Success Story

Yokogawa's Integrated Solutions Control FGD Processes at Romania's Largest Power Plant

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Turceni

Location: Turceni, Romania
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Industry: Power

AUSTRIAN ENERGY & ENVIRONMENT

Executive Summary

The Turceni thermal power plant (TPP), located in southwest Romania's Gorj county, is this country's largest coal-fired power plant, belonging to the Romanian state-owned coal energy producer Complexul Energetic Oltenia S.A. With a total installed capacity of 3,900 MW (9 units x 330MW,2 units x 315MW, 2 units x 150 MW spread across 4 power plants), it generates approx. 30% of the country's electricity.

As Romania joined the EU in 2007, it was required to bring its power plants' sulfur dioxide (SO2) and dust emissions into compliance with the EU environmental standards by 2011. Thus the power plants had a very tight deadline for achieving this reduction, and would not be allowed to continue the operation if they failed to comply. Given this situation, the Turceni TPP pollution abatement project chose to make use of a yen-denominated official development assistance (ODA) loan from the Japan Bank for International Cooperation (JBIC) to finance the installation of flue gas desulfurization (FGD) systems for units 3, 4, 5, and 6 at the Turceni power plant.

Yokogawa's Integrated Solutions Control FGD Processes at Romania's Largest Power Plant The FGD systems are designed to remove 96.4% of the SO2 and up to 80% of the fly ash from the boiler flue gas. Each boiler of units 3 through 6 is equipped with an absorber unit, and there is a total of two limestone slurry preparation lines for the four boilers. The flue gas SO2 absorption process produces a gypsum slurry that is pumped out to a subsequent dehydration process. 15,000 tons/year of commercial grade gypsum are produced. This technology is the one of the former Austrian Energy & Environment (AE&E), actually Andritz Energy & Environment.

For the Turceni TPP, Yokogawa provided its CENTUM VP integrated production control system (PCS); field devices such as DPharp EJX pressure/differential pressure transmitters, pH analyzers, and temperature transmitters; the Plant Resource Manager (PRM) integrated device management tool; the Exaquantum plant information management system (PIMS); the eLogBook tool for shift operator logging; and paperless recorders for environmental emissions tracking and the monitoring of large motors. Following the delivery of all of these products and systems between 2009 and 2012, the FGD systems for all four units have been operating to the customer's complete satisfaction.

The FGD control room

The Challenges and the Solutions

1. Integration with subsystems

The Turceni TPP has to run 24/7/365 for a steady supply of electricity to the national grid while meeting the strict requirements of the new EU environmental standard, which provides that the SO2 content in the flue gas must never exceed 200 mg/NmÑ. To promptly make the necessary adjustments, the operators in the FGD control room need to see in real time what is happening in each of the FGD processes. Yokogawa made this possible by achieving complete integration between its CENTUM VP PCS with FGD subsystems such as the gas monitoring and recording system (GMRS), vibration monitoring and recording system (VMRS), asset management package (PRM), and the closed circuit television system (CCTV).

From their human machine interface (HMI) stations in the FGD control room, operators can view live feeds from CCTV cameras installed in various plant locations, and are able to zoom in/out and pan left/right. Also, at the HMI stations, operators have access to a PRM screen that gives the status information for all field devices and a VMRS screen that displays a continuous stream of data as well as data logged by paperless recorders that can be used to identify when preventive maintenance is required for any of the large motors in the FGD facility, thereby minimizing the possibility that a failure can lead to an unscheduled plant shutdown.

Thus, operators can stay on top of what is happening in the process at all four units and they are provided with the right information at the right time to ensure that they can promptly take the right action to ensure safe and efficient operations.

