Relevant issues of fuel supply paths modernization at Ekibastuz GRES-1 n.a. B. Nurzhanov by introduction of automated process control systems

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Abstract. Modern requirements for the quality of technological processes and the level of automation of complex facilities have raised an extremely relevant issue of the process control system modernization at Ekibastuz GRES-1 n.a. B. Nurzhanov. In order to ensure the required level of technological parameters, the modernization of fuel supply paths was carried out by KER-Engineering LBC. As a result, the performance of Ekibastuz GRES-1 was significantly improved.

1 Introduction

The modern dynamic development of industry requires constant updating of equipment and technology. The introduction of the modern automated process control systems results in increased production efficiency and product quality. The slightest mistake or failure can lead to significant economic losses or create an emergency situation that is dangerous to humans. This is especially relevant for industrial facilities where manufacturing processes are extremely complex. The modern automated process control system based on the Ovation (Emerson) software and hardware complex is successfully implemented at Ekibastuz GRES-1, which allowed installing the specified heat and electrical power [1-4].

2 Object characteristics

Limited Liability Partnership Ekibastuz GRES-1 named after Bulat Nurzhanov, located on the north coast of Zhengeldy Lake, 16 km north of Ekibastuz city of Pavlodar region, is a thermal power plant with an installed capacity of 4,000 MW. It is one of the largest coal-fired power plants in the world with a current available capacity of 3,500 MW.

Since 2010 the modernization of the main equipment of the power plant was started driven by the present requirements.

In 2017-2018 the modernization of fuel supply paths Nos. 1,2 was carried out with the introduction of process control systems. An additional fuel injection unit was constructed with an automated process control system.

3 Program-technical complex (PTC) of fuel supply

Automation of most production processes is carried out using modern microprocessor-based controller facilities. They are combinations of hardware and software systems.

The Ovation software and hardware complex allows one to optimize the process operation mode according to the specified criteria and to timely obtain reliable information about the course of the process and the state of the equipment.

The integrated fuel-supply PTC system is divided into two start-up software and hardware complexes of the automated process control system of input No. 3 and the automatic process control system of inputs Nos.1,2.

Each complex is an independent process control system with its own uninterruptible power supply, controllers, domain controller, engineering station and network equipment.

This software and hardware complex performs information and calculation functions of the system. These include collection, transmission and storage of information, as well as processing operations (input, sampling, correction and issuance), provide prompt calculations and automate the exchange of information between workstations within the organization, to carry out data saving in the archive. It also registers technological deviations of parameters, indicating a violation in the normal process flow. Functional group control, in contrast to the centralized one, makes it possible to control the individual nodes of the fuel supply path according to a specific algorithm, checking

