CONCRETE STATION AUTOMATION APPLICATION USING EASYSOFT

Andreea Cristina **POP**[1], Paul **TAMAS**[1], Cristian **BARZ**[1], Alina **NECHITA**[2],
[1] *Technical University of Cluj-Napoca, Department of Electrical, Electronic and Computer Engineering,* [2] *Technical University of Cluj-Napoca, Psychopedagogical Specialty Department*
andreeapop05@yahoo.com

Keywords: Easy-soft, Programmable logic controller, Easy819-DC-RC, automation

Abstract*: The paper presents the automation of a concrete plant, with the help of PLCs (programmable logic controller). For the development of the development program, we used EASY -SOFT, which allows the use of different types of relays such as: EASY 500, EASY 700 and EASY 800. In the works we exemplified five automations of the most important processes underlying a concrete plant.*

1. INTRODUCTION

The development of the first PLCs began in 1968 in response to a request of the US car manufacturer, so the first PLC was installed in this industry a year later. Communication skills began to appear around 1973 and can also be used to send and receive various voltages allowing them to enter the analog world.

The 1980s brought the standardization of communications with the production automation protocol (MAP), reduce the size of the PLC and make them programmable by symbolic programming on personal computers instead of dedicated programming terminals or portable programmers [1,2,3].

Programmable logic controllers are automatic controllers used in processes technological. They were first developed in the automotive industry to provide flexible, robust and easy-to-program controls when replacing relays, timers and hardware sequences. Since then, they have been widely adopted as automation regulators high reliability, suitable for harsh

environments. A PLC is an example of a hard system in real time, because the results of production must be produced in response to the conditions of entry over time limited. PLCs can range from small modular devices with dozens of inputs and outputs in one housing integrated with the processor, with large modular devices, with thousands of inputs and outputs [4].

With the availability of general programmable devices, they have been a very short time to control sequential and combinatorial logic in industrial processes. At the same time, these early computers required the intervention of specialized programmers and a rigorous control of the environment for temperature, cleanliness and food quality. To meet these challenges, PLC has been developed with several key attributes. This would tolerate the store environment, support discreet entrances and exits in an easily extensible manner, would not it requires years of training and would allow it to be monitored.

Given that many Industrial processes have an easy response time depending on response times milliseconds, modern electronics (fast, small and reliable) greatly facilitate the construction of reliable controls and performance can be traded for reliability.

2. EASYSOFT PRO 6

EasySoft Pro 6 is an easy-to-use graphic editor program that directly displays the representation of the desired circuit chart. The selection menus and Drag & Drop functions make it easy to establish links by selecting contacts and reels and connecting with a simple click.

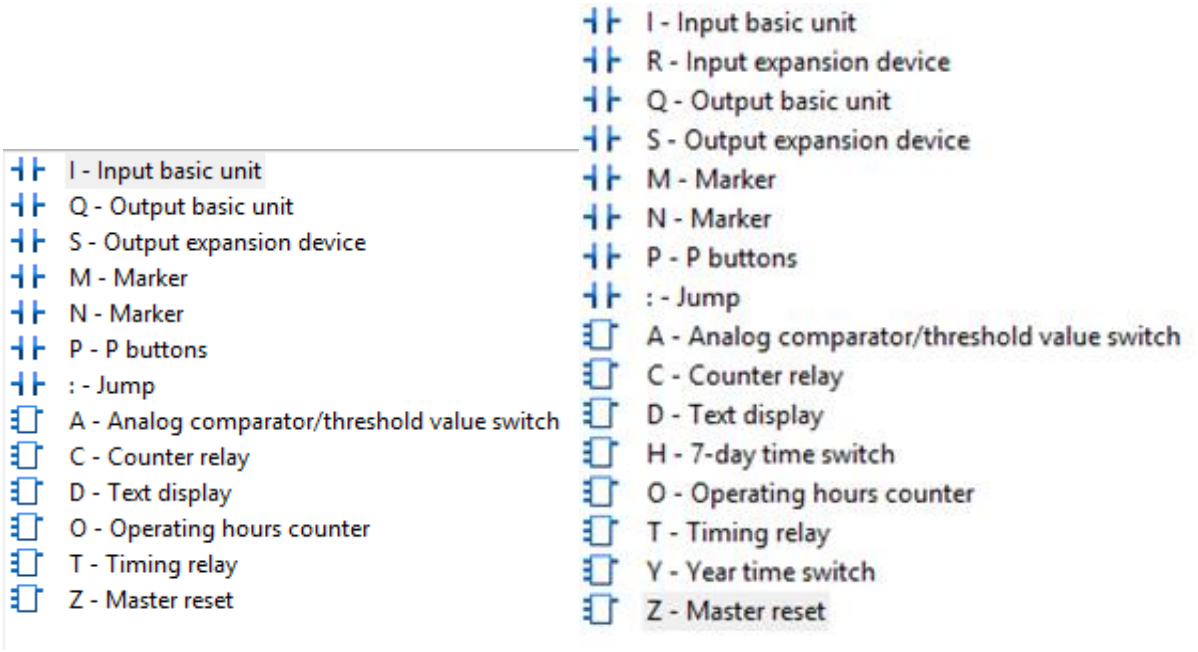
We also have the option to choose from 13 languages with easySoft menus and easy-to-use text [5,6,7].

