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Research on Technology Innovation Management of Changqing Oilfield

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Abstract

Develop of enterprise requires technology innovation management. The main business of Changqing is Ordos Basin whose reservoir has a characteristic of "three low". It decided Changqing must be carrying on technology innovation management. In this paper, we do research on the Changqing's technological innovation management, and puts forward some suggestions in order to support Changqing oilfield considerable development.

Key words: Changqing; Technology innovation; Management

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Technology innovation management throughout the whole process of the technological innovation activities of enterprises, to some extent determines the inputs, processes and effects of enterprise technology innovation, so the scientific and effective management of enterprise technology innovation is very important to improve the core competitiveness of enterprises, enhance the technological innovation capability of enterprises and promote the continuous technological innovation of enterprise.

Ordos Basin and peripheral basins is the main business area of the Changqing Oilfield. Despite the rich resource of Ordos Basin, Basin oil and gas reservoir has typical "three-low" characteristics: low permeability, low pressure, low abundance; Basin reservoirs ultra-low permeability is also rare in the world; Ordos Basin effective reservoir identification difficult, slow recoverable reserves growth rate has always been the primary factor restricting the size of the Changqing Oilfield development., It is a truly world-class mining problem to achieve the cost-effective development of oil and gas under such difficult conditions.

After nearly 40 years of continuous efforts to practice, Changqing Oilfield has been overcome the problem of "three-low". Through the application of technological innovations, Changqing has discovered 36 low-permeability, ultra-low permeability oil and gas fields, became an industrial base of the fastest growing in reserves of oil and gas production growth and became the model of low-permeability oil and gas field development. The results of technological innovation and the technological innovation of Changqing Oilfield management are inseparable.

1. THE NEED OF PRACTICE LEADS TO TECHNOLOGY INNOVATION

The needs of the oil and gas resource development, lack of reservoir development theory about "three-low" and advance of the development technology, decided the practical features of Changqing Oilfield technological innovation. In the 40 years, the Changqing Oilfield insists on the need led to the practice of technological innovation, carrying on fundamental research, overcoming the core technology research, accumulating the advantages of technology and promoted appropriate technology widely.

1.1 From the Need of Reservoir Development, Do Project Research

The surface construction optimization is a constant theme in its development process. In the surface construction,

gathering and water injection accounts for about 80% of the total investment. Changqing based on optimize and simplify the gathering, water injection system to carry on long-term technology research, achieved great technical breakthroughs and improved the technology of surface construction. In different stages of development, created four different kinds of surface construction mode adapted to different geological conditions and geographical environment: MaLing mode, Ansai mode, JingAn mode and Xifeng mode.

1.2 Sync with Reservoir Development Process, Accumulate and Improve Technology

Because of controlled by many factors, the complex relations between the oil and water, understanding of Ordos low permeability reservoirs is lack, only can be gradually improve with technology accumulation.

1.3 Use Development Benefit as the Standard and Expand Technology Application

Changqing oilfield gradually explored advanced water injection timing in practice, and successively applied advanced water injection technology in Xifeng, JingAn, Nanliang, Ansa, Jiyuan and so on. Advanced water injection zone, the initial average daily oil production is 1.35 tons higher, the average production per well increased 20% - 30%, and greatly improve the effectiveness of the development of oil and gas reservoirs.

2. GRASP THE DIRECTION OF THE TECHNOLOGY INNOVATION ACCURATELY

Without the guide of traditional theory, the reference of ready-made development technology and the famous foreign companies and experts claim no development value, Changqing Oilfield grasp the direction of the technology innovation strategy accurately, proceed with confidence,tackle hard-nut problems in science and technology and conquer the world problem of exploiting the "three low" reservoir scale effectively. Changqing Oilfield receives the supernormal development stage through the technological innovation to implement low cost development constantly.

2.1 "Two diversions", Leading Oilfield to the Historic Adjustment

In the 1980s, considering the condition of the oil production in one million tons for many years, through put the more storage, greater in size and richer in potential as the breakthrough, Changqing put forward the strategic transfer of "turning the Jurassic in priority to find oil to triassic period in priority; from Mesozoic to find oil to Paleozoic era them to find gas", which made a historic adjustment of changqing oil field development, and according to this the oil field carried out the exploration of new technology research and the preparation work of the development of low permeability oil field technical. Since then, Changing Oil field has found ultra-low permeability Ansai Oil field with over 100 million tons of oil and world-class Jingbian gas field, thus fundamentally changing the situation of the low growth speed of the recoverable reserves and laying a foundation for the big development.

