Oil & Gas Research
ISSN: 2472-0518

Editorial Open Access

CNOOC's Oil and Gas Well Drilling and Completion Technologies' Progress and Prospects

Zong Shu*

State Key Laboratory of Offshore Oil Exploitation, Beijing, 100028, PR China

Abstract

Offshore oil painting and gas product has come an important growth pole to insure public energy security. still, China's coastal oil painting and gas product is lack of crucial core technologies and weak in tool and outfit foundation and can hardly support the optimized fast development of important fields. To break these technological difficulties, China National Offshore Oil Corporation (CNOOC) claimed on independent technological invention and crushed a series of crucial core technologies through theoretical exploration and crucial technology exploration and test during the 13th Five- Time Plan. And the following exploration results are attained [1]. First, several crucial technologies are broken through, including effective drilling and completion in the middle and deep layers of the Bohai Sea, offshore large- scale heavy oil painting thermal recovery, deep- water oil painting and gas field development, and high temperature and high pressure well drilling and completion in the South China Sea, unconventional oil painting and gas stimulation, and coastal exigency deliverance. Domestic first singly operated ultra deep water giant gas field, videlicet " Deepsea 1 " is successfully put into product, so that the vault from 300 m to 1500 m of water depth and from disquisition to development is realized. Second, crucial tools and outfit are developed, similar as logging while drilling and rotary steering drilling system, deep- water drilling face captain, aquatic exigency killing device, and aquatic font Christmas tree, which promote the high- quality development of China's coastal oil painting assiduity. Eventually, some suggestions are proposed as follows. In the future, CNOOC shall strengthen independent technological invention, quicken the pace to deepsea oil painting and gas, and continue to probe crucial core technologies for oil painting and gas reserves and product increase(e.g. nonstop localization of drilling and completion technologies, outfit and accoutrements in complex fields), amalgamated gas product and test and green energy metamorphosis(e.g. geothermal energy), so as to make lesser benefactions to insure public energy security and make a maritime power [2].

Keywords: CNOOC; 13th five-year plan; Deep-water oil and gas well drilling; Deep-water oil and gas field development; "Deepsea 1" giant gas field; High temperature and high pressure; Equipment and tool

Introduction

China is a large oil painting and gas resource consumer and its dependence on foreign oil painting and gas has been adding continuously in recent times. In China, there are abundant coastal oil painting and gas coffers and coastal oil painting and gas product has formerly come an important growth pole to insure public energy security. In 2020, China's oil painting and gas product exceeded 6500 × 104 toe, setting up a new record, and the time- on- time increase of oil painting product was 240.3 × 104 t, counting for over 80 of the domestic total oil painting product increase. thus, speeding up offshore oil painting and gas product isn't only the demand of public development, but also strategically important for icing public energy security and erecting a maritime power [3]. During the 13th Five-Time Plan, China National Offshore Oil Corporation (CNOOC) singly developed, through theoretical invention and technological exploration. The crucial technologies include effective drilling and completion in themid-deep layers of the Bohai Sea, offshore large- scale heavy oil painting thermal recovery, drilling and completion of (ultra-) underwater oil painting and gas field development, high- temperature and high- pressure well drilling and completion in the South China Sea, unconventional oil painting and gas stimulation, and coastal exigency deliverance. These sweats ended the foreign monopoly of crucial tools and outfit, similar as logging while drilling and rotary steering drilling system, underwater drilling face captain, aquatic exigency killing device and aquatic font Christmas tree. This paper reviews CNOOC's inquiries on drilling and completion technologies during the 13th Five-Time Plan and forecasts the directions of unborn coastal drilling and completion [4].

Methodology

Material

Crude OilPainting The used crude- oil painting sample was collected from a high temperature force in Western China. Acid and base figures of the crude oil painting are of3.98 mg KOH/ g and1.3 mg KOH/ g independently, where the oil painting viscosity and density were 0.85 g/ cm3 and 5.23 mPa s independently at the standard conditions. Gas Pure methane(99.99 spook) and gas admixture (CH4 80 spook and CO2 20 spook) were bought from Coregas, Australia. It's worth mentioning that, the pure methane gas was used to represent natural gas and to pretend the field conditions. still, the gas is typically mixed with different gas contaminations in the typical field operations, which clearly affects the miscibility pressure. In particular, methane gas has the smallest critical temperature compared to other hydrocarbon feasts and hence it has a advanced MMP. thus, pure methane gas injection could be grueling as it requires the loftiest pressure to achieve miscibility compared to CO2 and other hydrocarbon feasts (46). Neptune A synthetic Neptune was prepared by dissolving NaCl

***Corresponding author:** Zong Shu, State Key Laboratory of Offshore Oil Exploitation, Beijing, 100028, PR China, E-mail: zong6688699@163.com

Received: 25-Jan-2023, Manuscript No. ogr-23-91279; **Editor assigned:** 28-Jan-2023, PreQC No. ogr-23-91279; **Reviewed:** 11-Feb-2023, QC No. ogr-23-91279; **Revised:** 21-Feb-2023, Manuscript No. ogr-23-91279(R); **Published:** 28-Feb-2023, DOI: 10.4172/2472-0518.1000288

