JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 04, April 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

USING HUMAN-MACHINE INTERFACE IN AUTOMATION OF WATER MANAGEMENT FACILITIES

Ubaydullayeva Dilorom Rahimovna,

Bukhara state technical university, Associate Professor of the Department of

"Technological Processes and Production Automation" at the University

of Candidate of Technical Sciences.

dubaydullaeva1945@gmail.com

Abstract: This research is devoted to the consideration of the reasons for using the human-machine interface in the automation of water management, the problems and advantages of its implementation. At the same time, the correct application of the human-machine interface for the effective use of water management in the conditions of Uzbekistan is envisaged.

Keywords: human-machine interface, automation, communication, screen, electricity equipment, diagram.

Introduction. Uzbekistan Republic geographical location and there is rivers from the number come came out without water from the farm productive use of the day current blues in line it stands. Scientists stating the next 10-20 years inside In Uzbekistan water shortage further high to indicators output For these reasons, water farm correct organization to make, from it effective use main to the goal around is going on. For this and this water facilities further effective to do and thrift increase for modern from technologies use, process complete or partially automation big importance has will be. The present of the day pump of stations only some partially automated in the state of. Modern technologies stay to us this problems to solve help This is developed countries in the example of our vision possible. Human car interface pump at the stations stay to us this problems to solve and human labor efficiency further to increase big help to give possible.

Materials and methods.

What does implementing a Human-Machine Interface (HMI) at pumping stations give us or what are the challenges in implementing it?

With the help of the Human-Machine Interface, manually operated electrical equipment can be controlled using a visual display. This allows you to easily control and monitor everything from small switches to large complex processes. In this case, you can completely monitor, control, and monitor the working process through a single display window. This eliminates the need for many small switching devices and electrical equipment that pose a danger to humans. The Human-Machine Interface is able to perform several actions at the same time. It consists of a display that depicts the process in a graphical or schematic form, a keyboard for entering data, and buttons for controlling the process.

Now let's look at the problems of supporting the human-machine interface. The very problem of automating the work of a human operator encourages developers of automation tools to transfer as many functions as possible to technical systems. However, initially this desire was limited by two factors:

1) relatively weak computing resources and high labor intensity and cost of implementing automation systems;

2) the lack of adequate models of complex systems and means of verifying them. It was believed that a person is not very reliable, but can act in situations where it is difficult to formalize it, while automation is the opposite. This rule formed the basis of the principle of distribution of functions, developed in the 1950s by Paul Fitts. This principle determines the assignment of each function to the control entity that best performs this function. Based on this principle, tables were created by various authors in the 1960s and 1970s, describing the qualities of a person and automation in terms of various criteria [2], for example:

- the level of complexity of the system, the level of uncertainty and the presence of formalized management models;
- the level of noise, interference and signals containing useful information; – the reliability and recovery rate of man and machine;
- resource characteristics and features of human and machine operation, multitasking processes, overload capabilities, – performance and operating costs.

Surprisingly, almost none of the works of that period seriously discussed such a criterion as the economic feasibility of automating a particular function. Over time, the situation with technical means and design tools changed, significantly expanding the possibilities of automation.
Modern automated control systems for technological processes (TACS) can collect and deeply process large amounts of data, which allows transferring part of the control and management functions from a person to a machine. However, this leads to a decrease in the operator's involvement in the control process, which has a negative effect when a person is required to make complex and quick decisions. Being "loose", he takes time to assess the situation and prepare a decision. Therefore, an increasing number of modern works are focused on harmonizing the distribution of functions in order to constantly involve the operator in the control process.
The problem of secondary activity and navigation HMI TJABT developers pay great attention to mnemonics, their dynamics, the design of windows for entering control effects, the selection and designation of colors and other important issues of data display. Much effort is spent on algorithms for entering control effects to prevent incorrect or unexpected actions. As a rule, this forces a person to perform additional operations to activate the control window, control virtual buttons (and other dialog elements), confirm the action, close the window.
The problem of communication and the creation of a single information model is the use of efficient devices, especially between local operators and employees of the blocked control panel (BBSH) and the central control panel (MBSH). Another problem is the communication of BBSH operators. The display control method provides completely individual information, but isolates operators and does not allow communication using a common visual image. In this regard, the

