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Monitoring Electrical: Pneumatic Systems Used Macro Code in HMI

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Abstract
Today, with the strong and outstanding development of science and technology, monitoring of electrical - pneumatic systems is an important field in factories. It includes the functions of monitoring electrical and pneumatic parameters, alarms, and reporting when there is an immediate problem or an emergency. The integrated monitoring and control system gives you a complete overview of the various tasks through an intuitive user interface. Along with the replacement of industrial equipment, the intelligent HMI monitor system has also been included in the press stamping industry. Aiming at the advanced electrical control method, it has been realized that the design and function of the press monitoring system based on macro code in HMI. Combined with the cooperation of various press control systems, by using the data communication mode of Industrial Ethernet, a set of real-time monitor system is designed, which uses DELTA touch screen as the display interface. The controller only uses HMI through interface design and Macro code programming to process data and make output decisions.

Keywords: Monitoring Electrical - Pneumatic Systems, Electrical Control, Press, Display Interface

1. Introduction

MACRO can be understood as a piece of program that supports the control command structure and it can behave like a simple computer program when acted upon. The advantage of Macro is that it can represent the operation method of the object easily, such as: change data, operating conditions, sequence of operations with a script familiar to any programming engineer. Today's modern industrial machines all support popular industrial communication protocols such as MODBUS, ETHENET... to control and monitor machine status and parameters. In this article the HMI is connected to the communication pins of the controllers.

2. Structures and Features of System Control

Hardware includes: HMI DELTA DOP107EV with COM1, COM2, COM3 ports with RS232, RS485(2W) communication signal types and 1 Ethenet port. Multi-function electrical quantity meter MFM484 with RS485(2W) communication port. CP700 air compressor controller with RS485(2W) communication port. Air compressor controller MAM980 with RS485(2W) communication port. Modbus RTU Relay Board with RS485(2W) communication port. 3-tier tower light with buzzer for warning. There is also a 24Vdc supply for the HMI and Relay board. Connections from the HMI to the devices use shielded twisted-pair copper cables.

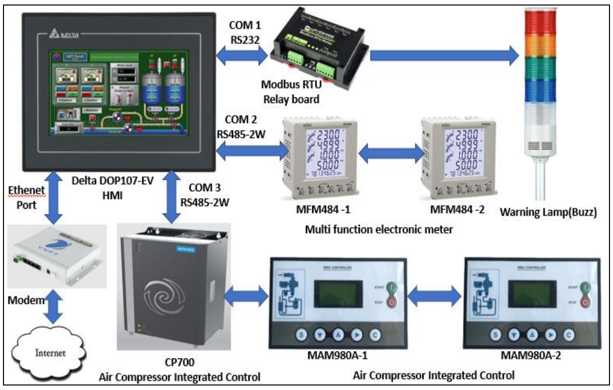


Fig 1: Block diagram of the pneumatic control system

3. Communication Design for Monitor System

In this design, the communication mode for all devices is as follows: Interface: RS485(2W, RTU), Data Bits 8, Stop bits 1, Baudrate 19200bps, Parity Bits Even, Addresses of Stations are marked from 1 ÷ 6. Ethernet port is connected to VNPT Router Modem. The HMI screen is open to the connection so that it can be accessed via VNC from the outside, the HMI acts as a Sever, the HMI address is 192.168.1.3 with Port 5800.

