

Overview of the inlet components of the elevation type oil-water separator

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Abstract

The output of single wells in a number of old oilfields in my country is declining. In order to increase crude oil production, water injection and tertiary oil recovery are often used for deep mining. The oil cross section is easy to corrode the pipeline, and the mining cost increases accordingly. Elevation type free water remover is a kind of oil-water separation equipment that adopts buoyancy separation method as the main method. It is mainly suitable for oil well produced fluid with water content of more than 90%. The equipment has simple structure, large processing capacity and high oil-water separation efficiency. Research and improve it The internal inlet component improves the separation efficiency, and it is of great significance and value to increase the oil recovery rate economically and effectively.

Keywords

Elevation oil-water separator; inlet component; liquid separator; separation efficiency.

1. Introduction

At present, most of my country's oil fields have entered the mid-to-late period of development. For example, a number of old oil fields such as Daqing, Shengli, Liaohe, Dagang, Zhongyuan, etc., whose single well production is declining. In order to increase crude oil production, water injection and tertiary oil recovery are often used. Deep mining has caused the water cut of the produced fluid in the oil field to continue to rise, and the water cut of the produced fluid in some oil wells is as high as 95%. The higher water content not only occupies the oil pipeline, reduces the utilization rate of the equipment, and gradually increases the mining cost. At the same time, the high water content easily corrodes the pipeline, causes crude oil leakage, and brings huge unstable factors to crude oil transportation and production. Effective oil-water separation before crude oil transportation can reduce mining costs. Elevation type free water remover is a kind of oil-water separation equipment that adopts buoyancy separation method as the main method. It is mainly suitable for oil well produced fluid with water content of more than 90%. The equipment has simple structure, large processing capacity and high oil-water separation efficiency. Research and improve it The internal components increase the separation efficiency, and it is of great significance and value to increase the oil recovery rate economically and effectively.

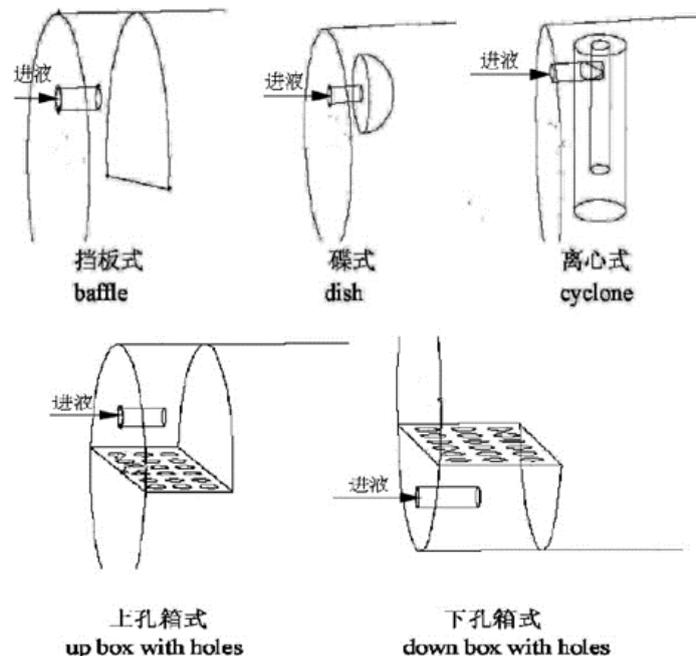
2. Elevation tube separator

Elevation-angle free water remover is a kind of oil-water separation equipment that adopts buoyancy separation method as the main method. It is mainly suitable for oil well produced fluid with water content of more than 90%. The main principle is: when the equipment has a certain inclination angle, after the ultra-high water-containing oil-water mixture enters the equipment, the gravity separation process is first carried out under the action of the density difference, so that the oil phase gathers in the upper part of the container, and the water phase

gathers in the lower part of the container. . Then, the oil phase accumulation section begins the process of gravity separation. Under the action of gravity, water droplets continue to settle down from the continuous oil phase to remove water in the oil phase; and the water phase accumulation section begins the process of buoyancy separation. Under the action, it continuously rises from the continuous water phase to remove the oil in the water phase. The separator structure mainly includes: support, separation tank (the separation tank is set on the support and has a certain angle with the horizontal plane), the produced liquid inlet, the inlet component, the oil phase outlet, the water phase outlet, the oil weir plate and the water weir plate, etc. member.

