Speed, Load, Extraction Control and HMI System Monitoring

**APPLICATION**

Power House, Water treatment plant
- Power Generation
- 2.8Bar extraction for water treatment process

**WATER PLANT OVERVIEW**

Seven boilers are used to produce up to 860 tons per hour of steam. 4 steam turbines are used to generate power with a total capacity of 103MW at this location. Steam is also used in the desalination process which has an installed capacity of 42 thousand tons per day. During the desalination process, high quality water vapor produced under vacuum conditions is condensed into distilled water.

The remaining salt water is diluted with sea water to form an environmentally safe mixture which is sent back to the sea. The desalination process eliminates all bacteria and guarantees that the water is pure and healthy. No chlorine is added to the drinking water. Tap water throughout the island is potable and can be used without any health risks.

**PROJECT OVERVIEW**

GCS custom-designed a digital Woodward control system for the TG3 single extraction condensing turbine which is primarily used to produce power. It is also used to maintain the 2.8Bar steam header that the water treatment process requires.

The Woodward Atlas II digital control replaced the original 505E governor control that had been installed in the mid 90’s. The actuation was converted from the original TG13 actuator acting on the pilot valve to a parker actuator working directly on the main steam rack, improving the response times of the valve. With the faster and better speed control TG3 was able to be left in frequency control of the utility which was previously a problem. A separate hydraulic system (HPU) was used to replace the turbine oil to a cleaner and more reliable control oil for the actuator.

The vibration monitoring was also upgraded from the earlier 3300 to a newer 3500 allowing us to easily extract the vibration data for monitoring and historical archiving.

**PRIME MOVER**

TG3 Single Extraction-Generators
- Westinghouse 34MW
- 3600 RPM
- 13.8KV Wye

**CONTROL TECHNOLOGIES**

Woodward Atlas II Digital Control
Custom designed Speed control, load-control, Loadsharing, Extraction pressure control, auto synchronisation, monitoring and overspeed detection.

Woodward ProTech GII
An independent overspeed device with two out of three voting architecture to prevent false trips on speed sensor failures and providing a greater level of safety.

V1 & V2 Valve Actuation
V1 servo valve and main steam valve were replaced with a parker actuator and independent HPU oil system. LVDT valve feedback was added to both valves

Allen Bradley ControlLogix PLC
Custom designed alarm handler, trip handler, jacking oil pump control, starting gear control, temperature monitoring.

Wonderware HMI / SCADA System
Touch-screen terminal control, monitoring, alarming, and trending

Protection and Regulators
ABB Unitrol 1020 Automatic voltage regulator.
ABB REG670 Generator protection relay.
Bently Nevada 3500 Vibration detection.
CONTROL SYSTEM FEATURES:

Master/Supervisory Control
Woodward AtlasII Controls
- Isochronous speed Control
- Isochronous Load Share or Droop Mode
- 2.8 Bar extraction control
- Load limiter

Master/Supervisory Control
Woodward ProTech GII
- Independent electronic overspeed
- Two out of three voting

Supervisory Control
ABB Uniotr 1020
- Automatic voltage control

Supervisory Control
ABB REG670
- Automatic voltage control

HMI / SCADA System
Wonderware OIC
- 19" Touch-screen HMI
- Turbine control
- System Monitoring
- Alarm Handling and Performance Data Trending
- Multiple User Access Levels

Redundancy
- Double 120V supply input (AC/DC)
- Internal dual 24Vdc supplies

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