THUMS Long Beach Automated Safety Systems
Presentation Agenda

- Introduction to Thums
- Evolution of Safety Systems at Thums
- Safety System Requirements
- Safety System Architecture
- Safety System Testing
- Questions and Answers
THUMS – A Unique Facility

THUMS/Occidental Petroleum
Field Contractor for oil producing property in Long Beach, Ca

- **Background information**
  - State of California – Owns 90% of the Wilmington Oil and Gas Field, Fourth largest in the USA
  - Operator – City of Long Beach
  - Field Contractor - THUMS/Occidental
    - Facilities 4 man-made islands
    - 1 pier facility
    - 1 gas processing facility
    - 1 power plant
    - Peak rate 150,000 BOPD in 1969
    - Present rate 30,000 BOPD
    - Injection rate 1,000,000 BPD
    - 737 producers and 455 injection wells
    - 50 MW/H annual electrical load
Thums Islands and Subsea Pipelines

- Grissom
- White
- Pier J
- Freeman
- Chaffee
Evolution of Safety Systems at Thums

Safety by Design
- Production and Injection Wells located in Cellars
- Secondary Containment on Islands

Automation Safety System Upgrade
- Process Hazard Review for Critical Systems
- Subsea Line Emergency Shutdown Valves
- Segregation of Process and Critical Shutdowns
- Redundant Safety System Processor
- Inter-Island Communication
Safety in Original Design

Production Cellars

Secondary Containment
At Seawall
Subsea Line ESD Valves
Safety System Requirements

Shutdown Production
- FWKO Levels and Pressures
- High Tank Levels
- Cellar Gas Detection

Isolate Subsea Lines
- High and Low Subsea Line Pressure
- ESD Valve Closure

Divert at J-2 (Shore Facilities)
- Divert oil on high FWKO level
- Divert water on high pressure

Failsafe
- Power and Air required to maintain operations.
- Valves fail to predefined positions on loss of power or air
- System response predefined for transmitter failure
Safety System Architecture

- Redundant Safety PLC for each location
- Segregation of Critical and Process Interlocks
- Dedicated Safety system transmitters and valves
- Microwave Ring to communicate with other locations
- Separate IT network for Automation system
- Hand shaking communication between Safety PLCs on each location
- Uninterruptible Power Supply for Safety PLC
- Safety PLC in secured location, limited access
- Operator Paging System for Alarms
Automation Network

**Important Points about Automation Network**

- Automation Network is separate from the IT Network using VPN and Switches
- Only Automation computers are allowed on the Automation Network
- Archive Server is the only computer on both the IT and Automation Network. Networks protected by firewalls within server
Safety PLC and Server Racks
Operator Control Station (HMI)
# Operator Shut-in System Graphic

<table>
<thead>
<tr>
<th>ISLAND SHUT-IN INITIATORS</th>
<th>INSTR. TAG #</th>
<th>ACTUAL READING</th>
<th>UNITS</th>
<th>ALARM SETPOINTS</th>
<th>ALARM STATUS</th>
<th>DEVICE STATUS (Active/Bypassed)</th>
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Safety System Testing

Quarterly DOG Testing
- Partial Stroke Testing of Subsea line ESD Valves
- Testing of Cellar Gas Detection
- Testing of Shut-in Devices
- Testing of Switches and Buttons

Annual DOG Testing
- Full closure test of Subsea ESD Valves
- Quarterly DOG Tests
Questions

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