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Modernization of Relay Protection and Automation of Boston 110/35/10 KVL Power Supply, Supplying Pump Station with Power

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Abstract: This article discusses the problem of developing new protection schemes and the use of digital and microprocessor relays in relay protection systems in substations during the modernization of protective devices of power transformers in the substation 110/35/10 kV Buston, which supply power energy of pump station.

Key words: Workstations, relays, analog signal, functional controllers, digital signal, RS- 485, over current, software and hardware complex "Protection - 3" CD – 110.

For the normal operation of the electrical systems supplying the power to the pumping stations, the damaged equipment, power lines must be quickly identified, disconnected, and thus the conditions for the normal operation of the remaining power consumers and the power system must be created. Safety is ensured when the power supply devices of pumping stations are detected in case of abnormalities and measures are taken. In conclusion, it can be concluded from the above that the construction and operation of automatic devices that protect its elements to protect electrical systems and power consumers from damage and abnormal conditions are in great demand in electrical systems [1].

Until recently, all the organs of relay protection of power supply devices of pumping stations were performed only with the help of electromechanical relays. In the logical part of such execution, the required patience time was created by means of clock mechanisms controlled by electromagnetic devices. For this purpose, in addition to clockwork, electromagnetic relays with magnetic holding of the armature separation were used [1].

Induction-driven mechanical systems were used to generate time-dependent characteristic relays. The speed of such mechanisms depends on the value of the current flowing through them. But the electromechanical equipment is outdated and needs to be replaced. They have high accuracy, fast mobility, difficult to perform difficult characteristics. Significant labor is required for maintenance to maintain the working condition of the protection. The equipment takes up a lot of space, requires a large number of electrical materials. High energy consumption requires high-power operating current sources, as well as high-power current and voltage measuring transformers [1].

In many cases, the new requirements for relay protection may not be met due to the imperfection of the equipment, including electromechanical devices.

It became clear that the use of electromechanical n-relay equipment in the power supply of pumping stations, both qualitatively and quantitatively, hinders the further development of relay protection technology. One of the possible ways out of this situation is the use of modern semiconductor circuitry, first of all - a new generation of relay protection.

The transition to a new element base in the power supply devices of pumping stations does not lead to a change in the principles of relay protection and automation, but only expands its functional capabilities, simplifies operation and reduces costs. For these reasons, microprocessor relays are rapidly replacing obsolete electromechanical and microelectronic relays [2].

The main characteristics of microprocessor relays in the power supply devices of pumping stations are much higher than those of microelectronic, especially electromechanical relays. The power they

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consume from current and voltage measuring transformers is around 0.1-0.5 V · A, hardware errors - 2-5%, the coefficient of return of measuring bodies is 0.96-0.97 [2].

In analog RH systems, as a rule, the performance of the hardware part, including in the presence of humans, is subject to periodic testing only. Periodic inspection has the ability to operate the faulty RH system for a long enough period of time - until the next scheduled inspection. Thus, it is considered more reliable to perform the function of digital devices in the power supply devices of pumping stations [2].

Based on the above considerations, we found it appropriate to use digital and microprocessor relays in the system of relay protection automation of the substation during the modernization of the protection devices of power transformers of Boston 110/35/10 kV substation.

On the basis of working tests and comparisons for RHA substations 110/35/10 kV power supply equipment of pumping stations (10) kV, microprocessor terminals (MT) of several leading domestic and foreign manufacturers were selected BMRZ (block microprocessor relay zashchita) type [2]. The advantages of MT BMRZ are proven long-term use even in the most demanding conditions, the external temperature activity is also reliable with -40 ° C performance. In terms of its technical and price characteristics, the Boston 110/35/10 substation will meet the requirements of the best protection location. Today, Mexhatronika has facilities for foreign state-owned enterprises with a production capacity of 100,000 MT per year. Typical solutions for RHA for 110/35/10 distribution networks of pumping stations power supply equipment Application of BMRZ-based MT-100 and new BMRZ-150-based MTs with equipment and their characteristics Shown in Table 1.

When using MT BMRZ-150, it is possible to obtain high levels of relay protection. MT BMRZ-150 The input currents relative to MT BMRZ-100 (0.05 ÷ 50 · I_ (nom)) differ in the range control. These are important for differential and remote protections. Has a sensitivity greater than 0.004 A. [3] MT BMRZ-150 additionally uses input and output discrete numbers, consumer algorithms MODBUS RTU, MEK 60870-5-101, -103, -104, MEK 61850, as well as time synchronizer PPS and TCIP, NMEA, SNTP, PTP RS-485 and can be used via Ethernet s. In addition, these devices used algorithms to monitor high-voltage circuit breakers.

