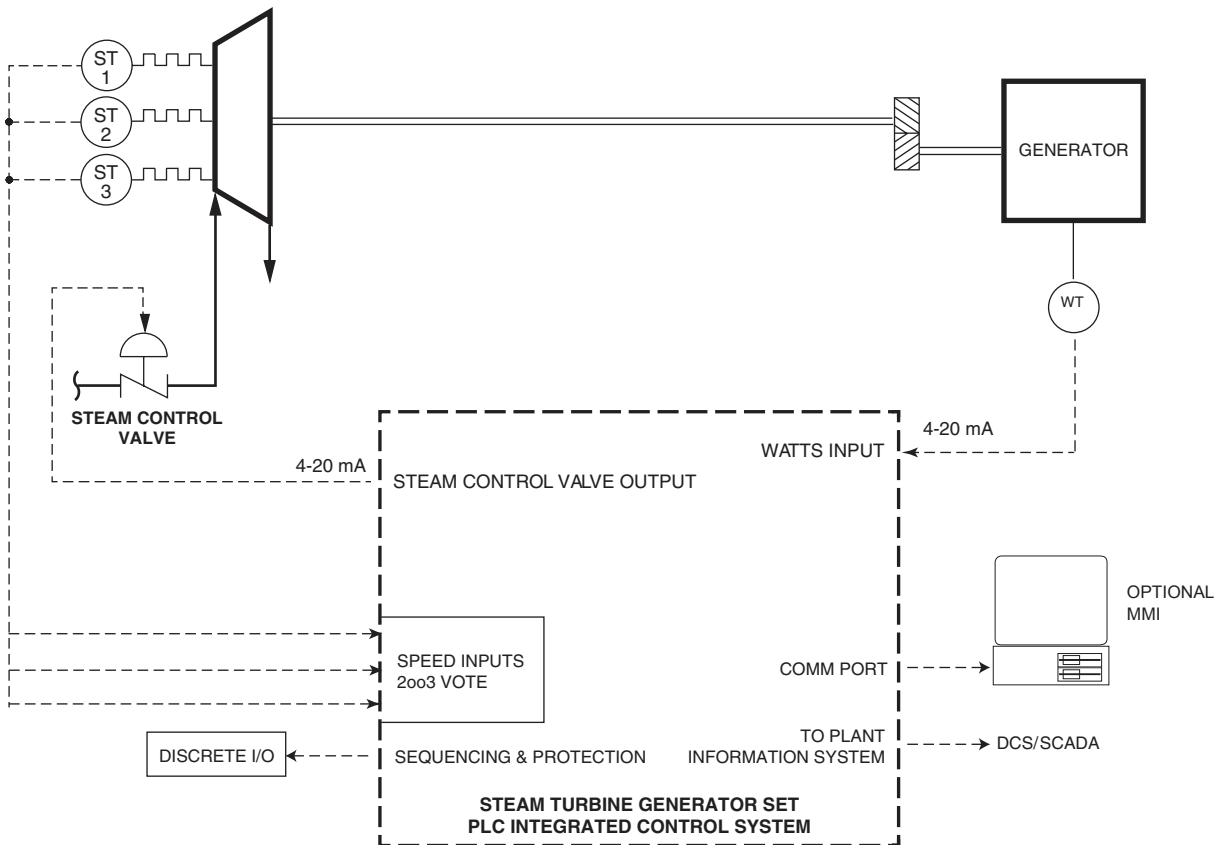


STEAM TURBINE CONTROLS FOR GENERATOR DRIVE APPLICATIONS



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Simplified schematic showing a Petrotech advanced PLC-based integrated steam turbine control system for a generator set. The system provides turbine steam flow control, temperature control, sequencing/protection, communication interfaces, and more.



APPLICATION

The Petrotech integrated control system provides cost-effective complete or partial control system retrofits for steam turbine driven generator packages. The control system provides replacement controls for outdated electro-hydraulic and analog-electronic controls. The PLC-based system can include turbine and generator sequencing, complete turbine control, load control, DCS interface, and a graphic operator interface for system status, trending, and data logging.

ADVANTAGES

- **Integrated control capability:**

Turbine speed control and sequencing/protection are integrated into a single platform. This eliminates the need for additional hardware and communication links, thereby providing a less complicated, more cost-effective solution.

- **Open architecture system:**

Application control package's portability allows customer choice of platform, reducing need for additional spare parts and training expenses. Available PLCs include General Electric 90-70 and 90-30, Siemens/TI, Modicon Quantum, and Allen-Bradley.

- **Fault tolerant:**

The control package is available on fault tolerant controllers for critical control applications.

