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DESIGN FEATURES OF CONTROL PANELS AND CONSOLES IN AUTOMATION SYSTEMS

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Abstracts: The paper considers main elements of automation systems – control panels and consoles. In course of analysis, main types of panels and control panels were identified, their main purpose was given, and their design features were emphasized. The paper also presents developed control panel for controlling magnetic starters.

Key words: system, automation, consoles, control panel, design.

Modern trends in development of science and technology lead to automation of all areas of activity [1, p. 46]. The diversity of modern automation methods expands the scope of their application [2, p. 116]. Automation systems (AS) are integral part of any modern enterprise, and panels and consoles are important component, as they allow operator to perform key functions of controlling and regulating technological process if necessary. Control panels make it possible to intensify production, so issues of their design will always be relevant.

When it comes to automation panels, such tools are needed to combine functions of a programmable controller and operator interface in one device. They appeared on the market about 15 years ago. Many early devices were just I/O panels with some local I/O, ladder logic, and flat database.

Thus, panels and consoles are structure on which devices and means of control and automation with electrical and pipe wiring are placed. Mnemonic diagrams,

overhead inscriptions, signal lamps, and displays are placed on their front side. Shields and consoles help to concentrate control and automation equipment and protect it from mechanical, temperature and other harmful effects. With help of equipment located on boards and consoles, operator receives necessary information about process and controls process automatically or manually.

The following types of control panels can be distinguished in course of AS analysis:

For its intended purpose:

1. Operational (from which technological process is managed and controlled).

2. Non-operational (intended for installation of apparatus, instruments and other devices that are not directly used for control and monitoring of technological process).

3. Control rooms (from which dispatcher receives information about state of mechanisms and key parameters characterizing course of technological processes, monitors and, if necessary, takes measures by influencing elements of automatic control systems for these processes or transmits necessary orders).

4. Control of power units (from which manual and automatic control of power equipment of thermal power plants is carried out).

By design:

1. Cabinet single panels, two-section and three-section panels with rear doors, as well as small-sized panels (in production facilities and in panel rooms) for installing equipment under special conditions [3, p. 12].

2. Panel boards with frame of all standard sizes and auxiliary elements to them in control rooms and operator's rooms, to which personnel servicing automation systems have access.

3. Cabinet boards with front and rear doors – as relay and other auxiliary boards for two-way service.

4. Consoles are devices for placing control and alarm equipment in control rooms and production facilities.

Now let's look at main elements of panels and consoles that make up such

structures. Firstly, it is frame – rigid, load-bearing, three-dimensional or flat metal frame designed to install panels, walls, doors, covers, rotary or stationary frames, unified mounting structures and installation of devices, apparatus, fittings, installation products, electrical and pipe wiring.

Secondly, it can be panel with frame – three-dimensional frame on support frame with panel mounted on it.

Next, it is cabinet, which looks like three-dimensional frame on support frame with panel, walls, doors, and lid installed on it.

A rack is three-dimensional or flat frame on support frame.

Cabinet panel – cabinet with installed (on unified mounting structures, rotary or stationary frame) equipment, fittings, installation products and with electrical and pipe wiring, prepared for connecting external circuits and devices installed at facility.

Panel with frame – panel with frame with equipment, installation products, and electrical and pipe wiring installed on unified mounting structures, rotary or stationary frame, prepared for connecting external circuits and devices installed at facility.

A stats is construction with three-dimensional frame with equipment, installation products, electrical and pipe wiring installed on unified mounting structures, prepared for connecting external circuits and devices installed at facility.

Flat rack – rack with flat frame with equipment and mounting structures installed on unified mounting structures, equipment, fittings, installation products, and electrical and pipe wiring prepared for connecting external circuits and devices installed on objects.

Now about consoles. The body of console is three-dimensional frame with inclined tabletop, walls, and doors.

The structural diagram of main elements of control panels and consoles (consoles) (Fig. 1).

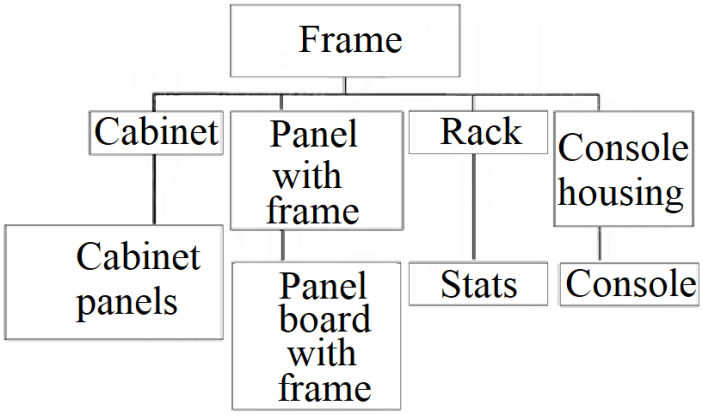
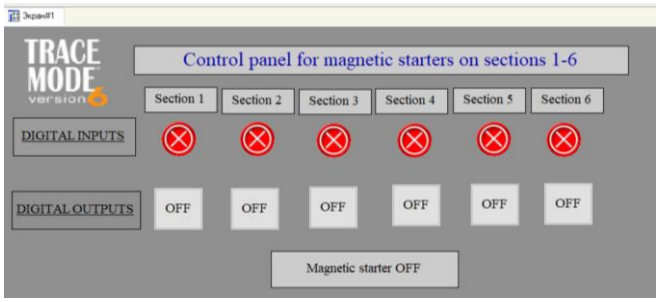
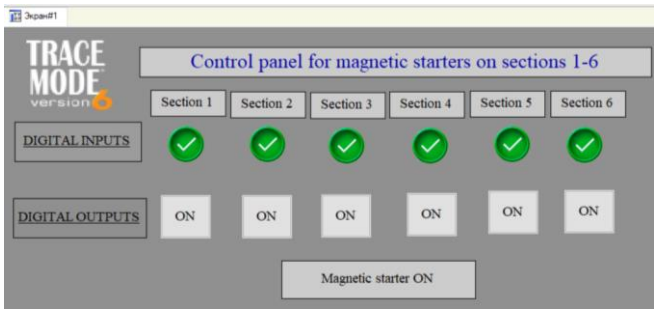


Fig. 1. Structural block diagram of main elements of control panels and consoles

The control consoles (CC) is device in form of table, column, stand, etc. Example of control panel developed in Trace Mode 6 system is shown in Fig. 2, a, b.



a)



b)

Fig. 2. Example of developed magnetic starter control consoles

Modern automation system has to do process control and demonstrate excellence in regulatory and discrete control [4, p. 1].

Thus, main elements of automation systems, such as control panels and consoles, were considered in this paper. This work is prerequisite for design of new process automation system in chemical industry. In course of analysis, main types of

control panels and consoles were identified, their main purpose was given, and their design features were emphasized. The paper also presents developed remote control for controlling magnetic starters.

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