International Core Journal of Engineering Volume 8 Issue 1, 2022
ISSN: 2414-1895 DOI: 10.6919/ICJE.202201_8(1).0084

A Process Flow Optimization Method for Coal Handling System in Power Plant

Mingan Zhang

Fujian Huadian Kemen Power Generation Co., Ltd, Fuzhou, Fujian, 350500, China

Abstract

Although the traditional uniform coal conveying mode can ensure the supply of coal and power supply, it does not meet the goal of energy-saving development. To solve this problem, the paper first analyzes the work flow of the coal handling system, and infers the relationship between coal demand and time according to the work mode of the coal handling system. According to the simulation results, the chute and guide chute of the transfer point are optimized. Compared with the simulation results before and after optimization, the compression and induction effect of material flow on the gas in the chute is obviously weakened It effectively reduces the production and operation cost and creates convenient conditions for the layout of mining and stripping transportation system in the lagging area of land acquisition in the future.

Keywords

Coal Handling System, Improve Quality and Efficiency, Optimization.

1. Introduction

Electric energy is an indispensable energy in modern industrial production and life, so the power industry is also the basic industry of all countries in the world. As the producer of electric energy, the power plant also has the problem of high energy consumption. Therefore, the power plant has important responsibilities in production and saving [1-3]. Although from the overall development situation and the development of science and technology, the power generation capacity of photovoltaic, wind power and nuclear energy is increasing, according to the current situation of our country, thermal power generation will still be the mainstream power source for a long time in the future [4]. Therefore, paying attention to energy conservation and emission reduction in the process of thermal power generation is not only the saving of coal and electricity, but also an important means of environment-friendly and sustainable development. In recent years, the fuel transportation workshop of new power branch aims at the transformation and development direction of "clean [5-7], comprehensive, intelligent and international". Due to the limitation of coal storage in dry coal shed, if the rainy weather lasts for a long time or the coal taking equipment in dry coal shed fails, the dry coal supply of phase I unit will be affected, thus affecting the stability of unit operation. Due to the influence of the process flow layout of the coal handling system, the dry coal shed supporting the phase II open coal yard and the dry coal of the phase circular closed coal yard cannot be supplied to the phase I unit by the corresponding coal taking equipment [8].

In the actual production of thermal power plants, constant speed belt conveyor is usually used to transport coal for coal bunker to ensure the reliability of users' power consumption. Therefore, when power consumption is low, there is usually the phenomenon of "big horse pulling small car", which obviously wastes energy [9-11]. At the same time, the service life will be shortened due to continuous equipment operation. Therefore, all power plants are carrying out technical transformation for constant speed belt conveyor.

ISSN: 2414-1895 DOI: 10.6919/ICJE.202201_8(1).0084

2. Process Optimization of Coal Handling System

2.1 Implement Small Target Project Management

In order to reduce the power consumption of coal handling and further improve the management and control level of small indicators of coal handling operation [12], the coal handling specialty summarizes the index management experience in previous years, establishes a management network team for reducing coal handling power consumption [13], takes the Department Director as the team leader, manages at different levels and implements the responsibility to each person. In the process of carrying out the evaluation of small indicators of coal handling operation, the management team implemented democratic management, gathered wisdom, mobilized the majority of employees to put forward reasonable suggestions, continuously improved the evaluation content, improved the system operation efficiency, reduced the common power rate of coal handling, and realized the project-based management and control mode of small indicators of team operation.

