extinction by atmospheric sea salt Aerosol in arctic in accumulation mode, and compared it with similar data measured by AERONET open aerosol network run by NASA [3]. The results of simulation are shown in Figure (A). It is compared to the data measured by AERONET on NY_Alesund site in Figure (B).

The modeled extinction uses similar particle sizes and optical properties (Arctic sea salt aerosol in accumulation mode). After comparing coefficient values at different wavelength, it is noticeable that the values for second curve are the closest representative for measured values. That makes sense, since $350 \cdot 10^3\ l^{-1}$ is the most common number concentration for Arctic sea salt aerosol. This works as the basis for further investigations in this field.

Conclusion

In this work we've developed a software complex for modeling incident radiation extinction for sea salt aerosol in Arctic conditions. The software complex work was tested and compared with experimental data gathered by AERONET aerosol network. The acquired results show the software complex usability for studying and researching Arctic aerosols. Researches based on optical methods can be applied to a number of problems, such as managing ecological situation, detecting pollutions, investigating the effect on global warming and many more.

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RUSSIAN PETROLEUM INDUSTRY IN THE ARCTIC: IN THE STATE OF PRIRAZLOMNAYA FIELD

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Development of offshore oil and gas fields in the Arctic has been widely discussed all over the globe during the last decades. Unsurprisingly, as one of the world leaders in oil and gas production Russia pays much attention to the Arctic territory as well. There are many discovered fields in the Arctic and many to be discovered in the near future. This article describes Russian experience in offshore production in the state of Prirazlomnaya oil field.

The oil field was discovered on Pechora Sea shelf 60 kilometers off the shore in 1989. Water depth varies from 19 to 20 metres [1]. It is currently the only Russian Arctic offshore petroleum production project. However, Russian companies have many plans to develop other fields in the Barents, Kara and the Sea of Okhotsk. As for the strategy, the comprehensive approach is to expand the production area by developing group of closely located fields, which optimizes cost and creates conditions for the simultaneous development of large and relatively small offshore fields.

The Prirazlomnaya oil field recoverable reserves are more than 70 million tons. Oil production was started in December 2013, with about 300,000 tons of oil produced over the course of 2014. The millionth ton of Russia's first Arctic oil was produced by November 2015. When the production reaches its maximum, an annual production level will be around 5.5 million tons. Since oil produced at the Prirazlomnaya significantly differs from any other presented at the market, the new type of it was created and named ARCO (Arctic Oil) to enter the global market in April 2014. ARCO is known for the high density (around 910 kilograms per cubic meter), an increased concentration of sulfur and low paraffin content, which means it is well suited for deep processing in Northwestern Europe, as it rather heavy compared to the standard Russian export oil called Urals. After the processing ARCO can be used to make chemical products used in road-building, rubber tire manufacturing, space industry and pharmaceutics.

In order to produce oil offshore it is needed to use a platform or FPSO (Floating Production Storage and Offloading vessel). For the Prirazlomnoe oil field an offshore ice-resistant oil-producing stationary platform was built and towed to the place. The topsides were based on the former UK North Sea Hutton tension leg platform. After the upgrade in Severodvinsk the new platform has a filed life of 50 years and costs about $800 million [2]. Anchored to the seabed, the platform is designed for operation under harsh climate environment, strict ecological limitations and the most stringent safety requirements and it is resistant to maximum ice loads. Arctic conditions are severe: constantly changing wind and sub-zero temperatures prevailing for almost five months of the year, ice cover in place from November to May, and under polar night, which means darkness 24 hours per day, for almost two months every year. The topsides weigh about 39,000 tones having a single derrick and 40 wells slots (Figure 1). The topsides are located on a 126 square metres caisson, which weighs around 97,000 tones. In this caisson there are 14 oil storage tanks with capacity of 113,000 square metres, and two water storage tanks with capacity of 28,000 square metres. The facility has an oil and gas production capacity of 22,000 tones a day and one million cubic metres, respectively. It can also inject 32,000 cubic metres of water per day [3]. As for the offloading and export, it is carried in two stages. Tankers transfer oil from the platform to Murmansk where oil gets customs clearance and then transferring further to Rotterdam to the customers. There are also two icebreakers for assisting the tankers as well as carrying out safety and environmental tasks.

