
Standardized Design of the Surface Engineering in Xinjiang Oilfield

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Abstract

Focused on petroleum and natural gas capacity building in Xinjiang Oilfield every year, to achieve the oilfield construction of standardization, modularization, skid-mounted in design phase. Therefore, it can able to speed up the progress of production from design to construction and shorten the construction period. At the same time, the concept of standardized brings great convenience for production management at a later stage. That can not only shorten the construction period, but also can reduce the engineering investment.

Keywords

Xinjiang Oilfields ; Surface Engineering ; Standardized ; Design.

1. Introduction

The Xinjiang Oilfield is located in the northwestern of Junggar Basin, those the geographical conditions determines oilfield surface construction time is short, usually no more than eight months. Moreover , with exploration and development of the Xinjiang oilfield to deepen, available-scale oil field to open up is less and less. In order to stabilize the oil field production, some of the edge of the scattered blocks are exploit each year. These construction blocks need to invest a lot of manpower according to the traditional mode. These presented new challenges for capacity building of the oilfield and greatly increase the difficulty of oilfield surface construction.

skid-mounted and modular are the premise of Standardized construction, factory prefabrication and large-scale procurement sites and assembled are foundation of Standardized construction, to assemble on site at any time , which can effectively shorten the construction period of on-site construction, reduce the difficulty of managing in oilfield , accelerate the oilfield capacity building pace, achieve economies of scale and improve the quality of construction projects, improve the contribution rate in the new oil field well, and improve the overall efficiency of oilfield development.

2. The necessity of Standardized construction

Xinjiang oilfield has exploited and constructed a total of more than 30 oil and gas fields in Junggar basin, of which the distribution point is over a broad area and long front. Geographical environment of the oil fields, oil characteristics and other relevant factors have brought many difficulties to the development and construction of the oilfield, as follows:

- (1) Topography of the oil field include Gobi, desert, mountains, and hills. The complexity of the construction environment is rare in Chinese oil companies;
- (2) Oil products contain light oil, heavy oil, extra heavy oil, ultra-heavy oil, and the oil field associated gas fluctuate a large range.
- (3) Multi-block, and large-scale construction of oilfield production capacity make a large difference between the modes of oil and gas gathering and transportation processing.

(4) The geographical environment where oil field is located determines the short effective time of oilfield surface construction, usually less than eight months.

With the exploring and developing of Xinjiang Oilfield, oil and gas fields supplied for "scale" development are fewer and fewer. In order to stabilize the crude oil production, the oilfield need to be invested to develop some edge scattered blocks every year. Traditional mode of construction requires a lot of manpower and money, and greatly increases the difficulty of oilfield surface construction. Therefore, the development of Xinjiang oilfield standardized design is urgent and serious.

The Seventeenth National Congress of the Communist Party of China clearly shows that: Thoroughly implement the scientific concept of development, and earnestly strengthen the standardization of construction, accelerate the pace of adoption of international standards and foreign advanced standards, increase the standardization work of innovation, and establish a sound scientific, unified standard system. Thus, Xinjiang Oilfield Company is actively pursuing standardization construction of oil and gas fields, in according with the ground engineering "design standardization, Manufacturing skid-mounted, modular layout and scientific management "of the" four modernizations "construction concept, vigorously carry out the standardization research of oil and gas fields, to expand standardized construction from the four directions of the process, technology, equipment and materials.

3. The advantages of Standardized construction

Standardized design, at the basic of simplify optimize, according to the same type of Station, installations and facilities in surface engineering construction, the advanced technology, strong commonality, reusable serialization design documents have been designed, then realize the construction content, standard and form unified system engineering.

From the view of the design, Standardized design not only reduces a large number of designers' repeated heavy graphics work, making designers invest more effort to optimize the design of the work, but also effectively reduces the "wrong, leakage, touch, lack" problem which produced in the design phase, shortening design time, improving the quality of the design; From the view of equipment purchases, the utility of finalized drawings makes the equipments, materials can be purchased in batch, which not only shorten the procurement cycle, but also reduce procurement costs, and also facilitate the later operation and maintenance; From the view of on-site construction, standardized design realize the factory's prefabrication manufacturing, effective shorten the site equipment material assembly and construction time; From the view of production management, the standardized design unified process flow and equipment selection, and realize the operation procedure of the consistency and the production of spare parts, making the production facility easier to operate and manage.

In general, standardized design has effectively improved the construction speed, quality, safety and efficiency.

