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MEANS AGAINST SETTLEMENT OF DEPOSITS

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Abstract

A new method for removing high molecular organic deposits left by crude oil and natural gas with the help of a new patented preparation.

Key words: deposits; settlement; removing; natural gas.

1. Introduction

Secretion of deposits in oil and natural gas mining operation in various parts of technological equipment is a world wide problem, which has not been fully removed despite the years long effort of many scientific and research institutions, namely because of specific features of materials extracted in individual mines. These depositions limit the smoothness of the extraction of natural gas and crude oil also in the mines of the Moravian Oil Mines, joint stock company, where the temperature of the material in the collector rises approximately 1°C every 30-33 m. That is why it reaches about 50°C in the depths around 1500 m. To this fact correspond - among others - the change of viscosity of the extracted crude oil, the solubility of the natural gas in crude oil, etc.

Generally speaking, removing of depositions from the mining equipment in oil and gas mines can be solved either at the phase of creation of the deposition or after its sedimentation on the mining equipment, it being understood that the phase of creation is especially connected with wells and surfaces of the technological appliances.

Removing of eliminated depositions can be carried out – irrespective of the economical aspect – in several basic ways. When applying chemical methods substrates can be used which dissolve the depositions, emulgate or disperse them. When using thermical methods, the material being extracted must be warmed up to such temperatures when creation of depositions does not occur, or when the already existing depositions from the period when the extracted raw material was not sufficiently warmed up, dissolve. The most demanding is the mechanical way, when wells are cleaned by various types of scrapers or so called clamps, or when the gear through which extracted materials proceed is cleaned with special wiping equipment, called pull-through plunger. Combined ways consist in combination of various procedures.

Having evaluated starting information and requirements, chemical means became our target, because its application would be technologically the easiest one, especially because of the wells in the field, economically the most interesting and it would solve a number of linked problems, e. g. liquidation or use of the deposition substance resulting from the cleaning.

2. Description of the samples of deposition

The development of the means was studied with the assistance of well samples taken in extraction localities – Žďánice and Dambořice. These samples were taken both from activities above the ground and extraction wells below the ground.

Samples taken in conformity with the operational terminology represented two elementary types of depositions: „soft paraffin" - it had a softer, mashed consistency – see picture 1

– and „hard paraffin" - it had a more solid pore-type structure – see picture 2. In laboratory tests it appeared to be worse dissolvable. The content of ashes in samples taken away was within the limits of 1 – 3 % wt.

Picture 1 Sample of deposition entitled „Soft Paraffin"

Picture 2 Sample of deposition entitled „Hard Paraffin"

3. Methods used in developing the means

On the basis of classical analyses, gas chromatography and substance spectrometry, organic liquid standards were first tested as solvents. At the following stage, mixtures of hydrocarbons, heterocycles and thereafter addictions of superficially active anticorrosion components were tested. The main targets that the means being developed had to meet, were the following: To transfer an as big a part of the deposition as possible under temperatures and pressures being applied in technological practice into a pumpable consistency, when the obtained liquid – the suspension of the means and of the dissolved depositions – could be transported without evident problems through the existing product ducts. By the effect of the means on depositions no huddles or curdles or slag inclusions should arise, which could in the course of extracting cause blocking of various technological parts.

4. Evaluation of laboratory research

Because long-term laboratory tests reliably verified that the subject means dissolves all types of the taken samples, does not interfere with the packing, does not create huddles or curdles, suspensions, emulsions and does not show any corrosive effects, an application to register this means as an invention was submitted [1].

5. Operational tests of cleaning of the above-ground technological parts

5.1 Pipeline systems

Blocked pipeline for the transport of crude oil from the extraction well into the extraction centre was after the decompression of crude natural gas gradually filled with the generated means by a pump. After a few hours of static activity, the ends of the pipeline were opened and an external pump was engaged pressing adjusted oil into the pipeline, thus driving out the mixture created by the dissolution. As documented by pictures 3 and 4, the passability obtained by the effect of the means was very expressive.

The effect of the developed means was - among others - also tested on removal of depositions from a desk heat exchanger used for decreasing viscosity of crude oil. This one was filled to such an extent that the flow of crude oil at the temperature of about 20°C, cleared of natural gas ensured by a pump, did not exceed 2 l/min. After circulating the means for half an hour over the exchanger, the desk heat exchanger was cleaned to such an extent that the flow of crude oil increased to the original 50 l/min. By a visual inspection after dismantling its front wall it was demonstrated that its surface was completely cleaned of depositions - see pictures 5 and 6.

