

Міністерство освіти і науки України
Північно-Східний науковий центр НАН України та МОН України
Національний університет
«Полтавська політехніка імені Юрія Кондратюка»

Тези

**72-ої наукової конференції професорів,
викладачів, наукових працівників,
аспірантів та студентів університету,
присвяченої 90-річчю
Національного університету
«Полтавська політехніка імені Юрія Кондратюка»**

Том 2

21 квітня – 15 травня 2020 р.

Полтава 2020

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EFFECT OF MAGNETIC FIELD ON ASPHALT, RESIN, PARAFFIN AND SALT DEPOSITS

Asphalt, resin, and paraffin deposits (ARPD) are one of the most serious complications in downhole oil production. They increase the filtration resistance of oil-bearing layers, clog the pores in the rock, and their deposits reduce the useful section of tubing and pipelines, while not taking countermeasures until their complete blockage. Asphalt, resin, and paraffins (ARP) decrease greatly overhaul period of the well (sometimes to 1–2 days), increase coasts and decrease the oil production [1].

The production of high-paraffin crude oil also creates significant environmental problems because of ARP are serious polluters of the environment. The deposits typically consist of the paraffins, resins and asphaltenes, wherein the total content of these components, the composition of each, and their ratio to various fields varies widely. Mainly, the composition consists of the paraffins (from 5 to 70 %); asphaltene and resin content may reach to 20%, moreover, in larger quantities of oil the latter are present in smaller amounts in comparison with resins [2].

Considerable problems in oil production can be created by the deposits of inorganic salts on the walls of tubing and equipment. Such deposits often form a very dense and mechanically strong layers, which not only reduce the cross-section of pipelines, but may even lead to jamming of moving parts (eg. submersible pumps), and its failure. To prevent, reducing the growth ARP and inorganic salts deposits and their removing, different mechanical, physical and chemical methods are used. Moreover, chemical methods became the most widespread. Thus, according to [3], a variety of chemical compounds are currently being processed about 10% of the wells complicated by ARP [1]. However, the use of chemical methods of protection against ARP deposits and organic salts, substantially increases the cost of oil, and often exacerbates environmental problems. However, the use of chemical methods of protection against deposits of paraffin and organic salts, substantially increases the cost of oil, and often exacerbates environmental problems.

The simplicity of the procedure, consisting in the fact that the flow of the fluid flows through the gap between the poles of a magnet or the solenoid powered electric current, stimulated experimental work on a wide range of objects. Therefore, in the following years, magnetic treatment was applied not only for aqueous salt solutions but also for oil, motor fuels, solutions of polymers, drilling muds and cement, plant seeds, blood, etc. By using magnetic treatment the salinization was eliminated even when irrigation water with high

salt content prevents the deposition of minerals and organic substances in the production and transportation of oil and water, achieved a significant reduction in viscosity slurries, etc. Widespread use of magnetic treatment was found in medicine to improve the condition of blood vessels, cleaning the blood from toxic substances, lowering a blood pressure [2].

However, in the early years, it was noted that the effects are not always repeated even for externally similar objects and processes. The effect of the magnetic field strength of several hundred oersteds on insensitive to such fields non-ferromagnetic materials – water, oil, blood, animal tissues and plants surprised greatly. All this has led to the fact that with respect to the magnetic effect two opposite opinions were formed: first – quackery and the result of "dirty" experiment, the second – at the heart of magnetic treatment are still unknown in the physics the fundamental properties of the matter. The scientific community is divided into the enthusiasts who continue to investigate the effects of magnetic treatment and the skeptics who did not take seriously the regular reports of the successful use of magnetic treatment.

However, in practice the application of magnets for specific oil fields, there are numerous cases where the magnetic treatment of oil does not give positive results. Available setbacks to some degree discredited the technology of magnetic treatment in the eyes of oil-industry workers. Because of this, the conditions under which the magnetic field prevents the formation of solid ARPD, until recently, remained unclear. Considering the experience of these installations operation must meet the following requirements:

- geometrically fit into the design of deep-pumping unit and does not to create a large hydraulic resistance;
- to ensure consistently the treatment of production fluid by a magnetic field with intensity of 20 - 40 kA/m, for at least 2-3 years;
- magnets should be secured and protected from aggressive action of products.

We proposed an original method for multi-reverse fields using a chain of permanent magnets. Using the device of this type, you can get multi-reversal (with a small number of reverse) magnetic field with predominantly perpendicular direction to the of fluid flow lines, with high intensity and gradient [2].

Література

1. Вахитов Г.Г. *Использование физических полей для извлечения нефти из пластов* / Г.Г. Вахитов, Э.М. Симкин. – М.: Недра, 1985. – 300 с.
2. Каган Я.М. *Влияние переменного электромагнитного поля на кристаллизацию и образование отложений парафина* / Я.М. Каган // НТС. Нефтепромышленное дело. – 1965. – № 10. – С.16–19.
3. Классен В.И. *Омагничивание водных систем* / В.И. Классен – М.: Химия, 1978.– 240 с.