

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Evgenii Kanin

**PhD Program:** Petroleum Engineering

**Title of Thesis:** Asymptotic models of coupled geomechanics/fluid mechanics phenomena of hydraulic fracture growth

**Supervisor:** Professor Andrei Osiptsov

**Co-supervisor:** Professor Dmitry Garagash, Dalhousie University, Canada

**Name of the Reviewer:** Dmitry Koroteev

I confirm the absence of any conflict of interest

**Date: 01-08-2022**

### Reviewer's Report

Evgeny's thesis covers theoretical research disclosing the effects of various hydrodynamical phenomena on hydraulic fracture (HF) dynamics.

The thesis is very well structured and reads perfectly. All the chapters, excluding the literature review, are devoted to separate phenomena influencing HF growth and accompanying phenomena: fluid exchange between the fracture and surrounding porous media, influence of polymeric additives (friction reduction agents), and, finally, yield stress rheology specifics effect.

The topic of the dissertation is fully relevant to the actual content. Evgeny uses classical asymptotic approaches for solving the differential equations. The approaches are absolutely relevant these days.

Evgeny has four highly rated Q1 journal publications on the topic of his dissertation. These publications support the compliance of the obtained results with the international research and the current state-of-the-art in HF engineering and applied problems of hydrodynamics.

I only have one suggestion for Evgeny to consider before the defense. Talking practical application of his study, I would like to see some kind of ranking of the importance of the studied effects for the actual success of HF job in various geological formations with various HF fluids, proppants etc. This would make a better fit for the petroleum engineering direction of Evgeny's thesis and may act as some kind of the recommendations list for advanced HF designers.

Overall, I fully support Evgeny's thesis as being applicable for the PhD defense. I have no doubt that Evgeny matches the PhD level.

**Provisional Recommendation**

*I recommend that the candidate should defend the thesis by means of a formal thesis defense*

*I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

*The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*