

# Exploration and Practice of Standardized Design and Management of Oil and Gas Field Surface Engineering

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**Abstract:** With the continuous development of society and the continuous advancement of science and technology, China has been exploring and practicing the standardization design and management of oil and gas field surface engineering, which has broken the situation of large workload, low efficiency and poor quality of traditional oil and gas fields. The quality of construction of oil and gas field surface engineering is closely related to the prospect of China's industrial development. Doing a good job in the standardization design of oil and gas field surface engineering can effectively promote the rapid development of China's oil and gas field industry, and drive China's economy further. This paper analyzes the background of the standardized design of oil and gas field surface engineering, and establishes the oil and gas field standardization design plan system and standard system of oil and gas fields to promote the construction of informationized oil and gas fields.

The so-called "oil and gas field" refers to the sum of reservoirs, gas reservoirs and oil and gas reservoirs within the same area controlled by a single local structural unit. If there is only a reservoir in this local structure, it is called an oil field; if there is only gas reservoir, it is called a gas field. The oil and gas field surface engineering has improved the mine end of the traditional oil and gas field surface engineering, so that the oil and gas field engineering can closely follow the footsteps of the times. With the promotion of science and technology and information age, there has been a great leap. Since 2008, China has launched a comprehensive standardized design and management of oil and gas field surface construction, and achieved great results.

## 1. The Implementation of Standardized Design for Oil and Gas Field Surface Construction

In recent years, under the trend of global economic integration, China is facing more and more economic pressures, especially in the construction and production management of oil and gas field surface. China ignores the quality of surface construction of oil and gas fields, and the grade of oil and gas fields is getting worse and worse. And low permeability reserves are the main factor in newly developed oilfields. At the same time, great attention is paid to safety and environmental protection, which makes it more and more difficult to carry out oilfield construction projects. Traditional surface construction of oil and gas fields is carried out based on construction projects, which is combined with the characteristics of the environment for design and construction. It emphasizes tailoring, which means that the traditional surface construction of oil and gas fields cannot meet these challenges. Therefore, the construction of design and management of oil and gas field surface engineering should be standardized to promote the effective and rapid development of surface construction of oil and gas fields.

### 1.1 The traditional engineering design methods are heavy workload and inefficient.

The traditional design method of oil and gas field surface construction is heavy workload and inefficient. There is great difference between the design of oil and gas fields in different places. The design of a project also means that we have to start over again. It involves a considerable amount of work. The design ideas and styles of different designers are also different, and the design level is uneven. It is, to a large extent, difficult to control the efficiency and quality of the surface engineering construction design of oil and gas fields. In addition, the traditional design method is

basically based on two-dimensional plane, which cannot provide a more comprehensive guarantee for the surface construction of oil and gas fields. It is difficult to guarantee the accuracy and quality of the construction because the work of auditing and checking is accomplished by human resources.

### **1.2 It is difficult for traditional construction methods to meet the schedule and quality of the project.**

The construction site operation of traditional oil and gas field surface engineering has a large amount of operations, low efficiency and poor environment, which cannot guarantee the quality and efficiency of engineering construction. The traditional process construction uses the design and materials needed for decentralized procurement and management of engineering construction, and the random stacking of equipment and materials in the construction site not only creates a chaotic construction environment and causes serious damage to the environment, but also is difficult to protect the safety of workers. Secondly, the site is mostly based on manual work, the staff is messy, and the management system is not comprehensive and orderly, so it is difficult to ensure the quality of the project construction to a certain extent.

### **1.3 The traditional operation and management mode of oil and gas fields are backward.**

The traditional oil and gas field operation management mode is backward. Because of the low standard of surface engineering construction and the low level of information management, there is a great difference in the lack of relatively perfect management system and management mode. In addition, the construction site is mostly based on people's work and has a large number of personnel, which makes it difficult to manage. Besides, the construction of ground floor is mostly based on manual operation. It is difficult to ensure its safety and quality, and it is extremely easy to cause safety accidents.

## **2. Standardized Design of Oil and Gas Field Surface Construction**

Standardized design is the innovation of the ground construction and management concept, the innovation of the mechanism, the innovation of the organization and technological management. When conducting the standardization design and construction of China's oil and gas field ground engineering, we should form the construction site flow operation according to the six unified principles of "process flow, layout, module division, equipment selection, three-dimensional piping, construction standards". On the one hand, it effectively improves the construction efficiency, on the other hand, it also avoids the chaotic situation of construction site in the traditional mode and effectively ensures safety, quality and environmental protection. The use of information technology can accurately monitor and detect the work on the construction site, and establish digital oil and gas fields.

