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MODERNISATION OF EXISTING CONTROL SYSTEMS BASED ON THE PCS

The features of integrating advanced information technologies based on automated control systems in the existing management system training workshop on the example of raw glass factory.

At the present stage virtually no one material production can not do without the full or partial automation. This is due to the complexity of technological processes that occur, rapid variability and dynamic modes of the equipment, the necessity of accurate and timely managing impacts. Automation of these processes is essential for increasing their efficiency.

The implementation of effective multifunctional measuring and control systems requires the use of modern software-technical instrumentality based on progressive information technologies and new generation design techniques. Establishment of new automated information measuring systems is one of priority directions of modern computer technologies development.

Full or partial automation of production processes provides automatic control, regulation and signalling of the process parameters through appropriate automatic devices, accident-free start and stop of the available units. Automation of technological processes at the present stage provides a broad introduction of computer technology in the management system, which should solve the problem by the main process equipment, auxiliary operations, monitoring, analysis and computer aided management and supervisory control and data acquisition systems.

During the modernization of frequent occurrence is the need for introduction of management in existing, debugged involved in the production cycle process. This is usually a requirement of making minimal changes to the existing technical system and the existing management system to provide it with emergence characteristics [1].

During an investigation at the department of feedstock at the glass factory the level of automation of the existing system of management of technological aids was determined. The composition of the present system of control consists of cabinets with based control equipment and buttons, some of which are based in place. The system includes a hardware lock not correct switch sequence units, and it is difficult with understanding the process start / stop the technology line, herewith the temperature at the beginning and end of each drum drying settings displayed on the recorder, located near each of them.

Location on three floors of the department control equipment and locking devices in cabinets and in place forced the operator, during operation of the equipment bypass, spending a long period of time, until to 15 minutes. The sequence of the bypass also depended on whether it was starting, or stopping of the technology line. Appropriate indication of the work of equipment is implemented only on the control boards, so during alarms triggering the operator should at first explain the reasons for refusal on the shield, and only then determine to re-start or stop the equipment of the line and make decision to eliminate all causes.

Based on the analysis conclusion about the possibility of establishing a comprehensive automation system which should be based on modern information technologies and the proposed three-level automation system, distributed on the basis of management of technological devices of the firm OVEN [2]. Lower level consists of remote input / output modules, which directly interact with the processing equipment without additional normalizing converters and relay interface elements. Compact design of remote input / output modules allows to install them in existing control cabinets of production lines of training materials shop without significant changes in existing electrical circuits.

All remote modules of analog input, discrete input and discrete output combined with each other in industrial network RS-485 using two wires line of twisted pairs of conductors. Through

automatic converter interfaces USB/RS-485 designed network connects to the USB port to a personal computer (Fig. 1).

