Waste Water Treatment Plant (WWTP) – Koubratovo, Sofia

Employer:	"Sofijska voda" JS Co., VA TECH WABAG Deutschland GmbH & Co. KG
Project:	Waste Water Treatment Plant (WWTP) – Koubratovo, Sofia
Design:	"Rehabilitation and modernization of WWTP Koubratovo, Sofia – Part "Electro"
Main contractor:	VA TECH WABAG Deutschland GmbH & Co. KG
Subcontractors:	"Start Engineering" JS Co.
Kinds of activities:	Full delivery of equipment, design, mounting, test and commissioning works part "Electro" from the project
Performance:	2002 - 2004

Short report, concerning the design :

The design is completed by Start Engineering JS Co., branches Automation, Sofia, Metallurgy and El. boards specialists with the collaboration of AMEES Ltd.

Design basis

The design is developed on the basis of a signed contract EU-PHARE LSIF Part 5 Project BG9906.01 CONTRACT for the Rehabilitation and Upgrading of the Sofia, District Kubratovo, Waste Water Treatment Plant - Water Line.

The design includes:

- Cable routes;
- Electrical installations 6kV – for the new transformers Tx3, Tx4, Tx5 and Tx6;
- Electrical installations 0,4kV;
- Distribution boards 0,4kV;
- I&C Devices and Automation;
- Lighting installations for the new premises;
- Grounding installations for the new equipment.

Technical solutions

The Electrical supply of the new transformer stations is realized by 6kV PDS (Power Distribution System) of the existing 110/6kV substation of WWTP "Koubratovo" - Sofia. Transformers Tx3 and Tx4 with a power of 1600kVA each are located in "Blower Station" building (27). These two transformers feed LV board SB2. Transformers Tx5 and Tx6, with a power of 1250kVA each, are in the "Return sludge pumping station" building (37.1) in separate premises, especially foreseen for them. These two transformers feed LV board MCC6. The electrical supply of the new machines and equipment is taken from el. boards MCC (Motor Control Center). The boards are shape 4, IP54. In connection with the increase of the personnel security are also used residual current protections.

I&C Devices and Automation

The equipment and the functions on the project for rehabilitation and reconstruction of the Waste Water Treatment Plant - Sofia, concerning the I&C part, can be divided in two main parts:

Measurements

The measurement equipment for the supervision, the signalling and the automatic control of all the necessary for the technology parameters and installations in the plant:

- Fluid levels
- Fluid and gas flows
- Quality rates of the treated water
- State of all the electrically actuated equipment

The measurement equipment (sensors, transformer, secondary devices) responds to the contemporary requirements of the Bulgarian and international standards for precision and reliability, with the relevant distortion and environment influence protections. The supply of the transformers is 220 V AC, reserved with batteries and invertors. A special attention is drawn to the measurements of the parameters of the treated water at the inlet and at the outlet of the Waste Water Treatment Plant. These parameters are basic for the evaluation of the efficient work of the treatment installations.

Control system

The system for control and supervision provides a possibility for complete automatic control of all the technological units in the Waste Water Treatment Plant. The normal operation of the equipment is possible in manual mode too – without participation of the control system.

The two Operator stations (reserved) in Dispatch center assure the complete supervision of the technological process in the Waste Water Treatment Plant, alarm signalling, parameter history, etc. The supply of the Operator stations is 220 V AC, reserved with UPS. For the needs of the SCADA system, in a cabinet are installed two controllers (reserved), which perform the functions of the so-called Data Concentrators. The supply of these controllers is 24 V DC, reserved with batteries.

The control and the supervision of the separate technological units is performed by means of Programmable Logic Controllers and Operator panels, locally installed and including the technological subsystems as follows:

- MCC2 PLC – inlet measurements, grit chambers, blower station, primary settling tanks;
- MCC3 PLC – primary sludge pumping station;
- MCC4 PLC – blowers for aeration tanks;
- MCC5 PLC – aeration tanks;
- MCC6 PLC – secondary settling, return sludge pumping stations;
- MCC9 & MCC8 PLC – outlet measurements, technical waters pumping station.