Picture 3 Transport duct of crude oil before the application of the means

Picture 4 Transport duct of crude oil after the application of the means

Picture 5 Cleaned warmth exchanging surface of the warmth exchanger

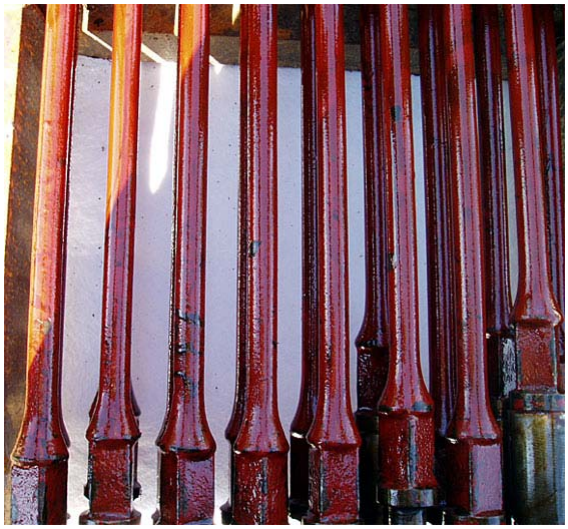
Picture 6 Cleaned warmth exchanging surface of the warmth exchanger

5.2 Cleaning test of the extraction well in the field

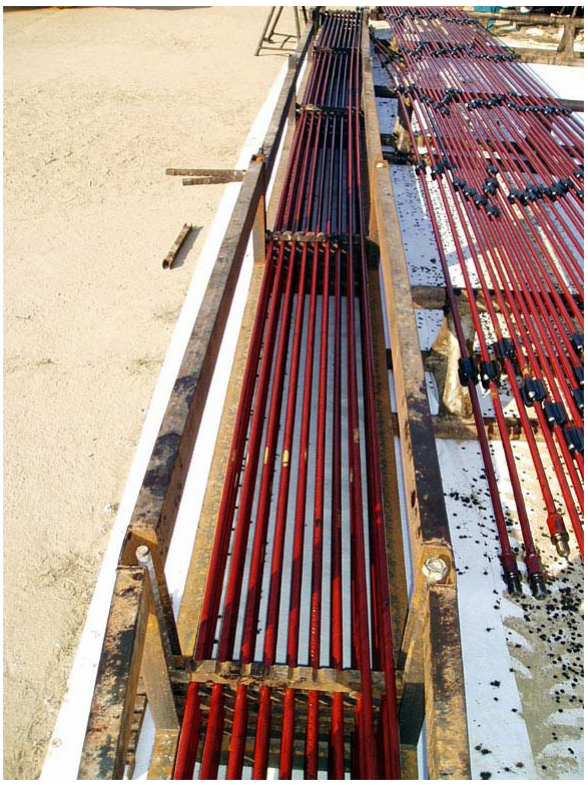
A technological test of the solubility of depositions was carried out on the extraction well of the mine Žďánice which had to be put out of service in consequence of plugging.

The test itself was organized as follows: The carburizing aggregate was attached to the ring of the probe and filled with cca 4 m³ of the means. Thereafter, with the help of a tank-truck, 20m³ of oil were pushed into the well. After an effect of several hours a pump was switched in. The effect was so significant that extraction was restored in full extent.

Also in this case, after a detailed verification whether depositions were removed from the well, the whole gear of the extraction well was pulled out. As pictures 7 and 8 prove, the several hundred metres long extraction well was through the effect of the means fully rid of all depositions until the level of the extraction horizon.



Picture 7 Cleaned extraction poles



Picture 8 Cleaned extraction poles

6. Conclusion

Using the newly developed means [1] in the technological practice consists in removing the existing very demanding procedures connected with the removal of depositions from various parts of the extraction equipment.

The simple and easy application of the new means will very meaningfully shorten the period of the time of laying off the equipment from extraction because of cleaning of the wells, filled ducts of products and various follow-up surface appliances. When using the means, costs for pre-heating of crude oil, indispensible for its transport, will be decreased. A non-negligible priority of the means is its using in a very simple cleaning of the storage space of crude oil. The exclusion of the present technologies connected with mechanical and steam cleaning of the extraction equipment also means a noted contribution to the protection of the environment, improvement of the working milieu, decreasing the quantity of various types of waste, etc. Last, but not least, there are positive facts that the developed means is economically accessible, can be easily prepared and stored, as well as the possibility of using the products obtained from cleaning technological equipment. Using the developed product means a unique no-waste technology of cleaning of sub-surface and surface extraction equipment. Having in mind operational results, the application of the means might also be considered for cleaning various ducts of products in petrochemical technologies.

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Literature

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