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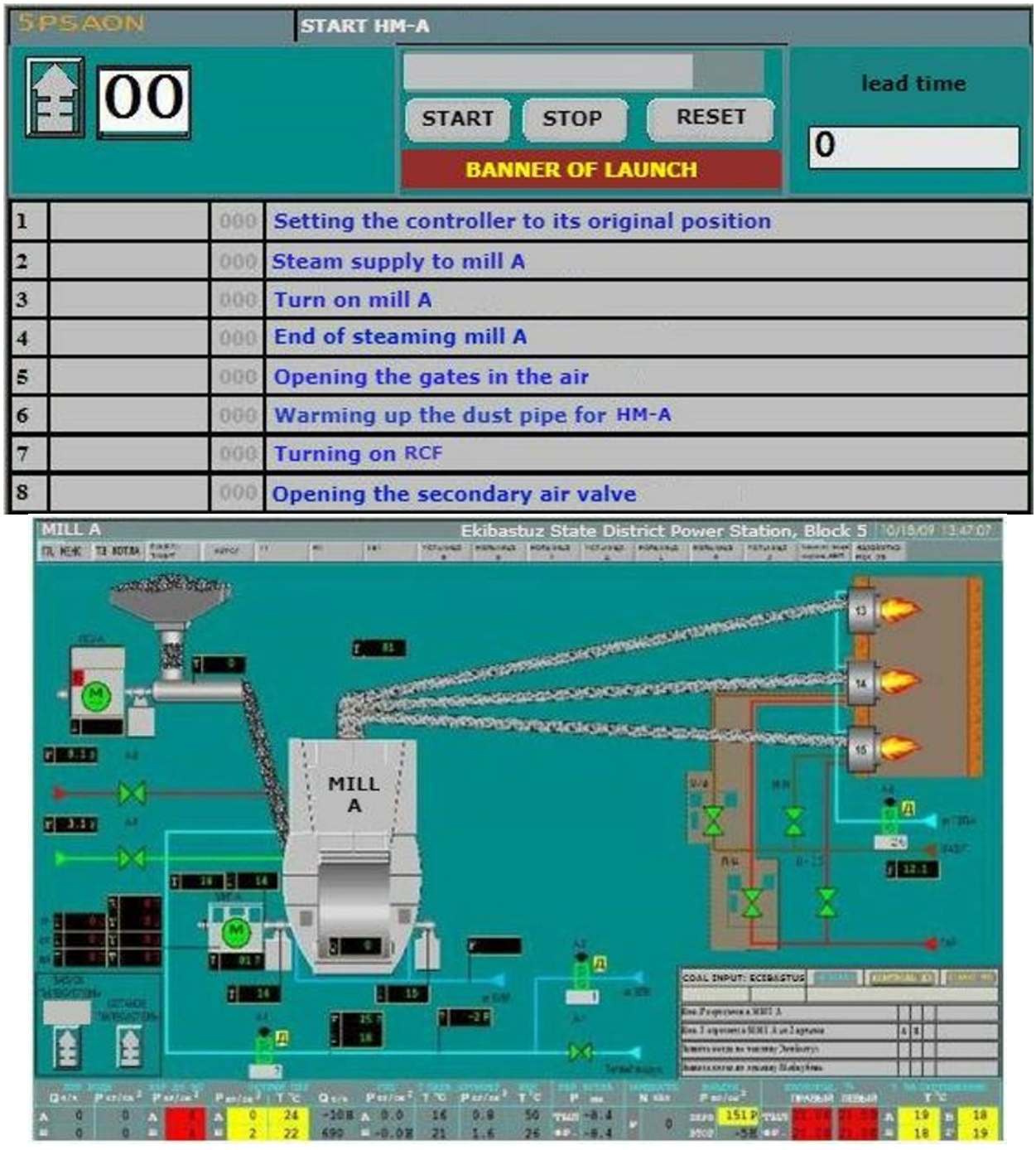

Fig. 2. Functional group interface of the "Start-up of a dust-cleaning system".

Fig. 1. The mnemonic scheme of the functional group control "Automatic loading of raw coal bunkers".

separator at the exit is divided into three dust lines connected to different burners (figure 2). Requirements for the system reliability are increased as the dust system is rigidly connected with the boiler.

Even before the improvement, this scheme had a number of advantages, namely: simplicity, compactness of the equipment, and low power consumption for transporting the dust from the mill. The performed modernization significantly increased its reliability, which is relevant, since the uninterrupted operation of the boiler is impossible without the proper functioning of the dust system. Functional group control "Start-up of a dust system" provides an automated start/stop of a dust system unit consisting of a mill, raw coal feeder, and air dampers for heating dust.

This component of the automated fuel path control system allows checking the readiness of the technological units of the dust system. This is done by implementing an algorithm for a clear stage-by-stage program to start/stop the system. When an error occurs, the system returns to its original state. Functional group control also interacts with the protection subsystem. The modern interface greatly facilitates the work of the operator [8-11].

6 Conclusion

As a result of the full-scale automated control system implementation, it became possible to achieve the predetermined output of heat and electric power. Modernization of the fuel supply paths of Ekibastuz GRES-1, carried out by KER-Engineering LBC, with the introduction of a modern automated process control system based on the Ovation (Emerson) software and hardware complex, allowed us to resolve many urgent issues. Now it is possible to control individual units of the path and the system as a whole, and control the algorithms execution at each stage. The exclusion of the operator from the implementation of routine procedures resulted in reduction of raw materials loss, increased productivity, and, consequently, the reduced technological costs.

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