2.2 Deepen the Benchmarking of Team Small Indicators

The introduction of benchmarking management is also the process of introducing advanced management mode. Refine the benchmarking indicators of each team. The benchmarking indicators of the operation team mainly include the qualified rate of mixed combustion and coal handling power consumption [14-17]. At the same time, the concept of coal loading rate, that is, the amount of coal loading per unit time, is introduced Carry out benchmarking of various indicators such as power consumption rate per ton of coal, analyze and compare the gap between the five teams, learn from the team experience with better indicators, improve the coal loading rate, strive to use the most coal in the shortest time, give full play to the post advantages to achieve the purpose of energy conservation and consumption reduction. The function of the data layer is to gather the data passing through the system and form various application data according to business needs, mainly including: monitoring video image data used to realize intelligent image analysis; Equipment data for equipment synchronization and operation; Identity information, face information and other personnel data. The platform layer is a customized Internet of things platform, which plays a central role in data access, management and transmission for front-end sensing devices and business applications. The platform realizes the unified management of various terminals with different protocols by connecting sensors, access control, cameras, personnel positioning and other equipment. At the same time, it connects with the upper business application, provides data support in the form of interface, and realizes equipment linkage control according to the requirements of the upper business system, so as to meet the control requirements of other docking systems for equipment. This platform mainly includes the functions of equipment access and management, data analysis management and service support, equipment linkage control, task command issuance, etc. The top-level application layer can modularize and customize application functions according to the actual business of the power plant.

2.3 Consolidate Safety Responsibility Network

In combination with the "five works" of workshop shift handover, pre shift meeting, team learning, patrol inspection and defect management, standardize the handover work contents of "finger dictation and safety confirmation" on site by both parties; Sort out and standardize the operation process of "team" pre shift meeting, and pay close attention to the post standard reporting process of team members; The team leader shall carefully record the troubleshooting of hidden dangers before the shift, the rectification of hidden dangers during the shift and the on-site handover after the shift, timely find problems, implement rectification, eliminate potential safety hazards, and pay attention to the dynamic safety management of the whole staff, the whole process and all-round on-site; The wechat platform is used to establish a work group. All managers know the whole work chain like the back of their hands, and timely grasp the information of water transportation coal port reporting, wharf unloading, equipment maintenance, coal transportation operation and loading operation, so as to deal with the problems in energy conservation and consumption reduction; Aiming at the problems that are easy to occur in the daily operation process, carry out QC activities, fully mobilize the

ISSN: 2414-1895 DOI: 10.6919/ICJE.202201_8(1).0084

consciousness of employees to independently solve the problems around them, improve the daily management of the team, and enhance the combat effectiveness of the team in reducing costs and increasing efficiency. (1) the occupational health module monitors the above indicators in the production environment that may endanger personnel's health in real time through temperature, noise and dust concentration sensors, displays them in a centralized manner, and gives an alarm for exceeding the standard. (2) the personnel positioning module is to set up a positioning network through positioning base stations, positioning electronic labels and other equipment to realize the personnel real-time positioning function, centrally and intuitively display the number, location and personnel information of operators in the operation area, and combine the positioning information with electronic two ticket system and video monitoring system to monitor the movement of operators outside the operation area during operation Non operators enter the operation area, patrol inspection is not in place and other behaviors to identify and alarm, and can immediately link the video camera to view the site situation. (3) the access control module manages the access authority of key areas by adding access card readers to key areas and authorizing employee cards to prevent irrelevant personnel from entering key areas. (4) at present, the common flushing method of ash prone cables in coal handling area is manual water holding pipe and water gun cleaning. The intelligent water flushing module of the system changes the flushing work from manual to automatic, timely feeds back the cable tray information through intelligent terminal equipment such as sensors and cameras, and lays flushing water pipes. It realizes automatic flushing through remote control or automatic control, liberates relevant staff, reduces the occupational health risk of staff and eliminates the risk of personal injury accidents, At the same time, labor cost and water cost are saved and work efficiency is improved. (5) the automatic inspection robot of coal conveying belt can intelligently and independently select the inspection mode according to the real-time operation state of coal conveying belt, maintain the full coverage and real-time monitoring of the running belt by carrying vision system and other composite sensor systems, and guide the operators to find the belt slip, deviation, tear and damage in time based on machine learning and large data technology Abnormal coal seam temperature and other faults.

3. Conclusion

Starting from the problems existing in the process flow of the coal handling system of the power plant, aiming at ensuring the safety of coal supply for the unit, reducing the economic loss of the unit, improving the economic energy-saving dispatching level of the coal yard and increasing the flexibility of the coal supply mode of the system, this paper introduces the current situation of the coal handling system and the optimization of the process flow of the system in Taishan Power Plant.