Citation: Shu Z (2023) CNOOC's Oil and Gas Well Drilling and Completion Technologies' Progress and Prospects. Oil Gas Res 9: 288.

and Cl mariners (125 g/ l NaCl and 15 g/ l KCl) intode-ionized water, where the attention of the total dissolved solid (TDS) was 140 g/l. Core samples Berea sandstone core samples were used in the trials, where the average core periphery and core length were measured to be 3.8 cm and 7.6 cm independently (2 core entrapments were used in each trial), with average absolute permeability of 110 mD and porosity of19.2. Chemical complements: Non-ionic alkoxylated surfactant (SOLOTERRA ME- 6) were used in this study due to its promising results in perfecting methane- oil painting miscibility in our former work. The named surfactant contains a propoxy functional head group and a lipophilic hydrocarbon chain, which is answerable in oil painting and it has low solubility in water due to its low hydrophilic- lipophilic balance (HLB) value of5.6 Davies. The chemical was supplied by SASOL Performance Chemicals.

Experimental procedures

Interfacial pressure In this study, the gas- oil painting interfacial pressure was measured by the pendant drop system using the IFT700 outfit (Vinci- Technologies) as shown. latterly, the evaporating interfacial pressure (VIT) fashion was used to estimate the MMP values. In the VIT system, the measured gas- oil painting IFT data is decided using direct retrogression to block with the pressure axis(x-axis), where the intercept represents the estimated minimal miscibility pressure. The IFT trials were conducted at a constant temperature (373 K) and within a pressure range between 5 MPa and 37 MPa. First, the IFT cell was completely gutted before each trial using acetone and toluene, also the system was connected to a vacuum pump for 12 h to dry. latterly, the gas is fitted and pressurized into the IFT cell using the connected hype pump, where the system temperature is controlled using thepre-installed heater in the IFT outfit. The trial starts at a certain pressure and temperature by introducing an oil painting drop into the cell, where the drop shape is recorded using the CCD camera and the IFT value is calculated using the drop shape analysis software [5]. Latterly, another oil painting drop is introduced into the cell and the IFT measures is repeated (under the same conditions) to confirm the repetition of the results. Throughout the measures, the IFT values were set up to be reproducible within ±0.4 mN/ m, where the final estimated IFT values in this exploration were grounded on the average dimension of three different oil painting drops at each pressure point. When the chemical was used in the trial, many way were added to the below procedure to dissolve the added chemical into the gas phase according to the weight chance [6]. First, a calculated quantum of the chemical was placed on the plate inside the cell. also, the gas was introduced into the cell to blend with the chemical under experimental pressure and temperature conditions. also a sufficient time was given to insure a proper mixing between chemical and gas phase. Coreflooding In this work, three coreflooding trials we performed using different injection scripts to probe the effect of reducing MMP of the methane-oil painting system on the oil painting recovery factor [7]. The trials were performed under the same pressure(28.6 MPa) and temperature (373 K) using a constant injection rate of 1 cc/ min. It worth noting that the experimental conditions of the temperature (373 K) were named to represent high temperature budgets, and the severance pressure of 28.6 MPa was named under MMP to represent immiscible injection conditions. Three positive relegation hype pumps were used to give a constant injection rate and a constant overburden and severance pressures which is controlled using a back- pressure controller (BPR); digital pressure transducers were used to cover and record the discriminational pressure across the core draw. Graduated cylinders were used to measure the produced oil painting, where the produced gas was safely vented into the cloud cupboard [8].