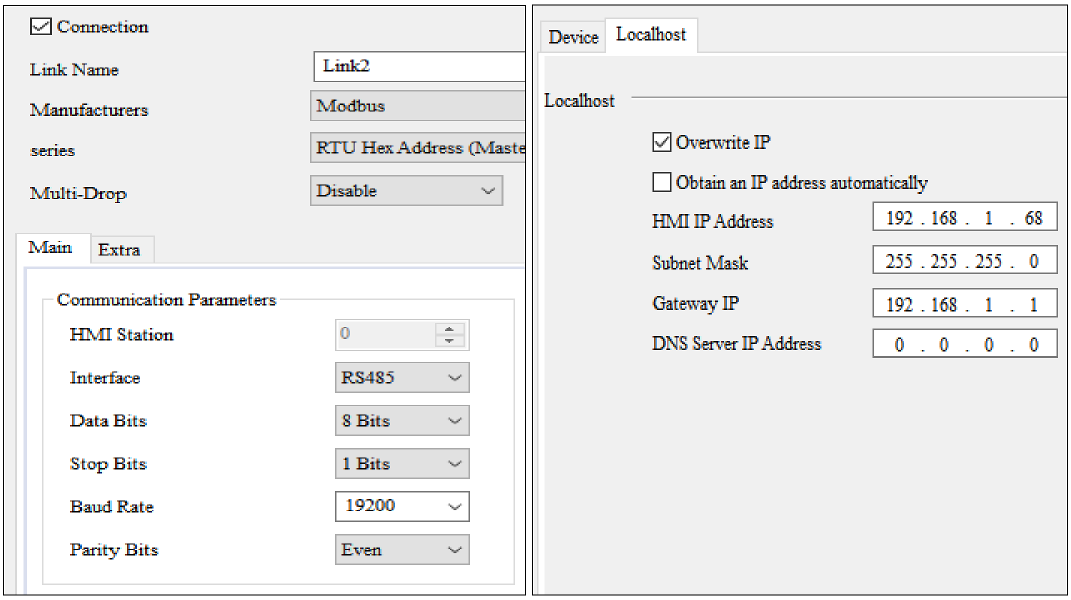


Fig 2: Communication settings of HMI

4. Main HMI Design

Using Delta HMI programming software, we can develop some application functions such as status prompt, digital setting display, real-time pop-up error warning display, information storage, logging information, etc., to design a clear and orderly operating procedure, display numerical settings, real-time centralized monitoring of parameters, and timely display warnings and store errors [5-6]. When compiling interfaces, it is necessary to fully understand the principles and functions of some of the functional components involved, and create a series of screens that display and switch functional components to switch between screens. this figure, as shown in Fig 3.

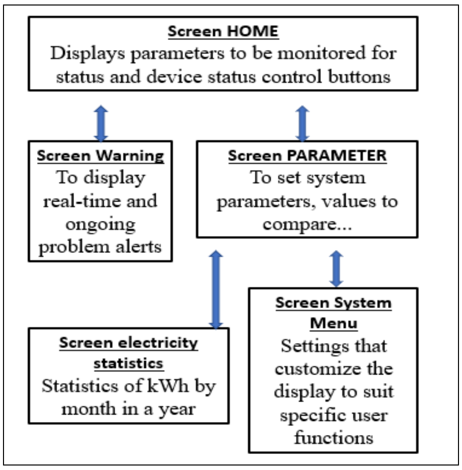


Fig 3: Relationship between screens in the interface HMI

4.1 Principles of flowchart design

All calculations and comparisons are done through Macro Code, in this design we use Background Macro mode due to constant parameter monitoring, this mode works as below flowchart.

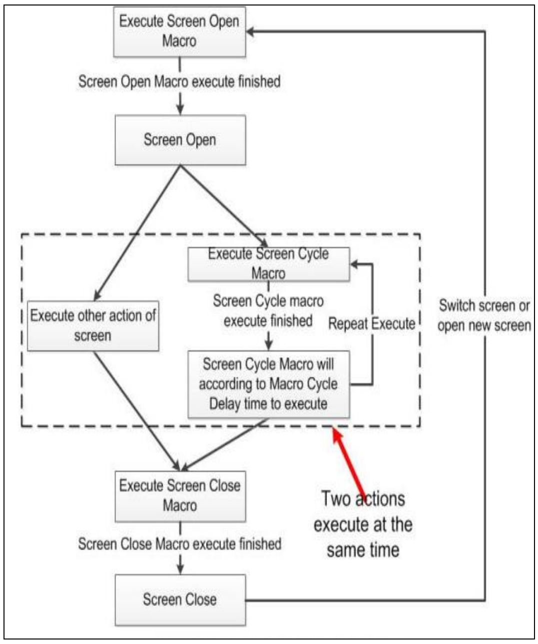


Fig 4: Monitor Cycle Macro Flowchart

4.2 Design flowchart

The monitored parameters are as follows: HMI plays the role of Master giving instructions to read the address of the memory cells containing the data of the Slavers, these Slavers will send back the HMI the value of the corresponding memory cell is the quantities. need tracking. For the protection mechanism, these parameters will be compared with the safety threshold of the device, if exceeded will give warning and alarm displayed by lights, buzzer and immediately send a notification about the device. Mobile for reporting. For the statistical mechanism, the working time value will be collected to compare with the time it takes to maintain, replace the equipment with smooth operation, and manage the power capacity by day and month to understand the situation. electric energy consumption pattern. The program in the Macro is shown in the following flowchart:

