

Impact Analysis of a Coal Conveying Belt Tensioning Device

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Abstract

The coal conveying belt conveyor is equipped with a tensioning device to ensure that the belt does not slip during operation. The insufficient weight of the tensioning device leads to the failure of belt tensioning in time during operation. The tensioning device of the coal conveying belt can provide tensioning force for the operation of the belt to avoid slipping. However, in the actual operation, it is often prone to collision accidents, which not only affect the machinery itself and transportation quality, but also threaten personal safety. Based on this, this paper first analyzes the investigation and main causes of impact accident of coal conveying belt tensioning device of bucket wheel turbine, and then puts forward some treatment measures. It is suitable for power plant application and covers various possibilities of belt tearing of coal handling system in power plant. It basically meets the technical requirements of belt tearing detection and protection. If the matching weight of tensioning device is insufficient, it will cause the problem of late tensioning during belt operation.

Keywords

Coal Conveying Belt, Coal Handling System, Hit.

1. Introduction

The coal handling system of the power plant is a system that provides fuel to the boiler, which is mainly used for coal storage, loading and unloading, transfer, transportation and metering, so as to meet the fuel demand of the generator unit [1]. Coal conveying belt and bucket wheel are the main equipment of coal conveying system, which undertakes the main tasks of coal storage and loading. Among them, bucket wheel turbine is an important equipment of coal storage and transportation system, and its operation also directly affects the safe operation of power plant [2]. The bucket wheel conveying system includes the bucket wheel and its matched coal conveying belt [3]. Only when they are properly matched can they ensure their reliable operation. Otherwise, the equipment will be difficult to meet the working requirements and even cause accidents [4]. The study 2 × Two subcritical coal-fired generating units are designed for the 600MW unit project, and the supporting coal handling system is constructed. In the belt conveying system, No. 3 belt conveyor can directly convey the coal from the truck coal unloading system and dumper to the next level belt, and then send it to the main plant [5]. At the same time, two bucket turbines can also be used to transport coal to the coal storage yard. The coal from each plant can be sent to the coal bunker of the main power house through No. 3 A and B belts and 2 taidou turbine.

The whole accident mainly occurred after the inspection and test of No. 3 a coal conveying belt system were completed to ensure that the control system and mechanical equipment were in normal state, and the person in charge of trial operation ordered to start the belt operation. After the belt is started, the drum is driven at the head, and the belt at the winding end is accompanied by large range shaking and relaxation, and the tail tensioning trolley is also accompanied by back and forth shaking, After the belt is in no-load operation for about 30 minutes, the belt in the suspension section of the upper bucket wheel bridge swings due to belt deviation or some other reasons, and the trolley at the tail also

moves back and forth. Then the amplitude of the belt swing and the amplitude of the trolley moving back and forth become larger and larger [6-8]. Finally, the trolley begins to impact violently against the vertical frame of the drum. Finally, the belt suddenly relaxed and contracted, causing the telescopic device of the head to bounce up and hit the roof. The whole accident took a relatively long time, so that although the supervisor found the belt swing and took the treatment measures of tightening the parking rope switch, the accident was not effectively organized.

2. Method

2.1 Development of Tear Detection and Protection Device for Coal Conveying Belt

The set of return belt tear detection device adjusts the distance of the control rope up and down the return belt by adjusting the U-shaped slot hole of the fixed base of the rocker arm travel switch mechanism, and the appropriate distance is 20 mm. When the return belt is torn or the torn edge is warped, regardless of the situation on the front and back of the return belt, depending on the inertia of the belt operation, the torn or torn edge warped part is directly hung with the control rope, and the control rope moves forward with the belt operation, so that the arm of the rocker travel switch mechanism also rotates forward. When the rotation angle of the arm is greater than 30 °, The rocker arm travel switch turns on and gives an alarm. Due to the lag of the alarm, the control rope will eventually be broken by the inertia of the belt operation. The streamlined coal chute + unpowered dust removal coal chute technology changes the material flow from the "explosive" or "impact" disorderly falling material in the traditional coal chute to the "cluster" popular line sliding in the streamlined coal chute by controlling the material flow, so that the outlet speed of the coal flow is consistent with the speed of the receiving belt, Minimize dust generated by impact and reduce the speed of air flow. The unpowered dust removal guide chute mainly uses the positive pressure induced wind generated by the falling shear air of the material through the multi-stage circulating pressure relief device, dust suppression unit and adjustable lifting dust curtain set in the main body of the guide chute

