

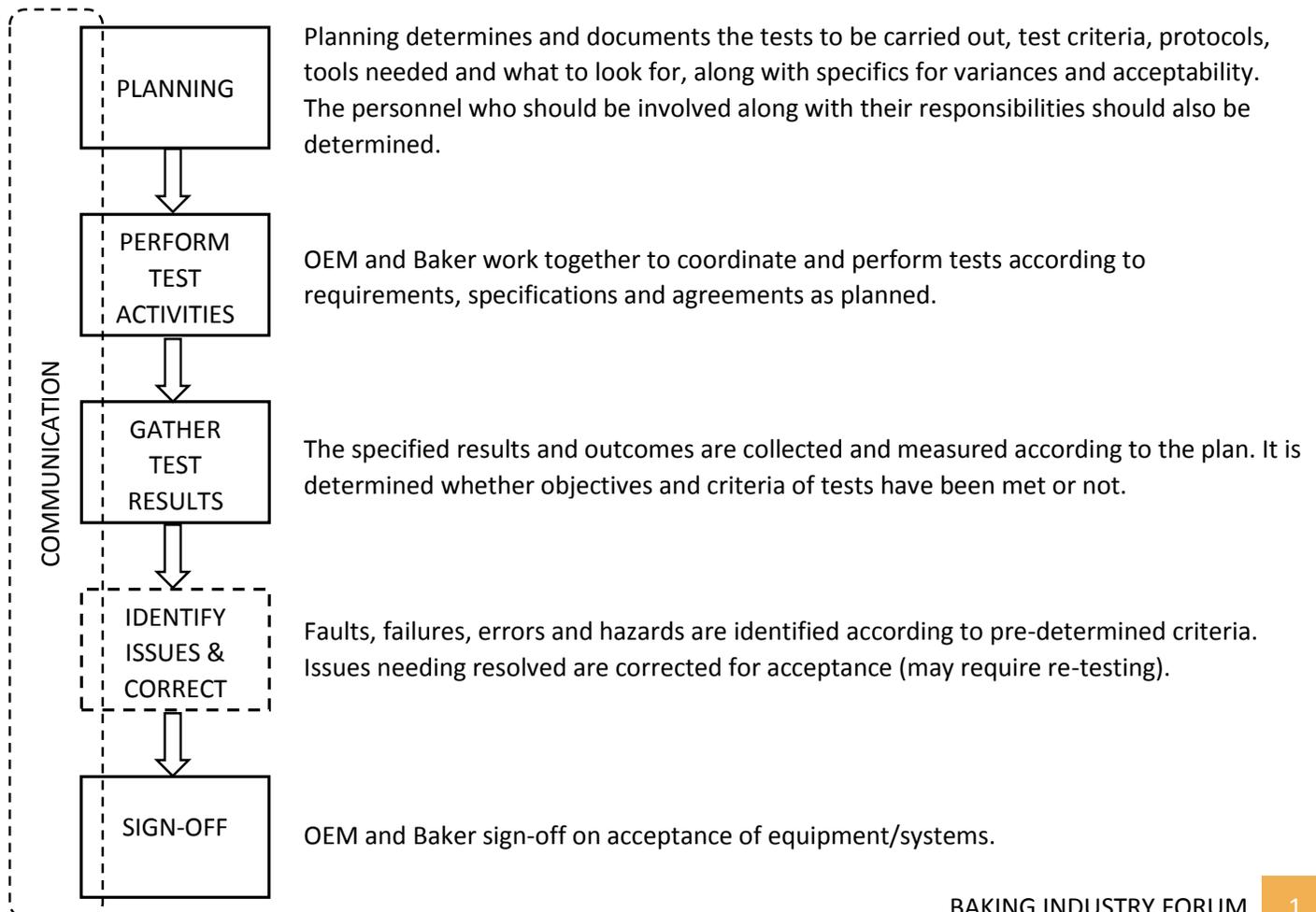
INTRODUCTION

FAT refers to a Factory Acceptance Test. This is a way to ensure that equipment/systems being purchased meet the agreed upon design specifications. Ideally this happens before arriving at the customer’s plant, however, for complex systems with high integration, tests may need to be performed at the customer’s location. Factory Acceptance Tests allow any issues to be corrected either at the vendor’s location or before production – leveraging the technical expertise and resources of the vendor, preventing any potential cross-contamination with the customer’s plant and improving the general quality of the product delivered to the customer.

