



TEXAS TECH UNIVERSITY

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### Review

From foreign scientific advisor

To the PhD thesis of Iskander Gussenov on the topic: "Study of the possibility of gel forming polymers application for the productivity increase of oil wells" submitted for the requirement of a PhD degree in the specialty of 6D070800 - Petroleum Engineering.

Mr. Iskander Gussenov, a PhD student, has been working in the Laboratory of Engineering Profile at KazNTU n/a K.I. Satpayev since 2011. I met him in 2012 and agreed to be his foreign advisor in the USA. Since then, I am keeping eye on his research progress. In November-December 2016 he successfully passed through his research training at Texas Tech University under my guidance.

The PhD thesis of Iskander Gussenov was dedicated to the problem of water production management and productivity increase of oil wells through the application of polymer gellan gum. This problem is very urgent for the oil fields in the Republic of Kazakhstan. In this work, the possibility of gellan gum application for water shut off and conformance control treatments has been investigated in details. The author has conducted a complex scientific study at the level of modern enhanced oil recovery science. In his research, Iskander Gussenov used modern equipment and reliable methods of experimental analysis.

The thesis is well organized and clear. The literature review section (Chapter 2) contains very valuable information that was organized by the author in a systematic way in order to show advantages and drawbacks of the existing polymer-gel materials and technologies used for permeability reduction treatments in oil reservoirs.

I consider this work as novel since the author has experimentally found the effect of the injection of gellan aqueous solution on the plugging of the porous media at different permeabilities of the media, brine salinities and temperatures. The hydrodynamic behavior of gellan solution in homogeneous and heterogeneous reservoir models has been studied as well. As a result of his experimental studies, the author was able to outline the range of reservoir conditions under which the successful application of

gellan gum is possible. Moreover, the effect of the injection of gellan solution on the permeability to oil has been studied in this work.

Since all laboratory tests have been conducted by modeling the conditions of Kazakhstani oilfields, the obtained results are of high importance in terms of practical application. In fact, there are a number of mature reservoirs in Kazakhstan which are suitable for gellan gum application. It should be highlighted that the work contains not only the results of laboratory experiments but also the results of field pilot tests in which the author has participated together with his colleagues. The interpretation of the results of the field tests presented in the Chapter 4 suggests the high effectiveness of gellan gum for the treatment of fractured reservoirs or formations in which water channeling problem is caused by the discrete high permeability streaks.

In the course of his PhD program, Iskander Gussenov has participated in the publication of 11 scientific papers. In fact, one article titled "Plugging behavior of gellan in porous saline media" has been published in the Journal of Applied Polymer Science (IF-1.866). This proves the high level of the conducted research. Moreover, the publication of the paper titled "Application of Polymer Gellan for Injectivity Profile Leveling" at onepetro.org (SPE-172299-MS) demonstrates the interest of the Society of Petroleum Engineers to the research that has been conducted by Iskander Gussenov and his colleagues.

This PhD thesis meets all the requirements and is recommended to be defended by the author, Iskander Gussenov, since he deserves to be Doctor of Philosophy (PhD) in the specialty of 6D070800 – "Petroleum Engineering". If you have any questions or concerns, please feel free to contact me.

Sincerely,



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