



**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 begins 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.

FAT PROCEDURE

MANUFACTURERS NAME & ADDRESS		Consultant		Revision No		REMARKS					
gpe Gas Processing Equipment T-181/1/B, MIDC, Bhosari, Pune - 411026, Maharashtra, India		End User	PMC	Date	7		9				
		Project	TPIA	Customer PO No	A						
		Package	FAT PROCEDURE	GPEL Project No	1 2 3 4						
		Customer	Doc. No	Inspection Class	1 2 3 4						
		Contractor	Doc. No	Inspection Class	1 2 3 4						
INSPECTION ACTIVITY		CHARACTERISTICS		ACCEPTABLE STANDARD		FORMAT OF RECORD		INSPECTION BY			
Sr. No.	2	3	4	5	6	7	8	9			
1 FAT PROCEDURE											
1.1	Approval of Factory Acceptance Test (FAT) PROCEDURE	Verification of inspection stages, hold points, locations and agencies	100%	-	-	FAT Report	X	P	R	A	NIL
2 FINAL INSPECTION											
2.1	Dimensional & visual inspection	Final dimensions of skid Final dimensions of tie-in points Visual inspection of complete skid assembly	100%	Approved P&ID Approved GAD	Approved P&ID Approved GAD	FAT Report	X	P	W	RW	NIL
2.2	NDE completeness check	DPT, RT completion check Visual inspection of welds in painted condition	100%	ASME BPVC Sec V, VIII Div. 1, Piping Isometrics	ASME BPVC Sec V, VIII Div. 1, Piping Isometrics	FAT Report	X	P	W	RW	NIL
2.3	Compliance with P&ID	Completeness check with P&ID Tag number checking of equipment, valves, instruments, JBS Checking of valve flow directions	100%	Approved P&ID	Approved P&ID	FAT Report	X	P	W	RW	NIL
2.4	Inspection of skid assembly painting	Visual inspection of painting finish / workmanship Review of painting reports	100%	Approved Painting Standard	Approved Painting Standard	FAT Report	X	P	W	RW	NIL
3 LEAKAGE TEST											
3.1	Leakage testing of piping assembly	Leakage check of piping assembly by soap solution pneumatic testing at operating pressure	100%	-	-	FAT Report	X	P	W	R	NIL
4 FUNCTIONAL TEST											
4.1	Test of PLC panel after temporary wiring with field instruments / valves	Continuity check from PLC to field PLC logic check Purge check of panel Ferruling Check	100%	Approved GAD and wiring diagram for PLC Panel	Approved GAD and wiring diagram for PLC Panel	FAT Report		P	W	RW	NIL
4.2	Test of heater after installation in heater vessel	Resistance test IR test Visual inspection of terminal assembly	100%	Approved heater datasheet and drawing	Approved heater datasheet and drawing	FAT Report		P	W	RW	NIL
4.3	Test of heater control panel	Functional test Interfacing test with PLC	100%	Approved GAD and wiring diagram for heater panel	Approved GAD and wiring diagram for heater panel	FAT Report		P	W	RW	With incandescent lamp
4.4	Actuated valve operation test	Functional test	100%	-	-	FAT Report	X	P	W	RW	NIL
5 FINAL DOCUMENTATION CHECK											
5.1	Final documentation check	Verification, compilation of inspection and test records for submission to customer as part of <u>Material Data Record</u> . Stamping of "As-Built" on P&ID and GA drawing	100%	Approved Index for Material Data Record	Approved Index for Material Data Record	Material Data Record	X	P	W	R	NIL
6 ISSUANCE OF IRN / DISPATCH CLEARANCE											
6.1	Dispatch clearance and issuance of IRN	a) Blanking of all open nozzle flanges b) Wrapping with plastic sheets, bubble sheets, thermocol layers, vacuum wrapping with silver foil c) Sea worthy packing in wooden crates	100%	-	-	FAT Report	X	P	W	A	NIL
Prepared by		Approved by									
FOR REFERENCE ONLY											
LEGEND		Gas Processing Equipment Pvt. Ltd.									
1 - Sub-vendor / testing agency / Lab		2 - GPEL (OEM)		3 - Third Party Inspection Agency		4 - Consultant / Customer		A - Approval Required		H - Full Witness / Hold	
P - Perform		W - Witness		RW - Random Witness		- No Role		R - Review			

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.