While there are some general guidelines for FATs, each FAT is a customized procedure. The complexity of the Factory Acceptance Test performed is generally determined by factors such as the degree of customization, familiarity with equipment, familiarity with the vendor and degree of integration. When consideration of these factors has been made the Baker (customer) and supplier may involve several people in the Factory Acceptance Test. From the Baker (customer) this might include plant support such as engineering, maintenance, quality assurance, technicians and/or corporate engineering. The supplier may include designers, manufacturing representatives and sales as participants.

To ensure a successful Factory Acceptance Test it is important to communicate effectively throughout the process, setting clear expectations and clarifying roles long before the FAT is to be performed.

The high-level process for a Factory Acceptance Test involves Planning, Performing Test Activities, Gathering Test Results, Identifying and Correcting Issues (if necessary) and Sign-off.



LEVEL 1 - FAT

Overview

A Level 1 - FAT is the most basic level of equipment/system testing conducted at the OEM. This is often the level of acceptance test for equipment that is similar to other equipment in the plant or for equipment that has simple to moderate upgrades and/or modifications. Generally a Level 1 - FAT will review equipment/system dimensions, fit/finish and quality of fabrication, dry cycle of motors and electro/mechanical devices.

Considerations for Level 1 - FAT

- Purchase of new equipment/system
 - If purchasing from a new vendor
 - If the machine/system has simple to moderate custom designs/features
 - For development of plant/corporate personnel or if there is an opportunity for plant/team to become familiar with equipment/system
 - *Example: New team members involved in the project or equipment specified by one group to be used by another (i.e. corporate specified equipment to be used in a particular plant)*
 - Introduction of simple to moderate new technologies to the plant

**Note: If the equipment purchased is off-the-shelf and/or the same as other equipment from the vendor, the Level 1 - FAT may be waived*

Level 1 - FAT Details

- Contract Written and Timelines Developed
- Baker (customer) provides Checklist and Acceptance Sign-Off documentation to Supplier
- Checklist Considerations:
 - Equipment/System Dimensions
 - Fit/Finish and Quality of Fabrication
 - Dry Cycle of Motors and Electro/Mechanical Devices
 - Safety
 - Correct Guarding
 - E-Stop Functionality
 - Safety Switch Functionality
 - Rough/Sharp Edges & Surfaces
 - Electrical Panel I/O
 - High-level overview/summary of PLC Program
- Approximately 1-2 weeks before shipment, Customer Representatives (1-3 depending on size/scope of purchase) meet at Supplier to review the equipment per the Checklist
 - *The supplier may have their own approval checklist for internal measures*
- If necessary, any items identified as unsatisfactory or requesting change are discussed for resolution. A timeline for the corrective actions is agreed upon
 - *If there are changes requested that were outside the scope of the original purchase agreement, cost and timing will be impacted*
- If required, changes are made
- Equipment is crated and shipped to Baker

Cost, Time, Quality Implications

- Cost
 - Level 1 - FATs are typically a no-cost line item on the original purchase agreement
 - Baker covers their own costs to send any representatives to the supplier
- Time
 - Per the project timeline, the Level 1 - FAT is typically scheduled to be conducted approximately 1-2 weeks prior to the promised ship date
 - A Level 1 - FAT should be able to be completed in 1 working day (depending on size of equipment/system)
- Benefits
 - Piece-of-mind knowing that the equipment being purchased meets all requirements before arriving on your dock
 - Baker/Vendor does not have to work on equipment at the job site (Cost/Timing/Expertise implications)
 - Reduction of installation/start-up time

LEVEL 2 - FAT

Overview

The Level 2 – FAT involves significantly more planning, time and effort than the Level 1 – FAT. Often a Level 2 – FAT is a means for not only acceptance testing the equipment/systems, but for research and development and training of Baker personnel. Due to the complexity of Level 2 – FATs, documenting clear expectations and thorough planning are essential for its success. Additionally, the dynamic and complex nature of a Level 2 – FAT means the involvement and coordination of more people, so ensuring the right people participate is critical.