2.2 "Both Simultaneously", Leading the Development of the Oil Field into Virtuous Cycle

In the late 1980s, Changqing Oilfield puted forward the strategic decision of "oil and gas simultaneously, coordinated development". During the next ten years, Changqing Oilfield had evolved the theory of oil and gas and main technology with changqing characteristics. The oilfield made great development, oil and gas reserves doubled and the oil and gas production broke through highest level in history. Especially for the successful development of reserves of 3 trillion tons of Ansai Oilfield, it is known as "Ansai model" by the Chinese petroleum and natural gas corporation and it is expanded in the national petroleum.

2.3 "Three to Three", Leading the Oilfield Into a Fast Development Period

In the early 21st century, Changqing Oil field putted forward "second venture" strategy and "three three" requirements, that is, "three re-consider": To re-recognize the ordos basin, to re-know changqing low permeability, to re-know ourselves; "three of everything": everything obeying the development, everything caring for the people, and everything paying attention to actual effect. "Three of establishment": devoting ourselves to the Chinese important oil and gas exploration and development production base, devoting ourselves to a patriotic and realistic dedicated staff team, devoting ourselves to the l first-class research and development international center of low permeable oil fields. The achievement in technological innovation was significant, which has formed more than 70 unique advanced advantage technology; Drilling, logging, underground work and so on set changqing oil field highest record many times; Oil and gas production has exceeded 10 million tons and 20 million tons one after another.

2.4 50 Million Tons, Leading the Oil Field to "A New Daqing Oilfield"

Since 2008, according to overall request of China national petroleum corporation "in 2015 to realize oil and gas equivalent of 50 million tons, the goal of the construction a new Daqing in the west " and "the development of oil fields, the construction of large gas fields and building the Ordos basin to the national important oil and gas production base", Changqing oil field put forward the strategy of "the big oil field management, the large-scale construction" and requirements of "to strength the oil and gas main business more powerful, to specialize in engineering business, do the optimal service business in

the field " makes full use of mining field internal potential in four aspects including the institutional innovation, mechanism innovation, management innovation, technology innovation. Meanwhile by using the national oil overall superiority, absorbing inside and outside resources of oil system, devoting to key point's research, the oil field jointly explored the new technology, new mechanism and new mode in ultra-low permeability reservoir development. The oil field have put the the 1277 science and technology innovation project in implementation and strived to improve the core competition ability to make the foundation of the goal in construction of a new daqing of 50 million tons annual production.

3. WE SHOULD ESTABLISH AN OPEN SCIENTIFIC RESEARCH SYSTEM, OPTIMIZE EFFECTIVELY COMBINATION OF TECHNOLOGY INNOVATION STRENGTH

In recent years, the oil company which based on leading the direction of technical innovation has established an open scientific research system. Through the market mechanism to integrate resources, the oil company makes full use of internal and external research institutions, universities and colleges, the advanced technology of some enterprises, to promote the technological innovation, which has primarily formed a science and technology innovation platform being on myself, learning widely from others' advantages, and used by me, which has largely put the innovation of science and technology into productivity.

3.1 Formed a Production-Teaching-Research Combination Technology Innovation Management Mechanism

The oil company comprehensively carried out the domestic and overseas science and technology communication and cooperation and established long-term cooperative relationship with PetroChina Exploration and Development Research Institute, China University of Petroleum (Beijing), Southwest Petroleum University, Xi'an Petroleum University, Xi'an Jiaotong University, Northwest University of China. We have combined to tackle the thesis of science research and participated together in all kinds of petroleum science and technology BBS, which has formed an open scientific research cooperation pattern.

3.2 Formed the International Technology Innovation Management Mechanism

Due to the low permeability reservoir is thick, the joint fracturing can increase the single l production. The breakthrough of the technology involved in the joint fracturing has realized on the basis of communication with foreign companies. In the operation of the cooperative development project of natural gas in Changbei, southern Jiangsu, the oil company learned from Royal Dutch shell, Total Oil Company and the advanced concepts and development process of contractor who is domestic and oversea. Therefore a set of advanced and practical technology get integrated and put in application in the oil company. Through integrate the resources to tackle the key technology barrier; currently the project of the technology development in densification oil and gas between the Oil Company and Schlumberger Ltd has made substantial progress.

3.3 Form the Market Mechanism of Technological Innovation Management

In the process of the development in the Sugeli oil-gas field, Changqing oilfield introduced the market factors to the oilfield development, exploring a "5 + 1" cooperative development mode. In other words, through the public bidding mode, the oil company combined with the five enterprises of Petro china with their respective advantages developed the Sugeli oil-gas field. That put the advantages of the relevant companies in the technique of gas field development, and formed a "six unity, three sharing, a centralized" cooperation mode, which was popularized as a kind of mode in Chinese oil system by China National Petroleum Corporation and China's oil and gas co., LTD.