4. The development process of Standardized construction

From the 16s and 17s of the twentieth century, in order to improve the speed and level of the building oilfield construction, the developed countries began to develop standardization, serialization and stereotypes of design, and adopt the unit combination modular assembly technology. After 70s and 80s, the domestic oil fields began to advocate and promote the standardization of design work in a different way. "three" design (design standardization, serialization, generalization) and "three" construction (construction of prefabricated, assembly and mechanization) has ever been put forward.

The standardized construction of the Xinjiang Oilfield, which began in the nineties standardization General Atlas assembler, Through the well site, metering station design atlas compiled design, has reduced labor intensity and improved the design efficiency; Along with the continuous development of the oil and gas field exploration and development of the integration building, the Xinjiang Oilfield standardized construction also expanded to the overall construction of the standardization of the

design, procurement, construction, management from a single atlas compilation, actively using of new technology, new technology, new equipment and new materials, and for different oil fields geographical environment, oil and gas properties and other characteristics, creating “desert mode” 、 “heavy oil mode”、 “older model ”oilfield construction mode[1], making the Xinjiang Oilfield developing towards a more economic and efficient direction.

5. The features mode of Standardized construction

In recent years, Xinjiang oilfield company, according to the Chinese petroleum corporation, has put forward “the older of simplification, New optimization” construction policy, focusing on “ speed up production capacity in place rate, reducing the constructed period, reduce engineering investment, reduce the energy consumption of gathering” guiding ideology, aiming at the surface engineering for the overall technology upgrade and optimization of innovation, to promote the development of standardization, and gradually formed a “desert mode” and “thick oil mode”, “old revolutionary base areas model” three sets of series of standardized design patterns, effectively reduced the investment and operation cost, laid the foundation for surface engineering implementing standardized standardization design work.

5.1 Desert mode [2]

According to natural environment and the characteristics of the development of oil field itself, Xinjiang oilfield company ,which located in the heart of the desert ,divided the construction quantities of measuring water distribution station into manifold, measurement, heating furnace, water distribution and dosing five skid, as shown in Figure 1, formed a “valve module, fission measurement module, water injection water distribution module, atmospheric water jacket furnace module” as a representative of modular measuring water distribution point. Modular design not only reduces the construction period, but also conforms to the requirements of oil field rolling development. And the module can also be combined according to the different functional requirements into a different type of station, fully meet the needs of the construction of the oil region.

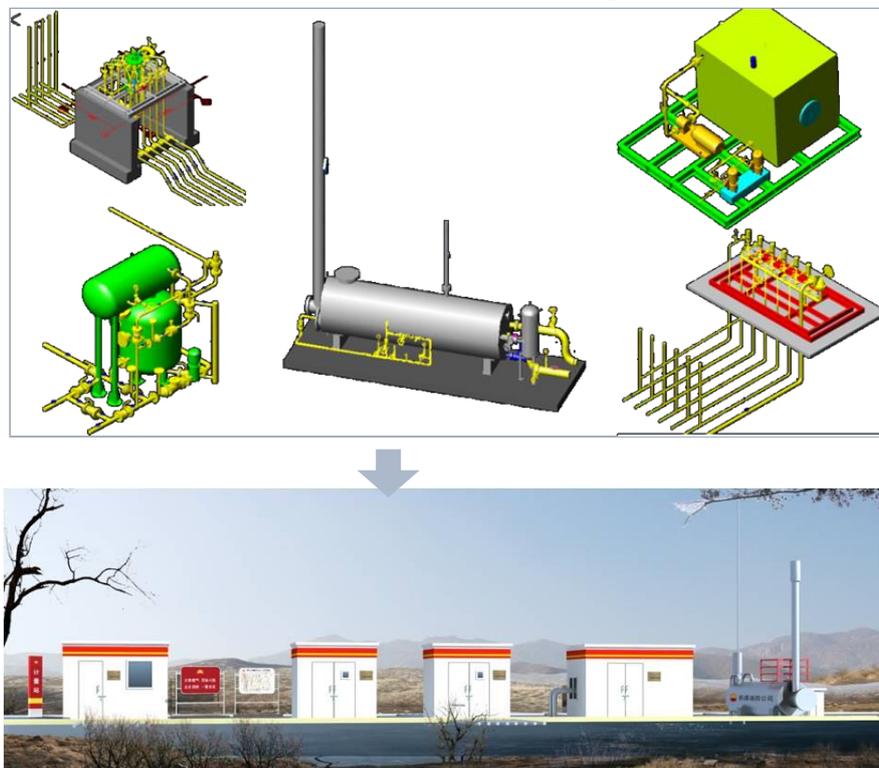


Fig.1 skid-mounted measuring water distribution station

5.2 Heavy oil mode

In order to improving the dryness of the steam injection in heavy oil wells, reducing the pressure of steam injection boiler, ensuring development effectiveness and construction quality, Xinjiang oilfield has established dispersed heating, single well tube steam injection production, valve choose well metering station, central treatment of heavy oil field construction mode. The establishment of Heavy oil mode effectively shorten single well steam injection radius, making wellhead steam dryness increased from the original 50% to more than 70%, and steam injection heat loss decreased from the original 14.7% to less than 5%. It not only improve the quality of the steam injection, but also effectively reduce energy consumption.