The program has several display options available for viewing, editing, and printing the program, which are: comply with the contact symbols and the IEC symbol, international standard; have a light circuit diagram, 1: 1 as it appears in the display window; compliant with ANSI, the American standard.

The integrated off-line simulation tool allows us to check the correct operation of the circuit diagram, before commissioning and without a connected device. Comments and names for contacts, reels and function blocks allow us to create a clear structure. A cover sheet with the individual company logo, different text fields and a cross-reference list with comments gives us a perfect documentation solution for the application [3].

In this program we have the opportunity to create new automation applications with thousands of different types of electronic control relays, among which we have the devices easy500, easy700 and easy800 [8,9,10].

In the first phase we have the Easy500 device that provides us with some elements with which we can create a simple application, for example a traffic light [11,12].



Easy500 *Easy700*

Fig.1 easyRelay Ladder Logic Symbol

3. EASY-SOFT CONCRETE PRODUCTION AUTOMATION APPLICATION

The creation of the program for the control system was done taking into account all the components that they also make up the concrete plant and the process by which the concrete is produced.

An easy 819-DC-RC PLC will be used to create this program.

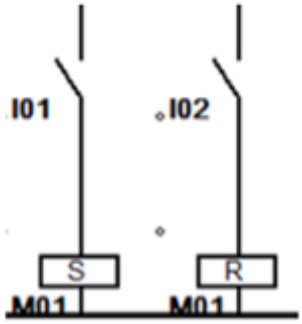


Fig.2 Start / stop section

The above figure shows the start / stop section of the operating system, where I01 is the start input and I02 the stop input. These activate the marker M01, which when actuating I01 has the role of keeping the ignition on and the process running until the actuation of I02 which stops the process.