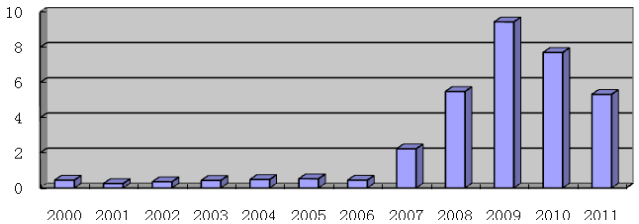
4. TECHNOLOGY INNOVATION AND THE CONSTRUCTION OF TALENTS GROUP

Science and technology talents are the decisive factor of the enterprise continuous innovation ability. Technology innovation need a multi-level core technical team including leading science and technology talent, center technology talented person, the backup technical personnel.

The oil field cultivated the science and technology team by improving system design and the encouragement mechanism. Meanwhile, the oil field strengthen innovation team and the leader i encouraging and selecting the young and middle-aged technology backbone to execute some significant scientific research projects, which has promoted the young group a large extent progress in science and technology. The oil field has formed some professional technical personnel incentives which is aimed at the young group, and greatly mobilized the enthusiasm of scientific and technical workers. Through the implementation of various measures about the special attention to young group, cultivating, guidance and encouragement, Changqing oil field have got some scientific research leaders, which was skilled at low permeability field with strong in scientific research ability,reasonable structure, and the clear level gradient. By June 2011, the company has 4432 professional and technical wokers, young people under the age of 40 accounted for 83.9%, bachelor and master degree accounted for 73.1%, thus it can be seen that the professional technical team in Changqing oil field are high knowledge level as well as abundant energetic youth.

5. ENSURE TECHNOLOGY INNOVATION INVESTMENT

Technology innovation needs adequate investment. From 2000 to 2009 Changqing set up 375 research projects, including five national projects, 7 company projects, 3 stock company major development test project, 59 exploration and production branch projects, 301 oil field company project. 2 billion Yuan was spent on project research.



Units: one hundred million yuan

Figure 1
The Project Investment Situation of Changqing Oilfield from 2000 to 2011

6. MANAGE RESEARCH PROJECT STRICTLY

The basic way of Changqing to manage the research project is "one unify 'three separate' four strengthen".

One unify refers to the big issue is managed unified, big topic is often multi-disciplinary; the participants involved in a number of departments, some issues should be cooperate with other person. Changqing sets up leadership team for major project which will be lead by the competent leadership, organized and coordinate; And set up a group which is responsible for the personnel distribution, cost management, research content and some concrete implementation, the group is responsible for the integration of human resources and technical resources, it has regular meeting system to communicate with recent work progress.

Three separate refers to grading, sorting and stages. Classification is is divided the project into three classes: national, group companies or shares in companies, Oilfield Company; Sorting of the project is divided into a technical breakthrough class, ahead of the reserves class and a large area; Technology research classes focus on strengthening requires innovation, called for a solution required results; Ahead of reserve category is the technology of the future development of reserves, not necessarily immediately results; Largely promote class is transfer technology into productivity; Staging is according to the research process management, do the pre-feasibility studies, set up project, open discussion, and operation of the project, implementation, results and other steps.

Four strengthens: the first is start early, arrange early and imply early.

Start the research plan early before set up the project according to their own station and the implementation of the oilfield; the second is keep cooperate with outside and establish an open research system as a result of lack of ability and related personnel; the third is strengthen project process management and control. Pay attention to technology, theory and basic research, the whole quality and utility of the research; the fourth is to cultivate strengthening results. Transfer passive form results into active results. Once the project is start, we should be clear what will be the innovation, which will form results. To do investigation we should gather information, don't do what others have already done, centering on the goal, refining according to the time node, human and so on, and finally achieve results.

Finally they carry out assess about the project, including achievements, patents, the number of papers submitted, project implementation coincidence rate, the application rate and so on.

7. STANDARD TECHNOLOGY INNOVATION WITH FINE MODE

Changqing always focus on acquiring effective from management, strengthening the manager of set up project, pilot test, applications and promotion, technology popularization and so on to standard technology innovation.

7.1 Uniform Standard Control

Changqing extended management philosophy and practice of experience of quality standardization to the management of technological innovation behavior and have done ahead of technical pre-research, development test, application improvement Trinity; exploration and technological innovation, the development of technological innovation, production and technological innovation one tricycles; the underground technology innovation, the Inoue technology innovation both one, and has achieved significant benefits.