5.3 Old oil field mode

Through the skid-mounted integration, new technology and new technology, to simplify optimization of the old area of the metering project water distribution stations, centralized processing station, transportation pipeline network and facilities, Xinjiang oil field reduces the investment of the project of transforming the old areas,, and improve the quality of the reconstruction.

6. The scope and content of standardized construction

The standardized construction range of Xinjiang Oilfield is determined by the composition of the oil and gas field surface facilities and reservoir geological conditions. Oilfield standardized design generally takes around the wellhead - the measurement of water distribution station - oil transfer station (water station) - centralized processing station as building object; Gas field standardized design generally takes around the wellhead - gas gathering station - natural gas processing station as construction object.

The Xinjiang Oilfield standardized Construction is dominated by the oil and gas fields' standardization of technology, and now building research content is mainly as the following aspects:

(1) oil and gas field technology integrated, modularization

Standardization technology of oil and gas fields include the oil region wellhead and measurement with water (steam injection, then turn) station integrated optimization technology, integrated the gas zone wellhead and gas gathering station optimization techniques, oil transfer station modular design, water injection station modular and skid-mounted optimization technology, oil and gas processing station module integration technology, the total graph layout module splicing technology, supporting system design module integration technology , etc..

(2) the modularization of construction of oil and gas fields electronic text template

Electronic text templates include oil and gas fields standardized design unified technical regulations, oil and gas fields production program designed format electronic templates, oil and gas field construction diagram design manual in electronic format template, oil and gas field calculation sheet standard format template, oil and gas fields purchased equipment technical specs standard format template, oil and gas fields production plan format electronic form, etc.

In 2008, China Petroleum started systematic standardized design work, which will steadily promote standardized design from the past a single standardized design standardization system construction. Xinjiang Oilfield Company, in accordaning with the Oil Corporation in the file indicates, conform to the trend of the development of standardized, to carry out the prefabrication supporting technology research and its application and standardized management system research work, so that the construction of the“four modernizations” of oil and gas fields in Xinjiang ground engineering standardization toward depth, the system in the direction of making great strides. In addition, the Xinjiang oil and gas field digitized construction is undergoing intensely as well, through the establishment of a unified platform for information sharing, multi-level monitoring, decentralized control digitized production management systems, production run data automatic acquisition, which can achieve production process automatic monitoring, state of emergency automatic protection, unified management and scheduling.

7. The Implementation and effects of standardized construction

In 2008, Well SN21 area of the Xinjiang oilfield used standardized design in the process of building, and optimized the desert oil region gathering and transportation, measurement technology, as well as crude oil processing and oil field water injection process. This projects in just 10 months from the project to full production, and realized the injection-production synchronization in crude oil, taking the oilfield's annual crude oil production capacity to 1.2 million tons and associated gas daily output to 500,000 cubic meters. Compared with conventional construction mode, the whole project saved construction cost 75.67 million yuan, saving the operation cost 9.55 million yuan every year, oil and gas unit operation cost below in less than \$1.98 a barrel. Among the four years ,since the well area has been put into production, the water content of crude oil has been less than 10%, and achieved the oilfield efficient construction and running, achieving significant economic and social benefits [3].