To change their travel path, make them offset each other, consume wind energy step by step, and effectively intercept and filter the dust in the gas, so as to effectively suppress the wind speed and dust by using the principle of inertial dust reduction. It is a technology to suppress the generation of dust from the source.

2.2 Process

The coal conveying belt is equipped with a tensioning device, which is used to generate a certain pre tension in the conveyor belt to prevent it from slipping on the transmission drum; At the same time, the deflection of the belt between the idlers shall be controlled to reduce the resistance and avoid scattering. Under normal conditions, the working process of the tensioning device is that when the belt is started and materials are added, the belt resistance increases, the belt tension increases, the belt is pulled up and lengthened, which will reduce the pre tension at the winding end of the transmission drum, and the tensioning trolley moves towards the traction counterweight box to tighten the belt and restore the pre tension; In case of unbalanced material loading, belt deviation, friction between the belt and the support, lowering or lifting of the unloader, etc. during operation, the resistance of the belt will change, resulting in the change of the tension of the belt at the tensioning drum, damaging the stress balance of the tensioning trolley, moving the tensioning device and re tensioning the belt, Restore the pretension to the original value.

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rocker arm travel switch turns on and gives an alarm [10]. Due to the lag of the alarm, the control rope will eventually be broken by the inertia of the belt operation. The spherical coal storage yard with small floor area, high utilization rate of coal storage site, less earthwork, high degree of automation and superior environmental protection performance is the first choice for many new power plants. For the old power plant, due to various reasons such as site and equipment, it can only be reconstructed on the original basis to meet the requirements of environmental protection and reduce the flying of internal dust. When the dust laden air flows in the guide chute without dust suppression plate, the flow is simple. Under the influence of gravity, the particles gradually settle near the bottom [11]. The flow field structure in the guide chute affects the movement direction of particles in the air flow [11]. Without interference, particles only rely on gravity precipitation. After flowing through the guide chute, there is little difference in the distribution of particle volume fraction at the outlet section [12]. In this case, since most of the particles are still in the air flow, after leaving the guide chute, their diffusion range is large and the degree of environmental pollution is high. The particle volume fraction distribution at the outlet section of each scheme. Without dust suppression plate [13], the particle volume fraction distribution in the section is basically uniform, only changes at the bottom and top, and the changed area is small, mainly near the top and bottom. The uniformly arranged dust suppression plate and incremental dust suppression plate scheme are used. The outlet particles are mainly distributed in the area near the bottom, the particle volume fraction of the upper part is low, while the air flow diffusion capacity of the upper area is significantly greater than that of the bottom area [14]. A large number of particles are in the bottom air flow, and in actual operation, the bottom belongs to the coal flow surface [15], and its general shape is circular arc. However, most of them are uneven and have strong deceleration ability to the air flow, which is conducive to the settlement of particles in the air flow [16-18]. As a result, the pollution degree of the dusty air flow at the outlet of the guide chute under the two schemes of uniform arrangement and incremental arrangement to the air in the trestle is significantly lower than that without dust suppression plate.

3. Conclusion

The normal operation of coal conveying belt in thermal power plant directly affects the production and economic benefits of power plant. The tear of coal conveying belt is a problem often encountered by power plant. Therefore, the detection of coal conveying belt tear is an important means to prevent the expansion of tear. The fundamental reason for the impact caused by the large swing of the tensioning device is that there is a matching problem in the design of the bucket wheel machine and the coal conveying belt. The position of the bucket wheel trestle is too high, so that the bucket wheel machine on the belt has a relatively long suspended section, resulting in swing during operation. However, the calculation of the matching weight of the tensioning device does not consider the additional force generated by swing, resulting in insufficient matching weight.

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