### **2.1 Establishing a standardized design method system for oil and gas field surface engineering**

To establish a quasi-standard design system for oil and gas field ground engineering, we must start from the following two aspects. Firstly, we must establish a standardized design working method and process to ensure that the oil and gas field surface engineering construction design can have a complete system. Second, we must have a standardized development model to effectively improve the quality of oil and gas field construction.

#### **2.1.1 Standardized design work methods and processes**

Standardized design of surface engineering construction in oil and gas fields is to form a complete system and proceed in stages and in an orderly manner. Three-dimensional structure is adopted, and its three-dimensional coordinates are time, logic and domain. There are five stages in standardized design of oil and gas field surface engineering construction, including planning, design, procurement, construction and operation management. We should adopt the methods of serialization, unification and modularization to complete the five stages of standardized design.

### **2.1.2 Standardization development model**

Standardized development mode is indispensable in the standardized design system of surface process construction in oil and gas fields. The standardized development mode adopts five-step cycle construction, i.e. research status, specific implementation of formulation strategies, improvement, promotion and application. In the process of construction, five cycles of construction are closely linked to form a stable and orderly construction site. At the same time, the support of modern science and technology and information technology not only greatly improves the construction efficiency, but also effectively improves the quality of construction and the level of standardized design system.

### **2.2 Establishment of management system and standard system**

Excellent enterprises cannot do without a sound management system and standard system. The construction of oil and gas field surface engineering should establish a sound management system and standard system. On the premise of establishing a standardized design system, we should further guarantee the high quality and efficient implementation of construction projects. To establish management system and standard system, the most important thing is to carry out standardized process management and standardized operating procedures, and to realize the process and standardization of all business activities.

### **2.3 Carrying out three-dimensional stereotype design**

#### **2.3.1 Scientific classification of oil and gas field ground construction mode**

Before the construction of oil and gas field ground engineering, it is necessary to conduct a full and detailed investigation of the oil and gas fields, to determine the standardization construction mode according to the characteristics of the oil and gas fields, and to form a design document with unified technical requirements, standardization and serialization. China's oilfields are divided into three categories according to the geological factors within the controlled oil and gas production area.

(1) Structural oil and gas fields, referring to the area of oil and gas production controlled by a single structural factor, such as folds and faults.

(2) Oil-bearing area of stratigraphic oil and gas fields, which are controlled by stratigraphic factors (such as unconformity, pinch-out and lithological changes) in regional anticline or monoclinic tectonic setting.

(3) Complex oil and gas fields. The area of oil and gas production is not controlled by single structural or stratigraphic factors, but by multiple geological factors.

According to the characteristics, forms and local environment of different oilfields, the oilfield modules are optimized and the appropriate standardized design of oilfield surface engineering construction is carried out.

#### **2.3.2 Unified design elements, technical finalization and solidification**

The standardized design of oil and gas field surface engineering construction should be based on the principle of “innovation, advanced, simplified, intensive and universal”. The oil and gas field process is based on “advanced, practical and economical”, and the process mainly consists of architectural style, standard, module division and process. The unification of processes and other aspects will help to establish a unified, standardized, integrated and informatized system. Secondly, the construction technology should be shaped and solidified. Different construction techniques will lead to increased construction difficulties and the incensement of workload, which is not conducive to the effective implementation of oil and gas field engineering construction.

#### **2.3.3 Design and management of modular combination stereotype drawing**

Through the three-dimensional structure module design, the standard module stereotype map and the standard station yard stereotype map are formed. According to the characteristics of different oil and gas fields, it is possible to directly select and transfer the standard station and yard stereotyping

map to effectively improve the efficiency of the design. On the other hand, the uniformity of the management system of stereotyped drawings should be ensured, the labeling of construction projects, the drawing appearance, the design software, and document storage should be standardized; at the same time, the drawing information platform should be established to provide more convenient means for the storage, transfer and management of document information.

### 3. Conclusion

The construction of oil and gas field surface engineering is an important way for China's industrial development. Standardized design of oil and gas field surface engineering is an important adjustment of the design idea of oil and gas field construction, and also an important milestone of oil and gas field engineering construction. Standardized design is not a phased matter, but it requires our long-term persistence and efforts to effectively guarantee the standardized body of oil and gas field surface engineering, and the department and management system can be implemented smoothly.

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