

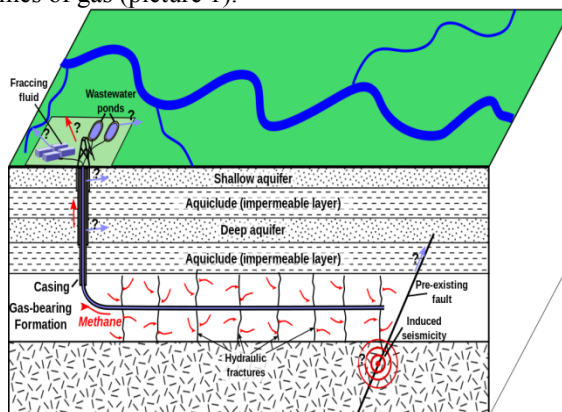
## EXTRACTION OF SHALE GAS BY THE METHOD OF HYDRAULIC FRACTURING OF THE FORMATION

New mining technologies are developing day by day. Now, people are looking for new technologies and ways to extract fossil fuels. One of the promising directions is the extraction of shale gas.

Shale gas is a natural gas containing up to 95 % of methane, located in clay sedimentary rocks in small quantities, about 2-3 %. On the ways and friendliness-to-environment of shale gas extraction, there are ongoing discussions. In Ukraine, shale gas is deposited in Ivano-Frankivsk, Lviv and Donetsk regions.

Determine the advantages of shale gas by the method of hydraulic fracturing of the formation.

The method of extracting this gas, proposed for Ukraine by Shell, is a break-up method. Hydro-breakdown of a formation is a technology of shale gas extraction with formation of cracks in the rock and injection into them of a fluid with a splitter for the flow of plate fluids into the well after the completion of the process. The very method of hydraulic fracturing will provide high-quality extraction with large volumes of gas (picture 1).



Picture 1 – Scheme extraction of shale gas by the method of hydraulic fracturing of the formation

The technology of extraction is quite simple - in the wells special liquid for hydraulic breakage at a certain pressure and at a certain speed is pumped into the well to stimulate cracks and fractures in the formation from which shale gas is planned to be produced.

At the first stage, as with the traditional extraction of natural gas, drilling of a vertical well is carried out. When the wells reach the shale rocks, the direction of drilling varies horizontally and the trunk of the well dip into the thickness of the shale formation. The length of the horizontal well can reach 1 km.

Later in the well is installed steel sheath, through which pumped cement to create a frame around the steel sheath. The cement is pumped up to the end of the steel sheath, leaving it empty and creating an additional cement layer around.

At the next stage, a special perforator containing an explosive mixture is lowered into the well. An explosion is initiated, which forms cracks in the steel sheath, the cement and the thickness of the slate rocks. The number of similar explosions in one horizontal well may reach 8-12 when performing a multi-stage burst.

After the formation of cracks at a depth of 1000-5000 meters, a fluid for hydraulic fracturing is pumped into the well under pressure.

The liquid for hydraulic fracturing consists mainly of water, and also contains sand that acts as a disintegrating agent, and additional chemicals.

The disintegrating agent enters the formed cracks and faults and ensures their conservation in order to release the natural gas contained in the thickness of the shale formation. After initiation of the formation of cracks and faults in the reservoir layer, the injection of fluid continues to deepen. The volumes of the required liquid depend on the geological characteristics of the shale breeds and the desired length of faults [1].

Gas from separate holes is concentrated in one place and pumped through the well to the earth's surface. For one well from 9 000 to 29 000 m<sup>3</sup> of water is needed, but from 1 300 to 23 000 m<sup>3</sup> of water with impurities returns to the surface.

Extraction of shale gas can be a good start for small and medium-sized businesses in Ukraine with the help of international investors and well-known shale gas exploration companies such as Shell, Exxon Mobil, Chevron and ConocoPhillips.

According to rough estimates, the number of stocks is from 1,2 to 7,0 trillion m<sup>3</sup>, which can be used for the power industry. The cost of shale gas extraction is approximately 150-180 \$ per 1,000 m<sup>3</sup>, which is cheaper than traditional gas extraction.

Concerning the negative effects on the environment, scientists distinguish poisoning of groundwater, cracks in the earth's surface, reduced soil fertility and high water consumption for mining technology.

Therefore, gas plays an important role in Ukraine's energy sector (more than 40 %). Natural gas' prices are increasing, so Ukraine is forced to look for new gas fields in its territory. With the modern technology, the extraction process becomes environmentally friendly.

### List of references:

1. Технологія гідравлічного розриву /<http://shalegas.in.ua> [Електронний ресурс]. Режим доступу: URL: <http://shalegas.in.ua/fracking>