Embedded Microprocessory SCADA system for Supervisory, Control and Data Acquisition in the process of purification of Gasses in Ferro-Nickel factory.

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Abstract: *In this paper is presented development and implementation of embedded microprocessory SCADA system in factory for production of Ferro-Nickel. In the process of refining of the molten metal are released huge amount of hot gasses that should be purified before letting them to the atmosphere. The project is to change old system of rellay logic and separately located indicators and controllers with centralised SCADA system with PLC and HMI interface, to monitor and control the work of gas Scrubbers and venting system. The paper presents SCADA system functionality and the advantages from the new digital over the old analog equipment.*

Keywords: SCADA, SUPERVISORY, CONTROL, DATA LOGGING, PLC, OPTIMISATION

1. Introduction

With the development of industry and more complex manufacturing processes, management of modern industrial plants is unthinkable without the help of modern monitoring systems or SCADA (Supervisory Control and Data Acquisition) designed for full supervision, better control and greater reliability in the production processes. These systems are present in all branches of the economy, but mostly in the process industry, energy, telecommunications, oil and gas industry, transportation, etc. Surveillance or monitoring of the plants, as the basic function of SCADA systems, uses communication protocols and a graphical user bond to present data for the state of the system to the end users or operators and provide a clearer image of the process.

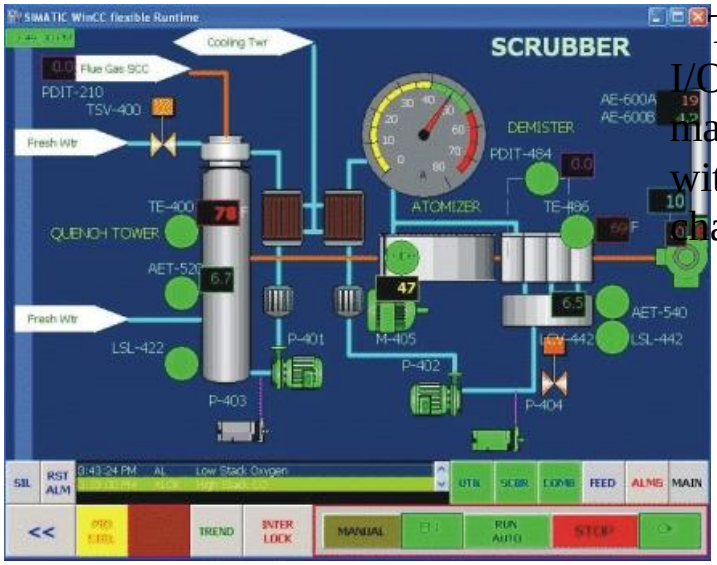

Fig. 1 *Example of SCADA for gas cleaning process.*

For all this to function impeccably it is necessary to constantly observe and monitor the properties of gas and water in the system. For this purpose, there are measuring instruments of different type: flow transmitters, pressure, differential pressure, level, position, temperature, PID controllers etc.

2. Hardware configuration

The project uses a standard PC for the SCADA program and PLC Siemens from the family S7-300 model 314C-2DP with analogue cards SM331 AI8x13bit.

Figure 2*: PLC Siemens with analogue cards*

The power supply of the PLC and I/O cards is from the same manufacturer Siemens model PS307 with the following technical characteristics:

Input voltage:	220VAC 50Hz
Input current:	1.3A
Output voltage:	24VDC
Output current:	5A

Table 1: Technical specifications of the power supply

For measurement of pressure, differential pressure, water flow and level were used Endress&Hausser PMD75 and PMD 70 transmitters.

Figure 3*: Pressure, flow, temperature transmiters used in the project*

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***Figure 4**: Actuator and valve controlling water and air flow*

For setting and calibrating the equipment were used Fluke 179 multimeter and 717 Pressure calibrator. Calibrating of the temperature transmitters was made with Chauvin Arnaux calibrators.

3. Software configuration

For the development and implementation of the software in this project were used Siemens software packages. SCADA was programmed with WinCC Flexible and PLC programming was in Step 7 Simatic Manager 5.5.

