ARS-AMEG 3030 Simulator – trainer

Simulator of the technological process of the thermal power plant block

institute MIHAILO PUPIN
IMP-AUTOMATION & CONTROL SYSTEMS

Investor: PE "Thermal Power Plant Nikola Tesla" Ltd Obrenovac, Serbia
Object: TE „Nikola Tesla A" Obrenovac, blok A3
Year of Project Completion: 2016

PROJECT DESCRIPTION

ARS AMEG simulator-trainer, a product of the Institute Mihailo Pupin, is a simulator of the distributed control system (DCS) and technological process of the thermal power plant block. It is realized by upgrading the VIEW® T-POWER DCS, produced by the Institute Mihailo Pupin, with the simulation software tools and technological process models.

The basic purpose of the system is the primary training of the future operators, the ongoing training of operators controlling the block, the training of engineers for programming automatic control and supervision, the testing of the management logic when changing control parameters and HMI overview before implementation at the real plant. The analysis of the technological plant using simulator enables the efficient development of the advanced algorithms for the management and optimization of the thermal block process.

The ARS-AMEG simulator is modularly realized to allow different installation and functionality variants depending on the complexity of the modelled system and the specifics of the user's requirements. Individual components perform the following functions: DCS system emulation, modelling of the control units of the plant, mathematical model of the entire technological process, the immediate bringing the system to the desired point of work, etc.

ARS AMEG is applied to a series of the systems controlled by VIEW® T-POWER DCS, but this is not its limitation. ARS AMEG supports standard communication protocols. **The complete structure of the simulator-trainer (or only its individual components) can be applied to any facility controlled by DCS system of any manufacturer that supports standard communication protocols.**

An example of this simulator-trainer installation is the SPPA-S300 system on the block A3 of the Thermal power plant "Nikola Tesla A" in Obrenovac. It was installed in command and training facilities of the block A3, and the project was realized in cooperation between the "Institute Mihajlo Pupin - Automation and Control Systems" Ltd. Belgrade, Siemens d.o.o. Belgrade and Thermal Power Plant Nikola Tesla A Obrenovac.

The plant control system is the SPPA-T3000 Siemens DCS for thermal power plants. The applied version of the simulator is the ARS AMEG 3030, which includes a model of the entire plant and operating mode selection. **The SPPA-S300 system has been developed by the integration of SPPA-T3000 and ARS AMEG 3030, which simulates the technological process and the DCS of the thermal power plant.** Within it, the SPPA-T3000 performs the emulation function of the DCS, and the ARS AMEG 3030 simulation of the technological process. The integration of two DCS systems is realized by the IEC60870-5-104 communication protocol.

Block A3 of the Thermal Power Plant "Nikola Tesla" consists of two basic technological units:

- Benson type boiler unit - membrane-welded boiler with forced circulation; the nominal fresh steam flow is 920t / h, the nominal pressure is 186 bar and the nominal temperature is543°C,
- a turbo generator unit consisting of a condensing steam turbine with one section of high and medium pressure among which there are two degrees of the steam superheating and one section of low pressure; with seven steam extractions for regenerative heating of the feeding water; bypass unit of high and low pressure; a generator of a nominal power of 328.6 MW.

The simulator-trainer SPPA-S300 was installed in 2016 and applied to the total number and all types of signals processed through the DCS system: 1800 analogue signals, 1200 binary signals, 100 control actuators, 230 electromotor servo drives, 200 pumps and motors and 2500 communication-exchanged signals.

The simulator system includes a complete simulation of the operation of the turbine regulator system and turbine protection that was realized on the block A3 using the "Alstom Alspa Controsteam v4.0" system and the bypass control system implemented by CCI.

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APPLIED TECHNOLOGY

The simulator-trainer system architecture consists of several computers with sufficiently strong hardware configurations for the functioning of the required simulator software packages. The basic part of the hardware of the implemented system consists of:

- SIMA server,
- servera SIMS,
- DCS simulator server,
- 3 communication processors.

ARS AMEG 3030 system is installed on the SIMA server of the technological process simulator. The basic operating system of the SIMA computer is Centos 5, with the virtual PLC, ATLAS® RTL type, installed using the VMware® Workstation software tool. Virtual PLC runs under the Real Time Linux operating system and at the same time it has the role of a gateway.

The server-engineering station SIMS is a computer that has the software necessary to configure the DCS VIEW® T-POWER system, write simulation algorithms, and monitor the responses of the desired values.

DCS is installed on the DCS simulator server to operate the version 7 of the SPPA-T3000 thermal power units.

Communication processors are of the type CS3000. They have the function of gateways for communication with the server of the model process according to the IEC 60870-5-104 protocol.

The basic version of the hardware has been upgraded with two engineering stations. The system of the simulator-trainer is modular. It can be expanded with additional operator and engineering stations, which provide an increased number of jobs to the desired capacity.

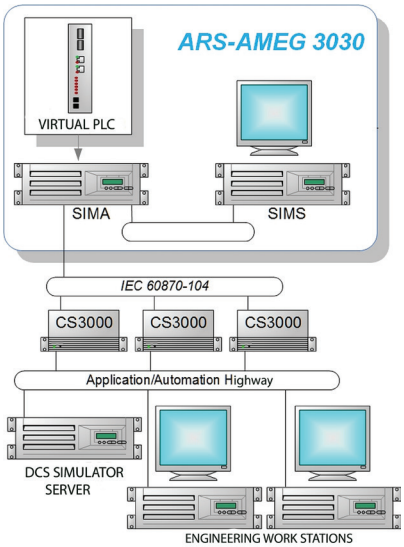
The operating environment of the simulator is completely identical to the operating environment on the block A3 regarding control algorithms, HMI images and user interfaces. Commands issued by operator stations are reflected on the system as if they were issued on the real system.

Regarding the function and operation of the simulator, the option of recording the complete condition of the simulator of the block and loading the recorded states into the simulator from the user's environment, the change of control and simulation parts of the system, etc. is available.

ADVANTAGE AND JUSTIFICATION OF THE SYSTEM USAGE

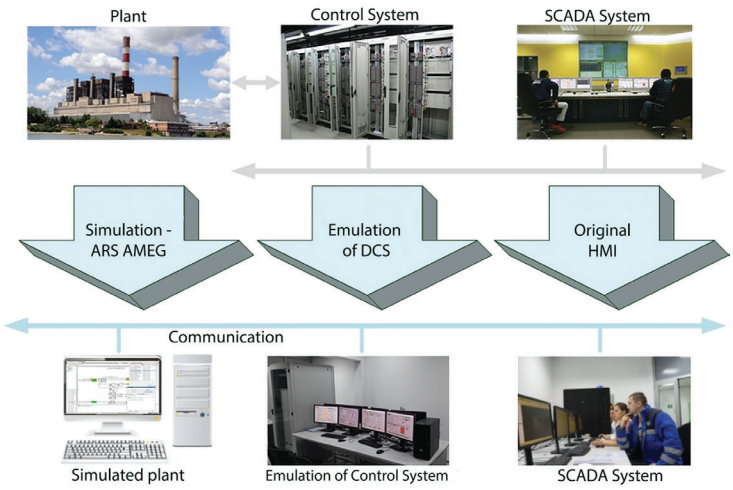
The application of the ARS AMEG system in the symbiosis with the Siemens DCS is a step forward in the opening of the market for the application of the thermal power plant simulators.

The hybrid simulator, as a symbiosis of two control-command systems, is significantly more competitive in the market regarding price and quality.



Thermal Power Plant

Simulator - Trainer



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