Research on Separation Process of Coarse Slime of Hydrocyclone Based on Computer Information Technology

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Abstract. The terminal equipment of the slime treatment system needs to realize that the slime water can be directly recycled or meet the conditions of direct discharge. The slime selection process has two main parts: first, the selection process and second, the product dehydration process. The slime recovery and recovery process has two main parts. The first is coarse slime recovery and dehydration equipment and the second is fine slime recovery and dehydration equipment. The above factors are the necessary conditions to realize the closed circuit of slime water. In these mitigations, the use of computers to complete their work can effectively increase production and this article studies them.

Keywords: Information Technology, Hydrocyclone, Sorting

1. Introduction

The slime water treatment process is as follows: slime water produced by jigging and washing coal enters the B800 fishing pit and the overflow of the fishing pit enters the pyramidal sedimentation tank. The overflow of the pyramidal pool enters the 150m³ water tank as coal washing water to continue coal washing and the bottom flow passes through the sewage pump for centralized drainage. After reaching the tank 1 # in the filter press workshop, it enters the rake thickener again. The rake thickener overflows and returns to the factory for reuse. The underflow is processed into a slime cake by the filter press and then sold.

2. Application analysis of computer coal preparation technology

First, filter press dehydration automatic control. In the production process of the coal preparation plant, different situations will be required. The automatic control of filter press, dehydration is to realize the automatic control of operating parameters according to different situations to ensure the orderly execution of the closed circuit process of slime water. Second, the flotation machine automatic control...

system. Its main purpose is to automatically adjust the flow rate and concentration of slime water and it is also possible to set the dosage rate of slime water according to specific conditions. However, because there are many factors that affect the proportion of the dispensing agent, this will to some extent cause the effect of automatic flotation control to be less than optimal[1]. Third, automatic coal blending control system. In the specific application process, the operator uses the online ash content detected by the computer, adjusts the frequency of the inverter by means of the implementation setting and adjusts the increase ratio of various coals to ensure that the coal ash content is reasonable in the range. Fourth, the density and liquid level automatic control system of heavy medium suspension. Determining the sorting density should be scientific and reasonable and the automatic control system can reasonably control the split opening and the amount of water added to complete the preset suspension density value. In addition, if the density value is not within the corresponding range, the automatic control system can adjust this at any time and the computer automatic processing system is shown in the figure 1.

![Figure 1. Computer automatic processing system](image)

3. Analysis of influencing factors of hydrocyclone

The hydrocyclone is mainly derived from the basic principle of the cyclone movement in the tube to remove dust in the air. Since the emergence of hydrocyclone in the late 1980s, it has been widely used in the separation of incompatible two media. Moreover, in the development process and the scope of application is getting wider and wider.

3.1. Inlet flow

The inlet flow rate is a very important operating parameter for the cyclone. When the oil-water mixture enters the interior of the hydrocyclone, it will eventually achieve oil-water separation under the action of a strong rotating force field[2]. Increasing the flow rate can further enhance the rotating force field inside the cyclone, so that the oil-water separation and the separation rate increase, but at the same time, under the strong rotation force, the oil droplets will eventually violently oscillate and break up. It gradually becomes smaller, which makes the separation of oil and water more difficult. More oil will flow out of the bottom of the cyclone with moisture and due to the increase of the rotation force, the residence time of the oil-water two-phase inside the cyclone is further reduced. Under the combined action of various factors, the oil-water two-phase separation efficiency will
eventually decline; and if the inlet flow rate is too small, although it will cause the oil-water two-phase mixture to stay in the cyclone field for a long time, but due to the internal generation of the cyclone. The swirl intensity is too small, which makes it difficult to separate oil and water\cite{3}. Generally, fixed structure swirl tubes have a certain high-efficiency flow range and the ratio between the maximum flow and the minimum flow in this flow range is often regarded as the flow adjustment ratio of the cyclone. The size of adjustment can largely reflect the adaptability of the cyclone to the fluctuation of the liquid flow rate. If the flow adjustment ratio is relatively large, it means that the cyclone has a strong adaptability to the fluctuation. Generally, the cyclone The flow adjustment ratio will be between 3-6, the structure of the hydrocyclone is shown 2.