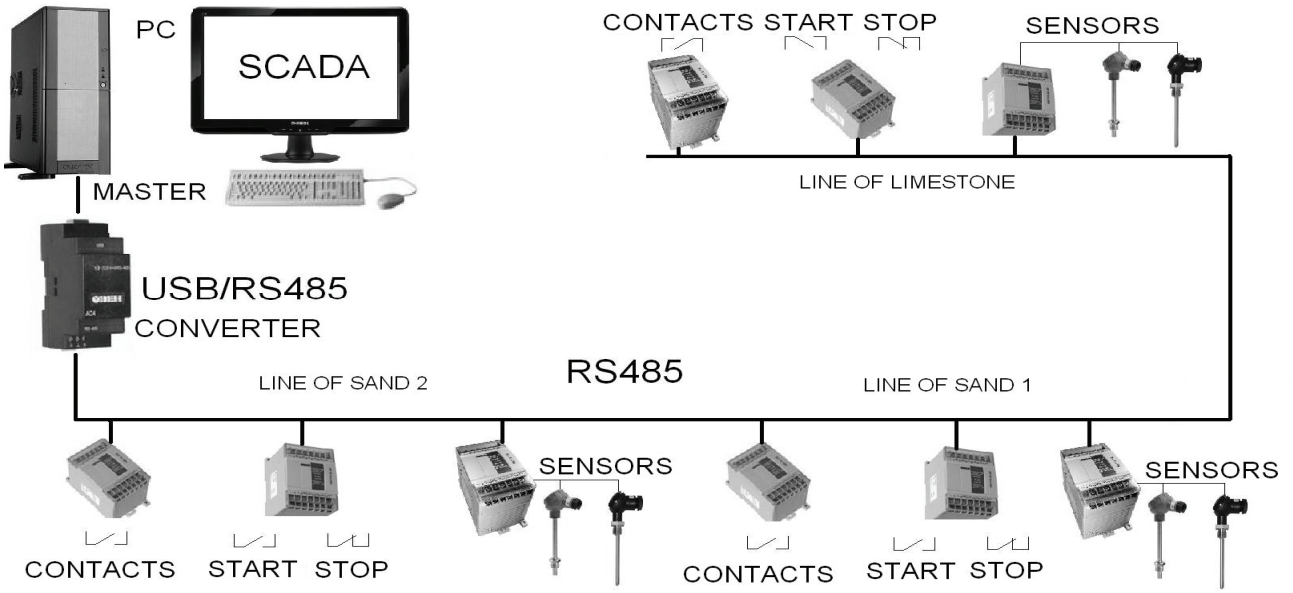

Fig. 1. Block diagram of automated process control system of raw materials for glass factory

Automated workplace organized by means of professional SCADA system Trace Mode. Graphical user interface developed using the existing SCADA system in object-oriented editor, which includes a full set of animated features [3].

For ease of displaying all available devices are represented in lines according to their appearance, in proportion to each other in sequence to their location at the department. For easy identification of process equipment at each group of buttons of start / stop at mnemonic diagrams also indicated the number of equipment items, as shown in Fig. 2. for line of limestone.

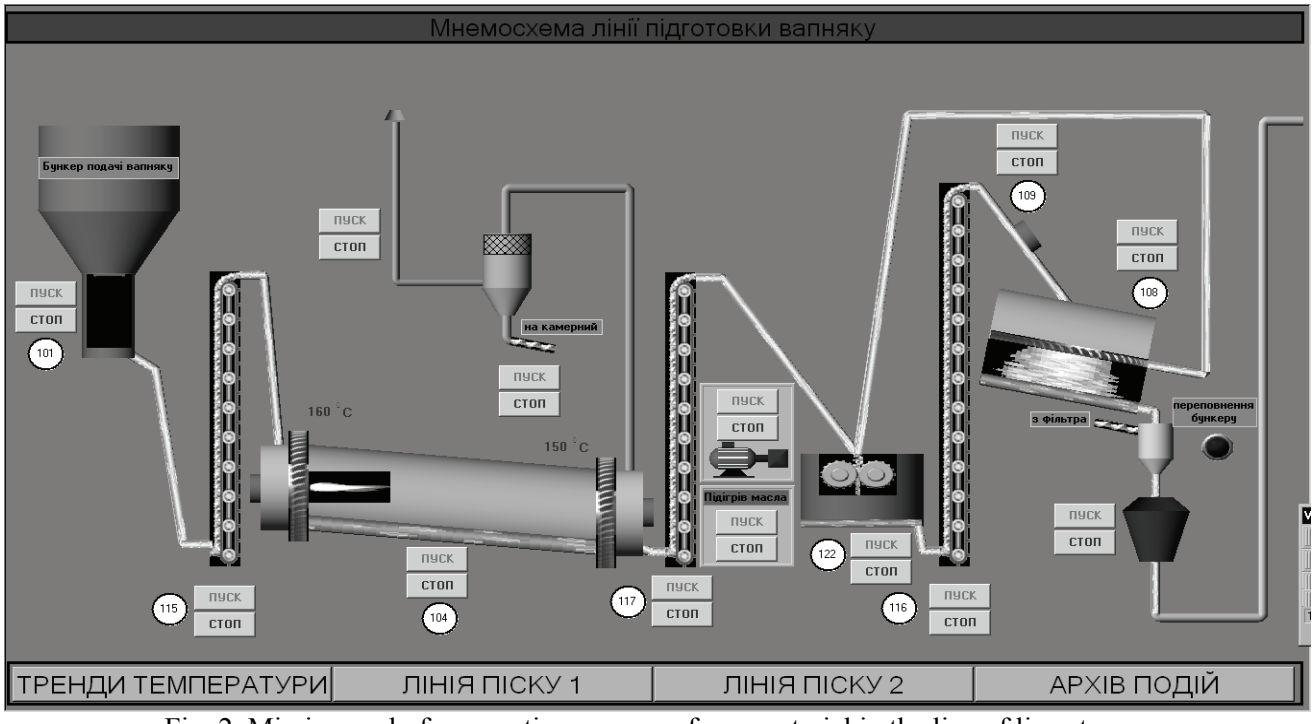

Fig. 2. Mimic panel of preparation process of raw material in the line of limestone