Considerations for Level 2 - FAT

- Custom Equipment
 - Level 2 – FAT advisable for custom equipment designed for unique applications that are either proprietary or one-of-a-kind systems
 - Equipment/systems that have never been implemented before
 - *If the customer design is iterative of previous designs, testing may be advisable but is determined by Baker and supplier*
- New Models
 - Level 2 - FAT advisable for new models or designs being released by the OEM
 - *R&D may be a joint effort by both parties, Baker looking for new technology and supplier undertaking development in anticipation of future business. A Level 2 – FAT in this situation is often a fact finding and R&D test conducted by OEM with input, direction, or advice from the Baker*
- Existing Models with Significant Modifications or Upgrades
 - Significant modifications or upgrades to standard equipment make it advisable to conduct a Level 2 FAT for sign-off of modifications/upgrades. Simulation testing may prove out proper functionality of requested upgrades and further justify the Level 2 FAT
- New Bakery Products
 - New Bakery products offer unknown's to both parties because lab testing, while generating a viable product, may have complications for the OEM equipment selected. A Level 2 FAT can provide information for both the Baker and OEM in order to make alterations in product formulation and/or the OEM equipment to achieve the best production results at full capacity. Testing may include variables to help the Baker identify possibilities in product variations that may occur with the equipment

- Customer's Products are New for OEM's Equipment or Expectations are Unclear
 - In situations where a piece of OEM equipment is highly effective at a particular task, but the Bakery product poses a new challenge that can potentially be solved by the OEM; the unclear expectations of both parties may warrant a Level 2 – FAT for simulation to determine required modifications/upgrades and/or to confirm success.
- New Technology for Plant Personnel
 - If the equipment/system is a new process for the plant and the OEM is experienced with it, a Level 2 - FAT enables the Baker to learn the equipment prior to installation at their plant. This enables plant representatives from production, sanitation and engineering to receive training prior to installation as well. It also allows them to identify impacts to existing processes, reducing time and frustration at start-up
- Extreme Change in Production Procedures
 - If the new equipment will cause an extreme change in existing procedures or processes for particular line or product a Level 2 – FAT may be beneficial. This allows for implementation of any required changes prior to delivery and installation

Level 2 - FAT Details

- Temporary Mechanical and Electrical Installation within the OEM Facility
 - With temporary provisions all safety precautions are met as much as possible
- Verification of Equipment Systems, Dimensions, and Specifications
 - Prior to simulation testing a complete Level 1 – FAT review must take place in order to ensure all machine components are ready for operation. Internal OEM quality control standards should be completed prior to temporary installation. The Level 1 - FAT is an additional walk-thru with Bakery personnel to ensure all specifications and quality of fabrication standards are met
 - Under no circumstances shall electrical panels be energized without proper testing, burn in, and I/O checks being performed. With temporary electrical connections extreme caution should be utilized
- When possible the Baker sends necessary pans and ingredients necessary to simulate testing to OEM facility 1-2 weeks in advance. If refrigeration or baking units are required to simulate testing, provisions should be made in advance
- Testing should be performed and analyzed per specifications, with allowances for OEM facilities and temporary installation that may not meet the same conditions of the final installation location. Some Bakery environments or production conditions cannot effectively be recreated within an OEM facility, all quality or performance measures should have the allowance and flexibility to accommodate for this difference
- OEM trains Bakery personnel on machine functions and options prior to simulation testing
- Baker collects performance variables per their needs
- OEM supports the Baker as needed during the simulation test, ensuring proper safety and operation standards are used in a temporary state of installation. OEM also ensures there is firm understanding of machine operation to prevent unnecessary damage of any kind prior to shipment
- Obtain approvals and signatures for required changes and to permit shipment

Cost, Time, Quality Implications

- Cost
 - Level 2 - FATs typically entail additional cost to conduct and should be negotiated into the original contract and/or change order. Costs are due to the temporary installation of equipment/systems that might not otherwise need to be pretested, which requires labor and/or special provisions. Additionally, plant supplied pans, materials or ingredients add to cost. Depending on the situation either or both parties together may cover the cost – determined by who benefits from testing and is allocated proportionately.

- Time
 - Per the project timeline, a Level 2 - FAT is typically conducted 2-4 weeks prior to the ship date – given the complexity of the system more time may be required. This allows time for the temporary installation and internal testing and preparation for the OEM. It also allows time for alterations prior to shipment and dismantling and crating of the temporary installed items after the Level 2 - FAT
 - A Level 2 - FAT is typically completed in 2-3 working days (depending on size of equipment/system) and the level of testing or product combinations
- Benefits
 - Peace-of-mind that the equipment being purchased meets all requirements and that any required changes have been completed before arriving on your dock.
 - Baker/Vendor does not have to work on equipment at the job site (Cost/Time/Expertise implications)
 - Reduction of installation/Start-up time and reduction of unforeseen issues from either side

LEVEL 3 - FAT

Overview

The third level of the factory acceptance test is the most critical and complex which generally involves production of the Baker's goods. The purpose of the Level 3 - FAT is for the Baker and OEM to confirm that the goals have been reached and the line can be "handed over" to the customer. Prior to this occurring, the equipment must be prepared physically, mechanically and electrically.

