Overview of Factory Acceptance Testing (FAT) at GPE
Setting up a process plant is a complex task involving not just hundreds of suppliers, consultants and service providers from across the world but multiple internal verticals and several stakeholders. Most projects end up getting delayed and invariably commissioning, integrated cold and hot trials are always on the critical path. With billions of dollars invested and sales orders in the pipeline, end users are hardly amused when a particular equipment develops a snag during commissioning – potentially delaying the start-up of the whole plant.

Based on decades of commissioning experience, we have developed a comprehensive factory acceptance testing regime which beings with days of continuous internal trials and culminates in thorough examination by customer representatives at our factory. This helps to identify any functional defects and saves precious commissioning downtime. All identified punch points are resolved as soon as possible, in co-ordination with various internal departments, sub-vendors, consultants and the end user.

This type of testing is the next best thing to a full blown performance test (which can only be carried out at site where all utilities and safety measures are available) and ensures the following:

- Construction has been verified with respect to the project approved P&ID.
- All component tag numbers are verified as per the P&ID.
- Continuity testing from field to junction boxes and panels have been checked along with cross ferruling.
- Panels have been powered-on and sequence of operation checked.
- All transmitters are simulated using special apparatus and signal values at PLC panel checked.
- All actuated valves are operated several times and feedback from limit switches checked.
- All control valves are operated manually and through control loops in the PLC panel. Feedbacks of positioners are checked.
- The package meets the specifications and expectations of the end user.
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**LEAKAGE TEST**

1. Leakage testing of piping assembly by soap solution/ pneumatics testing at operating pressure
2. Review of piping drawings and inspection reports
3. Functional test
4. Actuated valve operation test
5. Leakage test of piping assembly after temporary piping with field instruments/ valves
6. Functional test
7. Functional test
8. Functional test
9. Functional test

**FUNCTIONAL TEST**

1. Test of PLC panel after temporary wiring with field instruments/ valves
2. Test of heater panel
3. Test of heater control panel
4. Test of heater/ control panel
5. Functional test

**NDE COMPLETENESS CHECK**

1. NDE completeness check
2. NDE completeness check
3. NDE completeness check
4. NDE completeness check
5. NDE completeness check

**FUNCTIONAL TEST**

1. Actuated valve operation test
2. Functional test
3. Functional test
4. Functional test
5. Functional test

**INSPECTION AND TESTING**

1. Final inspection
2. Final documentation check
3. Final inspection
4. Final inspection
5. Final inspection

**FINAL DOCUMENTATION CHECK**

1. Verification, compilation of inspection and test records for submission to customer as part of Material Data Record
2. Stamping of "As-Built" on P&ID and GA drawings
3. Final inspection
4. Functional test
5. Functional test
Functional Test of PLC System

- Review of PLC panel FAT which was carried out at panel vendor’s works.
- Detailed check of sequence of operation and HMI.
- Discussion with end user to decide various levels of access to be provided to the system.
- Re-confirmation of communication scheme between system PLC and plant DCS.
- Sign-off from end user on the HMI and sequence of operation. Incorporation of minor comments which are invariably missed during the engineering stages.
- Continuity check from field to JBs and JBs to PLC panel.
- Powering on PLC panel and transmitters, positioners, solenoid valves and limit switches.
- Simulation of transmitters (pressure, temperature, differential pressure, level and flow) using special apparatus and checking of signal values in PLC.
- Operation of all actuated on-off and control valves and feedback check.
- Operation of complete system in auto mode as per sequence of operation.
- Checking glands and gland plates.

Functional Test – Heater after installation

- Opening heater head cover to check that electrical parameters have not been affected during international transit and storage.
- Checking of limited electrical parameters of heater bundle such as resistance per bundle, maximum leakage, minimum megohms and comparison with heater traveler report issued by supplier.
- Checking heater junction box for visual inspection of thermocouple terminations.
- Checking of glands installed on the heater.
Functional Test – Heater Control Panel

- Review of heater control panel FAT which was carried out at panel vendor’s works.
- Hardware and loop checking.
- Control circuit checking in Local / Remote by Injecting the control supply externally.
- Temperature limits and PID limits setting for element and flange.
- Testing of panel with lamp for SCR healthiness – 3 star connected bulb load used for checking of SCR healthiness by injecting 4-20 mA source to the firing circuit.

Functional Test – Interface between Heater / PLC Panel

- Checking of inputs and outputs between heater panel and PLC.
- Provision of heater set point and process temperature from PLC and heater operation in auto mode.

Functional Test – Actuated Valves

On-off valves
- Valve operation by 24 V (DO) signal from PLC and checking of open/ close positions and limit switch feedback signals.
- Operation of valves in PLC auto mode as per sequence of operation.

Control valves
- Manual operation by 4-20 mA (AO) signal from PLC and checking of proportionate opening.
- Checking of feedback in PLC.
- Setting of gain values in PID loop.
- Operation of valves through PID loop and in sequence.