



# Elliot Turbomachinery

## Designed for Success

### Results

- Greater equipment uptime for critical applications
- Improved productivity
- Trending data and records for reporting, predictive maintenance, and diagnostics
- Easy access to parts globally
- Simplified programming to put control changes in the hands of end users

*"By selecting GE Fanuc, we got a critical control solution that addresses the fundamental concern of maximizing uptime and improving production. In addition, we solved our parts-availability issue because of the worldwide supply chain that comes with partnering with a GE company."*

**Bruce Heckel**  
Engineering Manager  
Elliott Turbomachinery Company, Inc.

## PLC-Based Turbomachinery Management System Protects Continuous Operations in High-Availability Applications

Cost-effective management of high-availability applications, such as refining and oil and gas processing, often poses a major challenge to equipment owners. Elliott Turbomachinery Company, Inc., headquartered in Jeannette, PA., meets this challenge with a unique multiple-machine management solution integrating valuable monitor and control functions that increase equipment uptime and improve overall production, while streamlining day-to-day tasks.

Called the Elliott Digital System<sup>PLUS+</sup> or EDS<sup>PLUS+</sup>, this user-friendly turbomachinery management system employs a CPU Genius<sup>®</sup> Redundancy (CGR) 935 critical-control solution from GE Fanuc Automation. The system features two GE Fanuc Series 90<sup>TM</sup>-70 PLCs linked to Genius and field I/O with an Ethernet connection to the front-end PC running graphical human-machine interface (HMI) software. Simplex configurations are also available. Together, these components form a powerful tool capable of overseeing multiple machines and ensuring reliability and peak performance.

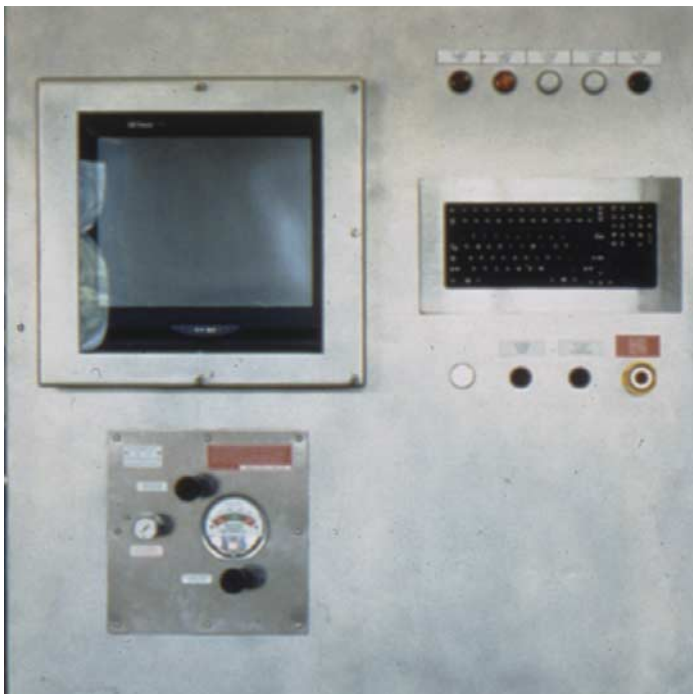
Operators are able to manage all networked turbomachinery components from the system's industrial PC or from an optional remote PC, adjust their controls as needed to optimize equipment efficiency and reliability, and generate trending data and records for reporting, predictive maintenance, and diagnostics. In addition to improving uptime and productivity, equipment owners simplify everyday tasks like reporting and maintenance scheduling.



imagination at work

### Easy as PLC

Elliott has progressed a long way from its beginnings as a manufacturer of boilers, tube cleaners, and related products. Today, Elliott keeps tens of thousands of turbomachinery units at work and is considered a heavyweight in the world of rotating equipment and related products. Best known for building air and gas compressors, steam turbines, power-recovery expanders, turbo-chargers, and power-generation equipment, Elliott also designs, manufactures, installs, and services its turbomachinery. These capabilities place Elliott equipment in production environments where continuous operation is essential, from liquefied natural gas processing, to oil and gas production, to refining operations and chemical production.



In the early 1990s, Elliott developed its first turbomachinery management system using third-party components. Bruce Heckel, Elliott engineering manager, recalls the design: “The predecessor of the EDS<sup>PLUS+</sup> was a mix of VME-based components, which provided similar monitor and control functions, but all of the logic was in high-level ‘C’ language, which made it difficult for our customers to maintain.”

According to Heckel, since most operator-level personnel were not trained in C, customers lost valuable uptime whenever they needed to make a change. Parts availability also became a source of disruptive downtime as system components became increasingly obsolete and shipments took up to several weeks in some cases.