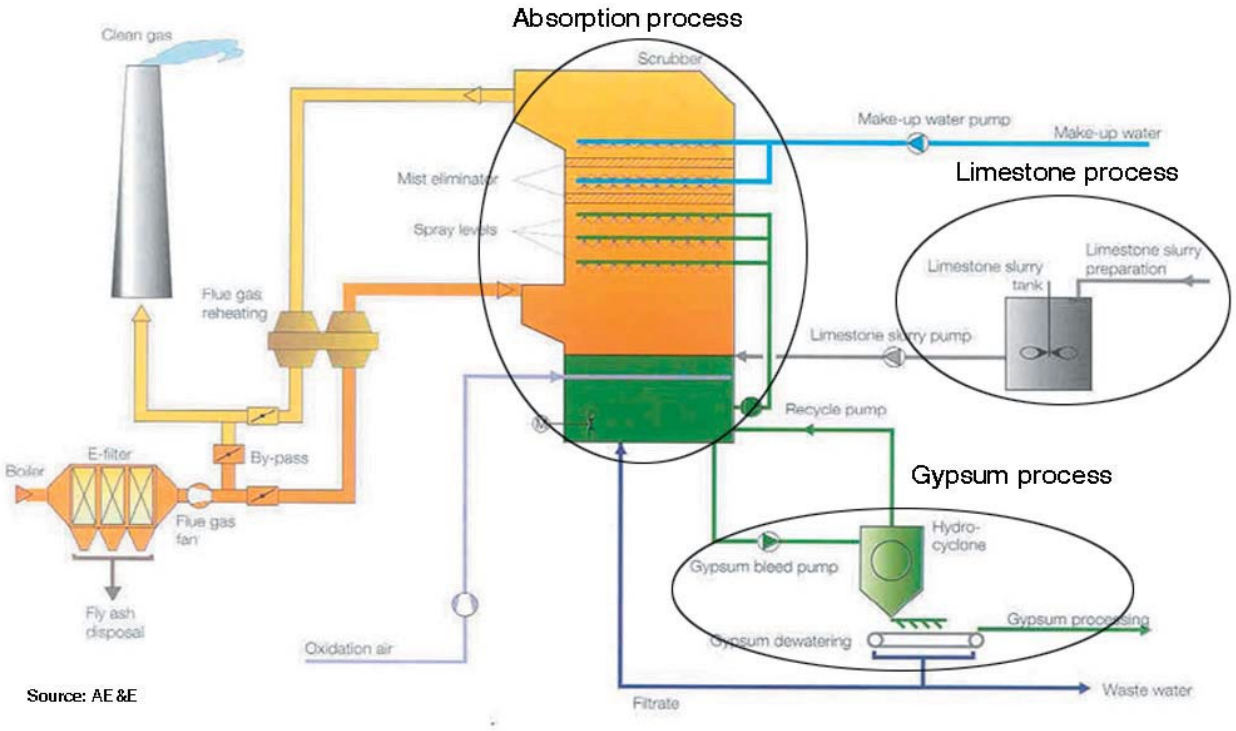
2. Optimum FGD absorber control

The FGD absorber has three main processes that must be precisely controlled to meet the government's environmental standard and to ensure the efficient production of a high quality gypsum by-product:

1. Limestone: the storage of limestone and preparation of limestone slurry
2. Absorption: the supply of limestone slurry and air to remove SO2 and produce a gypsum slurry
3. Gypsum: the recovery of commercial-grade gypsum from the gypsum slurry

The flue gas enters the absorption unit after passing through an electrostatic precipitator that removes fly ash. Based on the type of coal used and the data on the flue gas flow rate, the CENTUM VP system automatically controls how much slurry is sprayed inside the absorber unit by controlling pumps on or off, thereby ensuring the optimum desulfurization rate required to meet EU environmental standards. The reaction between the SO2 and limestone slurry produces calcium sulfite, which undergoes a further conversion to gypsum through the introduction of oxidation air. After the pH level is adjusted to 7.0 through the addition of CaCO3, the gypsum slurry is transferred to a gypsum separator. Here, through some processes, such as filtration and dehydration that necessitate the operation of numerous motors and pumps, a saleable gypsum by-product is produced and it is over 95% pure.

All strategies for the automated control of the above processes are configured in the CENTUM VP system, using a combination of sequential and feedback control functions. By means of graphic displays and guidance messages at the HMI stations, operators at the Turceni TPP are able to interact with CENTUM VP and stay on top of what is happening in these processes.



Flue gas desulfurization processes

3. Reporting and information transferring

The Turceni TPP must regularly submit reports showing that it is in compliance with the new EU environmental standard. The Exaquantum plant information management package collects all the necessary operational data for these reports, which are automatically generated on a daily, weekly, and monthly basis by the CENTUM VP system. The amounts of water, electricity, limestone, and steam used in the processes are also calculated so that the overall efficiency can be determined. This information can be used to further improve the operation. The eLogBook tool allows the operators on each eight hour shift to record and transfer information on any significant activities, operation changes, problems, and so on to the operators working the next shift, ensuring greater safety and efficiency in plant operations.

Customer Satisfaction

Marian Motocu, the former general manager of Complexul Energetic Turceni S.A.(at this moment, being the manager of Craiova II TPP): “Yokogawa’s fully integrated control solution and competence came with a great contribution to the success of this pollution abatement project, opening a new phase in the Romanian energy power sector.”

Laviniu Danciu, complex project manager, Turceni TPP, said, “Yokogawa’s systems and products, including the CENTUM VP PCS, Exaquantum PIMS, PRM plant asset management package, instrumentation, the eLogBook tool, sequence event recording (SER), and integrated 3rd party subsystems such as a vibration monitoring system, emissions monitoring system, and CCTV system have all demonstrated their strong capabilities over a one year period at all four units. Yokogawa is one of our best partners.”

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