesis, as he deserves to be awarded the Doctor of Philosophy (Ph.D.) in the specialty 8D07202 – Petroleum Engineering.

Scientific adviser, PhD, associate-professor



D.A. Ismailova