

# ANALYSIS OF THE EFFICIENCY OF HYDROFRACTURING OF THE FORM

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The fracturing process can be divided into three stages: creating a crack, maintaining it in an open state, and pumping the fracturing solution from the well.

In order to create a crack in the formation, it is necessary to increase the rock breaking factor. This is achieved by pumping a certain solution into the formation at a rate faster than the one at which the formation could accept. The pressure of the injected liquid is increased until the compressive forces in the formation increase and the rock does not break [1, 2].

When a crack appears, proppant is added to the solution, which is carried into it by the flow of liquid. The concentration of proppant will increase until it provides a good crack seal. When the process is complete, the pressure is reduced, the proppant holds the fracture open and conducts reservoir fluids.

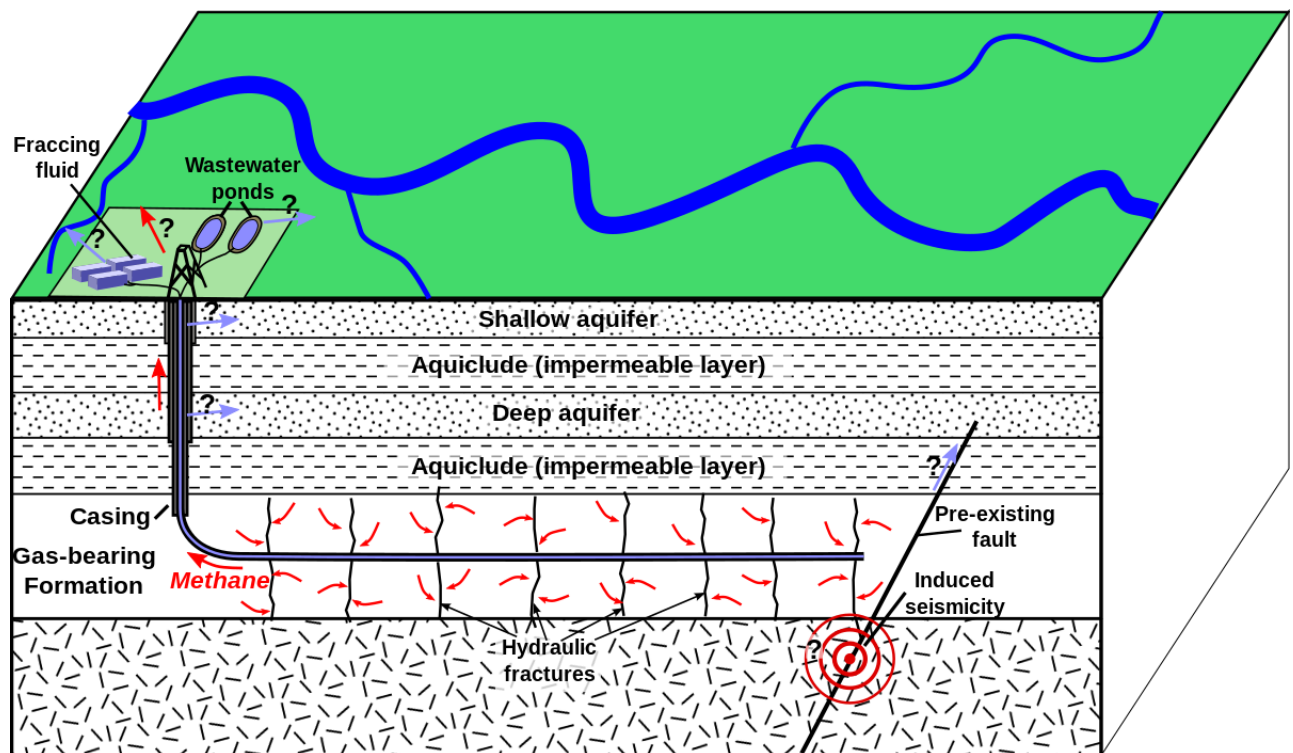


Fig. 1 Hydraulic fracturing

Before starting oil production from the well after fracturing, the solution used for fracturing should be pumped out. Thickening additives must be removed from the hydraulic fracturing solution. Deep temperatures can vaporize this solution, making it easier to extract. All thickened solutions injected into the well have a break point, so it is important to follow the scheme [3, 4].

The fracturing technology includes the following main stages:

- fracturing parameters are calculated: volumes of fracturing fluid, fluid-sand carrier, filler and supplied liquid;
- the well is prepared - special fittings are installed; let downpacker;
- depending on this, the number of pumping units required for hydraulic fracturing is set;
- the process of injection of fracturing fluid into the well should be carried out with a productivity that exceeds the absorption capacity of the well by 3 times;
- after fracturing the formation, liquid is fed into the well-sand carrier;
- after the end of liquid injection-sand carrier fluid is supplied to the well to pump the sand carrier fluid into the formation.

Fluids that do not differ from formation fluids are used as fracturing fluid. In order to reduce the filtering properties and increase the wedging effect, the viscosity of fracturing fluids can be increased by the addition of various thickeners [5, 6].

Work agents must meet the following requirements:

1. Should not reduce the permeability. At the same time, depending on the category of the well (extraction; injection; extraction, converted to water injection), working fluids of different nature are used.
2. The contact of working fluids with the rock or with reservoir fluids should not cause any negative effects physicochemical reactions, except for the use of special working agents with controlled and directed action.
3. They should not contain a significant amount of extraneous mechanical impurities (that is, their content is regulated by each worker agent).
4. When using special working agents, for example, oil-acid emulsion, the products of chemical reactions must be completely soluble in formation products and not reduce the permeability.
5. The viscosity of the working fluids used must be stable and have a low solidification temperature in winter (otherwise the fracturing process must be carried out using heating).
6. Must be available, not in short supply and inexpensive.

The sand-carrying liquid should have the ability to keep the fracture-sealing agent in suspension and penetrate well into the formation. Viscous liquids are used for this - oil, emulsion, sulfite - alcohol bard [7].

The proppant acts as a support fracture, forming fractures with sand with a certain size of high conductivity, so that oil can easily flow into the well through the fracture and increase the production and injection effect [8].

The proppant is designed to prevent the crack from closing after the end of injection. Proppant is added to the quench fluid and pumped in with it. In the production of hydraulic fracturing, in order to regulate settling processes, methods of proppant injection of various fractions are used. An example of such technology can be the injection of the main volume of sand or medium-strength proppant type 20/40, followed by the injection of medium- or high-strength proppant type 16/20 or 12/20 in the amount of 10-40% of the total volume. At the same time, the following goals are achieved [9, 10, 11].

- fixing the crack with high strength proppant in the vicinity of the well, where the compression stress is the highest;

- reducing the cost of operations, as ceramic proppants are 2-4 times more expensive than sand;
- creating the greatest conductivity of the crack at the edge a hole, where the speed of fluid filtration is maximum;
- prevention of carry-out proppant into the well

The main proppant used in the deposit is quartz sand and expanded clay. If the closing pressure exceeds 40 MPa, only expanded clay will be selected. Proppants are selected according to well depth and shut-in pressure.

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