

Nano Science 2016: The role of nano systems in oil and gas production - Valeh Shamilov -State Oil Company of Azerbaijan Republic

Abstract

Today nanotechnology is one of the prospective and rapidly developing areas in the world. Innovative technologies intended to advance efficiency and decrease costs in the oil and gas industry are also being advanced in Azerbaijan. Development, research and application of nanotechnologies from the sequences of advanced technologies are of interesting issues. Prevention of salt and sand deposition, expansion of hardly extractable remaining oil reserves having non-Newtonian belongings, protective actions against the corrosion and paraffin deposits mainly in the oil and gas manufacture, are the difficulties that need to be resolved. To study the properties of the advanced metal nanoparticle based nano systems in the hydrocarbon medium, the studies have been carried out on the reservoir-well system reproduction model, and the mechanism of motion in three phases- oil, gas and water were studied. Based on conducted wide analytical research the variations of the rheological properties of oils after nano-effect were confirmed, and the obtained stable and maintainable nano systems have been exposed. As the use of these technologies allows an increase in retrieval factor and carrying out development processes in more effective way, they are functional in the field-industrial scale in the under declared areas, and high efficiency is achieved. An removal of remaining oil reserves; the anticipation of sand flow from the creation to the bottom of the well; and the removal of salts formation in the collectors, discharge lines of wells and lift pipes. As a result of the application of developed nano

systems, oil production increased by 10-15% according to the directions, the inter repair period of wells increased, repair-related waste of time is limited, additional expenses and labour costs are reduced, and the period of operation of the downhole equipment and transportation systems is extended.

In a world where quick access to grease isn't any more the norm and extreme exploration and production scenarios dominate, the petroleum industry is facing new and difficult technical challenges for complying with the growing global energy demand. Critical difficulties associated to distant locations (such as ultradeep water and arctic atmospheres), severe surroundings (high-temperature and high-pressure formations), non-conventional oil reservoirs (heavy oils, tight gas, tar sands, etc.) can be faced and solved because of strong scientific developments, which are just not there yet. In the last 20 years, nanotechnology has brought numerous well-recognized practical advances during a good selection of research/scientific areas like aerospace, biology, and medicine. Recently, the refining industry is additionally viewing nanotechnology with growing interest and expectations. Currently, the complete goal is to bond the gap between the purifying industry and therefore the nanotechnology public using several creativities like groups between oil and repair companies and nanotechnology excellence centres, networking societies, workshops and conferences, and even dedicated study units inside some oil companies. The reason for this is often that

the overall perception is that nanotechnology might become a key think about all branches of the petroleum industry: from asset exploration to well drilling and completion, from manufacture to reservoir monitoring and administration. However, quite surprisingly, albeit tons of dialogue is happening, little research on these topics is currently being undertaken round the world by the petroleum industry. A very different attitude was demonstrated by other industries, and therefore the advances they achieved were outstanding. This paper provides an summary of the foremost interesting nanotechnology applications and critically highlights the potential benefits which will come from transposing the same-or adapted-solutions to the refining industry. As widely illustrated, some technologies which are previously existing off-the-shelf could offer real developments in handling some specific difficulties with the oil industry.

Other technologies would require further elaboration before direct use, but their potential is gigantic. The key question is whether or not the refining industry is prepared to require advantage of the opportunities offered by this branch of science and to take advantage of evident possibilities of cross-fertilization with other disciplines which only appear distant from the refining industry. Nano technologies are widely used in the oil industry. For 12 years, the Department of nanotechnology of SOCAR engaged in the

development and implementation of various nano systems in oil industry: Drilling, to increase oil production, against sand flow and the sedimentation of salt, cleaning reservoir water. In the applied nano systems are used different size of nanoparticles of different metals, different concentrations and various polymers. The experiments which are done over years show that, to get needed result it is not only important the nanoparticles used metal, but also, dimension of nanoparticles is the important factor. By the authors were prepared nano systems with using water-soluble polymers and aluminium and copper metal nanoparticles with dimensions 20-40 nm, 40-60 nm and 60-80 nm. It was compared the rheological characteristics of various nano systems used in the oil industry. As it can be seen from that the surface tension reduces with a decrease in the dimension of the nanoparticles. This fact lets to use nano systems as an agent for the displacement of oil. From the other part, it displays that in decrease of surface tension nanoparticles Al are more effective than the Cu nanoparticles. The reduce measurement of nanoparticles, cause the start of chemical response and increase total area of nanoparticles and the effect area of nanoparticles. Nano systems organized on the basis of water-soluble polymers and aluminium nanoparticles are more efficient than similar nano systems copper nanoparticles in oil movement as an agent.

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