- **Standard industrial components:**

Non-proprietary, commonly available parts are less costly and more easily serviced by customer's on-site personnel. Much longer time to obsolescence than proprietary systems.

- **Reliability:**

ALL control functions are performed by tested and proven industrial PLC equipment, not by MS-DOS based computer equipment which is not designed to function as a "controller".

- **Simplified interface to DCS or SCADA:**

Communication tasks are handled with a separate, dedicated module in the PLC, increasing data rate and simplifying network installation.

- **Non-proprietary interfaces:**

Interfaces in the form of 4-20 mA, RTD, frequency, thermocouple, and dry contact I/O allow simple integration into existing sequence/protection logic controller, making very low-cost partial control upgrades simple and practical.

- **Improved speed control:**

Fast loop sampling rate, combined with modern digital control techniques improve steady-state setpoint control, and reduce overshoot during transients.

- **Fail-safe features:**

Redundant overspeeds; open/short monitoring of mA and thermocouples; readback monitoring of outputs, and special self-check features improve safety.

- **Improved operator information with optional MMI:**

Industrial workstation graphically displays start-up sequencing, speeds, temperatures, operating points, and alarm/shutdown status. Optional data logging and trending can be used as part of a preventative maintenance program.

- **Simple installation:**

A dimensionally identical replacement of the control panel is possible, saving substantial architectural and installation cost. Control panels can be installed one at a time allowing other units to continue operating.

- **Rugged:**

Control panels can be built Division 2, Nema 4X for installation in harsh local environments.

- **Flexibility:**

The control system package can accommodate many different control strategies based on the customer's need and budget.

SCOPE OF SUPPLY

The steam turbine generator application control package typically includes:

- **Analog inputs, frequency:**

- Three (3) redundant turbine speed signals

- **Analog outputs, 4-20 mA:**

- Steam control valve

- **Operating states:**

- Start/stop
- Slow roll
- Accelerate
- Load/cooldown
- Active/standby
- Remote/local
- Auto/manual
- Isochronous Load Sharing

- **Status, alarms, and shutdowns:**

- Fault
- Overspeed alarm
- Overspeed shutdown
- Redundant overspeed shutdown (hardware)
- Speed switch #1
- Speed switch #2
- Speed switch #3
- Speed switch #4
- Speed switch #5
- Bolt test
- Manual
- Transmitter failure alarms
- Transmitter failure shutdowns
- Output failure shutdowns

- **Controllers/special features:**

- Start-up control (auto or manual)
- Slow roll
- Speed control
- Capacity control
- Two out of three (2oo3) voting on speed inputs
- Critical speed avoidance schedule
- Remote/local capability



CUSTOMER SELECTABLE COMPONENTS FOR THE CONTROL SYSTEM

Advanced Programmable Controller:

- Siemens S7
- Allen-Bradley Series 5, Flex I/O, ControlLogix
- GE Fanuc 90-70 and 90-30
- Modicon Quantum.

Application control package:

- Petrotech steam turbine control
- Petrotech sequencing and protection

Vibration Monitor:

- Bently Nevada 3300, 3500, and 2201 (for Allen-Bradley systems only)
- Vibrometer
- Metrix
- Vibrotec
- Customer specified

Autosynchronizer:

- Basler
- General Electric
- Customer specified

Man-machine interface, alphanumeric display (low end) plus panel meters for NHP, NLP, and EGT:

- NEMATRON®
- CTI Access 4000®
- Allen-Bradley Redi-Panel®
- Customer specified

Man-machine interface graphic display (high end):

HMI Hardware:

- Intecolor® industrial computer and monitor
- IBM® industrial computer and monitor
- Texas Microsystems® industrial computer and monitor
- XYCOM® industrial computer and monitor
- Nortech® industrial computer and monitor.
- NEMATRON® industrial computer and monitor
- Customer specified

HMI Software:

- Wonderware InTouch®
- Citech®
- Intellution®
- Realflex®
- Customer specified

Critical function redundancy for fail-safe action:

- Customer specified shutdowns in addition to Speed and ESD

Communication interface for DCS or SCADA:

- MODBUS
- Ethernet
- Customer specified

Type of control panel enclosure:

- Front and back plate for existing control enclosure
- Custom fabricated new control enclosure
- Class I, Division II stainless steel purged panel enclosure for hazardous locations
- Standard Rittal type panel enclosures

AUXILIARY SYSTEMS FOR STEAM TURBINE GENERATOR PACKAGES

The following auxiliary systems and components are also available for complete or partial system upgrades:

- Speed probe and exciter gear assemblies

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