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 04, April 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

introduction of collective use screens (JFE) facilitates the work, but their necessity and content are still being discussed. At the same time, JFE creates an additional "layer" of information (from the point of view of a "multi-layered" interface [4]), the design of which should not be a "beauty product", but the result of a deep analysis and part of the management concept.
The problem of virtualization of reality today has become an emotionally colored term with such epithets as virtual reality modern, stylish, convenient, etc. at the same time, playing with various objects (no matter what they are – mnemonic or in the form of a 3D image) using a computer, we can feel about them sound, real size, heat, vibration. If traditional control keys retain tactile sensations, have a volume, textured surface, require force to turn, then virtual organs and control objects turn the operator's work into a computer game. And in such conditions, it is important for the operator, including the main circulation pumps (AAN), to feel that he is controlling an object the size of a five-story house. Of course, the path of any operator in BBSH is made through "field" work, during which the real image of the equipment is forever fixed in memory. Employees with special experience in this matter found the period of construction and commissioning of this unit. However, due to simulators, the path to BBSH may be shortened and the virtualization problem will become more acute.

Results.

To use IMI in the automation of a pumping station in a water utility, we need to perform the following steps:

1. Selecting the appropriate display, controller, sensors and actuators for the pumping station based on functionality, reliability, ergonomics and cost requirements. The Mitsubishi FX3U-64m logic controller (Figure 1) can help us with this, which has 32 inputs and 32 relay outputs. Its contact rating 8A. This DIN relay installable logical module clamp finish to the method has. His big memory space - consuming applications for It makes sense. module supply power between 100VAC and 240VAC GX developer is a MITSUBISHI ELECTRIC company. by working PLC programming software supply, he ordered list (IL), ladder diagram (LD) and sequential function (SFC) languages supports. Between IL and LD in the process of work desired at the time transition possible. QnA / QnAS /System Q series), and a wide on a scale use possible was assistant programs there is.
2. For IMI software supply working exit, this pump station between the operator and the connection provides and technological parameters, events and settings signals, graphs and charts shows. Software supply working on the way out and IMI Samkoon sktool from the platform our use possible this Samkoon IMI Company by working IMI software released supply, it SK series IMI modules for intended. Its IMI displays using setup, design to do and manage possible
3. Display to the controller suitable interface connection and communication via (e.g. RS-485, Ethernet, USB, etc.) parameters (e.g. data transmission speed, device address, etc.) settings.
4. Sensors and actuators mechanisms to the controller suitable input-output channels (e.g. analog, digital, relay, etc.) to connect and measure and control parameters (e.g., values interval, work unloading stages, etc.) setup.
5. For IMI software supply to the display and controller loading and pumping station different kind work modes (e.g. manual, automatic, test, etc.) work ability check.

Figure 1. *Mitsubishi FX3U-64m logic controller*

Conclusions. My research through this we say maybe, Man-Machine interface in use problems there is even if it is Uzbekistan under the circumstances application to us only achievement to give The world is artificial. intellects creating one time we solve our problems in solution smart technologies if we don't use again behind mold Let's go.

References

1. Siddikova, S., Juraeva, M., Abrorov, A., & Kuvoncheva, M. (2025). Foreword-VII International Conference on Applied Physics, Information Technologies and Engineering–APITECH-VII 2025. In *EPJ Web of Conferences* (Vol. 321, p. 00001). EDP Sciences.
2. Siddiqova, S. (2024). Dual ta'limni joriy qilish metodologiyasi va psixologik jihatlari. *YASHIL IQTISODIYOT VA TARAQQIYOT*, *2*(12).
3. SIDDIQOVA, S. (2024). ORGANIZATION OF THE EDUCATIONAL PROCESS BASED ON THE INTEGRATION OF SPECIAL SUBJECTS IN DUAL EDUCATION. *News of the NUUz*, *1*(1.7), 185-187.
4. Siddiqova, S. (2024). Muhandislar–taraqqiyot tayanchi. *YASHIL IQTISODIYOT VA TARAQQIYOT*, *2*(3).
5. Siddiqova, S. G., & Saidjonova, P. S. (2024). ISSUES OF DIGITALIZATION OF MEDICINE IN UZBEKISTAN. *INTERNATIONAL SCIENCES, EDUCATION AND NEW LEARNING TECHNOLOGIES*, *1*(4), 168-172.
6. Siddikova, S., Yuldashev, N., Juraeva, M., Abrorov, A., & Kuvoncheva, M. (2024, February). Overview of the V International Conference on Applied Physics, Information Technologies and Engineering-APITECH-V 2023. In *Journal of Physics: Conference Series* (Vol. 2697, No. 1, p. 011001). IOP Publishing.