Table 1

Насос станцияларининг электр таъминоти нимстанцияси РҲА да қўлланиладиган ҳимоя қурилмаси	БМРЗ-100 МТ	БМРЗ-150 МТ	Электромеханик релелардан асосий фарқлари
Куч трансформаторлари учун асосий ва заҳира ҳимоялари	Асосий заҳира ҳимоя қурилмаси: БМРЗ-ТД-08-20-12 (БМРЗ-ТД-03-20-11) Қўшимча ҳимоя қурилмаси: БМРЗ-102-1-С-ТР (БМРЗ-102-2-С-ТР)	Асосий заҳира ҳимоя қурилмаси: БМРЗ-153-1-Д-УЗТ-01 (БМРЗ-153-2-Д-УЗТ-01) Қўшимча ҳимоя қурилмаси: БМРЗ-153-1-Д-УЗТ-01 (БМРЗ-153-2-Д-УЗТ-01)	Битта блок учун асосий ва заҳира ҳимояси; Автоматик ҳисоблашлар учун юқори кўрсаткичли дискрет кириш чиқишлар имкониятининг кенглиги; USB интерфейсига эга; MODBUS алоқа Инетрнет ва RS-485 орқали Синхиронлаш вақти PPS ва TCIP, NMEA, SNTP, PTP RS-485 ва Ethernet орқали

The following features are included in the terminal software.

- Synchronous motor protection;
- Overload protection;
- Tokli cut;
- Protection against asynchronous walking.

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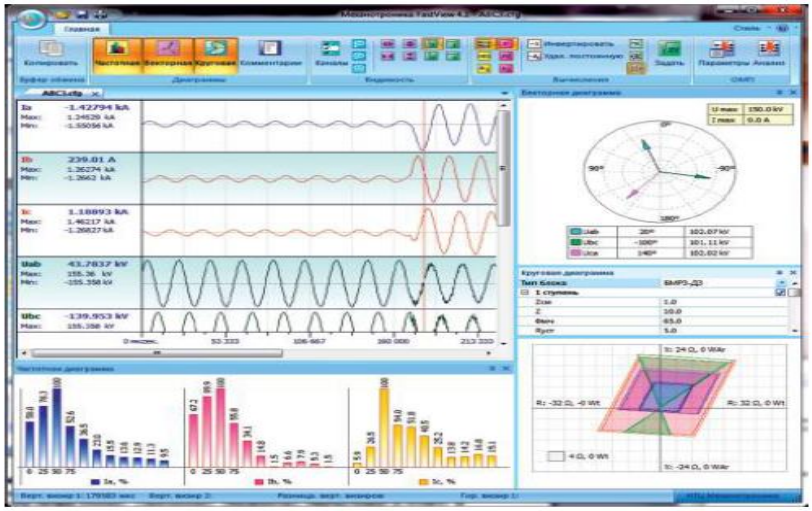
In addition, technological conditions for quality and trouble-free operation of relay protection have been developed.

Another advantage of the relay protection automation of the power supply devices of the above-mentioned pumping stations is that the data from the terminal is archived and sent directly to the memory of the server system DISK-110. The data sent and stored in the archive is in graphical and tabular form. It is also possible to extract various data from the archive, and the values obtained as a result of the measurement can be exported and sent to the EXCEL spreadsheet. The values obtained are automatically calculated in the EXCEL spreadsheet, and the graph of the change in size is constantly monitored by the host server [3].

The oscillogram in the relay protection automation terminal also writes data to the DISK-110 memory on the server in COMTRADE (* .CFG) and OSC2 (* .OSC) formats, which allows timely protection of data from various viruses and emergencies. With the help of "FastView" you can view and analyze the measurement results obtained from the terminals. For example, we can see in Figure 1 a video format based on the results obtained from the terminals.

For engineering relays, such relay protection automation devices create stationary and mobile-controlled automated operating conditions. The quality of the automated operating conditions is that regular users connected to the server system do not need to use DISK-110 memory or install any additional software to view data on it and manage relay protection automation devices. , Mozilla Firefox, etc.) [3].



1-расм. Терминаллардан олинган натижалар асосида тузилган видеоформ

Another connecting system for the connection of the terminal of the relay protection and automation with the functional control (VN) of the power supply of pumping stations is the technical software "Zashchita-3", which together solve the following problems:

• synchronization of relay protection and automation terminals;
• read the current (operating) status of the terminals and connect them to each other, as well as start-up;
• receiving control commands, confirming events and managing switching devices;
• reading event logs and oscillograms;
• placement of read / write;

The DISK-110 memory system is used to solve many problems as a dispatch information system for power supply devices of gas stations. It solves a number of problems in the power supply system, such as monitoring the function of distribution substations and their functional management, analyzing the load schedules of electricity consumers and, in short, monitoring the transmission and distribution of electricity. The block diagram of the connection of the terminal of relay protection and automation with the memory system DISK-110 is shown in Figure 2 [4].

