

## Features

- Comprehensive management plan
- Efficient, proven methods for planning and scheduling project activities
- Based on successful management of many types of projects
- Extensive collaboration with customers to ensure project requirements are met
- Assembly of the right project team from dedicated project groups with extensive industry experience
- Utilization of ISO-certified procedures for all aspects of project implementation



## Project Management Plan - Overview

Emerson Process Management (Emerson) has the experience base and the resources necessary to effectively manage any project. Our project management approach focuses on working closely with our customers to create detailed system design and implementation plans to meet your schedule and budget.

We conduct comprehensive factory acceptance testing programs designed to resolve problems before they get to the field. Projects are overseen from start to finish by engineers experienced in the needs and nuances of your industry. That experience includes familiarity not just with our products, but with providing seamless interfaces to virtually any device or sub-system within your operations. Dedicated and certified installation and commissioning teams are fully integrated with our design processes to maximize efficiency in the field and assure timely project completion.

Our approach to project management includes clearly defined lines of responsibility and authority. Integrated technical and schedule objectives are assigned to the appropriate levels of the organization. Project management tasks are fully integrated with other tasks to achieve these objectives.

Our project management methodology utilizes ISO 9001 approved procedures in every phase of the project cycle, including:

- Pre-Contract Preparation
- Planning
- Design
- Implementation and Test
- Simulator Development
- Engineer/Procure/Construct Activities

The following sections describe each portion of our project management and implementation philosophy in more detail. While all tasks of the project are not discussed, the major tasks are addressed.

## Pre-Contract

The pre-contract project phase includes the following tasks:

- Select project team
- Define project scope
- Identify key project goals

The Emerson project team is a collaborative group utilizing core competency areas of the Emerson project organization. Experienced personnel are selected for each team based on skills that match the project requirements.

Each team member has a single source of responsibility for the applicable design, implementation, and testing of the system.

Each project is assigned to a manager within the Emerson Project group based on the project type. A project group manager leads the team by allocating required resources for successful project results.

Each group manager assigns a specific Project Manager, who in turn is also the Lead Project Engineer. The Project Manager's responsibilities include:

- Coordinate performance and delivery of all items between team members
- Monitor the overall project schedule.
- Act as the primary interface with your Project Manager.

The remainder of the project team is selected based on the specific project requirements.

## Planning

The planning phase of the project includes the following tasks:

- Schedule development
- Project kickoff meeting
- Formal status reports

Emerson project planning is based on an integrated project schedule that uses the critical path method for tracking project progress. The schedule tracks many discrete activities over various phases of the project and provides comprehensive feedback necessary to make informed project decisions.

The project schedule defines milestones and control dates for monitoring the project status. Task related schedules and sub-schedules are developed based on each milestone to establish explicit start times, finish times, and work definition for all activities.

A kickoff meeting is held at the start of each project, attended by representatives from both your organization and Emerson. The purpose of the kickoff meeting is to introduce the project team members, review the hardware and software requirements, establish proper communication channels, review and refine the

preliminary project schedule, and resolve any outstanding issues.

Emerson monthly progress reports keep you informed of the project status. The Project Manager assembles the report by integrating all Emerson and vendor information into a coordinated reporting system. This process consolidates all project data and reduces the number of necessary reports. At a minimum, the reports address work completed in the past month, work in progress in the present month, outstanding issues, and progress on identified action items.

## Design

The project design phase includes the following tasks:

- I/O database development
- Field device specifications
- Control system engineering
- Design reviews
- Customer collaboration

### I/O Database Development

Initially, you or your representative generates and finalizes the input/output database for all plant systems. This information should include tag name, description, transmitter type and range, alarm setpoints, and cabinets to be terminated. The final I/O database is partitioned, with each point placed on a specific channel of an I/O module within a Controller.

### Control System Design

Your or your assigned engineer provides a design for development of the control system functional logic, including control and graphic designs, as well as report definition. Detailed control loop and sequential logics are developed in SAMA and/or Boolean type functional form based on the existing logic drawings or written description of operation. Once the existing logic is documented in functional form, Emerson meets with you to jointly review the logic during the Logic Design Review Meeting.