Principles for control and supervision of the processes and installations

The control and supervision of the processes and the installations exists on three levels:

- local for each installation;

The local level includes the control of the relevant installation or groups of installations from the relevant local boards, in order to assure their independent work and to facilitate their operation during repair or rehabilitation procedures.

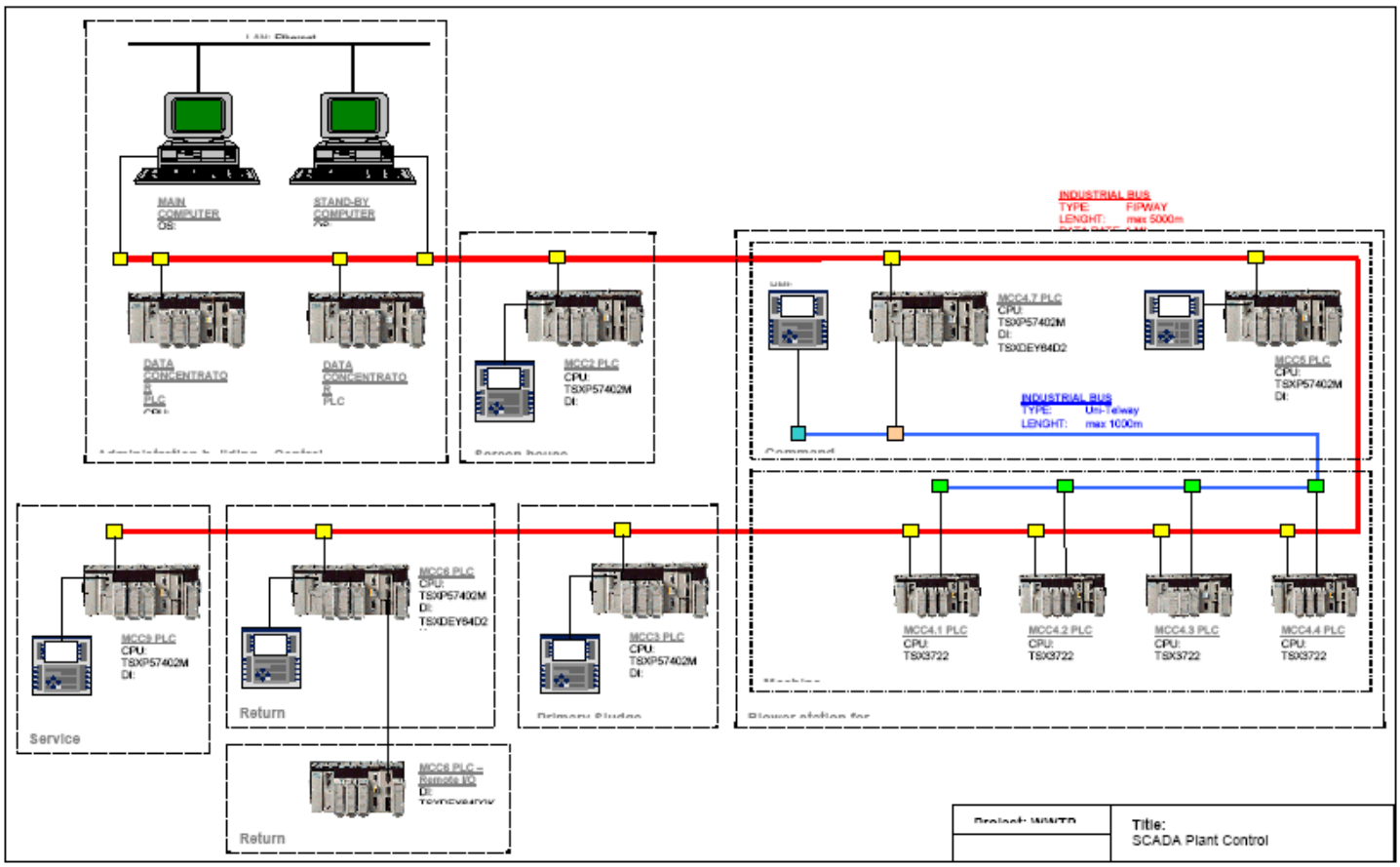
- technological unit level;

The normal operation of the devices from the relevant technological level (subsystem) is performed from this level. There is a possibility for manual and for automatic control in compliance with the requirements of the technology. The necessary alarm signalling, referring to the subsystem equipment is organized.