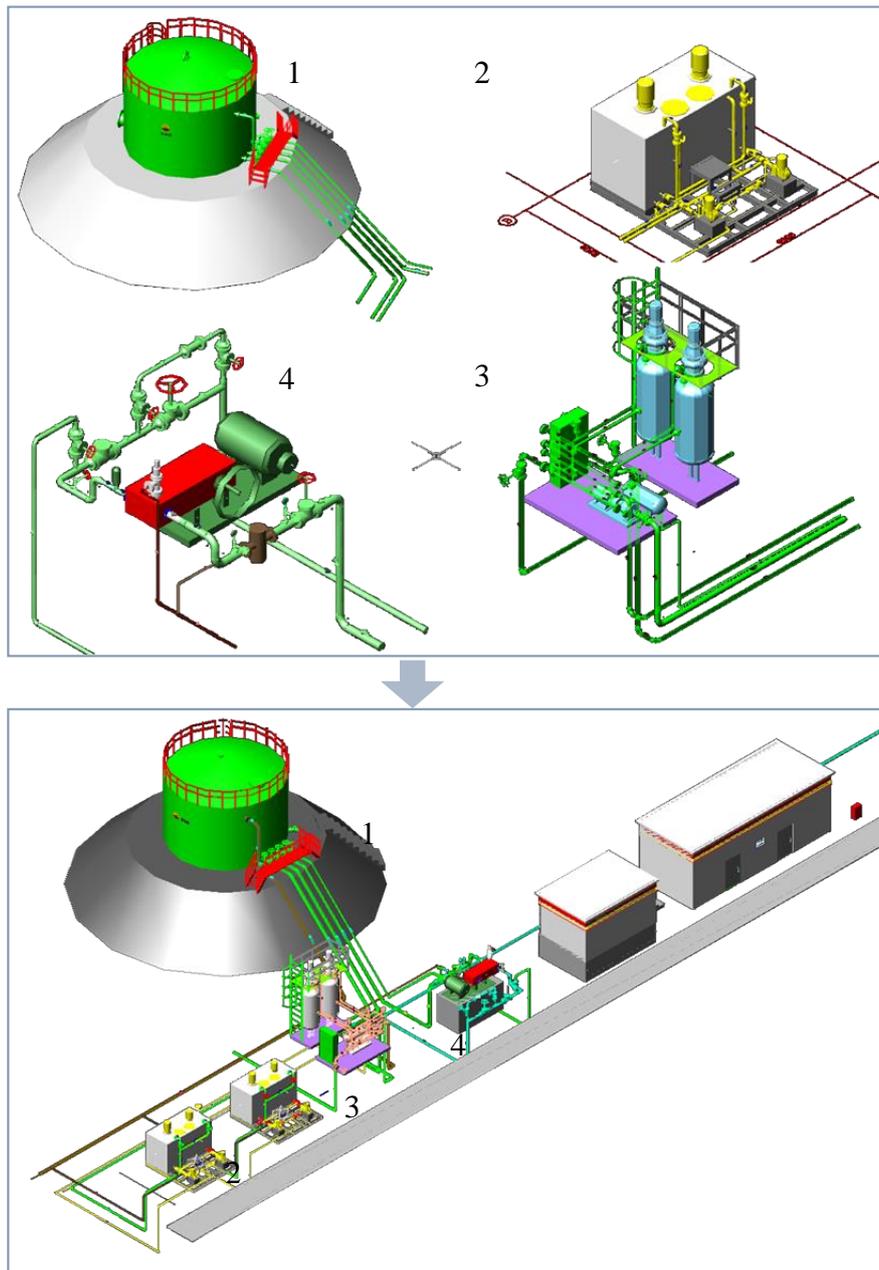


Fig.2 small skid-mounted water injection station

1–wastewater tank;2-dosing skid;3-clean water filtered skid;4-water injection pump skid

In 2009, to meet the needs of small-scale, remote block oilfield water injection, Xinjiang Oilfield developed and designed a small skid-mounted confined water injection system, of which the design

is mainly composed of water source well, water injection station, water distribution device three components, (water injection station, water distribution device designed by Skid-mounted). Skid-mounted water injection station based on a different function modules, which was combined according to the need of water injection station functions, and mainly consisted of water injection pumping station module, dosing pump house module, water storage tank module, box-type switching station module, heating skid modules, duty room modules and instrumentation and control system, as shown in the figure. Through the skid-mounted design, it not only meet the requirements of oil field the edge block development and construction time, but also shorten the design cycle by 30% and construction period by 20%, and perform the oil extraction and injection-production simultaneously . In 2010, small skid-mounted the confined water injection system started to be used in Dixi-12 well block, Che-95 well block, Ma-2 well block in Xinjiang Oilfield, which achieved good results[4].

In 2010, among the 51 completed surface Engineering constructions of Xinjiang Oilfield Company, small station standardized design coverage reached 100%, medium-sized station reached 83%, so the design time is 33.4% shorter than conventional construction, and the construction time is shortened by 12.5%. Large-scale procurement rate reaches 71.7%, the project investment reduces by 5.2%, and standardized design work is widely used and has been advanced.

8. Conclusions

It has been proved that: the Xinjiang Oilfield standardized construction is according with the needs of the times, and its standardized design also presents the growing awareness, increasing investment, the rapid increasing outcome, the growing role of the good development trend. The Seventeenth National Congress of the Communist Party of China emphasized: Industrial building should be moving in the direction of optimizing the structure, expanding the depth and improving efficiency. Therefore, Xinjiang Oilfield has a long way to go to realize standardization.

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