

Using LabVIEW 6i and FieldPoint to Improve Performance of Turbo-Gas Generators

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The Challenge: Automating a combustion air-cooling plant for turbo-gas generators to improve equipment performance as outdoor temperature increases.

The Solution: Using National Instruments LabVIEW 6i and FieldPoint to monitor environmental conditions and control plant equipment.

Centro Elettrotecnico Sperimentale Italiano (CESI), an Italian research center, operates in the electrotechnical and energy fields. In the last years, the Business Unit Processi per la Generazione carried out a research activity for improving the performance of turbo-gas generators. The combustion air-cooling plant injects suitable quantities of demineralized H₂O, atomized into drops of controlled size, into the turbo-gas machinery suction pipe. Originally, it was designed for semi-automatic control, suitable to test the potential of the equipment using manual procedures. By the end of the experiment, having achieved positive results, we implemented it into the full automation of the plant. The first step towards full automation was to provide the plant with electronically controllable components, such as valves, actuators, and inverters. We equipped the plant with sensors to monitor environmental conditions and instruments (pressure transducers, flow gauges, etc.) for process parameters controlling.

Functional, Versatile Software

To develop the combustion process in the turbo-gas generator and the control algorithm, we developed a virtual instrument (VI) using LabVIEW 6i. With the system management software and the FieldPoint system, we can:

- Perform data acquisition from the field and transmission of commands from the processing equipment to the field
- Verify plant parameters at user-defined intervals
- Update plant management parameters at user-defined intervals
- Store process data at user-defined intervals

Adaptable Automation Hardware

We used National Instruments FieldPoint distributed I/O system for our automation hardware. Because the power plant is a rugged, noisy environment, we needed to guarantee the reliability of the system. We chose two FP-1001 network modules for each turbo-gas generator and several dual-channels modules for the I/O. The dual-channels modules were used in differential mode to avoid channel-to-channel interactions from either the ground loops or electromagnetic coupling at network frequency.

Results – Cost and Time Savings

Thanks to LabVIEW 6i and FieldPoint, we can now control the flow rate and pressure of the atomized water (demineralized H₂O) injected into the turbo-gas through its air suction pipe. With this NI solution, we can use the air-cooling plant in a fully automated way – no operators are required to control the plant.



Detail of the QCC where the FieldPoint system is installed.

We no longer need additional operators in calibrating the air-cooling plant. The plant synoptic we designed using LabVIEW 6i allows the utility operator to have, with a glance only, all the important information of the plant state. Using National Instruments software and hardware platform, we implemented the solution in a short amount of time – it would have taken researchers at CESI several years to develop.

National Instruments provided a solution with the lowest costs and fastest time to market compared to other solutions. Moreover, NI platform permits the remote control of the plant in a very easy and fast way. Thanks to the implemented technique, the extra turbo-gas power generation increased by 5.3 percent.■



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