

# Analysis on New Technology and Development of Oil Production Technology in Offshore Oilfield

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**Abstract:** *With the sustainable development of China's economy, the demand for energy, especially oil and natural gas, is getting higher and higher. At present, the import dependence rate is as high as 70%. Therefore, it is urgent to increase domestic oil and gas exploitation, and the development of offshore oil and gas fields is the top priority. Compared with the onshore oil field, the offshore oil field is difficult to exploit and the cost of equipment maintenance is high, which determines that the offshore oil field must produce the maximum economic benefit and obtain the maximum oil recovery in the shortest time. CNOOC has innovated a number of core technologies with international advanced level in offshore oil and gas development and production, engineering construction and equipment manufacturing, and supported and established a modern offshore oil industry system with Chinese characteristics. This paper analyzes the oil recovery technology of offshore oilfields, and looks forward to its development trend, which has a certain theoretical guiding significance for the development of offshore oilfields in China.*

**Keywords:** New Technology and Development, Production Technology, Offshore Oil Field; Oil Recovery Technology; Technical Problems.

## 1. Introduction

The ocean contains more than 70% of the world's oil and gas resources. After nearly 30 years of exploration and development of offshore oil and gas resources, the China National Offshore Oil Corporation (CNOOC) was in the Bohai Sea, the Yellow Sea, the East China Sea and the South China Sea at the end of 2017[1-3]. More than 80 oil and gas fields have been developed and built, the annual output of oil and gas has exceeded 50 million tons, and an "offshore Daqing oil field" has been built, indicating that China's energy development has entered the "marine era." Therefore, we should pay attention to the research of offshore oil exploitation technology and pay attention to the exploitation technology, which is of great significance to the exploitation of offshore oil. With the national attention to offshore oil exploitation, China's offshore oil exploration technology and technology have made remarkable progress, but compared with some countries, there is still room for improvement, special technology development. Therefore, it is very important to enhance the understanding of offshore oil exploration.

## 2. The main problems faced by the oil production technology of offshore oilfields in China

The areas that can realize offshore oil exploitation are mainly concentrated in the offshore areas of China, focusing on the following: Beibu Gulf, East China Sea, Bohai Sea, Pearl River Estuary, Yinggehai and Qiong Southeast. At this stage, large-scale mining has been achieved in the Bohai Sea, the East China Sea, the western South China Sea and the Pearl River Estuary. There are some problems in offshore oil exploitation in these areas, which are manifested in the following aspects:

**2.1 Technical problems of thermal recovery used in the exploitation of offshore heavy oil**

Through investigation, it is found that there is a reservoir with high consistency in Bohai Oilfield area of China, and the viscosity of crude oil in this reservoir is greater than 460mPa •s[4]. Because of the high viscosity, in the existing production technology and production capacity, the use of water injection and other technologies to develop economic benefits is relatively low, compared with the use of heavy oil thermal recovery technology is a better choice. However, there are some problems in the process of using this technology, such as artificial lifting technology, downhole safety technology, steam generator and so on. The existence of these problems brings certain challenges to the economy and technology.

### 2.2 Challenge of tapping potential in marine sandstone (extra) high water cut stage oilfield

Marine sandstone oil field is the most important form of offshore oil field in China, which is usually a strong bottom water reservoir. In the South China Sea, most of the comprehensive water content in this form of oil field is more than 90%, and the oil field resources can reach about 40%[5]. It can be known from the cumulative production in these fields and the average production in a single well that the risk will increase if adjustment wells are used to tap potential. In addition, as a result of sidetracking around the old well and the gradual reduction of empty grooves, As a result, the difficulty is enhanced in the process of tapping the potential, and the cost in the process of mining is also gradually increasing. If the water content in this kind of oil field is increasing, the liquid structure of this kind of oil field will also change greatly, that is, it will deteriorate continuously. In order to change this form through body fluids, but it is difficult to increase production, at the same time, there is also serious pressure in energy saving, emission reduction and sewage treatment.

**2.3 Offshore oilfields face the problem of stable production**

First of all, in the process of oil and gas field exploitation, there may be pressure reduction and production time prolongation, the production of single well will shrink. In addition, the existence of wellbore fluid problem also leads to the risk of single well production shutdown. In the process of oil and gas exploitation, there is a relatively high content of carbon dioxide in some oil and gas, and with the increase of working time, there may be a serious problem of acid corrosion in the process of oil and gas exploitation [6].

#### **2.4 Cost problems in low permeability development of oil and gas fields**

In terms of economic benefits, offshore drilling requires a higher cost, which is more than ten times the cost of ordinary single well drilling, and its engineering accounting is also dozens of times that of ordinary single well drilling[7]. Especially in the development of "three low" oil and gas fields, not only the cost of development is relatively high, but also the difficulty of exploitation is also relatively large. Therefore, in the process of exploitation of "three low" oil and gas fields, low-cost oil recovery technology should be selected according to the actual situation.

