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## **Sylurian shales hydraulic fracturing operation quality assurance as a key of successful treatment – case study**

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The first hydraulic fracturing of the sylurian shale gas formations in Poland was performed in 2013. Relatively deep shale formation, high stress anisotropy, ultra-low permeability and limited net-pay, challenged completion engineers from the very beginning. Therefore, hydraulic fracturing operations were prepared and performed with high concern and scrutiny. One of the most crucial part of the completion success was treatment fluids and proppant quality control and assurance.

In order to assure the qualitative performance during either slickwater or gelled stimulation treatments, the operator contracted independent research company to survey fluid parameters and proppant compliance with ISO standards. Thus proppant control was carried out based on the ISO 13503-2 standard. Proppant sieve analysis its strength, and amount of impurities were the most crucial tests. The survey of treatment fluids rheology and in-fluid proppant concentration was done using samples collected during the treatment. Rheological properties surveys were carried out based on ISO 13503-1 standard. Quality Control for multi-stage hydraulic fracturing was performed in the laboratory before the treatments and on-site during the treatment.

All surveys were carried out irrespectively of materials and information provided by service companies, supplying the fluid and proppant. The objective of the proppant and treatment fluid laboratory survey was to verify fluid, proppant parameters and confirm the compliance with treatment design. As a consequence of the control, multiple deviations from the declared or designed parameters were stated. In most cases the revealed variances were within acceptable limits. However, in a few samples variances, which could have impacted on quality and simultaneously efficiency of the operation, were noticed. Surveys outcomes and variances' remarks were reported to the operator representatives. All the variances have been analyzed to find their causes and to eliminate similar occurrence in the following treatments. The design assumptions and detailed evaluation of the treatment performance is going to be presented in the paper.

The detailed quality control of fluids and proppant during the shale gas completion operations in Poland is, above all, aimed at ensuring high quality of the works performed. Their failure-free performance in order to obtain the best effect was also the most important. In addition to developing good practices of co-operation by the operator with service company and an independent company performing quality control during hydraulic fracturing operations.