7.2 Opened Integrated Control

Changqing Oilfield has always been adhering to the concept that "integration is also innovative ", focusing on through the analysis of the existing technology, integration, improvement, optimization, fast and efficient to integrated supporting technology. From the earliest Maling mode to latest Sugeli mode, Changqing's technological innovation always with a deep imprints of technology integration. During the last "five-year" period, Changqing made new breakthrough too, the seven supporting technology became matured.

8. IMPROVE THE SYSTEM OF THE MANAGEMENT OF TECHNOLOGICAL INNOVATION

During the latest five-year period, the target of corporation is 50 million tons, building the western Daqing, but with the object of oil and gas exploration and development is more and more complicated, advanced technical reserves still obviously insufficient, some technical bottleneck need to breakthrough, science and technology management system and operational mechanism still need further straighten out, innovative scientific and technological personnel especially leaders still obviously insufficient, capital investment and long scientific research resources and achievements can't fully share the phenomenon still exists, Therefore, the urgent need to continually carry on technical innovation, and constantly improve their technology innovation management system. Therefore, oil field should be making further efforts in the following several aspects:

8.1 Strengthening Technical Innovation Strategy Planning

Make sure the direction of technological development, promote the human and material resources distribution between the company and the sector; distinguish between levels, around with the matter of company survival and development and technology strategic reserves, reduce costs, and increase reserves and production, and greatly improved the company's economic efficiency, and carry out the shot-term, medium and long-term technology research.

8.2 Make Full Use of Talents

The goal of technology is promote corporation's technology innovation, but the key of innovation is talents, so talents play a crucial role in technology innovation.

Insist on the employing system which adheres to the introduction, training and the use of talents expand and maintain the stability of talents, and gradually form an optimized talents structure.

Further to establish and improve the material, development and spirit incentive combination of incentive mechanism, to make every one consciously put their value and enterprise development and technology innovation work connected, activate human capital,construct a incentive system which can arouse the enthusiasm of the innovator. Only in this way can the system be full of energy.

8.3 Improve the Open Scientific Research System

As a result of the object of scientific and technological is more complex, the investment needed increasingly large, increasingly wide variety of professional disciplines, the major domestic and international oil companies have begun to cooperate, joint research, sharing of benefits and risks. In the recent years, the practice shows that technological innovation alliance plays an increasingly important role which has become an important way to achieve the objectives, and to enhance the competitiveness. The full range of open innovation can effectively improve the efficiency of innovation.

At the same time of make full use of the function of "three academy, two center", Changqing should be further strengthened with domestic and foreign universities, research institutions and enterprises to establish complementary advantages, mutual win-win pattern of production and research cooperation in science and technology, improve resource configuration, absorption and use of all available scientific and technological resources, to expand the depth and breadth of innovation cooperation of the International Science and Technology Cooperation, to improve the effectiveness of cooperation, and form a reasonable and efficient technology innovation system. Changqing should also continue to strengthen the "integration" mode which treats the enterprises as the mainstay, market as guidance, a combination of scientific and technological innovation. Unitized the basic research, applied research, engineering development, engineering test, technology promotion and technology integration services and strengthen the independent intellectual property rights technology research and development, shorten the time of transfer scientific and technological achievements into productive, acquire the access to the core technology with independent intellectual property rights, and at the same time to speed up the application and promotion of scientific and technological achievements.

8.4 Increasing the Investment of Technology Innovation

Adequate and stable funding is a fundamental guarantee of technology innovation. Only when the funds are protected, can enterprises accumulate a certain technological innovation capability, and acquire the achievement of technological innovation. Changqing is face to a worldwide problem, no previous experience and achievements can learn, so in the process of development it need to constantly carrying on independent innovation, cooperation and innovation, technology introduction and application promotion. So it should increase funding for technological innovation.

8.5 Establish a Culture Advocating Technological Innovation

The subject of technological innovation is people. It is a people's process of decision-making, the investment behavior and the behavior of the distribution of benefits. The culture of corporate can greatly influence the formation of technical innovation ability. So to enhance the innovative capability of enterprises, it is necessary to promote independent thinking, respect for the independent personality, regard the ability to create as the dominant value orientation, and establish a corporate culture which is technical democracy, decision sciences, intense and orderly, collaboration, harmony, mental compatibility, encourage innovation, allowed to fail, and resist the quick success.

Changqing will guide innovation with the scientific epistemology to, use the lofty goals to guide innovation, use the actual demand to lead innovation, use the independent innovation leading open innovation, and use the core technologies to achieve breakthroughs in integrated innovation through continuous improvement of technical innovation management system.

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