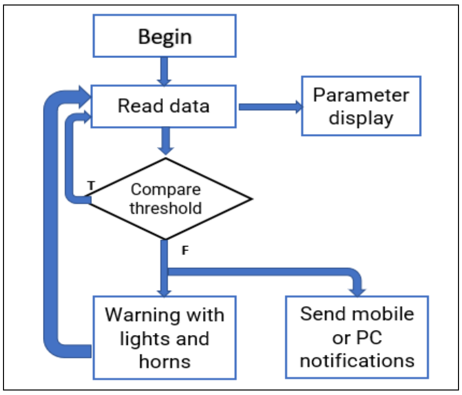


Fig 5: Design flowchart

4.3 Design on HMI Dopsoft software

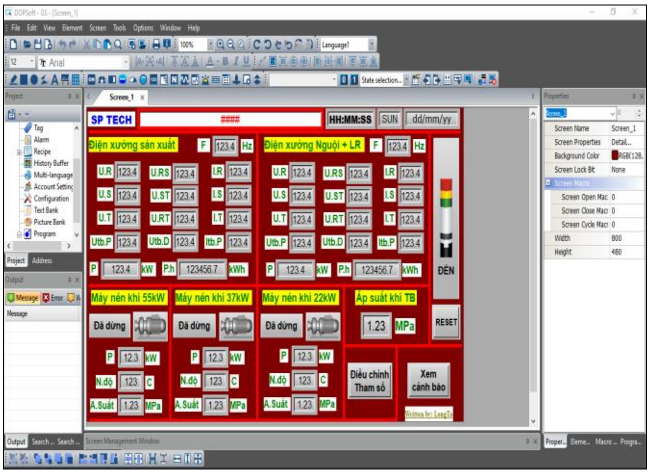
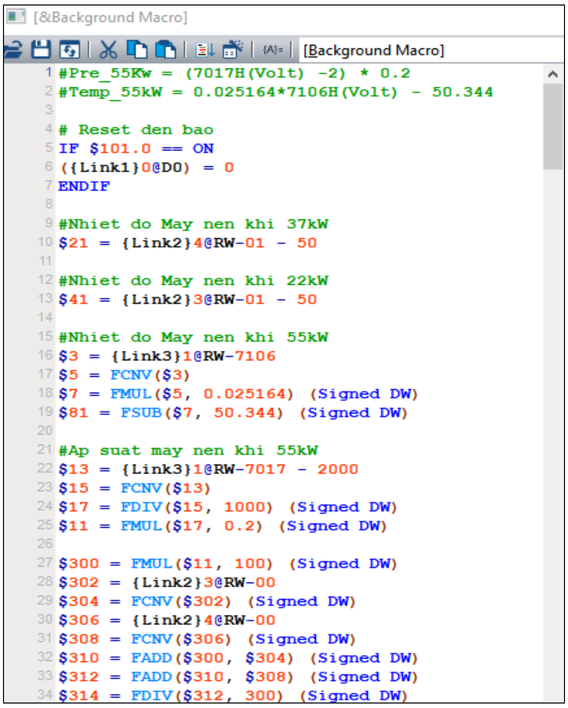


Fig 6: Design interface




```
#Pre_55Kw = (7017H(Volt) -2) * 0.2
#Temp_55kW = 0.025164*7106H(Volt) - 50.344

# Reset den bao
IF $101.0 == ON
({Link1}0@D0) = 0
ENDIF

#Nhiet do May nen khi 37kW
$21 = {Link2}4@RW-01 - 50

#Nhiet do May nen khi 22kW
$41 = {Link2}3@RW-01 - 50

#Nhiet do May nen khi 55kW
$3 = {Link3}1@RW-7106
$5 = FCNV($3)
$7 = FMUL($5, 0.025164) (Signed DW)
$81 = FSUB($7, 50.344) (Signed DW)

#Ap suat may nen khi 55kW
$13 = {Link3}1@RW-7017 - 2000
$15 = FCNV($13)
$17 = FDIV($15, 1000) (Signed DW)
$11 = FMUL($17, 0.2) (Signed DW)

$300 = FMUL($11, 100) (Signed DW)
$302 = {Link2}3@RW-00
$304 = FCNV($302) (Signed DW)
$306 = {Link2}4@RW-00
$308 = FCNV($306) (Signed DW)
$310 = FADD($300, $304) (Signed DW)
$312 = FADD($310, $308) (Signed DW)
$314 = FDIV($312, 300) (Signed DW)
```

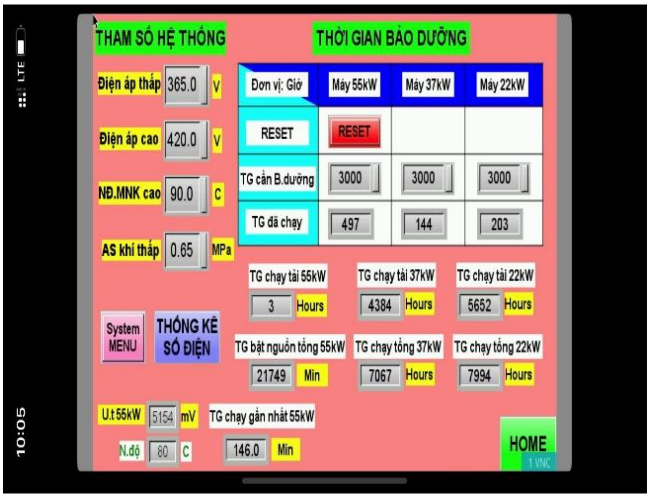
Fig 7: Macro Code writing interface

5. Results

The accuracy of the display program is verified by the actual equipment installed in the company's factory, the messages and alarms work properly.

Fig 8: Actual operation of the system

Access on mobile



Access on PC

Fig 8: Access on mobile and PC

6. Conclusion

Through this project we can see. For systems that are not too complicated with communication ports, we can directly use the HMI to collect data and control the device. Using Macro Code to process data without any PLC, this is an advantage to solve the problem of operating costs. The system has been working stably continuously 24/24h, accurately informing the parameters, working status and warnings if any about monitoring screens, PCs and smart mobile devices. This can be a good solution for developing industrial monitoring systems.

7. Acknowledgment

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8. References

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