

DEPLOYABLE, READY-TO-OPERATE PACKAGED PLANT MBR System Supply Factory Acceptance Test

Factory Acceptance Tests (FATs) are a key milestone in any new capital equipment project. With proper focus, detail, and team participation, a successful FAT can be the difference between a successful vertical start-up and frustration as the plant struggles for weeks or even months.

The focus of the test should be on the personnel who will ultimately be responsible for running the system, those who “own the operations.” The people who will run the equipment daily are uniquely qualified to make observations beyond the specifications and recognize issues or flaws prior to delivery. Additionally, the ownership aspect is invaluable, as the best technology going into a plant is not going to work if the operators are not comfortable with it, or have no faith in it. The FAT provides a structured and empowering opportunity.

A successful FAT is in both parties’ interest. Not all (or many) suppliers have factories set up to perform a well-rounded full system FAT for customers. Some will build mock up systems, as duplicating a customer’s process can be very difficult and expensive. Savvy customers will demand FATs and training on their purchased system in a supplier’s facility before the system ships. The FAT is an ideal forum in which managers, operators, plant engineers, and maintenance personnel can touch and feel the equipment in an operational mode. By making it an inclusive “team” oriented trip, the customer is able to interface with the same individuals who show up at the plant during start-up.

Due diligence spent in assuring that the FAT checklist is complete will result in significant reductions in time and money once the system arrives for installation and start-up. A collaborative effort by the buyer and seller builds trust in the relationship. With a thorough full system FAT, the equipment arrives on site with a confidence that will carry through the transfer of ownership. The result is a dramatic reduction in start-up costs related to contractors and operator training, with an immediate gain in optimization and efficiency’s when the plant is brought online.

The following is suggested specification language to capture this topic:

Note to design Engineer: Verify values and statements bounded by square brackets, [], and remove highlighted alternates and instructions.

SECTION [XX XX XX] SPECIFICATION - FACTORY ACCEPTANCE TEST

1.01 MBR SYSTEM SUPPLY QUALITY ASSURANCE

A. Definitions

1. FAT: Factory Acceptance Test (FAT) is a full system readiness test conducted at the MBR System Suppliers facility prior to shipment. This may include checks for mechanical inspection, hydraulic system operation, training for end users and maintenance procedures.

2. MBR System Supplier / Supplier: The Company responsible for providing all equipment and services as described herein and for providing warranty support.
 3. MBR System: A fully inclusive MBR System of equipment, tankage, and controls, pre-engineered to be ready-to-operate upon delivery.
 4. Pre-training: Is a training session conducted at the MBR System Supplier's facility after the FAT is completed and prior to shipment of the system to the site.
- B. Prior to shipment, the MBR System Supplier shall coordinate and conduct a system factory acceptance test (FAT) of the MBR Complete MBR System which will include:
1. The PLC control logic and HMI operability shall be demonstrated by systematically forcing I/O to verify all controls functions and HMI screen representations defined in the system control narrative
 2. The MBR control panel shall be inspected for completeness, and workmanship.
 3. The system shall be completely connected including ancillary equipment, all interconnecting piping, interconnecting electrical and interconnecting communications. Wet test of the system with a complete hydraulic run through demonstrating the functionality of all pumping and blower subsystems shall be performed.
 4. The MBR System Supplier shall furnish all materials, instruments, and incidental and expendable equipment required for Acceptance Testing of the Goods, except where otherwise specified.
 5. The Owner or an authorized representative of the Owner may be present to witness the Acceptance Testing.
 6. The MBR System Supplier shall keep detailed notes regarding the FT and record all test data and results. Upon successful completion of the Acceptance Testing, the Supplier shall submit a written report on the FAT.
- C. Prior to shipment, the MBR System Supplier shall coordinate a two (2) day pre-training session of the MBR System after completion of the FAT which will include:
1. A combination of classroom and hands-on training. All training shall be conducted at the supplier's location.
 2. The required materials, texts, and supplies.
 3. Video recording by the MBR System Supplier which will be edited for inclusion into the digital.
 4. Equipment Operation
 - a. Describe equipment operating (process) function.
 - b. Describe equipment's fundamental operating principles

