

Brief analysis of the sdecanter centrifuge

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Abstract

Centrifugal settlement refers to the process of solid settlement in liquid by centrifugal force, and the material after settlement is further squeezed by centrifugal force to achieve solid-liquid separation. Centrifuges based on the principle of centrifugal sedimentation are referred to as sedimentation Centrifuges. Settling centrifuge has high separation factor, liquid-solid two-phase separation, solid phase after settling in the device's outer wall, do not need to use the filter medium etc., especially suitable for solid particle diameter is small. The difference in density between material separation difficult situations, can also be used for liquid- liquid two phase, liquid-liquid-solid three phase separation or sizing, etc., It is widely used in chemical, pharmaceutical, metallurgy, food, tobacco and other basic industries as well as energy, biology, environmental protection and other new technology fields.

Keywords

Decanter centrifuge, separation.

1. Summary

In recent decades, the development of the centrifuge is extremely quickly, using the field more and more widely, such as chemical industry, light industry, environmental protection, pharmaceutical, food, the use of oil fields, mines, metallurgy and other fields, fully demonstrates the special status of scientific, along with our country in the scientific field development to raise the level of comprehensive its applying prospects will be more extensive. According to their structural characteristics and use, can be divided into various forms, according to the structural characteristics can be divided into countercurrent, parallel flow, compound and other forms, according to the use can be divided into clarification, dehydration, three-phase separation, classification and other forms.

Compared with other filtration and separation equipment, the sedimentation centrifuge has the advantages of energy saving and consumption reduction, good separation effect, good adjustability and wide application range. In recent years, it occupies a large market space in the field of filtration and separation equipment. With the development of filtration separation technology, there are more and more efficient and energy-saving sedimentation centrifuge, according to the principle and structure can be divided into spiral discharge sedimentation centrifuge, dish type centrifuge, tube centrifuge and indoor centrifuge and other models. The spiral discharge and sedimentation centrifuge can realize slugging and filtration separation at the same time, to achieve the purpose of continuous separation, suitable for dehydration, concentration, classification clarification and many other occasions. Another widely used sedimentation centrifuge for disc separator, it is suitable for the separation of difficult to separate materials, such as large viscosity, small solid particles, similar density emulsion mixture, in the separation principle and performance has its unique technical characteristics.

2. Development situation of the decanter centrifuge

According to the structure of spiral unloading and settling centrifuge can be divided into horizontal and vertical two kinds, of which horizontal screw centrifuge is the most widely used. Since the introduction of foreign horizontal spiral unloading centrifuge in the 1980s, China's horizontal spiral unloading centrifuge through digestion, absorption of advanced technology, has made great progress. At present, China's horizontal spiral unloading centrifuge manufacturers have developed from the initial production drum diameter of 160mm to the present 1000mm of various specifications of horizontal screw centrifuge, separation factor has been increased from 1000 to 4000, diameter ratio is also increased from 2 to 5. In addition, the relevant scientific and technical personnel in China have done a lot of research on the horizontal spiral unloading centrifuge, including technical parameters, separation process, the development and selection of wear-resistant and corrosion-resistant materials, the innovation of safety protection devices, vibration reduction technology, bearing lubrication system and man-machine control, etc. At present, the comprehensive technical level of horizontal spiral sedimentation centrifuge has been greatly improved. After nearly 30 years of research and engineering application, horizontal spiral unloading sedimentation centrifuge has been developed rapidly, with the following advantages: a wide range of applications, can meet the needs of solid-liquid separation occasions, complete solid-phase dehydration, liquid phase clarification, liquid-liquid-solid, liquid-solid-solid separation and particle size classification separation process; It can be used to separate suspensions with solid phase particle diameter of 5-2000 μm and solid phase concentration of 0.5%-40.0%. It can operate automatically and continuously, with large installed capacity and low operation and maintenance cost.

The decanter centrifuge uses a closed structure with high speed rotation, and its internal flow field is difficult to accurately measure. At present, the research on decanter centrifuge is mainly focused on the strength check of drum and spiral ejector, and the research on the influence of the separation efficiency in the decanter centrifuge is still insufficient.

Tan Zhichao et al. [1], based on the mixture model and using CFD numerical simulation method, studied the influence of parameters such as drum speed, processing capacity and speed difference of a certain type of horizontal screw centrifuge on the gasification ash-water separation process.

Ren Xiaolei [2] studied the application of decanter centrifuge in coal gasification, and made a comprehensive comparison between the principle and parameters of the traditional fine slag dehydration equipment -- vacuum belt filter and decanter centrifuge, and concluded that the decanter centrifuge has great advantages.