3.2. Oil droplet size

Among all the factors that affect the separation effect of the cyclone, the oil droplet size in oily sewage is a very important parameter. Combined with stokes law, it can be known that as the oil droplet size continues to increase, the difficulty of oil-water separation will also be getting bigger. If the particle size and corresponding separation efficiency of oil droplets at different values are used as basic parameters, the corresponding efficiency curve can be drawn. Through the change curve of oil droplet size and flow rate, it can be found that when the oil droplet size is 75 μm, the oil droplet size will show a trend of decreasing first and then increasing with the increasing flow rate. When the particle size is 50 μm, as the flow rate continues to increase, the particle size of the oil drops will continue to decline and does not show a significant increase trend. This also fully shows that in the process of increasing flow, the rotating force field inside the cyclone tube will continue to increase, thereby further increasing the oil-water separation effect. However, as the flow rate continues to increase, the intensity of the rotating force field is too large and eventually the oil droplets break up. The probability of breaking up oil droplets in the above two particle diameter ranges is very large, which leads to a decrease in the separation effect\cite{4}.

4. Separation of coarse slime in hydrocyclone based on computer technology

4.1. Scheme analysis

The first type is to install a hydrocyclone in the filter press workshop, to recover coarse slime before the slime water enters the rake thickener, install a ZKK2050 vibrating screen and lay the filter cloth
above the screen plate as a hydrocyclone, install the vibrating screen on the west side of the 604 slime belt conveyor in the filter press workshop. After the slime water enters the filter workshop, it first enters the hydrocyclone. The sieve is grounded by the 604 belt conveyor and sold as slime. The slime water under the screen enters the concentration and pressure filtration system, which can reduce the burden of the concentration and pressure filtration system. The second method is to recover the coarse particles in the slime water before entering the filter press workshop, transform under the existing conditions, install a valve on the pipeline of the sewage pump depressurization filter workshop and connect the sewage pump outlet pipe to 826. 827 Wash the dewatering screen at the end. When there is a large amount of washing powder in the sewage pump pool and the 150m³ water tank, cone tank and sewage pump need to be cleaned, the valve of the sewage pump depressurization filter workshop is closed and the slime water is sent to the washing dewatering screen through the newly installed pipeline. Coarse-grained coal slime is dehydrated by the end-of-wash dewatering screen and bucket vertical centrifuge and then enters the end-of-wash silo, which avoids the phenomenon of blocking the pipeline and recovers the end of the wash, increasing sales revenue\(^{[5]}\).

4.2. Plan selection

Consider the following factors: (1) Due to the long pipeline from the sewage pump tank to the filter press workshop, it is easy to block the pipeline if it contains coarse particles in the process of transporting slime water, because the second scheme is to recover the coarse particles in the sewage pump pool, which can be avoided. Blocking of pipelines. (2) The coarse-grained slime recovered in Option 2 is sold as the end of washing and the recovered product in Option 1 is sold as slime, so Option 2 increases sales revenue. (3) The first scheme requires the installation of a dewatering screen at the end of the filter press workshop, while the second scheme uses the existing dewatering screen to recover coarse-grained slime with less investment and less workload. Therefore choose option two.

When the amount of slime water is large, the processing capacity of the dewatering screen at the end of the washing process is insufficient, resulting in the overflow of slime water, which not only affects the system operation and causes environmental damage and the workshop often accumulates water and mud, so we have improved the coarse-grained slime recovery system. Based on the existing conditions, install a valve on the pipeline of the sewage pump depressurization workshop and connect the sewage pump outlet pipe to the B800 fishing pit. The modification only needs to install a 6-inch ball valve on the sewage pump outlet pipe and install a 5-meter 6-inch pipeline. Considering the convenience of operation, the valve is installed in the sewage pump room\(^{[6]}\).

5. Conclusion

In actual operation, many coal preparation plants have proved that direct flotation and concentration filtration processes are very beneficial to achieve closed circuit of slime water, which is a fundamental reform in the flotation and filtration of slime water treatment. After direct flotation is implemented, the source of circulating water is single, which is convenient for effectively controlling the quality of circulating water, simplifies the slime water treatment system and is conducive to the closed circulation of slime water. The concentration filtration has achieved the effects of reduced cake moisture, 100% cake removal rate and two filters on top of one filter. However, the problem of defoaming in concentration filtration remains to be solved. In summary, slime water treatment is an indispensable part of the coal transportation unit of a power plant. The effective improvement of the
process of its treatment process can greatly improve the efficiency of slime separation, improve the utilization rate of water resources recovery and the slime disposal process is more Reasonable and convenient, the operation stability of the entire slime water treatment system has been improved and good economic benefits have been achieved.

Acknowledgments

The project of this paper is Study on simulation and application of hydrocyclone in coarse coal slime separation process.

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