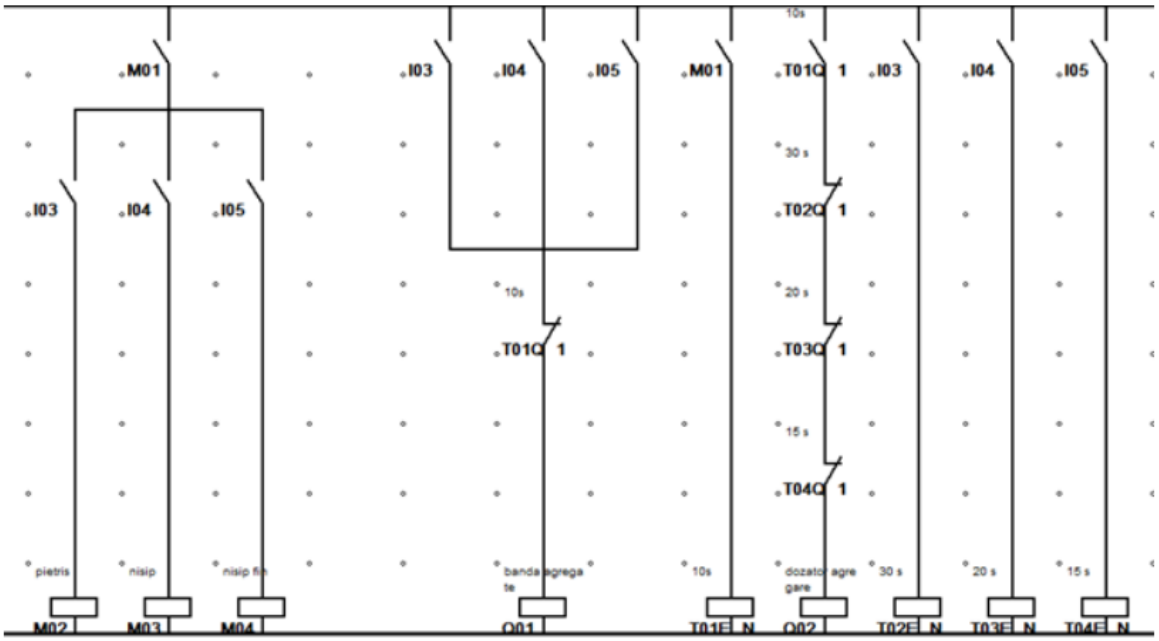


Fig.3 Aggregate supply

When M01 is activated the system starts, and further on by actuating one of the inputs I03, I04 or I05 we have the possibility to choose the type of aggregate desired. After that, one of the markers M02, M03 or M04, corresponding to the selected input, activated the valve that kept you open for a predetermined time. This process is performed using the time relays allocated for each of the above inputs, the relays being represented by T02EN, T03EN and T04EN as inputs, and T02Q, T03Q and T04Q as outputs.

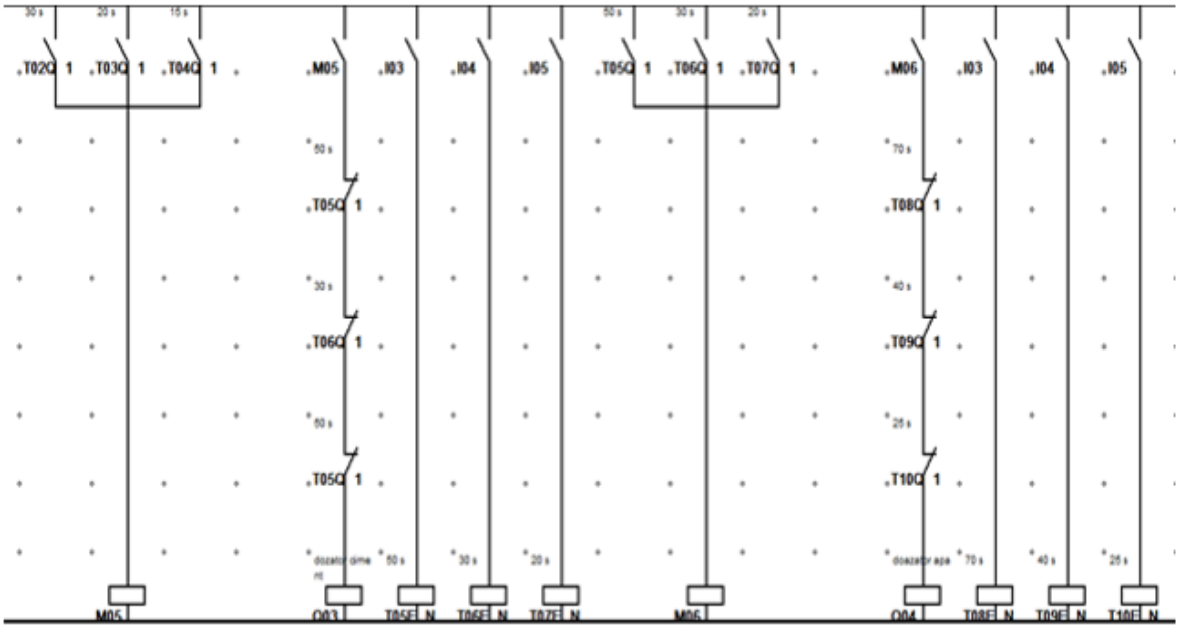


Fig.4 Cement and water supply

In *fig. 4* we have presented the supply of cement and water.

