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Deep energy and oil inflow testing for reservoir's resource supporting

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In Tatarstan, one of the Russian oil producing regions, sedimentary deposits are underlain by the Archean and Proterozoic crystalline basement at a depth of 1,900-2,000 m subsea. Oil saturated strata in the giant Romashkino oil field cross - section are found throughout the sedimentary section, from 750 m to 1,900 m depth.
Since 1999, TatNIPIneft Institute has been carrying research of the hypothetical deep oil inflow from basement. This assumed phenomenon is of huge interest from the scientific and practical standpoints, since it incorporates nonconventional approach to the most urgent problem of today's oilpatch – increase of recoverable reserves in the fields under production. Analysis of geologic and production data from a number of producing areas, as well as compositional and physico-chemical analyses of the Devonian crude samples showed a number of anomalous results.
As have been shown in our reports earlier are some indirect indications, which support our hypothesis of the deep oil inflow into the D1 and D0 Devonian formation strata of the Romashkinskoye field western areas.

It's known that huge energy flow penetrate Earth from nucleus to surface. On the base of our previous research results we planned stimulation test for evaluation of deep thermodynamic energy inflow, which is an extremely important for basement – sedimentary formation connectivity identification. Pilot with 7 production wells in Devonian formation and one basement completed well on the perspective area of Romashkino oil field have been chosen. We injected tracer and then implemented minifrac in basement completed well for creating high-conductivity communication between pilot's wells. We sampled oil and associated water before and after minifrac.
Four wells demonstrated positive and two well negative oil production rate change with different duration. One well had instable pre and post frac history. Results of analyses showed different reaction of wells on minifrac. Part of the samples contented lighter and lower viscous oil as another part contented heavier oil in comparison with stable pre-fracking value. Abnormal fluid and oil production rate changes have been registered in part of wells and they couldn't directly refer to viscosity and density values of produced oil samples.

Thus, the first results of our research allow us to evaluate energy inflow channels influence on pilot fluid distribution and develop possible stimulation program for deep energy and oil inflow management.