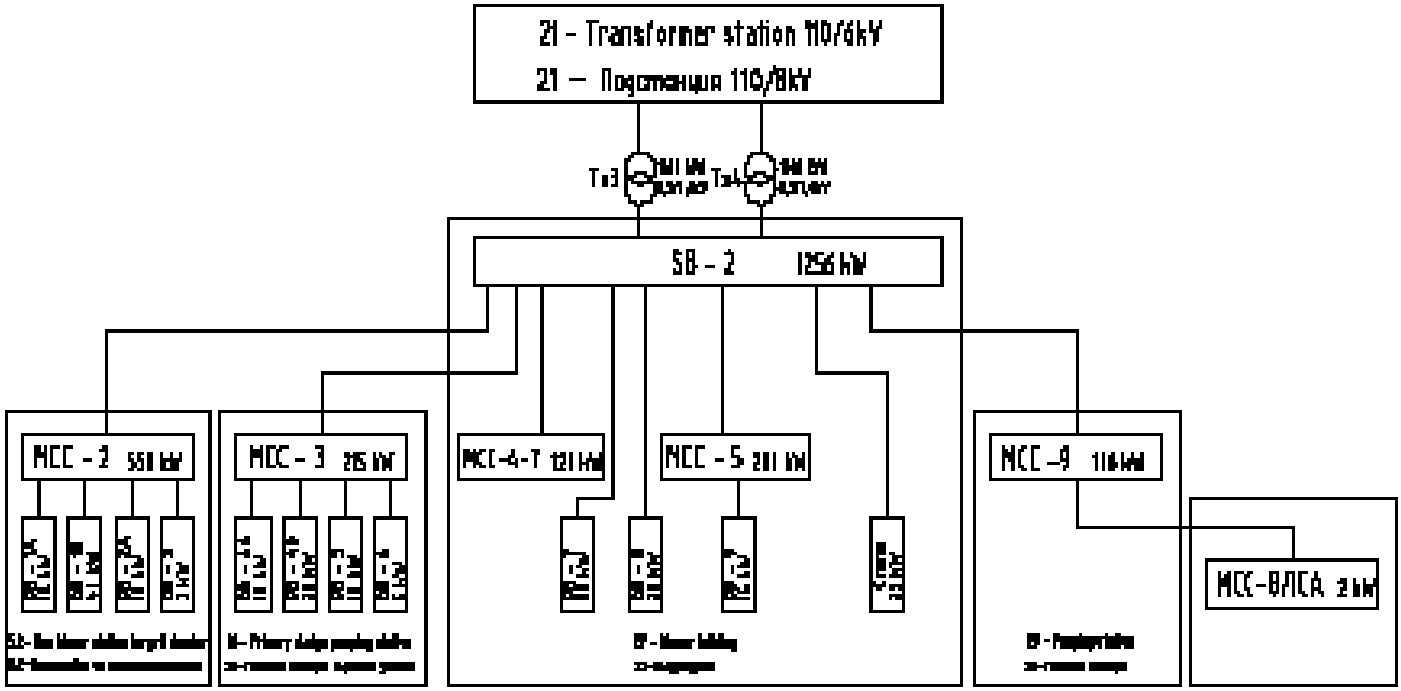
- dispatch center level.

At this level a supervision of all the processes of the Waste Water Treatment Plant is possible, as well as the control of some of the main installations. All the necessary information functions, facilitating the control and the analysis of the technological processes, the identification of alarm and failure events, etc. are assured.

The structure of the implemented system



Block diagram for power distribution between transformers Tx3 и Tx4



Block diagram for power distribution between transformers Tx5 и Tx6