Level 3 - FATs can be conducted at the equipment manufacturer's facility or at the final site. This is dictated by the size of the project, ability to assemble equipment/system at OEM facility, time restrictions, and cost. Often this occurs at the customer location, especially if the scope is an entire line. Unit machines and simple Level 1 FATs may be performed at the OEM factory.

Considerations for Level 3 - FAT

All Level 2 – FAT considerations apply to Level 3 – FATs as well – the defining characteristic of Level 3 – FATs is commissioning.

If the acceptance is to be conducted at the Baker's location, Physical placement, mechanical installation and electrical installation must occur prior to the acceptance of the equipment. The physical and mechanical installation often occur using local contractors directed by an installation supervisor from the OEM in conjunction with the Baker's project manager. The electrical installation is generally completed by local contractors using electrical installation drawings provided by the OEM and approved by the Baker's project manager or plant engineering staff.

Due to the complexity and components involved in a Level 3 – FAT, communication is critical. Here are some considerations for communication.

- Goals are clearly set by the Baker and OEM at the start of the project
- The OEM clearly set the Bakers' expectations as to what is being supplied and when according to Baker's goals
- All goals and expectations are documented in writing with specifications, drawings and photos
- If possible, a visit to a current installation using the same equipment is conducted
- Regular meetings, generally via phone, are conducted to update on progress
- The OEM should visit the installation site to see where the equipment will be installed
- A general fit, finish, and design acceptance is completed

FAT – Level 3 Details

**This process begins after equipment, mechanical and electrical installations are completed to the Baker’s specifications*

- I/O Checkout (can be thought of as individual motor checkout)
 - Each motor is started and stopped from the operator interface individually
 - Rotation and current draw are confirmed
 - All safety and process lock outs and run enable signals are also confirmed
 - Noise level and any vibration are addressed

- Engineering Test Runs
 - Once the operation of each motor in the system is confirmed, operation is confirmed for the entire system in both maintenance and automated modes.
 - Line speeds, belt speeds, and system interlocks are confirmed
 - Safety circuits are all confirmed to be functional
 - Interlocks and permissive circuits with up and downstream equipment are confirmed
 - Raw materials are brought to the line to confirm the basic system operation.

**Quality of products is not considered at this time, only the ability to move product through the equipment is confirmed at this time*

- Commissioning
 - It is at this point that product can actually be produced on the line. Any attempt to short circuit the process will result in a frustrating commissioning process. During this process product is produced to meet the standards sets early in the project
 - A critical point to understand is that a standard or target needs to exist to confirm successful acceptance testing. There needs to be a target product and rate. “Make the best product possible” is not a standard the equipment manufacturer can be held to. “Match this product which you became familiar with at the start of the project” is the best standard
 - It is important for the equipment manufacturer to understand that not only will he be judged on the quality of the equipment and the quality of the finished product, he will be judged on the amount of time required to complete the onsite FAT process

Cost, Time, Quality Implications

- Cost (*Highest cost for a FAT, which can be as much as 10% to 25% of the equipment cost.*) is determined by
 - Time at vendor’s factory or customer’s location
 - Amount of Equipment
 - Complexity of Equipment
 - Number of Products Commissioned

- Time
 - This depends on the complexity of the equipment, but two weeks to complete is typical
 - Depending on the number of SKU’s, the commissioning process alone can last between two days and three weeks

- Benefits
 - Time from equipment delivery to production can be greatly reduced because the equipment manufacturer is very involved = Reduction of installation/Start-up time



CONCLUSION

The value of a factory acceptance test can be found in each of the cost, time and benefit areas. If issues are identified early on and the Baker can rely on OEM expertise, it will save money and time over the project life cycle. Additionally, the training and learning opportunities before operation provide significant preparation prior to operation in the plant.

It is important to have an in-depth conversation about what the Baker and OEM needs are, the possibility and practicality of different levels of FAT and to take into consideration the factors discussed here – primarily degree of customization, familiarity with equipment, familiarity with the vendor and degree of integration. Once that conversation has taken place, it's important to invest in proper planning and communication to ensure successful completion of the FAT and to reach the desired outcomes.

If you are trying to figure out where to start, begin with the FAT Infographic, which can serve as a guide for your discussion. Although not intended to determine the correct level of FAT for you or the details of your FAT, this infographic will help you think through your needs and the implications.