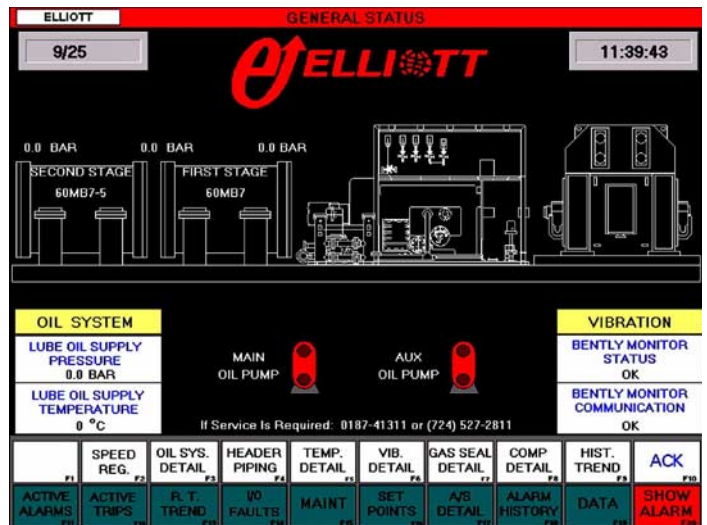
“Ultimately, we lost confidence in our suppliers’ ability to effectively provide next-generation components that would allow us to upgrade the system over the long run and place management control in our customers’ hands,” Heckel says.

Working to find a better way, Elliott partnered with GE Fanuc to design a new solution that would provide improved reliability, as well as centralized monitor and control capabilities for multiple machines, and would also address the programming language and parts availability issues.

“By selecting GE Fanuc, we got a critical-control solution that addresses the fundamental concern of maximizing uptime and improving production,” explains Heckel. “In addition, we solved the parts-availability issue because of the worldwide supply chain that comes with partnering with a GE company. Also, since the solution uses Ladder Logic, a much simpler language, our customers were finally able to take complete control.”

### The Heart of Critical Control

At the heart of the EDS<sup>PLUS+</sup>, the CGR critical-control system provides synchronized modular redundancy using two PLCs to ensure proper sequencing and protection of the rotating machinery, oil systems, and related process equipment. Operating as primary and secondary units, each PLC has a redundancy communications module and a bus transmitter module, providing dedicated synchronization and “bump-less” transfer between the two units. The PLC redundancy is also complemented by two synchronous CPUs, which transmit all status and I/O data. This scanning process is also designed to eradicate “bumps” when switching between primary and secondary CPU control. Such redundancy eliminates common mode failure and allows critical turbomachinery processes to continue even if failure occurs in any single component.



With respect to I/O components, Genius and field I/O choose between outputs from the bus controller associated with either the primary or secondary CPU. When configured for hot-standby operation, output modules on the Genius bus choose between commands from the Genius bus controller associated with either the primary or the backup CPU. If communications from both Genius bus controllers are available, the I/O blocks accept data from the primary CPU. If after

three consecutive scans there are no communications from the primary CPU, the I/O modules will use data received from the backup CPU. If outputs are not available from either CPU, the I/O modules revert to their reconfigured default value.

Employing the PLC and HMI configuration, the EDS<sup>PLUS+</sup> monitors turbomachinery pressure, temperature, flow, and vibration conditions so that each condition remains within its preset parameters. When a condition falls outside these parameters, an alarm is triggered and communicated via the HMI. From the HMI's general status screen, the operator can access all subsystems and modules—including the oil system, steam turbine governor, anti-surge controller, and vibration/temperature monitoring—view the screen of choice, and perform monitor and control functions.

Operators can also view and change settings, alarms, and set points, determine sequence of events, and monitor and control oil-system operation including pump start/stop or pump switchover, as well as generate trend information for analysis, download archived information, and produce reports and records about any aspect of system performance. To protect system security, only authorized personnel can access the system's database and change operating parameters, and the system identifies the user, time, and date of every transaction.

Further improving communications options, the EDS<sup>PLUS+</sup> also features a serial port that allows a single connection interface between the management system and the owner's distributed control system (DCS) or data acquisition equipment to receive process control set points and send data for long-term storage. A modem is also available for remote data transfer and off-site service assistance.

#### **Critical Control for Critical Industries**

Follow Elliott around the world, and you'll find machines at work for oil and gas production in the North Sea, for ethylene production in Pakistan, for synthetic fuel processing in Brazil, for gas processing in Mexico, for refineries in the United States, and for lube oil dewaxing in Australia. Committed to servicing the world's foremost energy providers, Elliott is doing its part to lead these companies to greater efficiency and reliability.

Summarizes Heckel: "By upgrading the control, and resolving our parts availability and programming language issues, we've positioned the EDS<sup>PLUS+</sup> to serve our customers as a powerful, cost-effective tool that helps them optimize their production and profitability with maximum uptime."



#### **GE Fanuc Automation Information Centers**

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1- 800-GE FANUC  
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Europe, Middle East and Africa:  
(352) 727979-1

Asia Pacific:  
86-21-3222-4555

#### **Additional Resources**

For more information, please visit the  
GE Fanuc web site at:

[www.gefanuc.com](http://www.gefanuc.com)