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 04, April 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

7. Siddikova, S., Sirojidinov, S., Bakhriddinova, N., Zaripova, M., & Juraeva, M. (2024). Increasing oil absorption in bearings as a result of ultrasonic exposure to ultrafine particles. In *E3S Web of Conferences* (Vol. 471, p. 05021). EDP Sciences.
8. Siddikova, S. G. (2019). Using New Generation Electronic Educational Resources in Teaching Special Disciplines at Professional Colleges. *Eastern European Scientific Journal*, (1).
9. Siddikova, S. G. (2019). POSSIBILITIES OF APPLICATION OF MULTIMEDIA IN THE PROCESS OF STUDYING THE DISCIPLINE" TECHNOLOGY OF PROCESSING OIL AND GAS". *Информация и образование: границы коммуникаций*, (11), 72-73.
10. Siddiqova, S. G. (2019). Elektron ta'lim resurslarining yangi avlodi: tahlillar, arxitektura, innovatsion sifatlar. *Ta'lim, fan va innovatsiya. Ma'naviy-ma'rifiy, ilmiy-uslubiy jurnal*, *1*, 91-95.
11. Djuraev, K., Yodgorova, M., Usmonov, A., & Mizomov, M. (2021, September). Experimental study of the extraction process of coniferous plants. In *IOP Conference Series: Earth and Environmental Science* (Vol. 839, No. 4, p. 042019). IOP Publishing.
12. Abduraxmonov, O. R., Soliyeva, O. K., Mizomov, M. S., & Adizova, M. R. (2020). Factors influencing the drying process of fruits and vegetables. *ACADEMICIA:" An international Multidisciplinary Research Journal" in India*.
13. Mizomov, M. S. (2022). Analyzing Moisture at the Drying Process of Spice Plants. *Texas Journal of Agriculture and Biological Sciences*, *4*, 84-88.
14. Mizomov, M. (2025). ANALYZING TECHNOLOGICAL PROCESSES WITH MAIN TECHNOLOGICAL PARAMETERS. *International Journal of Artificial Intelligence*, *1*(3), 120-124.
15. Mizomov, M. (2025). RESEARCHING HIGHER EDUCATIONAL ACTIVITIES AROUND UNIVERSITIES. *Journal of Applied Science and Social Science*, *1*(2), 284-291.
16. Mizomov, M. (2025). REVISITING STRATEGIES FOR IMPROVING ORGANIZATIONAL MECHANISMS. *Journal of Applied Science and Social Science*, *1*(1), 364-370.
17. Mizomov, M. (2025). ANALYZING DRYING PROCESS OF SPICES USING THE LOW TEMPERATURE. *Journal of Applied Science and Social Science*, *1*(1), 645-651.
18. Djurayev, K., & Mizomov, M. (2024). Optimizing the efficient transport of mass from alternative energy sources and the process of heat and mass exchange during the processing of spices. *YASHIL IQTISODIYOT VA TARAQQIYOT*, *2*(3).
19. Khudoynazarov, F. J., Djuraev, H. F., Mizomov, M. S., & Fayziev, A. K. (2024, February). Development of an optimal mechanism for a solar-air collector for drying thermolabile products. In *Journal of Physics: Conference Series* (Vol. 2697, No. 1, p. 012015). IOP Publishing.
20. Mukhammad, M. (2024). THE MAIN TECHNOLOGICAL PARAMETERS IN THE PROCESS OF DRYING HERBS: HUMIDITY AND TEMPERATURE CONTROL. *Universum: технические науки*, *5*(9 (126)), 17-20.