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CONTROL OF MODEL THROUGH INTRANET/INTERNET NETWORK

ŘÍZENÍ MODELU V SÍTI INTRANET/INTERNET

Abstract

The laboratory model of tanks, structure and features are described in the paper. Programmable logic controller Mitsubishi FX is used for control of the whole model. Six new functions were programmed for PLC Mitsubishi including functions for operating. All functions were programmed in Melsec Medoc Plus program version 2.1. Human interface SCADA/HMI for visualization within InTouch program, which can be used for control of the system providing that relevant rights are set, was created for the model. Visualization and control of the model were designed and implemented not only within the local network but also through Internet with the help of the industrial information server SuiteVoyager that gathers data and transfers it to clients in the form of web pages. Actual and historical alarm messages are acquired from distributed alarm system of the InTouch application.

Abstrakt

Příspěvek popisuje vytvořený laboratorní model nádrží, jeho strukturu a vlastnosti. Celý model je řízen pomocí PLC Mitsubishi FX. Pro PLC bylo naprogramováno 6 úloh a doplňková úloha, umožňující ovládání modelu. Všechny úlohy byly programovány v programu Melsec Medoc Plus verzi 2.1. K celému modelu je vytvořeno operátorské prostředí SCADA/HMI pro vizualizaci v programu InTouch, ze kterého je možné při patřičných právech také celou soustavu ovládat. Bylo navrženo a realizováno řešení pro vizualizaci a ovládání soustavy v místní síti, ale také přes Internet za pomoci portálu SuiteVoyager, což je průmyslový informační server, který získává data a předává je klientům ve formě webových stránek. Pro sledování současných i historických alarmů je použit distribuovaný alarmový systém aplikace InTouch.

1 INTRODUCTION

Great requirements are still given for visualization and control of technological process. Information about situation of manufacture is sufficient for operators and supervisors. This information are not available for others users so-called opportunity users. The using of SuiteVoyager portal is very profitable for these purposes. SuiteVoyager enables to monitoring and control of process for these users. The client does not need any software for visualization and control, Internet browser which is the part of installation MS Windows, is sufficient.

The laboratory model of tanks, structure and feature are described in the paper. The model is controlled by using of programmable logical controller Mitsubishi FX. Six new functions were programmed for PLC Mitsubishi including functions for operating. PLC was programmed in Melsec Medoc Plus program. For all programmed tasks was created InTouch application. InTouch application can be used for control of the system providing that relevant rights are set. The

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communication between the real model and InTouch application was tested by using DDE server MITSUFX. Visualization and control of the model were designed and implemented not only within the local network but also through Internet with the help of the server SuiteVoyager. Actual and historical alarm messages are acquired from distributed alarm system of the InTouch application.

2 DESCRIPTION OF THE LABORATORY MODEL

The whole model is set on the stand and by the help of bolts is fixed. From the back side there are taken hold PLC with its expansion modules, electromagnetic valves and power supply units. The power supply unit for the pump and the supply of the electrical energy 230V are located in the box with the switch and safety-fuse. From the front side there are the panel which is used for the operating of the system and the set of tanks for demonstration of tasks (Figure 1).

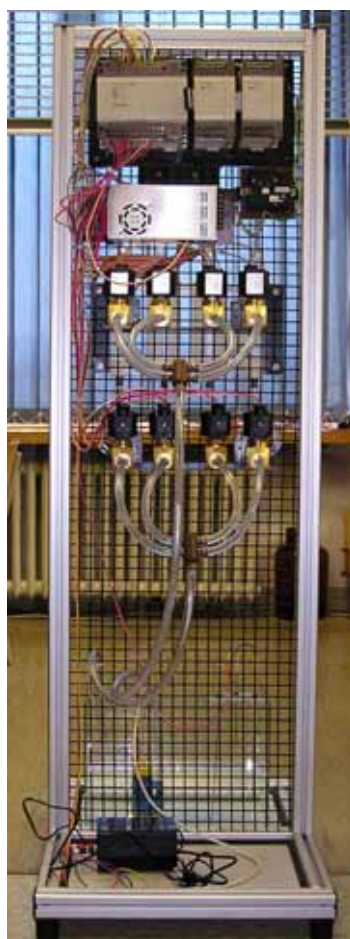Front side of the model   Back side of the model