In the next step, the M05 marker will automatically operate to supply cement. This marker also operates the output Q03 which is the cement dispenser, and also depending on the desired recipe, one of the time relays T05EN, T06EN or T07EN will act as input and one of T05Q, T06Q or T07Q as output.

After the proper dosing with cement, the water supply follows, a process very similar to the cement supply. In the same way the marker M06 acts automatically, through it being the water dispenser Q04 you have activated one of the time relays T08EN, T09EN or T10EN as input, and T08Q, T09Q or T10Q as output

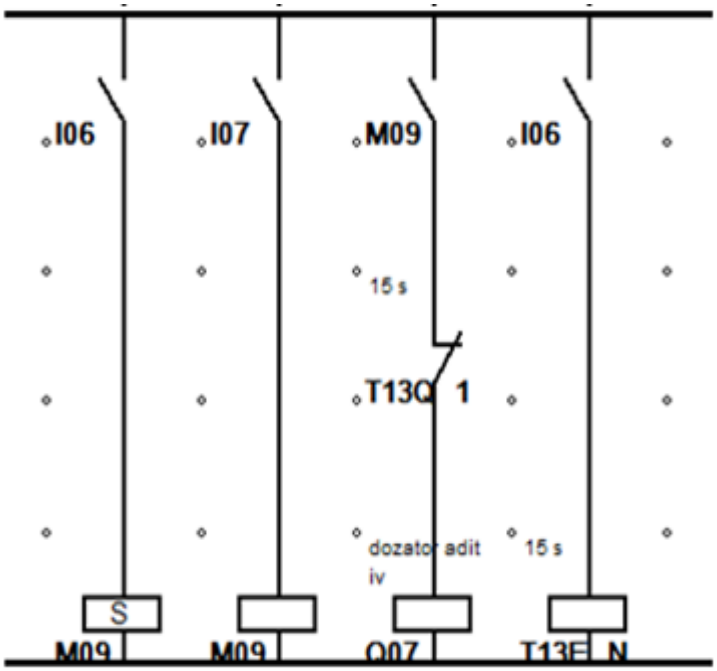


Fig.5 Feeding additives

In the following figure we have presented the optional part of the process, the supply of additives is not strictly necessary, but nowadays it is much more common because these additives or hardeners as they are called only help to accelerate the drying of concrete faster, not having an impact on its quality. .

At this stage we have as at the beginning of the software we have an I06 input for starting the additive supply system and an I07 input for stopping it.

Assuming that the system is turned on, it will automatically operate the M09 marker from the power supply, through which in turn the additive dispenser Q07 will operate, which will activate one of the time relays T13EN as input or T13Q as output that will hold the when the additive supply is closed if the system is switched off or open if the system is switched on.