References

[1] Zhan Changyi Research and design of coal handling control system in thermal power plant based on PLC [D] Hefei University of technology, 2020 DOI:10.27101/d.cnki. ghfgu. 2020.001104.

[2] Hao Runsheng, Zhang Guozeng Study on direct coal feeding mode across coal yard in coal handling system [J] Electromechanical information, 2020 (12): 106-107 DOI:10.19514/j.cnki. cn32-1628/tm. 2020. 12. fifty.

[3] Li Yanqiang Research on removal technology of single coal handling system in gasifier operation [J] Chemical management, 2020 (07): 131-132 + 147.

[4] Zhang Yaodong, Wang Ligang, Sui Xiaoli Low cost optimization of coal injection system [J] Hebei metallurgy, 2019 (12): 66-68 + 50 DOI:10.13630/j.cnki. 13-1172.2019. one thousand two hundred and seventeen.

[5] Song Junfeng Transformation and energy saving optimization of coal handling unpowered dust removal in thermal power plant [J] Equipment management and maintenance, 2019 (21): 163-164 DOI:10.16621/j. cnki. issn1001-0599.2019. 11.83.

[6] Liu Wei Discussion on dust causes and dust removal Countermeasures of coal handling system in power plant [J] Inner Mongolia Science, technology and economy, 2019 (15): 108-110.

ISSN: 2414-1895 DOI: 10.6919/ICJE.202201_8(1).0084

[7] Ren Zhiling, Zhao Xing, Lin Dong, Zhang Guangquan, Zhang Zhongbao Energy efficiency optimization of coal conveyor system in power plant based on MPC [J] Control engineering, 2019,26 (07): 1372-1377 DOI:10.14107/j.cnki. kzgc. one hundred and sixty-one thousand one hundred and five.

[8] Yuan ganyi Research on warehouse operation optimization of GK Coal Terminal Company [D] Guangdong University of technology, 2019 DOI:10.27029/d.cnki. ggdgu. 2019.001242.

[9] Jing Changcai, Liu Zhiyuan Energy saving index analysis and Improvement Countermeasures of fuel and coal handling system in power plant [J] Shenhua technology, 2018,16 (12): 86-88 + 93.

[10] Wu Junke Research on cost control and efficiency increase of thermal power project [D] Zhejiang University, 2021 DOI:10.27461/d.cnki. gzjdx. 2021.002138.

[11] Ma Ning, Zhang Xiaomin Application of anti blocking coal chute in coal handling system of power plant [J] Coal science and technology, 2020,41 (06): 90-93.

[12] Wang Kun Influencing factors and solutions of coal conveying belt damage in power plant [J] Technology and market, 2020,27 (11): 113 + 115.

[13] Li Yuying Acceptance and environmental protection design of completed environmental protection facilities of coal-fired power plant [J] Electric Power Survey and design, 2020 (10): 26-30 DOI:10. 13500/j. dlkcsj. issn1671-9913.2020. 10.006.

[14] Lu Peng Application of equipment diagnosis technology in coal handling equipment maintenance [J] Electronic technology, 2020,49 (06): 154-155.

[15] Wei Peng, Suo Hui, Xiang Hui Performance based design of automatic fire alarm and fire linkage control system in thermal power plant [J] Power station system engineering, 2020,36 (03): 79-80.

[16] Yu Qiyi, Hua Jie, Shi Jing Discussion on water management and zero discharge of wastewater in thermal power plant [J] Shanxi architecture, 2020,46 (09): 136-138 DOI:10.13719/j.cnki. cn14-1279/tu.2020. 09. 061.

[17] Ying Anna, Wang zuofan Control design of multi high voltage frequency conversion long pipe belt at the wharf of Java 7 power plant in Indonesia [J] China water transport (second half of the month), 2020,20 (04): 64-65 + 75.