- c. Identify equipment's mechanical, electrical, and electronic components and features
 - d. Identify all support equipment associated with the operation of subject equipment.
 - e. Recommend standard operating procedures to address start-up, routine monitoring, and shut-down of the equipment.
5. Detailed Component Description:
- a. Identify and describe in detail each component's function.
 - b. Group related components into subsystems, where applicable. Describe subsystem functions and their interaction with other subsystems
 - c. Identify and describe in detail equipment safeties and control interlocks
6. Equipment Preventive Maintenance (PM):
- a. Describe PM inspection procedures required to:
 - i Perform an inspection of the equipment in operation.
 - ii Spot potential trouble symptoms and anticipate breakdowns.
 - iii Forecast maintenance requirements (predictive maintenance).
 - b. Define the recommended PM intervals for each component.
 - c. Provide lubricant and replacement part recommendations and limitations
 - d. Describe appropriate cleaning practices and recommend intervals
 - e. Identify and describe the use of special tools required for maintenance of the equipment.
 - f. Describe component removal/installation and disassembly/assembly procedures.
 - g. Perform "hands-on" demonstrations of preventive maintenance procedures.
 - h. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
 - i. Define recommended torque, mounting, calibration, and/or alignment procedures and settings, as appropriate.
 - j. Describe recommended procedures to check/test equipment following a corrective repair.
7. Equipment trouble shooting;

- a. Define recommended systematic troubleshooting procedures.
 - b. Provide component specific troubleshooting checklists.
 - c. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.
8. Control System. Training is to include:
1. Navigation of all HMI screens and menus.
 2. Review of automatic operations and controls.
 3. Changing process set points
 4. Overriding controls from the HMI
 5. Manual operation of the system in the event of a power failure
 6. Trouble shooting.

END OF SECTION

The following is suggested specification language to capture and evaluate the MBR System Supply Quality Assurance & Experience:

Note to design Engineer: Verify values and statements bounded by square brackets, [], and remove highlighted alternates and instructions.

SECTION [XX XX XX] PROCUREMENT BID EVALUATION – FACTORY ACCEPTANCE TEST

1.01 BID EVALUATION

- A. The MBR System Supplier shall provide all of the information required by the Bid Documents. This information, along with other design and equipment information contained in the Bid Documents or available to the Owner through information included in the Bid will be used by the Owner to determine the apparent successful Bidder. The Owner may verify information and references provided in the Bid as part of the Bid evaluation.
- B. In accordance with applicable law, the Owner reserves the right to reject any or all Bids and to waive any informality in any Bid. By submitting a Bid, each Bidder agrees that the Owner, in determining eligibility for the award, may consider the Bidders conduct and performance under other contracts, financial condition, and other factors, including claims against the Bidder, which could affect the Bidders ability to provide the Goods and Special Services. The Owner may conduct such investigations as the Owner deems necessary to assist in the evaluation of any Bidder and to establish the responsibility, qualifications and financial ability of the Bidder to provide the Goods and Package Plant MBR Specification, Membrane System Supply Factory Acceptance Test

Special Services in accordance with the Contract Documents to the Owner's satisfaction within the prescribed time. The Owner shall be the sole judge of responsiveness as well as who is considered a Responsible Bidder and reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to the sole satisfaction of the Owner.

1.02 FACTORY ACCEPTANCE TEST AND PRE-TRAINING QUALIFICATION CRITERIA

- A. MBR System Suppliers shall be experienced in providing the Goods and Special Services as described herein. MBR System Suppliers shall possess sufficient equipment, capital and manpower to provide the Goods and Special Services within the time allowed. A Bid may be rejected if MBR System Suppliers cannot show that they have the necessary ability, plant, and equipment to provide the Goods and Special Services at the time prescribed and thereafter to prosecute and complete the supply of Goods and Services within the time specified.

- B. Membrane System Suppliers submitted for consideration shall meet qualification criteria as described below. A "yes" answer shall be provided to all questions below to satisfy the qualification criteria for participation in Membrane Bioreactor Equipment Procurement.
 - 1. The Membrane System Supplier shall coordinate a complete system Factory Acceptance Test at the Suppliers facility. The system shall be completely connected including ancillary equipment, all interconnecting piping, interconnecting electrical and interconnecting communications. Wet test of the system with a complete hydraulic run through demonstrating the functionality of all pumping and blower subsystems shall be performed per the bid specifications.

The Bidder hereby certifies that the above can be performed.

Yes _____

No _____

- 2. The Membrane System Supplier shall coordinate a complete two (2) day hands on training at the Suppliers facility. The system shall be completely connected including ancillary equipment, all interconnecting piping, interconnecting electrical and interconnecting communications. Wet test of the system with a complete hydraulic run through demonstrating the operations and maintenance of all subsystems shall be performed per the bid specifications.

The Bidder hereby certifies that the above can be performed.

Yes _____

No _____

- 3. The MBR System Supplier shall have and submit documentation on the Factory Acceptance Test plan and Pre-training syllabus.

The Bidder hereby certifies that the above is true.

Yes _____

No _____

Submit Factory Acceptance Test Plan and Pre-Training Syllabus

END OF SECTION