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Analysis on Economical Land Use in the General Drawing Design of Oil Field Stations

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ABSTRACT

This paper takes the analysis of economical land use in the design of oil field stations as the research object. Firstly, it elaborates the significance of saving land. Then combined with the "Fire Prevention Code of Petrol Chemical Enterprise Design", the paper analyzes and studies the safety and economical use of the general drawing design of the oil field stations for reference.

1. Introduction

Land and resources are the foundation of social and economic development and a basic national policy of China. The development of traditional oil field station construction is often too extensive, and there is a large amount of waste of land resources, which has a serious impact on China's economic development. Therefore, it is necessary to analyze the land saved in the design of the oil field battlefield drawing, so as to realize the land use for the design and construction of the oil field stations, which is of great significance for promoting the full utilization of China's land resources.

2. The Significance of Economical Land Use

Although China has a vast territory, due to its large population base, the per capita land is less and the arable land is less, far behind the world's per capita arable land. Some provinces and municipalities have even fallen below the warning line of 0.8 mu per capita arable lands set by the UN Food and Agriculture Organization. In 2011, China's urbanization coverage exceeded 50% for the first time, which means that China's urban population has surpassed the rural population. With the rapid urbanization of China, it took only 30 years to complete the Western 200 years. But at the same time, we should also see that with the

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continuous advancement of urbanization, the per capita cultivated land in China is gradually decreasing, and the promotion of some cities is too extensive. The rapid expansion of the "big cake" type of city is based on the massive devouring of rural land, which further aggravates the shortage of land resources in China. Under the above situation, it is imperative to make rational use of land resources and implement economical land use. In response to the above-mentioned problems of land resources, China has also introduced the Law on the Protection of Land Resources, and will cherish it very much, rationally use land and protect cultivated land as a basic national policy of China to effectively protect China's existing land resources.^[1]

The general drawing design of oil field stations is an important part of oil field construction and development, and because of the relatively large number of oil field development and construction points, the distribution scope is relatively wide, and there are many divisional and sub-project construction projects. These are all directly related to land use. It is necessary to rationally plan land use in the design of the oil field master plan and strictly implement the basic national policy of China's land resource conservation and protection. On the other hand, in the design of the general drawing of the oil field stations, rational optimization of land use is also very positive, which has a very positive impact on the petrochemical enterprises themselves. The size of the petrochemical enterprises occupies a close relationship with the amount of their own investment. For example, the relevant oil field enterprise oil production equipment and oil tank interval are not combined with actual needs. If the design is too large, the construction volume and floor space operation resources will be greatly increased, resulting in an increase in investment costs.^[2] Based on this, it is of great significance to do a good job of designing the general drawing of the oil field station and realizing the land use for conservation, both in terms of implementation of policies at the national level and construction of oil field enterprises.

3. Analysis on Economical Land Use in the General Drawing Design of Oil Field Stations

For the general drawing design of the oil field stations, it is mainly divided into two parts; one part is the layout design, which requires the actual process flow of the oil field to meet the requirements of the actual production process and the safety production and transportation needs. Due to the inflammable and explosive nature of the oil field itself, the layout should be strictly in accordance with the national fire protection regulations, such as the "Fire Prevention Code of Petrol Chemical Enterprise Design" (GB 50160-2008) (hereinafter referred to as "Fire Prevention

Code"). In terms of vertical layout, mainly based on the actual production requirements of petroleum companies, combined with the drainage requirements of the corresponding sites, fully consider the conditions of oil field topography, hydrology, geology, etc., while performing the corresponding plane layout, complete the site leveling method selection; determine the site design elevation, layout location, etc.^[3] Specifically, when conducting the analysis of the land use for the general plan design of the oil field station, the following aspects should be done:

3.1 Do a Good Job in Scientific and Rational Selection of Oil Field Sites

Firstly, the address of the oil field station should be scientifically and reasonably selected. When selecting a site, first, the normal life of the surrounding residents cannot be affected; second, try not to occupy the cultivated land, such as forests and vegetable gardens; third, it is strictly forbidden to increase the demolition expenses without any reason and achieve effective control of budget costs. In the specific site selection, the surrounding open land hillside should be selected, and the development scale and product characteristics of the oil field enterprise should be analyzed reasonably, so that the site is not worth more compact, and the site shape selection is more regular. Every inch of land within the site can be fully utilized to eliminate the waste of land resources, which is to some extent an effective form of land-saving expression.^[4]

Secondly, it should be ensured that the site selection of oil field stations has certain space for development of the site. The petroleum resources are more precious, and the corresponding oil demand will gradually increase. Under this circumstance, in order to effectively meet the demand for petroleum energy in social development, the enterprises in the oil station sites will inevitably continue to develop, and the expansion of the oil station will become inevitable. Therefore, when preparing site selection, it is ready to prepare for the rain, so that the site of the site has certain potential for expansion, so that it can meet the development needs of society and oil enterprises, and can effectively save resources. After all, the expansion on the basis of the original is more resource-saving and other resources than the "restarting the stove". Therefore, it has a more positive impact on land conservation.