Fig. 1 Laboratory model

The model is composed of 5 tanks $N_1 - N_5$. Tanks $N_1 - N_5$ are regulation tanks. In these tanks run two level control. The tank N_5 is store and also collecting tank which simulate the possibility of failure. When the high of the level is maximum, in this case the maximum will be indicated on the front operating panel. Vice versa minimum will be indicated. These indications are done with the help of LED's diodes. There are the potentiometer switch, the switch of PLC, the seven-level display

and the button for the task 5. The potentiometer switch is used for the task switching. The switch of PLC is used for the initiation of PLC to mode RUN or STOP. The seven-level display displays the number of chosen task. In the following the model is composed of 9 activators. It means 8 electromagnetic valves and 1 pump. Resistor sensors are used for the sensing of high the level in the tanks. In every tank there are 2 sensors (maximum and minimum), but just in the tank N_1 there are 5 sensors which are used for the task 5 (Figure 2).
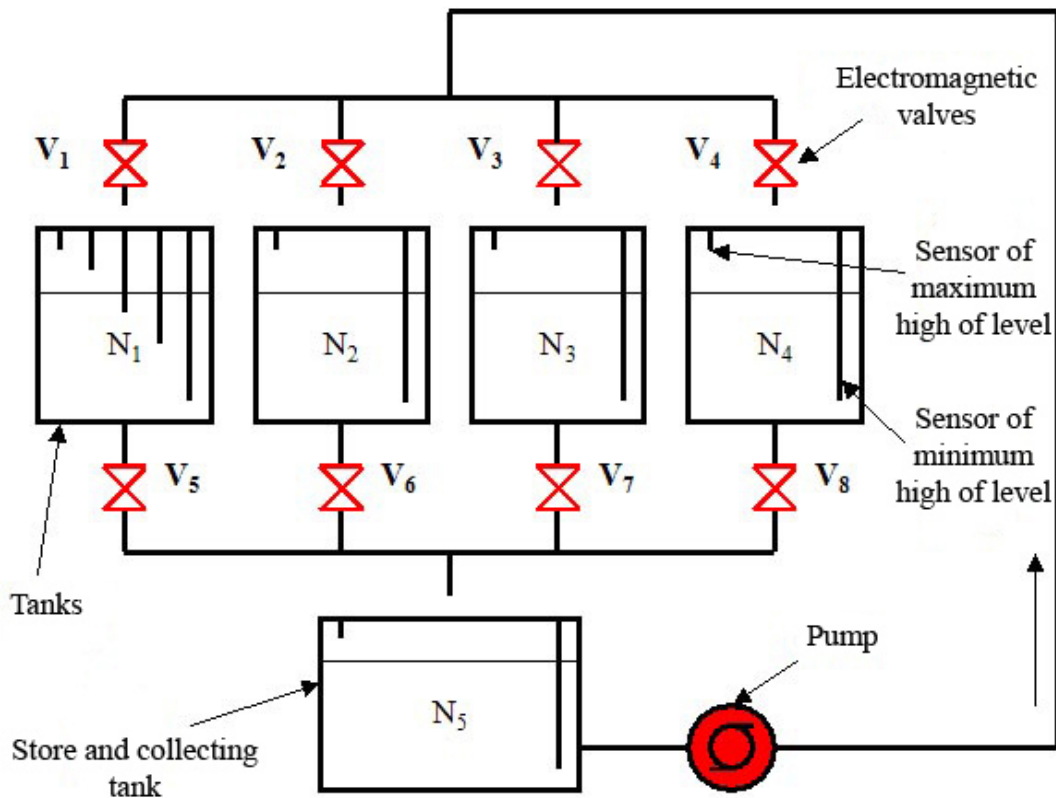

Fig. 2 Schema of laboratory model

3   CONTROL OF THE MODEL THROUGH INTOUCH PROGRAM

For the control of the model from InTouch program application the next task was programmed in PLC, which is started by the button *Ovládání soustavy* from InTouch. This button sets the memory M29 on value 1 and starts the task 6 (control of the model) in PLC. All programmable tasks are not described in this paper. The attention will be focus on the task of control.

