

PROJECT NARRATIVE



System Description

Owner: RusHydro

Plant Name: Volzhskaya HPP

Plant Type: Hydroelectric plant with Kaplan turbine generators

Product Type: Ovation

Plant size (MW): 20 x 115 MW, 2 x 120 MW, and 1 x 11 MW Hydro units

Application: Hydro

Commissioning Dates:

- Unit 8 = 2004
- Unit 4 = 2005
- Unit 19 = 2006
- Remaining 19 units = 2007 - 2011

Emerson Products & Services used for Volzhskaya Modernization:

- 1 Ovation Control system per unit. Each unit consists of:
 - 1 Redundant Ovation fiber-optic network
 - 1 Redundant Ovation controller for 14 units (unit retrofit) and 2 Redundant Ovation controllers for 5 units (unit replacement)
 - 1 Ovation workstation
 - Control system I/O point count: DI = 224, DO = 128, AI = 104, AO = 12, Total points: 468
 - 4 Modbus RTU links
- Emerson transmitters: Level, Pressure, Flow, Temperature
- Vibration Monitoring
- Power Distribution System with Emerson UPS
- Installation, startup and commissioning Services
- Electrical Services



Photo courtesy www.industrcards.com

RUSHYDRO

Volzhskaya Hydro Electric Power Plant (HPP)

Located in the Volgograd Region of Russia

Hydropower is a key element in ensuring the reliability of Russia's Unified Energy System. Of all the existing types of electric power stations, Russia depends upon its 102 hydropower plants over 100-megawatts each to cover peak load demands because of their ability to quickly increase output.

RusHydro is Russia's largest hydro-generating company and the second biggest in the world in terms of installed capacity of over 25,000 MW. RusHydro has made significant investments in the construction and rehabilitation of their hydro facilities throughout Russia. One of the first facilities to undergo modernization was the Volzhskaya Hydroelectric Power Plant (HPP). The Volzhskaya station consists of twenty 115-megawatt units, two 120-megawatts units, and one 11-megawatt unit. The combined units generate a total of 2551-megawatts for the Volgograd area, making it one of the largest hydroelectric plants in Europe.

Obsolete and vintage equipment were hindering operations at each Volzhskaya unit. The Kaplan turbines used throughout the plant were equipped with aging controls that did not support current grid control requirements. The turbine mechanisms were manually operated through local control panels. Subsystems were not connected and diagnostics were poor. Issues associated with the hydraulic governor included the use of worn out equipment, operating with the same oil as the main vane actuators, use of wires to provide position feedback measurements and obsolete parts causing escalating maintenance costs.



Volzhskaya 8 was the first unit to undergo modernization by Emerson. Obsolete cabinets (far left) were replaced by Ovation controller cabinets (center). The inside of one Ovation cabinet is shown on the far right.

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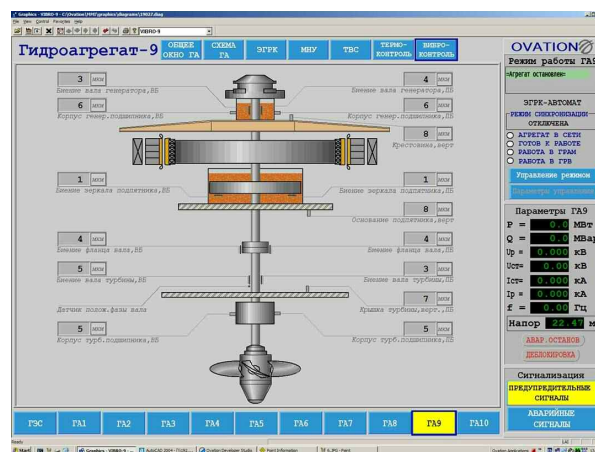
Project Scope Summary:

- Electronic controllers
- Turbine governor valve position, speed, and power control
- Turbine governor position measurements, spool valve actuation scheme, high pressure oil supply
- Hydro-mechanical turbine protection
- LP oil pressure and level control
- Turbine auxiliary mechanisms with new sensors:
 - Pipeline valves for cooling water supply
 - Drain pumps
 - Air admission to runner chamber
 - Generator braking block controls
- Temperature monitoring
- Auto synchronization
- Vibration monitoring
- Coordination with excitation, electrical protection and electrical subsystems
- Remote control

RusHydro selected Emerson Process Management to modernize the plant's control systems with Ovation[®] expert technology and to upgrade the hydro-mechanical turbine governors. The goal of the project was to increase operational reliability and plant safety. The Ovation system enables the Volzhskaya units to meet current grid requirements for supplying generated power. A fiber-optic Ovation network allows the control rooms to communicate with the unit control system, which can sometimes be separated by great distances – more than 1 km. A multi-network configuration provides communication between the Ovation networks and control rooms and with the dispatch centers. The Ovation system is equipped with a turbine protection system that shuts down the turbine using the main valve for fast action or the emergency stop valve for slower action. Start sequences and compensator modes are also included.

A new turbine hydraulic governor, designed by Emerson, was also installed. Immediately, obsolescence and maintenance issues were eliminated through the use of the most up-to-date technology and equipment design. The new governor uses a dedicated hydraulic power unit with clean oil. Additional cost savings are provided through using less oil to operate the governor. The new design eliminates mechanical feedback, cam follower, and oil linkages. The use of redundant pumps, standard base elements, stainless steel, and local electrical and hydraulic control elements improves operation of the plant's turbines.

Emerson's comprehensive solution also included Rosemount level, flow, and temperature transmitters, a vibration monitoring system, Liebert UPS system, and services. Emerson's successes on Volzhskaya Unit 8 lead to similar modernizations on the remaining units. By 2011, the entire Volzhskaya HPP will be optimally operating with Emerson Ovation controls and turbine hydraulic governors.



Example of Ovation Graphic at Volzhskaya showing turbine vibration diagnostics