3. Entrance components

In traditional gravity oil-water separation equipment, there are generally two types of inlet components. One is a centrifugal inflow component, which uses the characteristics of high flow velocity at the inlet and uses inertia or centrifugal force to strengthen the pre-separation effect of the inflow component due to its processing capacity. Large, short residence time, high separation efficiency, low maintenance cost, and have great application potential. When pre-separation is emphasized, centrifugal inflow components are a good choice; the other is to use special inlet components The structure gradually reduces the inlet flow rate, absorbs its kinetic energy, and reduces the impact of fluid turbulence on the flow field in the device. There are five common types of typical traditional inlet components: baffle type, dish type, centrifugal type, upper hole box type and lower hole box type. The respective structures are shown in picture 1.

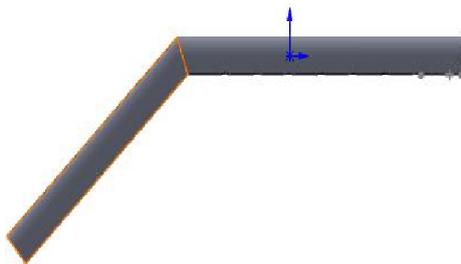


Picture 1

3.1. Round hole decentralized dispensing tube

At present, most of the inlet components of the elevation-angle oil-water separators use a liquid distributor. The dispensing tube uses uniformly distributed round holes with equal diameters, and a small number of holes with multiple grades of different diameters. Existing studies have shown that the parameters such as the hole diameter, hole spacing, and number of holes on the separator tube have a greater impact on the oil-water separation performance of the separator. In order to achieve the best oil-water separation performance of the oil-water separator, the liquid distribution hole on the liquid distribution pipe should be designed so that each hole is

proportional to its corresponding settlement area, and the oil-water mixture flowing out of each hole should be divided as far as possible. The liquid pipes are evenly distributed, so as to make full use of the sedimentation space of the separator and improve the effect of dehydration and degreasing. In order to make the opening design of the dispensing tube uniform, it is particularly important to determine the diameter, spacing and number of holes of the dispensing tube. It is necessary to make the flow of the holes equal, and to make the holes evenly distributed. The elevation type oil-water separator mainly relies on water washing and gravity sedimentation to separate oil and water. Therefore, the position of the separator tube in the separator should maintain a certain water washing layer, and make full use of water washing to improve the efficiency of oil-water separation. As shown in picture 2.