The state of each vehicle is displayed using dynamic graphics, which during running lines have representation on the progress of the process. Conditions of separate units indicate by

changing the color of simple static elements (red - off, green - on). It should also be noted that to enable individual sized devices with large inertia, or for those that contain their own microprocessor control system, you need a certain period of time. So provides hold of manager with control buttons until you start moving images, which indicates a full launch of the technological device.

To display at these mnemoschemes other plant lines below each screen are the buttons. All graphs of temperature change at the beginning and at the end of each drum drying installation located in a separate window. With the trend can be traced by the change in temperature over time and determine its current value.

Some technological devices to ensure safety include local lock buttons, at which the operation of it is not possible no remote, no manual switch in place. Therefore, informing the operator about a particular blockage of technological equipment, mimic panel contains appropriate informative indicators. In case of accident with blocked apparatus in place, the orderly controller must inspect this machine, knowing the reason for blocking, and the possibility of its withdrawal from this state.

Working hours of each line are displayed on a separate schedule on a dedicated screen monitoring of plant lines (Fig. 3).

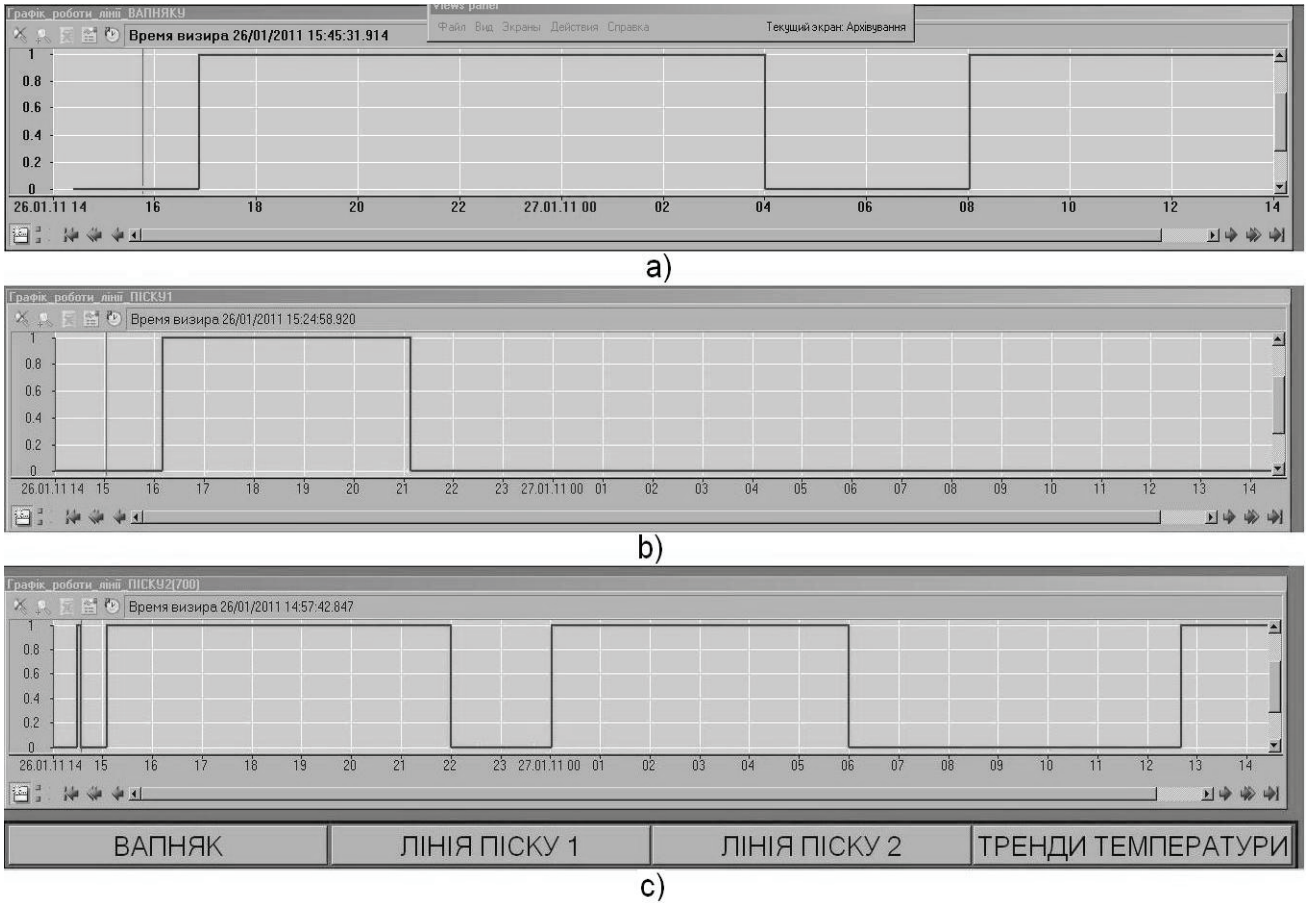

Fig. 3. Display of schedule workshop training materials during the day: a) line of limestone; b) line of sand; c) line of sand 2

The peculiarity of this PCS is that it SCADA-system performs functions of the controller, such as conducting unpacking bit fields obtained from blocks decentralized peripherals. It is a master with respect to the RS-485 and configured OPC-server reads the data from all units that comprise the network. Each block has a unique network address. Settings of the port number, to which the auto transformer of the interfaces is connected, data rate and protocol for all blocks that includes decentralized periphery, should be the same. During unpredictable turned off of the power or network from one block or group of input / output blocks SCADA-system continues to work with remained part of the network. It falls a little performance of the system as a master network

several times trying to find unconnected blocks. After eliminating the causes of failure in the network developed PCS alone returns again to the previous mode.