Shan-shan xu [3] to study the efficient application of horizontal screw centrifuge in vinasse mash separation, this paper expounds the effective composition and working principle of horizontal screw centrifuge, respectively for high performance of the horizontal screw centrifuge with large length to diameter ratio, large cone Angle type selection, structure of high speed, high wear-resisting performance, energy conservation and loss are studied, finally by comparing with the conventional centrifuge The results show that the high efficiency decanter centrifuge is superior to the common decanter centrifuge in all aspects.

Liu Jinhai [4] analyzed and summarized the reasons for the failure and shutdown of the horizontal screw centrifuge in the oxidation device, including the failure of the torque protector, the discontinuity of the connecting bolt between the differential and the drum, and the lubrication failure of the bearing at the feeding end of the drum. Corresponding improvement measures were proposed for these failures.

Zhou Cuihong etc. [5] using Fluent software, choose the RSM and DPM model, through appropriate simplified flow field inside the horizontal screw centrifuge three-dimensional numerical simulation, analyzes the horizontal screw centrifuge length to diameter ratio and the

slurry viscosity on the influence of the pressure field and tangential flow velocity in the centrifuge, found that the longer the length to diameter ratio, the smaller the slurry viscosity, improves solid-liquid separation effect.

Chen Xi, LuHongWei [6] application of horizontal screw centrifuge jacket platform oily water sludge disposal was studied, using poor high silt-laden water in the wet sand tank into the horizontal screw machine, selection of centrifuge are calculated, including production capacity, separation factor, axial velocity and so on, finally, the main performance characteristics are analyzed, the scheme has been used on the spot.

Lu Yang et al. [7] selected model LW900 horizontal screw centrifuge to dewater the silt with high moisture content generated by dredging in order to solve the problem of limited dredging site. Based on the selection test of flocculant, the effect of the process parameters such as drum speed, overflow plate diameter and differential speed on the centrifuge operation was studied. In the study of vibration of decanter centrifuge, the analysis of different structural parameters and complete machine model at 4200r/min high speed is lacking. For this reason, Li Huachuan et al. [8] conducted overall and single modal analysis of drum and spiral conveyor of horizontal centrifuge at a speed of 4200r/min by establishing a numerical calculation model, and studied the influence of structural parameters on its model.

Li Zhengguo, Meng Qinghua [9] replaced plate and frame filter press by introducing decanter centrifuge with large processing capacity through technical transformation and process reengineering to deal with salt mud sent by brine refining post. All the filtrate is recycled, and the salt mud is transferred to the desulfurization tower of the thermoelectric workshop with the slurry of qualified concentration through the slurry adjusting device, so as to achieve the wet desulfurization, which completely meets the requirements of the use. However, through the use of the centrifuge, it is found that it is inadequate, and it is hoped that it can be further improved to fully meet the needs of the enterprise.

Ren Yuanyuan [10] established a simulation model of the internal flow field of decanter centrifuge based on transient calculation method. Meanwhile, the reliability of the simulation model was verified by the existing experimental results, and the influences of the speed difference and the pitch of the spiral blade on the separation efficiency of decanter centrifuge were mainly studied.

Dai Zhaohui [11] used numerical simulation method to study the influence of length-diameter ratio and half-cone angle of the drum of decanter centrifuge on its separation performance, and introduced three-dimensional model modeling, mesh division method and numerical simulation process of decanter centrifuge.

Wang Dachuan [12] introduced Swedish ALFA horizontal spiral unloading and settling centrifuge for the oil-bearing sludge generated from the wastewater treatment of Yan 'an Oil Refinery. By on-site adjustment of centrifuge operation parameters and test medium parameters and on-site sampling, he analyzed the influence rule of each parameter on centrifuge treatment effect according to the results of laboratory analysis.

Li Jianpo [13] studied various factors affecting the treatment effect of decanter centrifuge, and believed that on the premise of qualified solid content of filtrate, the primary and secondary order of influence on mud cake moisture content was: feeding rate>difference>solid load>mud concentration>mud flow, and on this basis analyzed the adjustment scheme of decanter centrifuge.

3. Working principle of the decanter centrifuge

The decanter centrifuge is mainly composed of drum, spiral ejector, differential, driving device and other components. After the sludge mixture into the centrifuge drum, larger than the liquid

density of solid particles under the action of centrifugal force rapid subsidence to the inner wall of the drum, screw conveyor and a drum to the same, but the speed difference between existence, form of relative movement, using the relative motion, the deposition of solid phased particles on the inner wall of the drum into the small drum drying area further dehydration after the slag discharge, The clear liquid after separation flows out from the overflow port at the big end of the drum, so as to realize the continuous slag discharge and filtration separation.

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