Picture 2

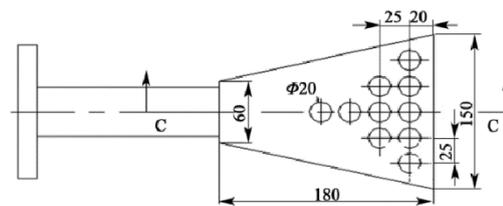


图3 液盒式入口构件具体结构

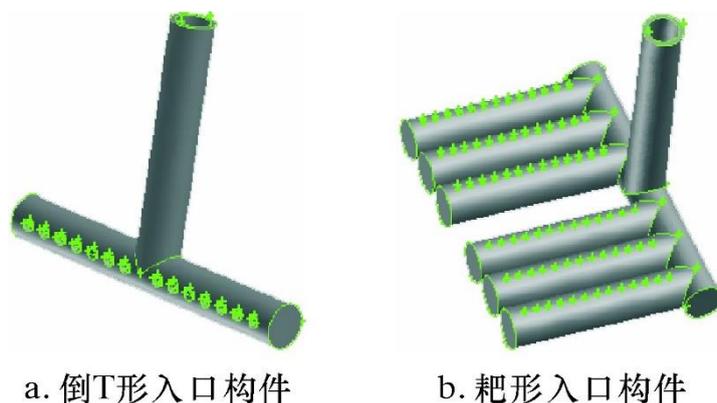
Picture 3

3.2. Liquid box inlet component

Hole box type entrance components are divided into upper hole box type and lower hole box type. The two forms have similar structures but different installation positions. The hole-box type inlet component can effectively reduce the generation of vortex, but because there is no violent impact similar to the collision type, the gas-liquid pre-separation effect is weakened. The bottom hole box type has good gravity energy dissipation and water washing effects, which can promote the coagulation of water droplets in the oil phase. The liquid box type inlet component is developed on the basis of the hole box type. The front end of the liquid box is small in size, and then gradually becomes larger and gradually expands. There are many small holes on the upper part of the liquid box, so that the two-phase liquid can be sprayed vertically upwards. out. As shown in picture 3.

3.3. Inverted T-shaped entrance member and rake entrance member

Both the inverted T-shaped inlet member and the rake-type inlet member have effectively added the effects of gravity energy dissipation and water washing. The gravity energy dissipation effect is mainly due to the upward jet working method. The liquid flow out of the orifice has to be overcome. In addition to the fluid drag force, it must overcome gravity to do work, so the energy dissipation effect is strengthened, which is more conducive to the timely conversion of liquid flow energy into pressure energy; the water washing effect is because the inlet component is located below the oil-water interface, when the oil-water mixture passes through the lower water In the phase, due to the jet effect, stirring and shearing, the flow field produces a certain amount of turbulence and confusion, thereby increasing the chance of coalescence between oil droplets and between water droplets and the continuous water phase, and improving the pre-separation effect. As shown in Figure 4.



a. 倒T形入口构件

b. 耙形入口构件

Picture 4

4. Conclusion

(1) Traditional baffle type, dish type, centrifugal type, hole box type and other inflow components. The baffle type and butterfly type mainly use the collision principle to make the liquid flow flow from the edge of the baffle to the separation zone to prevent the inflow from directly impacting the flow field of the separation zone. However, the flow field behind the baffle is relatively turbulent and the flow conditions are poor, which is not conducive to the oil-water separation process. It is rarely used at present; the centrifugal inflow component has obvious pre-separation effect, but it has the disadvantages of large power consumption and uneven inflow; the hole-box inflow component has good flow stabilization and rectification, but the structure of the component is complex, It occupies a large effective space, and the pre-separation effect is not as effective as the centrifugal inflow component.

(2) The round-hole dispersed pipette, liquid box inlet, inverted T-shaped inlet member and rake inlet member all separate the oil and water through the washing action of the oil phase and the sedimentation of the water phase, which can achieve a certain pre-separation effect. Possesses good oil-water separation effect. The circular-hole dispersed pipette has the advantages of simple structure and small volume; liquid box inlet, inverted T-shaped inlet member and rake inlet member to absorb part of the kinetic energy of the incoming liquid, reduce fluid turbulence and stabilize the flow field , Weakening the impact of the imported material liquid jet on the main part of the coalescence, the structure is relatively complex and the volume is large.

(3) The process design of the internal structure of the tubular separator, such as the structure size and operating parameters of the oil-water outlet, the liquid distribution pipe and the liquid distribution pipe hole, as well as the position of other components such as inlet components, weir plates, etc., will directly affect the separation efficiency of the separator. Affect the separation effect of the separator. Therefore, the structural size design of the tubular separator should be combined with numerical simulation and experimental research to analyze and compare, and select a more suitable elevation angle oil-water separator internal component size.

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