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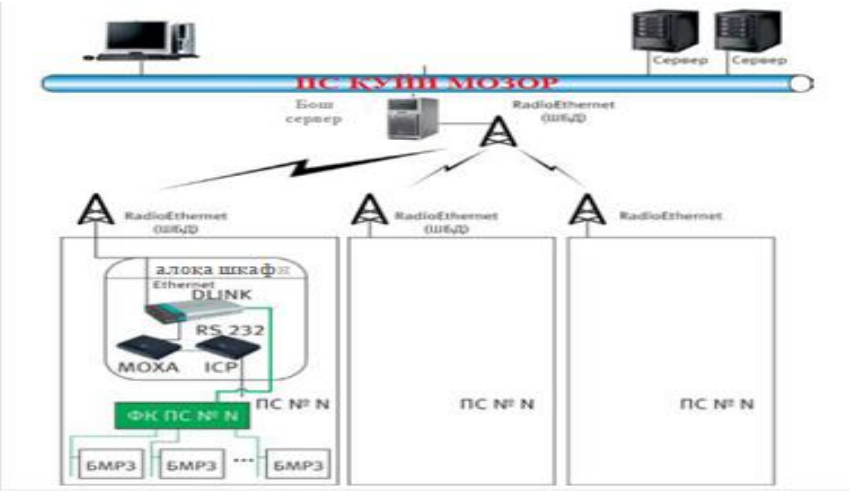
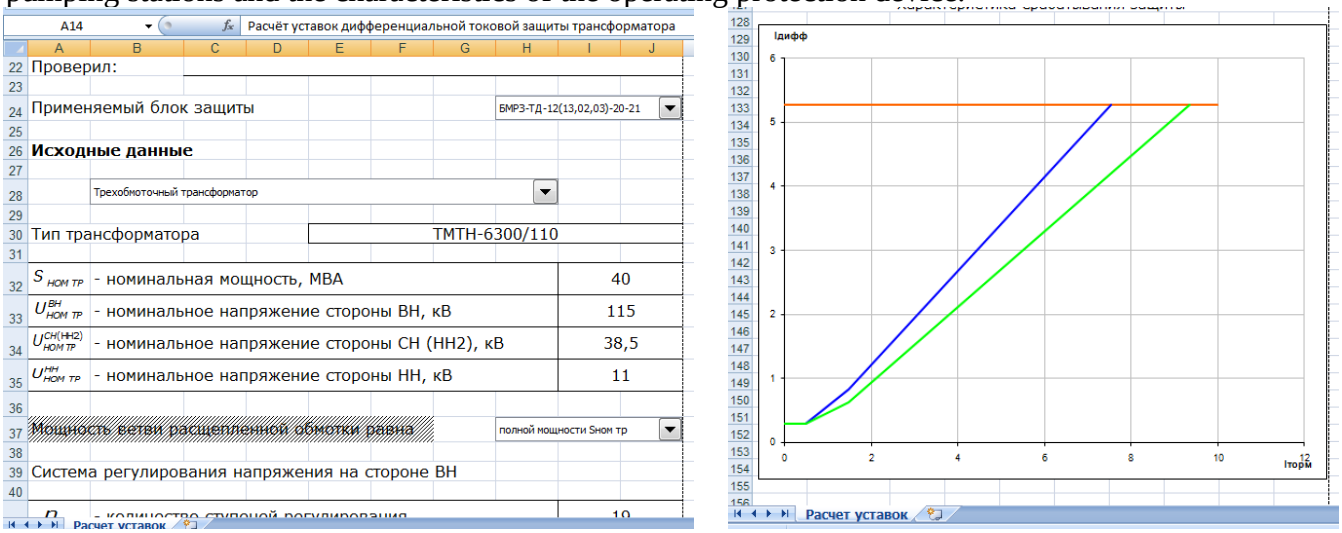


2- расм. ДИСК-110 хотира тизими билан реле ҳимояси ва автоматикаси терминалининг уланиш структуравий схемаси

EXCEL spreadsheet algorithms based on the quantities obtained from the terminal were developed based on the block diagram of the connection of the terminal of relay protection and automation of power supply devices of pumping stations. Figure 3 shows the algorithm for calculating the differential current protection of the BMRZ-TD block of a three-phase transformer type TMTN-6300/110 of the power supply of pumping stations and the characteristics of the operating protection device.