### **3. New Technology and Development of Oil Recovery Technology in Offshore Oilfield**

The exploitation of offshore oil is not only expensive, but also technically difficult, so it needs to face a variety of difficulties and challenges in exploitation. After years of practice and efforts, relevant technical and scientific researchers have developed some oil exploitation technologies, which have made remarkable progress in the exploitation of heavy oil, the improvement of oil recovery, water control and water injection, and so on. At the same time, a suitable technology and technology for oil exploitation in China has been developed, and these advanced technologies and processes have been widely used and popularized[8-9].

#### **3.1 Offshore heavy oil recovery technology**

Some problems need to be dealt with in the process of mining high consistency oil, the first is the problem of viscosity reduction. In order to solve this problem and improve the mining efficiency, the relevant oil workers and researchers have made a lot of efforts, especially in the supporting technology. In order to realize reasonable oil recovery technology, it is necessary to implement viscosity reduction technology in wellbore and reservoir. Viscosity reduction technology mainly includes chemical viscosity reduction technology and flow balance control technology. In addition, on the basis of thermal viscosity reduction technology, the thermal use of water, thermal generator selection and transformation and other processes and technologies have been greatly improved.

#### **3.2 Matching technology for tapping potential in marine sandstone (special) oilfield**

Marine sandstone (special) oilfields are distributed in the South China Sea, which is characterized by strong bottom water reservoirs. Therefore, it is necessary to use targeted techniques, that is, upward return and drilling adjustment techniques, in the process of mining. In this process, it needs to be based on high-energy fuel micro-crack composite technology, PURE dynamic negative pressure perforation technology and TCP negative pressure perforation technology. The comprehensive use of these technologies and the matching technology of tapping the potential of marine sandstone (special) oil fields can improve the efficiency of production and solve the problems existing in drilling adjustment wells after being put into production.

#### **3.3 Techniques for maintaining stable production in offshore oilfields**

The corrosion of materials has a serious impact on the exploitation and production of offshore oil. Therefore, in order to change this situation, relevant researchers and technicians should develop some materials with strong corrosion resistance in the light of the actual situation of the development of oil fields in the region. At the same time, it is used in the exploitation of oil field, and continues to be widely used. In addition, it needs to be heavy.

#### **3.4 Technology for exploitation of "three low" oil and gas fields**

"Three low" oilfields often appear in the process of oil exploitation. "Three low" mainly refers to low permeability, low bottom pressure and low oil and gas production. In exploitation, oil field water injection can be adopted, which can maintain formation pressure and enhance oil recovery at the same time. In the process of water injection, we should adhere to certain principles, that is, enough water and good water injection. Therefore, in order to enhance the development and utilization of the "three-low" oil field in the process of offshore oil field development, relevant technicians and researchers have carried out various efforts and experiments. For example, experiments have been carried out in some oilfields in China, such as Pinghu oil and gas field, Bozhong 25-1 oil and gas field, Tianwai Tiantian oil and gas field, etc. the test was carried out to test the reconstruction technology of water injection pressure fracturing reservoir. After testing, measures are taken to realize the optimization, so as to reduce the cost of single well production, that is, from 2500 yuan per well to 4 million yuan per well. In addition, some reservoir protection techniques have been used in workover engineering. Some pressurized water injection techniques are used to supplement reservoir energy, such as horizontal electric submersible pump and inverted electric submersible pump in order to realize pressurized water injection.

#### **3.5 Water control completion technology for horizontal wells**

The horizontal well water control completion technology is realized on the basis of Packer completion, open hole

completion and so on. At present, this technology has been used and popularized in oil exploitation in China, including horizontal well center pipe and segmented horizontal well variable density screen tube and so on. Segmented variable density tests have been carried out in some oilfields in China, such as Shengli Oilfield. The working principle of horizontal well water control completion technology is to optimize the permeability membrane in horizontal section combined with the change of medium permeability of offshore oil reservoir. In the process of optimization, we need to pay attention to some problems, that is, the porosity and the density of the sieve tube. Through the control of these factors to achieve balanced production pressure difference, so as to reasonably control the flow rate.

#### 4. Conclusion

Summing up the above description, we can know that with the development of economy and the progress of science and technology, China's oil field exploitation technology, especially offshore oil field exploitation technology and technology has been significantly improved. In addition, there are some problems in the process of offshore oil field exploitation, petroleum workers and researchers should pay attention to the research of new exploitation technology, such as anticorrosion and rust technology, water injection technology, workover technology and so on. It can be said that only by strengthening scientific research and practice can we really enhance China's offshore oil exploitation capacity and promote the overall increase of China's oil production.

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