All critical states, which can arise, are programmed in PLC. PLC processes all possible situations which can arise during the control. The user has the possibility to control of all lower valves from InTouch application. He also has the button *Napust nadrze* and the button *Aktivuj ovladani dolnich ventilu* at his disposal. After pressing of the button *Napust nadrze* all upper valves are opened (where the liquid falls short of maximum) and the pump is started. This button is visible only when at least one from the level in tanks has fallen under the sensor of maximum high of the level. The button is active when lower valves are closed. During the soaking it is also possible to press the button *Napust nadrze* again. It leads to the stop of soaking to regulation tanks. We can let out each regulation tank by opening of the appropriate lower valve.

The version InTouch 9.0 is used for visualization of all types of tasks. The whole application is composed of 22 InTouch active windows which contain condition scripts and scripts for reports of alarms. The most important windows of created InTouch application will be described in this paper, as for example the window "Menu*"*, "Info*"* and the window of actual chosen task. The window "Menu" contains buttons *Soustava*, *Trendy*, *Alarmy*, *Ovládání soustavy*, *Napoveda* and *Konec*. After the press of the buttons, the appropriate window will display and the appropriate application script will start.

The window "Info" contains data, who user is login and information about his warrants. Furthermore the window "Info" offers actual date and time, information about the chosen task, status of alarm in the tank N_5 and buttons *Prihlaseni* and *Menu*. The button *Menu* is accessed only for users having warrants 5000 or higher than 5000. If we choose the button *Soustava* from the window "Menu", the actual running task in PLC will display and the operator can observe it. When we switch the task on the front panel, the immediate actualization of task will be done in this application too (Figure 3).
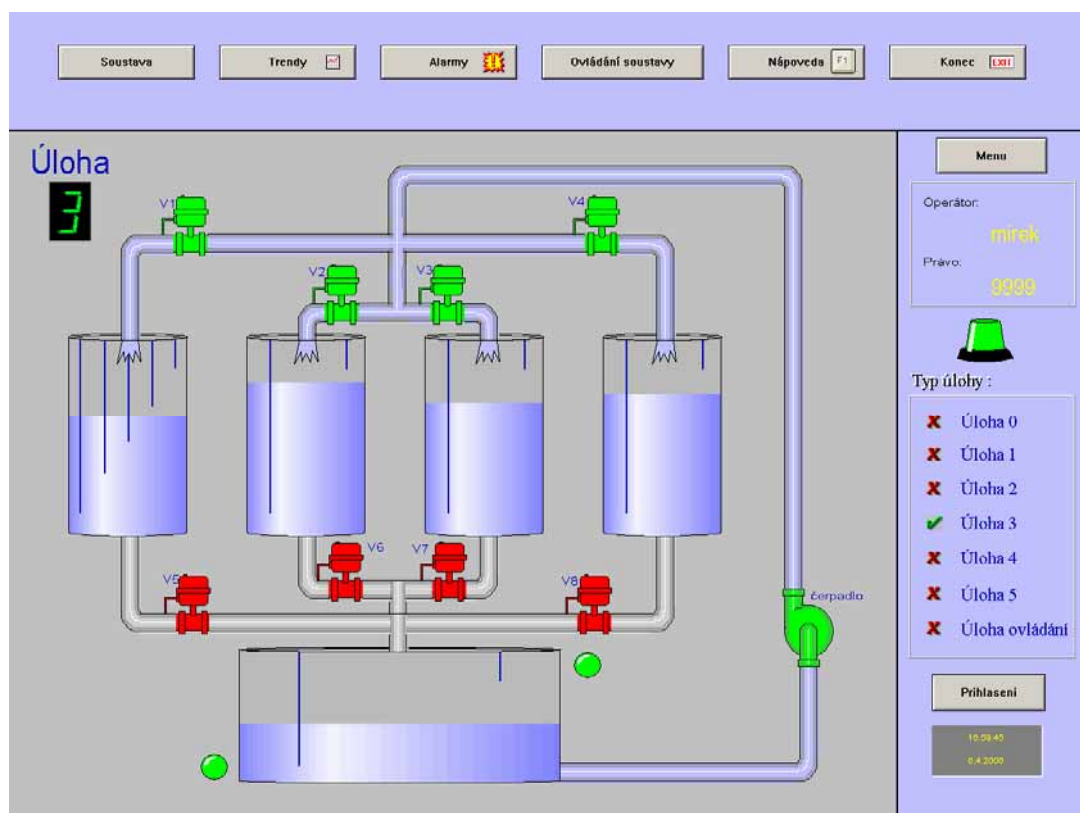