3-расм. TMTH-6300/110 типли уч чўлғамли трансформаторнинг БМРЗ-ТД блокли дифференциал ток ҳимоясини ҳисоблаш алгоритми ва ишлаб турган ҳимоя қурилмасининг характеристкаси

Based on these calculations and considerations, we designed the power supply of the pumping stations to protect the power transformers during the modernization of the Boston 110/35/10 kV substation as shown in Figure 4.

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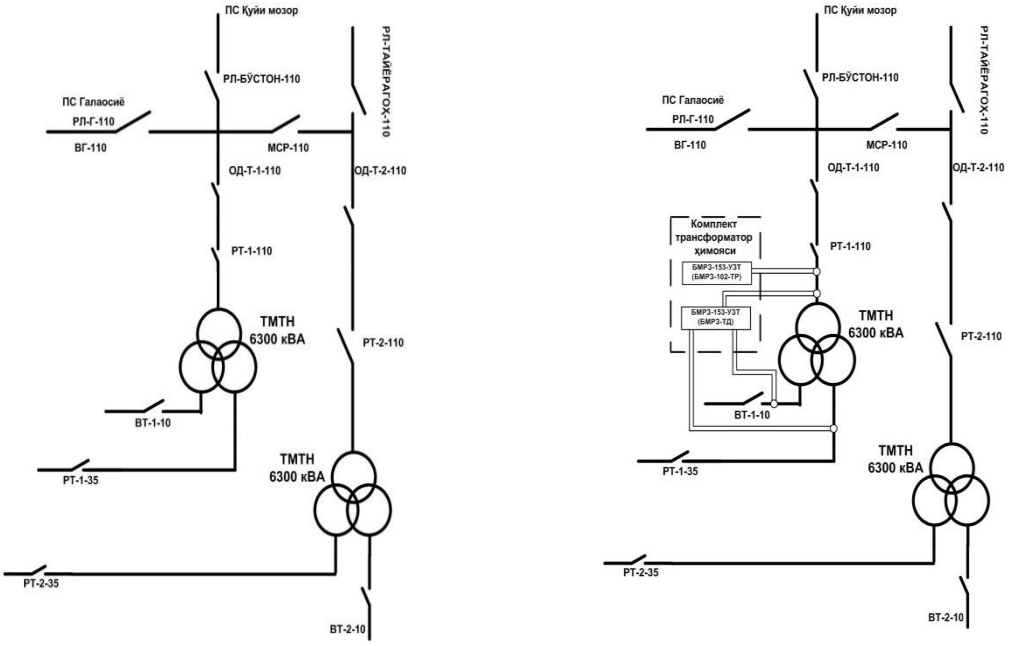

а) **б)**

4- расм. Насос станцияларининг электр таъминотини Бўстон 110/35/10 кВ нимстанциясининг куч таранформаторларнинг ҳимоясини
а) ҳимоянинг ҳозирги ҳолати **б) таклиф этилаётган ҳимоя схемаси**

The advantage of the power supply scheme of pumping stations shown in Figure 4 (b) is that DISK-110, functional control and interconnection of the technical software "Zashchita-3" connecting them, as well as control of the operating characteristics of the power transformer, also analyzes the situation. This is because if the temperature of the transformer exceeds the normal temperature, various damages and losses will increase as a result of the breakdown of the insulation layer of its windings. This sharply shortens the operating life of the transformer. The proposed protection block not only ensures the operation of the transformer for years, but also saves energy by creating automated workplaces.

Conclusion: In conclusion, it is worth noting that the power supply of pumping stations at Boston 110/35/10 substation is improved by checking the operation of RHA devices and electrical equipment using digital and microprocessor relays, complete information on all events, failures, short circuits automatically only operational not only to the workplaces of the staff, but also to the dispatch address of the enterprise, not only RHA devices, but also other equipment, such as switches, diagnostics, recording currents and number of shutdowns per second, ie the ability to diagnose the status of switches, Calculations of RHAs are simplified and their accuracy is increased, the acceleration of QT shutdown is reduced by a factor of two - to 0.3 seconds (on existing conventional RHA devices - 0.5-0.6 s), which reduces the damage size of electrical equipment and reduces the cost of restoration work.

References:

1. I. X. Siddikov, "Relay protection and automation", Textbook for universities, Tashkent-2002.
2. R. B. B. Jalilov, M I Maxmudov, S. P. Shoyimova, "Digital and microprocessor devices of modern controllers and industrial computers", Monograph, Tashkent-2015.
3. Genin V.S., Gondurov S.A., Nesterov A.P., Evseev A.N. Integration of terminals RZA in the system of dispatch control of distributed substations 110/35/6 (10) kV // Novoe v rossiyskoy elektroenergetike. 2012. № 3. S. 34–41.
4. www.mexatron.ru