The structure of decentralized periphery contains the following types of modules: 16D-MV110, MV110-2A and MU110-8R. Discrete Input Module MV110-16D contains 16 discrete input channels. It can be connected using non potential (dry) contacts and the transistors of the n-p-n type keys. Analog input module MV110-2A contains two universal analog inputs, which can connect a wide range of sensors: thermocouples and thermistors without using of normalizing transducers, and sensors with uniform current and voltage signals. In this unit are implemented filtering and correction of the output signals. Module of discrete output MU110-8R has 8 relay outputs with a switching capacity 4A, 220V. Modules are powered with current of direct voltage DC 24V or AC 220V, which is very convenient for existing systems. All these devices are working in the network RS-485 by protocols OVEN, ModBus-RTU, ModBus-ASCI and DCON. One should not forget that the OVEN protocol developed to describe the exchange of information between OVEN devices and a PC on the network RS-485, it is used in the configuration of devices.

All of the modules are provided by the manufacturer with OPC-server that is used for devices connection to the SCADA-systems and controllers of other manufacturers. Modules configuration conducted on a PC through automatic converter of interfaces AS4 using "M110 Configurator" [2]. All modules in regard toEMC have class A, they are resistant to the interference of this kind. Convenience of using modules detected during installation of them, when it was necessary to install the equipment in cabinets. These devices were mounted on the standard DIN-rail, compact arrangement had been reliable in use and economized cost of laying electrical cables.

Existing remote supervisory control system includes available hardware blockage. Introduced PCS based on SCADA-system, even without a controller, can provide the same features. In this case the locking can be prescribed in the respective programs using one of the IEC 61131-3 standards, which are supported by the Trace Mode.

Developed system allows realizing an automatic start and stop of the automated production lines after clicking by the appropriate button of the start or stop. After this technological devices will be run and stop in predetermined sequence, and with pre-defined time intervals prescribed in the appropriate control program.

Conclusions

The proposed system of supervisory control and data acquisition in real time for the workshop training materials of the glass factory fully corresponds to the set to it demands. Implementation of this system allows reduction of the start-up of each processing line for ten times, entering the continuous monitoring equipment, to reduce unproductive happening of equipment. Specialized software together with hardware includes the properties of universality, extensibility and scalability. The presence of these properties enables further gradual evolutionary expansion of the integrated ICS without stopping production. Lack of the controller and industrial network using simple and relatively inexpensive units of decentralized information gathering allows us to offer the above set of software and hardware for automation control systems and other technological processes, while ensuring a profitable price and system reliability.

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