Fig. 3 Created InTouch application – the image of task 3

Valves, which are red, are closed vice versa green are opened. The same obtains for the pump. In the lower tank (store and collecting tank) the failures are signalized. The whole system is closed when the maximum high of the level occurs. This status is signalized by the red blinking diode on the main panel of the model. The indicator gives the alarm signal to the user in the window "Info" too. Simultaneously the window "Potvrzalarm" is displayed. All limiting statutes are written to actual and historical alarms. These information about the alarms it is possible to display with the help of the button *Alarmy* from the window "Menu".

4 LABORATORY MODEL, ITS VISUALIZATION AND CONTROL THROUGH INTRANET/INTERNET NETWORK

For visualization and control of the model within the local network and through Internet were installed these programs:

- MS Windows 2000 Server
- Service Pack 4 for Windows 2000 Server
- MS Internet Explorer 6.0
- MS SQL Server 2000 Developer
- InTouch 9.0 SP1
- SuiteVoyager 2.0 SP1 portal

This PC services as the provider of data. It is useful to keep to mentioned sequence of the installation of programs. All these programs were installed to PC **pcf205a** which was connected to **NT352.FS.VSB.CZ** domain. The model is connected to serial port of PC. Three users with the warrant for the access on portal were created within NT352 domain. These are:

- **svadm** – domain administrator
- **sveng**, **svuser** – domain users

The installation of MS Internet Explorer version 5.5 or newer is enough for the access of clients to portal. Server of NT352 domain is connected within collective network with the PC **pcf205a** (Figure 4).
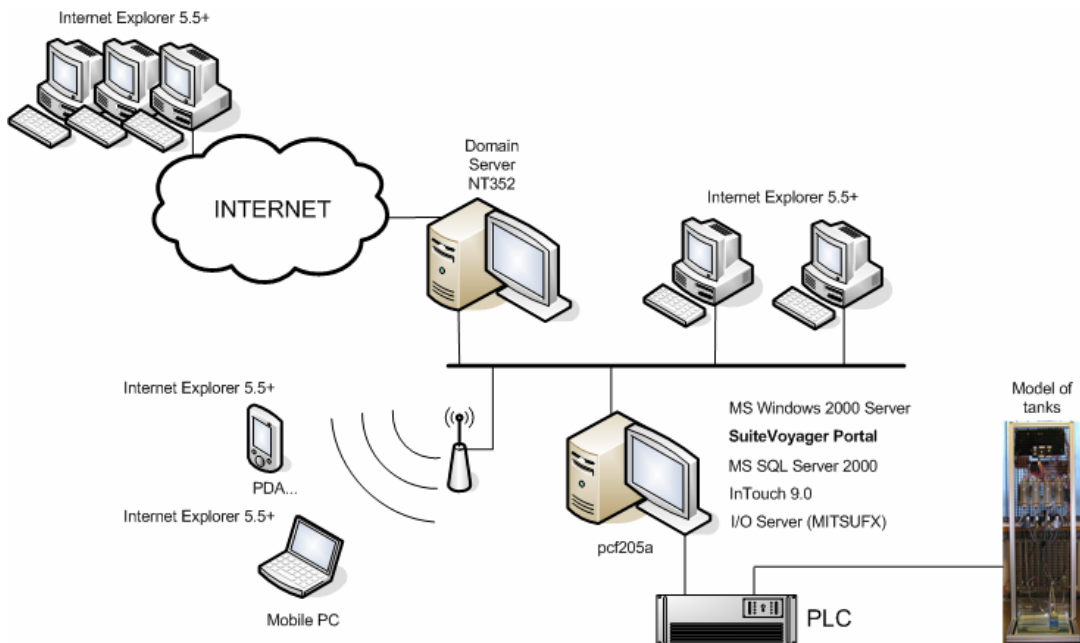

Fig. 4 Architecture with SuiteVyager 2.0 portal

Server of NT352 domain is used for the login of users. If the message *Need to upgrade your MSXML* display after the access to portal, it is needed to upgrade XML version.