### Graphic Design

Emerson generates process graphic displays based on design input from your or your Engineer. This input can take the format of printouts of existing graphics, CAD generated

graphics, or hand drawn sketches. Prior to graphic implementation, a graphics design specification is generated by Emerson detailing items such as color schemes, process point displays, control window definition, alarm messages, process device representation, process flow paths, and trend displays. The graphics design specification is submitted to you for review and comment. Emerson then meets with you to jointly review and approve the graphics during the Graphics Design Review meeting.

A sample of the available standard report and log templates is provided. Emerson implements the reports and logs based on the templates determined by you.

## Implementation and Test

The project implementation and test phase includes the following tasks:

- Procurement
- Manufacturing
- Configuration
- Factory acceptance test
- Shipment

Emerson implementation of each application portion begins upon your approval of the functional design documentation including:

- Project database
- Control functionals
- Process graphics
- System reports and logs

Approval and implementation of control, graphics, reports, and logs occur at separate times based on the project schedule.

Upon completion of the project design phase, all non-control system material required for your project is procured by the supply management organization within Emerson. This process is started only after you have approved the vendor equipment or service to be used. The Emerson project team then works with supply management to issue vendor purchase orders and administer procurement activities. Non-control system material may include custom consoles, field devices, and 3<sup>rd</sup> party software, as defined by the contract.

The system manufacturing process consists of the advanced order system (AOS), hardware release, manufacturing, and testing. Emerson's manufacturing department is alerted by the project team with an advance order of equipment upon return from the project kickoff meeting. The AOS allows the manufacturing department to plan resources required to manufacture the system. The AOS doesn't release the procurement of standard control system material; however, if non-standard control system material is required, the material may be released for procurement depending on lead times and project schedule.

Upon completion of the detailed hardware-engineering phase of the project, the Emerson project team releases all hardware to the manufacturing department. At this time, all material is procured and manpower is allocated to assemble the equipment.

At the end of the manufacturing phase, fully assembled Ovation hardware is delivered to the test floor in the form of complete functional drops. Test floor technicians load all standard software, perform diagnostic tests to verify the operation of each drop, and integrate the various drops into the system. Upon completion of the hardware test, the system's I/O database is loaded into all drops and a complete I/O verification is performed. The I/O test stimulates each point with a signal (i.e. 4-20mA, T/C, RTD, etc.) at the terminal blocks. The test technician records the readings observed on the HMIs. The inputs are stimulated at low, mid, and top scales. Once the I/O test is completed, the system is turned over to the Emerson project team for testing of the control and graphics software.

All control logic, graphics, and reports are implemented into the system software platform while the hardware is being manufactured. Upon completion of the implementation, the software is loaded on the system hardware and software functional testing commences.

Prior to factory testing, the Emerson project team performs a software functional test to verify that all design requirements have been met. The functional test utilizes a tieback simulation program to verify proper operation of the control software.

The tieback simulation program demonstrates that all devices can be controlled from the graphic displays and verifies the analog loops are responding appropriately. The tieback simulator is not a mathematical model of the plant.

Upon completion of the software functional test, a Factory Acceptance Test (FAT) is held with your selected representatives. The control logic, graphics, and reports are demonstrated to verify adherence to the design requirements. A punch list is maintained to identify and track problems encountered during the FAT, with every effort made to resolve punch list items prior FAT completion. The FAT concludes with a meeting to formalize an agreement to ship the system and to identify a plan of action to resolve any open items on the punch list.

Prior to shipment, Emerson's Product Assurance department inspects the system to ensure all hardware manufactured is within specifications and all hardware is complete based on the hardware drawings used for manufacturing.

