Tuxpan Combined cycle full scope simulator

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Simulation products & services

- **Simulator Supply and Upgrade**
  Different Scopes and Technologies (over 50 simulators supplied)

- **Modernization of Simulator Platforms**
  Best-estimate models implementation
  New Simulation Tools

- **Operation and Maintenance of Simulators**
  Management System Configuration
  SW and HW Corrective Maintenance
  Plant Modifications Implementation

- **Simulator Assisted Engineering**
  Safety Analysis Support
  Plant Design Modification Assessment
  Procedures and I&C Systems Validation
  Virtual Reality
Tuxpan Combined cycle

- 983 MW two-unit combined cycle
- Operated by GPG, Global Power Generation (Gas Natural Fenosa Group)
- Operating since 2003
- Mitsubishi technology
  - 2 Gas Turbines M501F
  - 2 HRSG (Heat Recovery Steam Generator)
  - 1 Steam Turbine
  - DCS DIASYS NETMATION
Tuxpan CC Full scope simulator

International procurement process in 2015

- Tecnatom was awarded the contract for the simulator development and supply

Control room full scope simulator

- Reference unit – Tuxpan III
- Enables training in full-range operation from the control room
- Covers normal operation, operational transients and abnormal operation due to failures in equipment
- Compliant with ANSI/ISA-77.20.01-2012 Fossil Fuel Power Plant Simulators. Functional requirements

Developed with Tecnatom´s simulation technology suite

- Simulation environment
- Instructor station
- Thermal-hydraulic, logic & control and electric models

Human Machine Interfaces, both simulated

- Mitsubishi Distributed Control System (DCS)
- Performance & condition monitoring tool
Tuxpan CC FSS. Project plan

- **Kick-off meeting**: 8/1/2015
- **Technical Specification Approval**: 11/30/2015
- **Acceptance Test Procedures Approval**: 5/16/2016
- **FAT approval**: 10/14/2016
- **RFT**
Simulator layout
Simulator architecture

- HMI
- HMI DB
- DIASYS Netmation DCS Monitoring tool
- Instructor Station
- WEBSERVICE TCP/IP
- SIMULATION ENVIRONMENT
- SIM DB
- WEBSERVICE TCP/IP
- Simulation models
  - Hydraulic
  - Logic & control
  - Electrical

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DCS simulation

DCS: DIASYS NETMATION, by MITSUBISHI HITACHI POWER SYSTEMS

Solution for the implementation of the DCS in the simulator:
Simulation by the development of an automatic translator
DCS simulation

Mitsubishi DCS
DIASYS Netmation

Tecnatom´s simulation tools
• Control & Logic – Team.Logic
• Displays – Team_Sketch
DCS simulation

Online modification of logic interlocks, setpoints and field values
Performance monitoring simulation

EtaPRO: Commercial tool for performance and condition monitoring

Solution for the implementation in the simulator: Simulation with Tecnatom’s simulation tools
Tecnatom’s simulation technology

THERMAL-HYDRAULIC

ELECTRICAL

LOGIC & CONTROL
Tecnatom’s simulation technology

- TEAMFLOW – Multi-fluid networks builder
  - Design for **thermal-hydraulic** net calculations in real time
  - Mass, energy and momentum conservation principles
  - Flows, pressures, temperatures, concentration and activity calculation
**Tecnatom’s simulation technology**

- **TEAM_LOGIC** – **Logic & control** model builder
  - Design to solve logic nets in real time
  - Libraries of icons similar to plant diagrams (analog, digital, instruments, wiring, etc.)
  - Translator tool - Automatic translation from plant control

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**Plant logic diagram**

**Team_Lock equivalent diagram**
Tecnatom’s simulation technology

- **TEAM_ELECTRIC** – Electric network builder
  - Design to solve electrical nets in real time
  - Resolution of a net with Kirchhoff and Norton equations (Nodes (V) and Lines (I))
  - Voltage, intensity, frequency and power calculations
Simulator-based training programs

Basic Course
- Overall knowledge about the plant operation
- Non-operator personnel. Management and maintenance
- Equipment operation and troubleshooting

Induction Course
- Normal operation in different conditions
- Entry-level operators
- Response to operational incidents

Re-training Course
- Normal operation and unusual transients
- Plant operators and shift supervisors
- Customized according to plant needs

Hybrid Course
- Other technologies operation
- Plant operators and shift supervisors
- Different technologies, operating experience
Conclusions

✓ Tuxpan combined cycle full scope simulator is a high precision tool, allowing the training in the whole range of relevant operation scenarios

✓ DCS simulation by an automatic translator is an efficient and reliable implementation solution

✓ The development and supply of the simulator has been a success, in terms of quality, cost and timescale