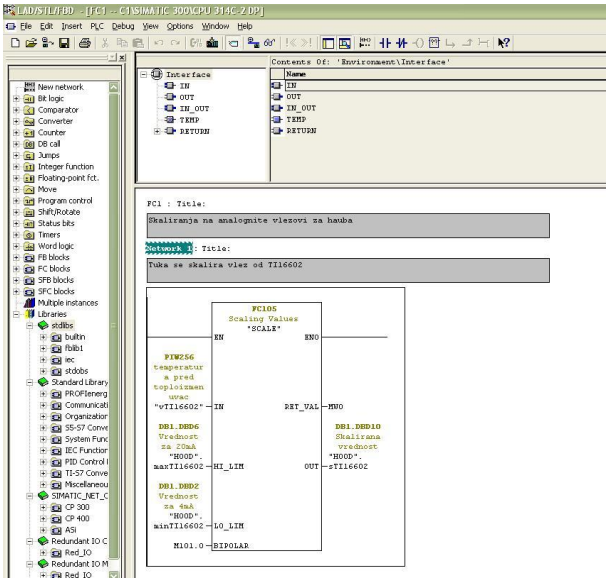
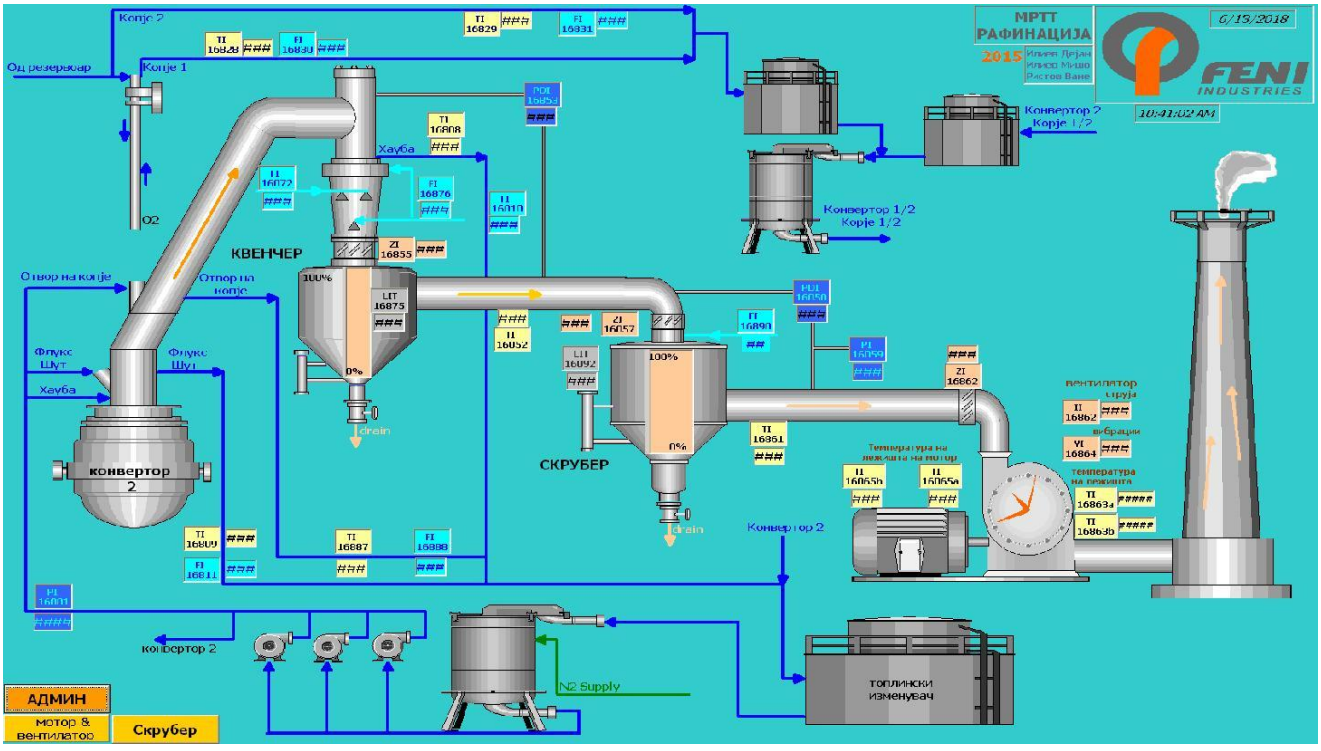


***Figure 5**:Part of a Function Block in Simatic Manager*

Scada software SIMATIC WinCC flexible is powerful HMI software for controling, monitoring and data



collection in automated systems that use personal computers. In addition, it enables the defining and displaying the alarm conditions in the system, displaying trends, i.e. displaying changes in the system variables in time, forming alarm