## Service Support

Field service support by the Emerson Service Group is provided per the contract. Emerson's Field Service Engineer has access to the Lead Project Engineer for additional support relating to specific project details. Emerson field service support can be used for the following tasks:

- Site review and walkdown
- Control System equipment energization and checkout
- I/O loop checkout
- Hardware/software verification
- System tuning
- Site acceptance test

Field service is scheduled directly by the Emerson Field Service Manager and should be planned as early as possible in advance of the service need.

## Simulator Development and Implementation

If selected as part of your scope, design of the simulator begins with collection of unit specific

operating data. During the simulator kickoff meeting, P&ID's are reviewed to make sure that every plant function to be included in the process models is identified. This information is then used to create a simulator design specification, which includes hardware layout drawings, hardware bill of material, process model descriptions, process model schematics, hard panel definition, local controls, and parameterization procedures. This specification is reviewed in detail with you during the Simulator Design Review Meeting.

After your approval of the simulator design, implementation and parameterization of the process model can begin. At the same time, an approved copy of the control system database is used to generate the simulator I/O model. The I/O model interfaces the simulator process model to the database. Each I/O point is scaled according to the points range defined in the database and then linked to the associated point in the process model. After the process and I/O models are completed, they are verified in an open loop test and then loaded into your simulator hardware in preparation for integration testing.

Simulator integration testing begins with loading the FAT approved control logic into the simulator system and verifying I/O point connections with the process model. The next step is to verify that the simulated variables move in response to operator inputs as expected by running the simulator through multiple unit startups. It is desirable to have an experienced member of the plant operations group participate in the simulator startup testing.

Upon completion of simulator integration testing, a simulator FAT is conducted with your simulator team. The simulator FAT follows the test plan provided in the simulator design specification. The tests include unit startup from cold conditions to full-load, shutdown from full-load to offline, and hardware verification. Simulator discrepancies identified during the FAT are resolved off hours during the FAT period or during the simulator software cleanup period prior to shipment.

## Engineer, Procure, and Construct (EPC) or Design Build Activities

If your contract requires installation, the following outlines typical tasks performed prior to and during installation.

### Pre-Installation Project Phase

The pre-installation project phase includes the following tasks:

- Site mobilization
- Finalize installation plan
- Conduct training
- Installation readiness review

Emerson and its selected installation subcontractor work with you to develop a project mobilization plan after contract award. This plan includes a preliminary construction schedule, plans for the placement of material, and man power requirements. Allocation for site space for field offices, use of temporary utilities and construction facilities, site access, traffic control, and parking facilities are also outlined in the plan. During construction, Emerson coordinates the use of the site facilities, as well as any ongoing operations and maintenance activities with your appropriate personnel.

A safety plan is developed to address how clearances are to be obtained, specific station requirements, proper dress, where to be and not to be and plant safety training.

During the pre-installation phase of the project, any installation activity which can be performed with the unit online is completed. Activities may include construction of cable trays and conduit, pulling of new cables, installation of control equipment, identifying and labeling all wires to be lifted, erecting scaffolding, installation of new devices, and labeling all hardware to be removed from the plant.

Prior to the installation, a readiness review meeting is conducted and attended by Emerson, your representatives, and the installation contractor. The purpose of the meeting is to finalize the outage plan, identify outstanding tasks for completion prior to the outage, and identify resources for supporting unit startup.

### Installation Project Phase

The installation phase of the project includes the following tasks:

- Demolition
- Field equipment installation
- Wiring
- Installation
- Startup
- Breaker closure

Emerson's Site Manager is responsible for monitoring the installation schedule, manpower allocation, tracking all issues, identifying recover plans if the project plan duration is jeopardized and attend regularly scheduled meetings to keep you informed of our progress.

At the start of the project, the installation contractor demolishes all equipment tagged for removal and sets the new equipment in place. Once the equipment is in place, Emerson verifies that the power and ground connections of each cabinet are adequate prior to energizing the cabinets. The field wiring is re-terminated and the installation contractor installs any field equipment. When the system becomes available, Emerson works with you to perform functional testing of the systems based on specific plant procedures. At the conclusion of startup, the generator breaker is closed, thus concluding the installation.