

POWER GENERATION

BY ROBERTA PRANDI



The Hot Spring, Texas, U.S.A., combined-cycle power plant of Suez Energy Generation North America has implemented the Commander software by AAT for the optimization of its start-up procedure.

Commander Delivers Optimization Solutions and Fuel Savings

Advanced Aerofoil Technologies' Commander software maximizes operational flexibility without additional capital expenditures for plant upgrades

Advanced Aerofoil Technologies (AAT), the Swiss specialist in turbine airfoil production, recently divided its activity into two segments. The first and most historical of the two, blade casting and machining, relocated from Switzerland to a brand new plant in Bayreuth, Germany, in December 2008 (see sidebar story). The second, and just recently launched segment, provides software solutions for the optimization of thermal power plants. AAT recently provided a live demonstration of Commander, one of the software packages in the company's portfolio.

The Commander software is a niche product specifically designed for the optimization of combined-cycle plant start-ups. AAT is well positioned with this product since there are few, if any, similar software offerings available. AAT explained that Commander was first applied to coal power plants in the U.K. in 2002 and, starting in 2005, it was employed on combined-cycle applications in the United States, mainly in the state of Texas. Due to the large number of combined-cycle power plants and the complex power generation market characteristics, the U.S. is a favorable market for its products.

Many combined-cycle plants were built seven or eight years ago, when gas prices were relatively low, and were designed to run 24/7. Volatile gas prices cause frequent use of start-and-stop procedures and, as a result, some of these plants are cycled as much as 200 times a year. AAT found the need for optimizing plant start-ups was most prevalent in the state of Texas, where the regulations for bringing a plant online involve heavy fines if predetermined output is not achieved. In the Texas market, rules require traders to declare in advance the megawatt output during the start-up phase, divided into 15-minute windows. If the plant is not delivering the declared amounts, it incurs commercial penalties.

According to the experience of AAT in older coal-fired plants, once the units are

synchronized, the start-up procedure usually continues with regular advancement, which makes it easier to predict the output at any time. However, in modern combined-cycle power plants, the start-up advances with a more complex profile, making it difficult for operators to predict the output and avoid penalties. Commander is able to design the start-up profile and effectively predict the power output in 15-minute increments.

In addition to start-up optimization, the Commander software also provides fuel savings benefits. When operators start up a plant manually, they focus on having hot steam available as soon as possible to start the steam turbine. Gas turbines are usually started and set up to a high level, which results in a lot of gas being burned. Commander is able to calculate, in advance, the exact amount of gas required to achieve the steam temperatures required, which yields energy and consequently cost savings.

AAT realized that traders typically plan start-ups a few hours in advance. The temperature needed for the steam depends on the current temperature of the steam turbine and what it will be at time of start-up. However, the ambient temperature also affects gas turbine performance and exhaust gas temperature. With this in mind, AAT uses the cooling curve of the steam turbine and the forecast of the ambient temperature to set the gas turbine megawatt output levels to the level that is just right to

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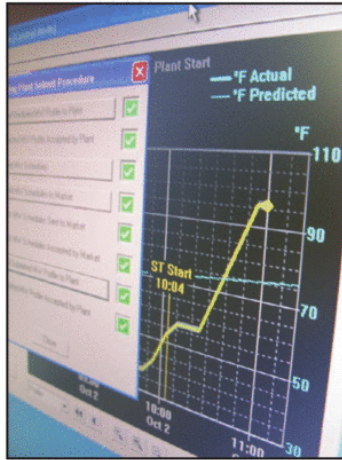
have the steam hot enough without having unnecessary fuel waste.

A live demonstration at AAT headquarters in Hombrechtikon, Switzerland, demonstrated the ease of communication between the trader and the power plant. The software is installed in two places: an interface for the trader at the trading floor and also one for the control room operator at the power plant, with the two stations communicating online to each other. The software was first applied by AAT in a combined-cycle plant by Suez Energy Generation North America three years ago. The trading company is located in Houston, Texas.

The feedback from Suez Energy Generation North America has been very positive and, in fact, a statement by the production support manager reported that overall, Commander is showing its benefits in keeping up with schedules and reducing penalties.

The system is configurable and can be adapted to different power plants. Also, when a gas turbine's efficiency decreases over time, the system can be reconfigured, even remotely using a fairly simple process.

Customers have expressed the wish to have the system readjust automatically after unforeseen plant equipment failures during a start. This prompted the company to work at adding this feature to the software package. Testing



Shown is a screen of the optimization software Commander by AAT designed for the start-up of combined-cycle gas turbine power plants. It is interactive software that puts the trader and the power plant operator in direct connection.

of the new feature was recently completed and the new package is now ready for the market. This recently improved version allows the trader to cancel an older plan and move to a new one with the click of a button.

Based on its experience with the coal power plants in England, once the start-up process becomes more automated, the operator removes much of the human-related problems. AAT estimates that this process automation pre-

cludes 60 to 70% of issues that can arise with the start-up of a combined-cycle power plant. The issues that are not immediately handled by the software may occur due to the structure of the plan but can be quickly identified and addressed. As an example, at one of the plants that AAT worked with, the company found that one of the spray valves was leaking, causing the steam for the steam turbine to be too cool to overcome the start permissives. In this case, the Commander software helped to identify the problem.

To date, AAT has developed experience with the Westinghouse 501G gas turbine, which according to the company has a complex start-up profile, and it is also making advancements with the Mitsubishi 501G and the GE 7FA engines, which according to AAT have simpler profiles.

At this time, the payback period for the Commander software is approximately six months to a year and is typically completed with other control system upgrades. The company is focusing mostly on the deregulated U.S. power generation market where the system of penalty payments makes Commander an ideal tool. However, AAT is also pursuing power plants using the same kind of engines in Europe and Asia.

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New Facility Manufactures Gas Turbine Blades

Swiss company Advanced Aerofoil Technologies AG and its German subsidiary MTS Deutschland GmbH opened a new production facility for the manufacturing of gas turbine blades in Bayreuth, Germany.

The company said that the MTS Deutschland's new 4000 m² plant has been built in a record time of 10 months and will house all the key phases of the manufacturing process to produce gas turbine blades. Processes such as tool making for dies and molds, ceramic core and wax molding, shell making, investment



The new production facility of MTS Deutschland located in Bayreuth, Germany, is for the manufacture of gas turbine blades.

casting, heat treatment, grinding/milling, brazing and laser-hole drilling will be performed under the same roof.

Advanced Aerofoil Technologies said that this new manufacturing facility

will optimize and align the various processes and ensure a considerably reduced delivery time to market.

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