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In the picture 5 there is the screen of **sveng** operator from client PC who has warrant of visualization and control of the whole model. For monitoring and control of the model it is needed to have running InTouch application and DDE server at PC **pcf205a**.

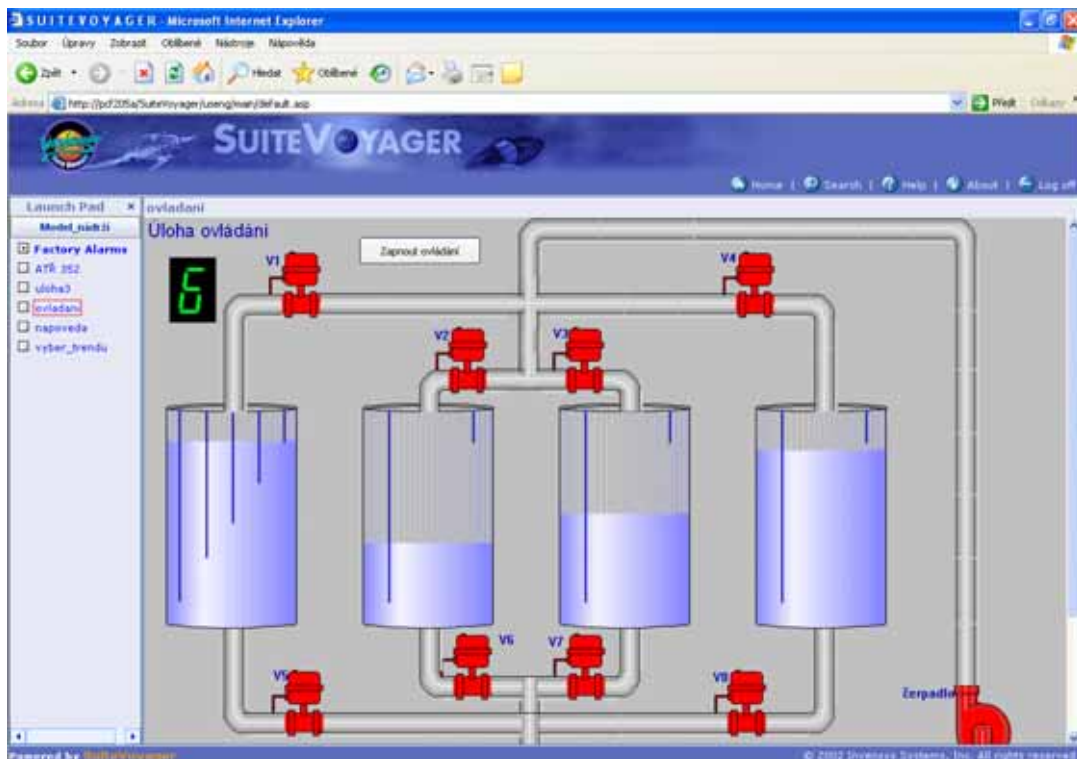By setting of the address //pcf205a/suitevoyager it is possible to connect to SuiteVoyager portal from NT352 domain.

Fig. 5 Display application of model in client PC

5 CONCLUSIONS

This paper deals with visualization and control of laboratory model through network interface. The structure and features of the model are described. The model is controlled by PLC Mitsubishi FX. The communication between programmable logical controller and InTouch application runs with the help of DDE server MITSUFX.

The task of control is described in more detail from number of programmed tasks. For the whole model human interface SCADA/HMI for visualization and control was created. It is possible to carry out this visualization and control through the local network but also through Internet. Portal SuiteVoyager was installed for these purposes. SuiteVoyager is the industrial information server which gathers and transfers data to clients in the form of web pages.

The whole model serves for purposes of the education.

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