Results and Discussion

Methane-oil painting

MMP reduction

First, the MMP value between pure methane gas and crude oil painting was used as the base case to determine the MMP reduction after adding chemical or CO2 in the following trials. In our former work, the MMP between methane and the same crude oil painting (base case) was measured to be31.7 MPa, where the first contact miscibility (FCM) pressure was64.8 MPa as shown [9]. As the results indicate, adding the system pressure decreases the IFT of the methane-oil painting system at all pressure values. The IFT reduction between the two fluids could be due to the dynamic relations (mass transfer) between the two fluid phases, as the motes are attracted between the two fluids by dissipation and dipole intermolecular forces, where adding the pressure improves the birth and condensation processes between gas and crude oil painting motes. In this fluid commerce, the light crude oil painting factors are wracked (uprooted) into the gas phase, and the fortified gas phase condenses into the crude oil painting. thus, themulti-contact miscibility is developed and achieved due to the bettered birth and condensation processes. In the following trials, the effect of the chemical- supported methane and the gas admixture on the equilibrium IFT were measured and colluded with comparison to the base case. originally, for the chemical- supported methane, the IFT results show that adding surfactant to the methane- oil painting system decreases the IFT values through all the studied pressure values, accordingly the MMP dropped in the presence of chemical from 31.7 MPa to 28.8 MPa, which represents 9 of MMP reduction compared to the original case. In this trial, chemical- supported MMP reduction has been tested by adding 1.5 wt of the tested surfactant into the gas-oil painting system. In the presence of surfactant, bettered miscibility conditions of vaporisation and condensation grease the methane- oil painting IFT reduction. Analogous to the CO2- oil painting system, the surfactant motes would be adsorbed onto the gas- oil painting interface, while the propoxy functional head groups of the surfactant interact with methane motes and the lipophilic hydrocarbon tail attaches to the oil painting motes [10]. This process in turn improves the birth capacity of the methane and leads to enlarging the miscibility zone and reducing the gas- oil painting the interfacial pressure, which promotes further condensation and vaporisation processes until achieving miscibility. Effect of chemical- supported gas injection The ideal of the core flooding trials is to estimate the effect of the MMP reduction on the oil painting recovery effectiveness under different scripts of secondary and tertiary recovery modes [11]. During the trials, a constant injection rate of 1 cc/ min, injection pressure of28.6 MPa and temperature of 373 K were maintained constant throughout the trials. In the first trial, pure methane was fitted in the secondary mode under immiscible injection conditions, as the severance pressure was28.6 MPa which is lower than the MMP (31.7 MPa), also the injection was followed by chemical- supported methane injection in the tertiary recovery stage. Effect of gas admixture on the recovery factor at secondary mode 7 shows the recovery profile of the gas admixture (CH4 80 spook and CO2 20 spook) without chemical compared to the chemical- supported methane injection at the secondary mode. In this trial, the injection was performed under near miscible conditions, as the MMP dropped from 31.7 to 27.6 MPa in the presence of 20 spook of CO2 according to the IFT measures [12]. As indicated the oil painting recovery profile using CO2 shows nearly a analogous overall performance compared to the chemical- supported methane, where the ultimate recovery factor achieved using gas admixture is 79, which is1.8 advanced than chemical- supported methane injection and 13.5 advanced than pure methane (immiscible condition).

Conclusion and implications

In this study, we presented a new disquisition to quantify the effect of chemical- supported MMP reduction on the oil painting recovery factor during methane gas injection at core scale. First, the interfacial pressure of the methane- oil painting system was measured after adding surfactant and CO2 independently. latterly, three coreflooding trials were performed to quantify the effect of the MMP reduction on the oil painting recovery factor under different scripts. The IFT measures show that dissolving1.5 wt of surfactant grounded chemical (SOLOTERRA ME- 6) into the methane- oil painting system was suitable to reduce the MMP from 31.7 to28.8 MPa (9 reduction), while adding 20 spook of CO2 achieved 13 MMP reduction. The coreflooding results demonstrated the significance of achieving miscibility during gas injection, as the ultimate recovery factor increased from 65.5 under immiscible conditions to 77.2 using chemical, and to 79 using gas admixture (CH4 80 spook and CO2 20 spook) after achieving near miscible conditions. These results likely expand the operation envelop of the miscible methane/ natural gas injection to further seeker budgets, which accordingly results in advanced oil painting recovery factor, in addition to the implicit environmental benefits of exercising (re- injection/ recycling) the produced gas which will have a significant impact on reducing the hothouse gas emigrations.

Acknowledgement

None

Conflict of Interest

None

References

1. Gbadamosi AO (2019) An overview of chemical enhanced oil recovery: recent advances and prospects. Int Nano Lett 9: 171-202.
2. Kamal MS (2017) Recent advances in nanoparticles enhanced oil recovery: rheology, interfacial tension, oil recovery, and wettability alteration. J Nanomater 1-15.
3. Alvarado V, Manrique E (2010) Enhanced oil recovery: an update review. Energies 3: 1529-1575.
4. Stalkup Jr FI (1983) Status of miscible displacement. J Petrol Technol 35: 815-826.
5. Jin L (2017) Impact of CO2 impurity on MMP and oil recovery performance vof the bell creek oil field. Energy Proc 114: 6997-7008.
6. Al-Mjeni R (2010) Has the time come for EOR? Oilfield Rev 22: 16-35.
7. Godec M (2000) CO2 storage in depleted oil fields: the worldwide potential for carbon dioxide enhanced oil recovery. Energy Proc 4: 2162-2169.
8. Zhang K, Jia N, Zeng F (2018) Application of predicted bubble-rising velocities for estimating the minimum miscibility pressures of the light crude oil–CO2 systems with the rising bubble apparatus. Fuel 220: 412-419.
9. Teklu TW (2017) Low salinity water–Surfactant–CO 2 EOR. Petroleum 3: 309-320.
10. Li S (2019) Diffusion behavior of supercritical CO2 in micro- to nanoconfined pores. Ind Eng Chem Res 58: 21772-21784.
11. Wang x, Gu Y (2011) Oil recovery and permeability reduction of a tight sandstone reservoir in immiscible and miscible CO2 flooding processes. Ind Eng Chem Res 50: 2388-2399.
12. Cao M, Gu y (2013) Physicochemical characterization of produced oils and gases in immiscible and miscible CO2 flooding processes. Energy Fuels 27: 440-453.