Finally, reasonable control of the plane shape of the oil stations. Generally speaking, the good shape of the oil stations field has a positive impact on the land area utilization rate and layout effect of the stations, and should be combined with the actual rectangular shape as much as possible. It is strictly forbidden to choose irregular triangles with narrow space to avoid land use dead angles.

Generally speaking, the aspect ratio of the site selection of the oil stations is controlled at about 3:1, which is more conducive to the utilization of land resources.^[5]

3.2 Total Plane Fire Spacing Control

According to the "Fire Prevention Code", for the new A-B process equipment and facilities layout, the linear distance from the fence of the plant should be controlled at 25m. At the same time, the distance between the newly-built A-B process facilities and facilities should be controlled at 50m. The above-mentioned so-called pitch is a safe distance between the land boundary line of the device and the facility and the land boundary line of the factory area. However, in actual planning and design, it is generally encountered that the boundary line of the land on both sides of the device and the facility is generally adjacent to the site road. For the oil field road, there is generally a red line of the road, that is, a boundary line for the road land. After the power boundary line of the corresponding process device can only overlap with the road boundary line or retreat to the road boundary line, it is strictly forbidden to cross the road boundary line. The width of the road boundary line generally exceeds 60m, that is, the distance between the boundary line of the device wall and the center line of the road is 30m. If the land boundary of the installation and facilities is controlled at 25m, the 25m empty space in the middle will be wasted. Based on this, in the principle of saving land, when the design is actually carried out, the distance between the newly built facilities and the process equipment and the wall can be appropriately reduced, and a good land saving effect can be achieved.^[6] When the premise is that the red line of the road has been determined and it is guaranteed that no facilities will be built, the corresponding distance should also ensure that the actual pipeline layout and fire protection requirements are met.

3.3 Plane Spacing Control of Building Layout

The "Fire Prevention Code" have clear regulations on the control of the fire prevention plant equipment and the plane fire distance of the building, that is, for the facilities and equipment such as the oily sewage regulating tank, the dirty oil tank, the grease trap containing the combustible gas, the fire prevention distance should be controlled at 15m, and all of the above structures belong to the same nature, that is, they are all flammable and explosive places. Therefore, it is not necessary to set the fireproof spacing between structures that are in the same sewage treatment and have the same nature. Structures with different properties need to control the fire distance to 15m. Therefore, when the safety control of the building plane is controlled, the nature of the corresponding structure

can be understood, and unnecessary fire distance control can be constructed, and the purpose of saving land can be achieved.

3.4 Reasonable Setting of Roads in the Factory Area

The roads in the factory area occupy a large area in the general plan design of the oil field station, which generally accounts for about 30% of the total site area, and the potential for saving land is also relatively large. Some planners pay too much attention to the "grade" of the road. In the design of oil field station roads, large-scale roads and large-channel forms are adopted, ignoring the core functional requirements of road design. While occupying a large amount of land area, but not fully exerting the actual road transportation effect, the related construction cost has been seriously wasted, which can be described as "a thankless task". It has a serious impact on the general quality design of the general oil field stations. Therefore, in the actual design process, reasonable design should be carried out in combination with the type of roads, so that it can meet the requirements of actual transportation functions and achieve the purpose of saving land, thereby effectively reducing design costs and improving design economic benefits. Generally speaking, the roads in the factory area can be generally divided into three types, namely main roads, secondary trunk roads and branch roads. In the specific design, the road type should be reasonably determined in combination with the flow of people in the factory area, product transportation, etc., to ensure that each road design can make the best use of it. In particular, attention should be paid to the width design of the road. Generally, the width of the main road in a large factory area is between 7 and 9 m, and the width of the main road in a small factory area should be less than 7 m. For the design of main roads used in non-production office areas, the urban road styles can be used for reference. As far as possible, the road width can be built according to actual needs, which can effectively save land.^[7] For the secondary trunk road, it is generally mainly responsible for school fire protection, overhaul, etc. Therefore, combined with the actual driving demand for roads for fire trucks and maintenance vehicles, the width can be controlled at 6 to 7 m, and the small factory area can be controlled at 4 to 6 m.