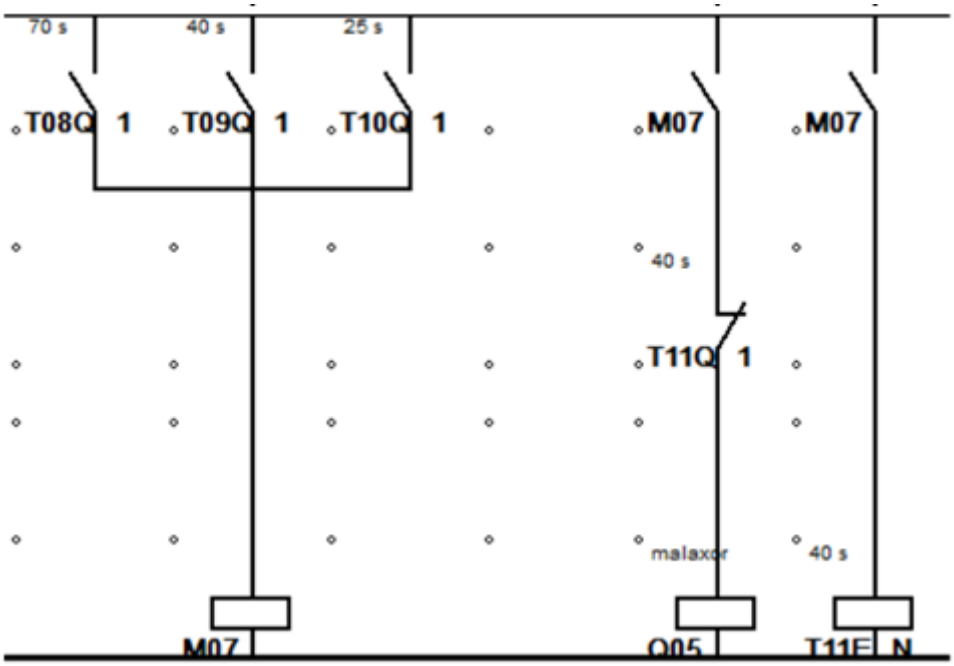


Fig.6 Concrete conveyor

After we have finished selecting the desired recipe type by executing the previous processes, by automatic actuation the M07 marker will start the Q05 mixer which will work for a time preset by the time relay, T11EN being its input and T11Q its output.

4. CONCLUSIONS

Automation of a concrete plant is very practical, because the control and monitoring they can be executed remotely, providing a greater degree of safety to the staff, while fluidizing the manufacturing process.

EasySoft Pro 6 is very easy to use because it allows the user to With the availability of general programmable devices, they have been a very short time to control sequential and combinatorial logic in industrial processes. At the same time, these early computers required the intervention of specialized programmers and a rigorous control of the environment for temperature, cleanliness and food quality.

To meet these challenges, PLC has been developed with several key attributes.

This would tolerate the store environment, support discreet entrances and exits in an easily extensible manner, would not it requires years of training and would allow it to be monitored.

Given that many Industrial processes have an easy response time depending on response times milliseconds, modern electronics (fast, small and reliable) greatly facilitate the construction of Reliable controls and performance can be traded for reliability.

REFERENCES

[1] http://www.plcmanual.com.
[2] http://www.automatizarieaton.ro/_pics/content/docs/170_moeller_easy_800_ro.pdf.
[3] V. Halas, L. Babinszky, *Energetic efficiency of fat deposition from highly fermentable NSP in fattening pigs*, Volume84, Page201-202, Supplement1, 2006.
[4] https://ro.wikipedia.org/wiki/Beton.
[5] https://www.google.com/search?q=statie+betoane&rlz=1C1GCEU_enRO820RO821&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj8gLTSy7bjAhVLpYsKHZf0DDgQ_AUIESgC&biw=1920&bih=969.
[6] https://www.google.com/search?rlz=1C1GCEU_enRO820RO821&biw=1920&bih=969&tbm=isch&sa=1&ei=pkQsXYXtKMmxrgTLtrfgCQ&q=cifa&oq=cifa&gs_l=img.3..0l10.271828.272759..273034...0.0..0.96.338.4.....0....1..gws-wiz-img.....0i67.7J0o18MiAfA.
[7] https://www.moeller.pl/Programs/TBI/profibusdp_easy_gb.pdf.
[8] Victoria Ballard Bell, P. Rand, *Materials for Architectural Design*, Lawrence King, 2006.
[9] T.-Y. Ku, W.-K. Park and H. Choi, *IoT energy management platform for microgrid*, IEEE 7th International Conference on Power and Energy Systems (ICPES), pp. 106-110, 2017.
[10] X.-J. Wang, L. Chen, W.-Q. Tao and G. -Y. Cui, *Application Analysis of Contract Energy Management in Industrial Parks*, 2nd IEEE Conference on Energy Internet and Energy System Integration (EI2), pp. 1-9, 2018.
[11] F. Mohamad, N. H. Abdullah, M. Mohammad, N. Kamaruddin, *Implementation of ISO50001 Energy Management*, International Symposium on Technology Management and Emerging Technologies (ISTMET), pp. 275-280, 2014.
[12] F. Julaihi, S. H. Ibrahim, et al, *The Effectiveness of Energy Management System on Energy Efficiency in the building*, 2nd International Conference on Applied Science and Technology (ICAST), 2017.

Aucknowledgements This article was produced under the project HUSKROUA/1702/6.1/0075 "Cross-border network of energy sustainable universities" – Net4Senergy, as part of the ENI CBC Hungary-Slovakia-Romania-Ukraine 2014-2020.