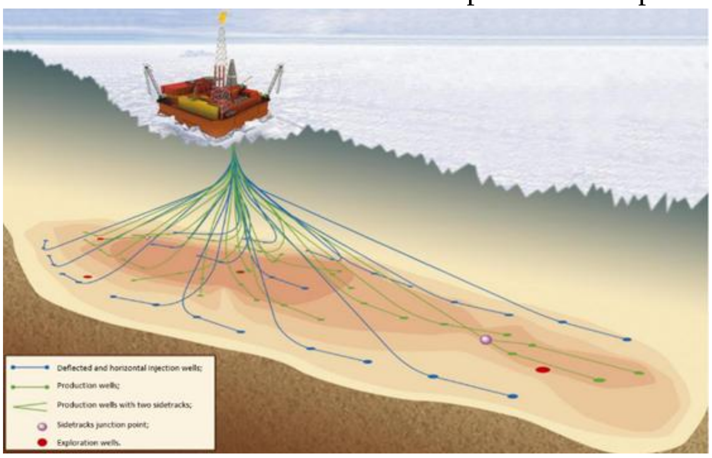

Figure 1. Prirazlomnaya Wells Placement Scheme [1]

The platform is used for all production operations including drilling, oil extraction, storage, treatment and offloading. All the wells are drilled using the equipment installed at the platform and the wellheads are located within the platform, while its foundation serves as a buffer zone between the well and the open sea. The buffer zone is surrounded by three metres thick walls made of concrete and steel ensuring full isolation of wells from the environment. Besides, there is a 'zero discharged' system integrated into the platform to prevent the discharge of any production or drilling waste. Following the safety requirements the equipment installed at the wells is meant to prevent blowouts of oil and gas and the offloading line used to transferring oil to tankers is equipped with an emergency shutdown system that can be activated instantly. There is a special round-the-clock monitoring system consisting over 60 detectors tracing the changes in its operation. As it was mentioned, safety issues are an overriding priority for the companies dealing with the Arctic offshore petroleum production. Taking account of both international best practice and the requirement of Russian legislation, there was developed a detailed plan for the prevention and control of potential oil spills. Regular emergency training and response drilling are undertaken in the area where the rig is located to ensure maximum team skills and knowledge in the event of any emergency both offshore at or near the platform or onshore to protect coastal strip.

In conclusion, offshore petroleum production in the Arctic demands both technological innovation and safety assurance. It is necessary to use robust equipment able to work in extreme weather conditions without a chance to make mistakes. That is one of the reasons why Arctic offshore fields are developed quite slowly. Petroleum companies must be sure they reach the required level of technology and have enough amount of resources to deal with yet dangerous but promising area for the industry. Prirazlomnaya oil field is the first step in Arctic development, which is a great opportunity to get experience and improve offshore production technology even more.

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OILS PROPERTIES BASED ON FOURIER TRANSFORM INFRARED SPECTROSCOPY IN ARCTIC WESTERN SIBERIA

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Immense hydrocarbon reserves are associated with the Russian Arctic, but theirs production and transportation are a difficult engineering task. Russia takes the leading position in the number of the northern oil and gas fields among all Arctic states; in addition, the oils within the territory are characterized by low viscosity. This fact attracts the oil companies and the government to begin exploration and development of the Russian Arctic.

Even within the Arctic region, each oil is unique in terms of composition and physical-chemical properties, which requires an individual approach when choosing a rational method of production, transportation and processing of hydrocarbons. The methods of FTIR spectroscopy and GC-MS are the most sensitive and informative methods to investigate organic and inorganic compounds structure. Therefore, the goal of this study is to investigate the application of infrared spectroscopy for the analysis of crude oils within the Russian Arctic.