3.5 Arrangement of Flammable Liquid Storage Tanks

In the general drawing design of the oil field stations, the arrangement of the flammable liquid storage tank group is very important. In the actual design, it is necessary to take into account the safety of the tank group and ensure that

the grounding purpose can be achieved, so strict design is required. According to the "Fire Prevention Code", when the flammable liquid storage tank group is designed and designed, it should not exceed two rows (excluding the C-type tank group) for the safety of the tank group, so that once the tank group fires, it can make the rescue more convenient and more secure. Therefore, in the actual design of the flammable liquid storage tank group layout, it should strictly comply with the requirements of the "Fire Prevention Code", which can not only ensure the actual fire protection requirements of the tank group, but also effectively save the land. In the actual transformation process of the flammable liquid storage tank, two flammable liquid storage tank group arrangement schemes as shown in Figure 1 and Figure 2 can be adopted:

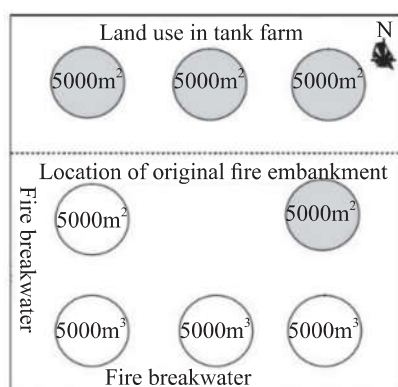


Figure 1. Flammable Liquid Storage Tank Group Arrangement Plan A

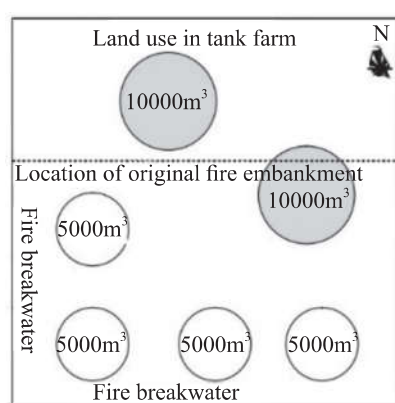


Figure 2. Flammable Liquid Storage Tank Group Arrangement Plan B

As can be seen from Figure 1 and Figure 2, this arrangement seems to have exceeded the arrangement of two rows, but mainly based on the perspective of saving land, and this arrangement is based on the original tank arrangement, if it belongs to the new tank group layout, the layout of the schemes 1 and 2 should be avoided.

Specifically, Figure 1 and Figure 2 above show the existing coal-fired tank group of a chemical plant with a total volume of 5000m^3 and only 4 tanks in the early stage. Two tank locations are reserved during the position design, used for subsequent expansion. In the east, south and west directions of the tank group, fire exit passages were arranged. On the north side of the tank group, restrictions were imposed on the land boundary of the tank group. At the request of Party A, it is necessary to increase the jet fuel volume by 200003 on the basis of the original tank group. Since the aviation coal tank belongs to Class B, it can be known from the "Fire Prevention Code" that tanks of Class B or above should not be arranged in two rows or more. The above Plan A and B seem to violate the requirements, but they are not. From the perspective of tank arrangement in Schemes I and II, Scheme 1 added four jet fuel tanks, each with a tank capacity of 5000m^3 , and Option 2 added two jet fuel tanks, each with a capacity of $10,000\text{m}^3$. And from the arrangement position, no matter which position direction meets the requirements of fire protection and storage tank cooling, it does not conflict with the specification requirements, and the newly added storage tank area is generally large. Based on the existing fire dam height and calculating the effective volume of the tank group, the above two schemes can also meet the requirements in the "Fire Prevention Code", that is, the tank volume should be greater than the maximum volume of a tank. Based on this, the above two plans can meet the actual requirements, and achieve good land-saving effects, and do not conflict with the provisions of the "Fire Prevention Code". After further analysis, Plan B was selected as the final implementation plan. The reason is that the tank layout is not new, but the optimization is carried out on the basis of the original tank. If the plot is re-selected for construction, on the one hand, it will increase the floor space, on the other hand, the corresponding pipeline will be further elongated, and other supporting public works will increase, and for the north side of the tank group, the area where 3 tanks can be added (the tank volume is 5000m^3) cannot be fully utilized, thus causing a certain waste of land resources.^[8]

4. Conclusion

In summary, in the actual design of the oil field station yard, the oil field-related site is inflammable and explosive, so it is necessary to strictly follow the fire protection requirements in the "Fire Prevention Code", and at the same time, It is necessary to further integrate the land-saving requirements, and it also has a more positive impact on the specific design implementation cost reduc-

tion. However, because the "Fire Prevention Code" have a wide range of applications, some of the provisions are difficult to match the actual design requirements. Therefore, it is necessary to analyze the specific problems in the actual design, and to have a deep understanding of the various elements in the specification, in order to meet the safety requirements of the "Fire Prevention Code", and to achieve cost savings and land resource conservation in order to make the oil field station drawing design more scientific and reasonable, compact and beautiful.

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