

AUTOMATED CONTROL SYSTEM AND REGULATION OF PUMP STATION OPERATING MODES

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Annotation: The paper considers and studies the types of installation of a pumping station for irrigated lands. In pump installations with an axis located above the water level, the unit can only be started up by pre-filling it with water when the valve in the pressure pipe is closed. The control scheme for these installations should ensure the interaction of all auxiliary mechanisms. In the Republic of Uzbekistan, three types of pumping station system are used. The first is the gander system, the second non-return valve, the third vacuum pump. One common method is to automatically pump pumps using a vacuum pump. The technological operation of pre-filling pumps at automated pumping stations is performed by various vacuum installations, mainly using liquid ring vacuum pumps.

Keywords: Time relay, logic elements, transistors, relays, contact, diode, pumping stations, technological processes, protection, mode, automation means, control, management, microcircuit, cascade amplifier, vacuum pump, operation mode, time period.

Introduction

Automation covers all areas of technology, dramatically increasing labor productivity. Automation makes it possible not only to free (unload) a person, but also to achieve the results of the operation of individual mechanisms or machines that cannot be ensured by other methods [1]. Automation not only reduces and facilitates human labor, but also modifies the nature of labor itself and its quality, makes it possible to link separate production processes into a single technological complex, leads to important social and economic changes, and helps blur the lines between mental and physical labor; human tasks are reduced to the management of technological processes [2]. At large stations, a small staff is provided, which primarily carries out control functions. Set the automatic mode of operation of pumping units. Station-wide installations are also

automated [3]. All these structures and devices are involved in the process of pumping water, and the automation of their work is usually included as part of the total automation of the pumping station. The pump station as a whole, in addition to the above, is automated depending on the purpose and the specified operating mode [4]. In irrigation and drainage for many millennia, water intake, water supply, water distribution and irrigation were primitive, had a low coefficient of performance (COP), which contributed to the deterioration of the reclamation situation, etc. The intensification of agriculture requires an integrated approach to both the design and construction of new and reconstruction existing reclamation systems, and here the primary role is given to the achievements of scientific and technological progress [5]. So, irrigation systems made at the modern technical level with the automation of technological processes allow you to save up to 30 ... 40% of irrigation water and free up to additional 6 ... 8 ha for every 100 ha for sowing. The efficiency of such systems reaches 0.9 ... 0.95 [6]. Moreover, automation allows, in principle, to change the design of the irrigation system, in particular, to drastically reduce the length of the channels, due to this increase the coefficient of land use (KZI), etc.

The control of such a pumping unit essentially boils down to controlling the electric motor and monitoring the operation of the unit. The automatic control scheme is very simple, requires a minimum number of equipment and provides high reliability [10].

Such schemes are used, as a rule, for pumping units with axial pumps. The operation of centrifugal pumps, and especially horizontal ones, according to this scheme, is possible only with special design solutions of pumping stations that ensure the location of the pump axis under the water level and the use of individual pressure pipelines. Here, start and stop modes acquire a specific character. It is possible to exclude preliminary priming or to ensure that the axis of the pump is level by installing the pump in recessed chambers or using a suction pipe or storage tank to fill the raised elbow [11]. The pump casing with these filling methods is constantly filled with water, which greatly facilitates start-up and shortens its duration. In pump installations with an axis located above the water level, the unit can only be started up by pre-filling it with water when the valve in the pressure pipe is closed [12].

The control scheme for these installations should ensure the interaction of all auxiliary mechanisms. One common method is to automatically pump pumps using a vacuum pump. The technological operation of pre-filling pumps at automated pumping stations is performed by various vacuum installations, mainly using liquid ring vacuum pumps.

Solution methods. Consider one of the main methods of starting a pumping unit using a vacuum pump. Figure 1 shows the connection diagram of the vacuum pump 5 with the main pump 1. The constant water circulation required for the normal operation of the vacuum pump is ensured by the circulation tank 3, from which water enters the suction pipe 6 and enters the pump casing together with air. Then, as the impeller rotates, air and excess water through the discharge pipe 4 are thrown back into the

tank [13].

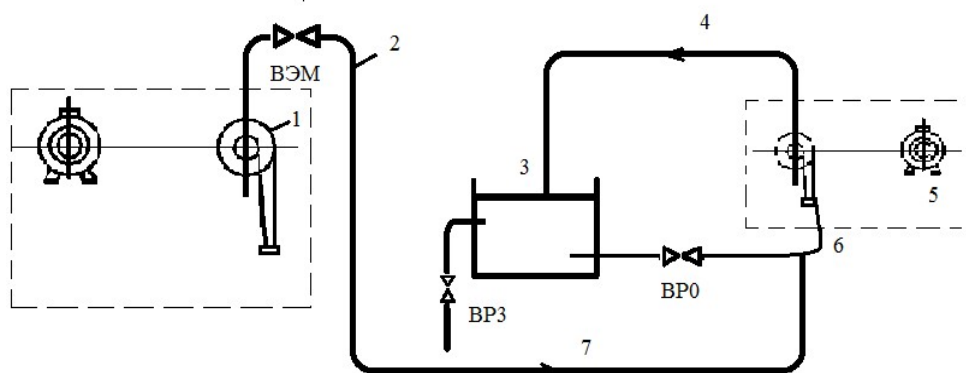


Fig. 1. Functional diagram of filling the pump unit with a vacuum pump.

Automation of this device requires the installation of a sensor or relay 2, which controls the level or flow of water and fixes the end of the fill (fill control relay) [14]. To isolate the pipeline connecting the vacuum pump to the centrifugal, a VEM electromagnetic valve is used. The vacuum pump is driven by an asynchronous squirrel-cage electric motor with a power of 1.5 or 2.2 kW [15].

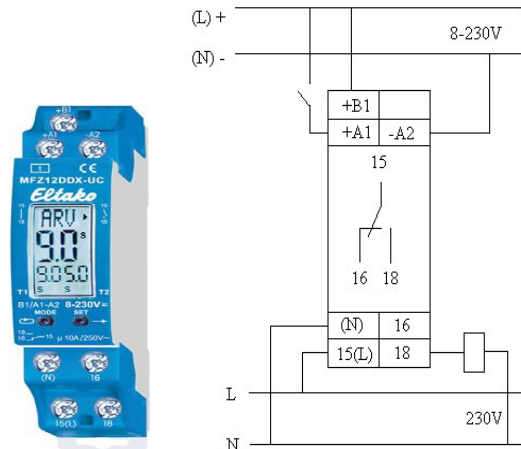


Fig. 2. Electronically programmable delay relay.

When you press the "start" button, the first unit (vacuum pump) is turned on, after completing its task, the pump vacuum must be turned off and the second pump unit (main pump unit) is turned on in parallel, after which the first unit is turned off. Switching the pumping units on and off, the staff sets the time period and operating mode.

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