***Figure 7**: SCADA main screen with process values*

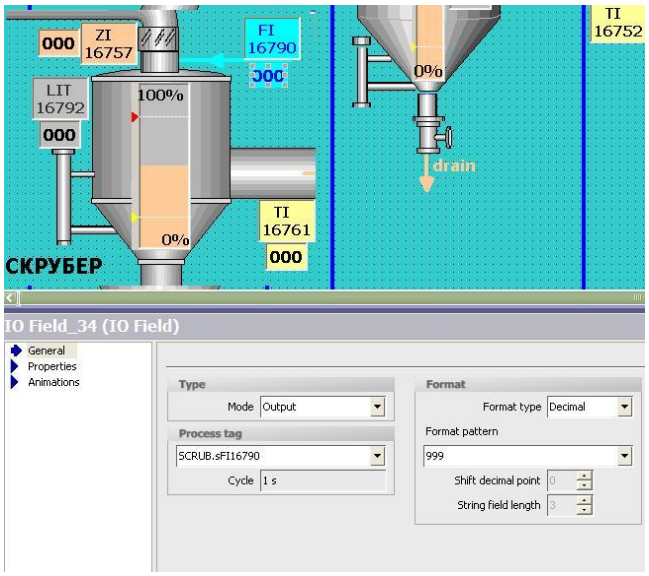


***Figure 6**:Configuring I/O field in Simatic WinCC Flexible*

4. Results of SCADA configuration

As a result of the software and hardware configuration, making measurement, calibration and parameterization of the instruments, in this paper is made SCADA project showing the process variables divided in three screens: Main screen, Admin, Scrubber and Motor & Ventilator.

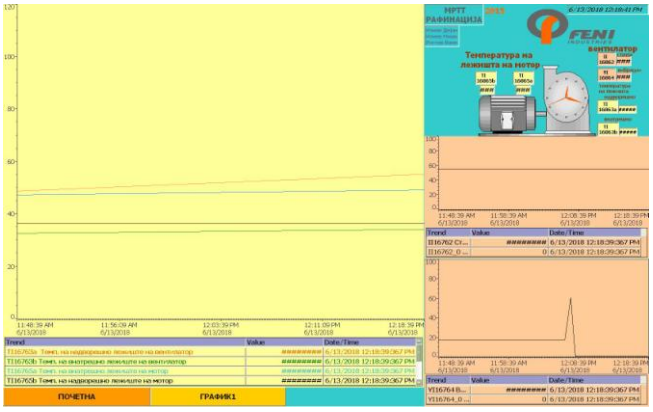


***Figure 8**: Motor & Ventilator screen showing values and trends*

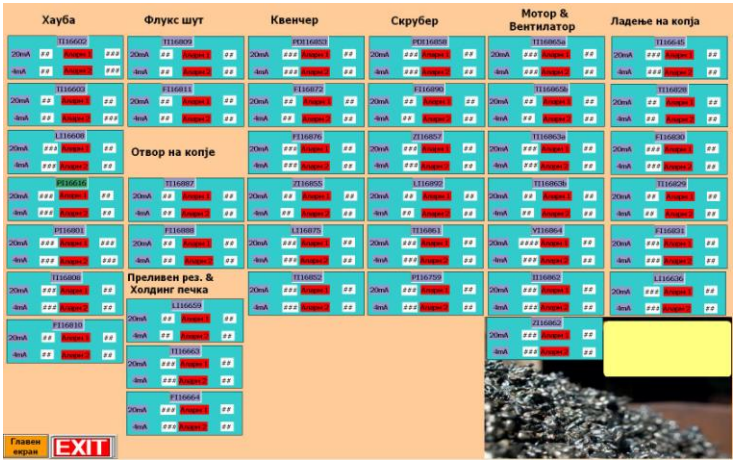


***Figure 9**: Admin screen for setting the system thresholds*

5. Conclusion

In this paper is presented embedded microprocessor SCADA system for Supervisory, Control and Data Acquisition in a process of purification of Gasses in Ferro-Nickel factory. There is a short view of the hardware and software setting in the system. The system is build to replace and old system with lots of separate indicators, controllers, alarm cards and paper recorders. From an economic aspect, there is an initial investment, but the total amount of the system is far cheaper and more cost-effective than the cost of only a few process indicators.