Back to Front – EPC Project Execution Strategy – Planning – Execution

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Technip’s EPC Project Objectives

DELIVER FIRST PRODUCT
SAFELY, EFFICIENTLY AND ON TIME!
EPC Projects – Today’s Requirements

- Today, there is increased pressure on projects to reduce cost, to shorten schedules and for EPC Contractors to construct, commission, start-up and operate (particularly the utility systems) to secure the schedule.

- Work is performed in various engineering centers; multiple vendors/sub-vendors, fabrication yards, and subcontractors at site.

- Suppliers are global, transportation is complex, tariffs and customs requirements can change and unique quarantine requirements may be imposed.

- Regulatory oversight and requirements are complex and changing.

- Managing these multiple challenges requires concise detailing, tracking, communication and transparency - mandatory for a project to be successful!
Technip’s back to front methodology has identified many critical items that at first glance do not seem critical but soon can be:

- Long lead equipment and material are usually addressed early, but what about the special tools!
- How many boilers are required to complete the steam blows?
- Which large bore piping is required first; steam, cooling water?
- What undergrounds have to be complete to move in the first modules?
- Commissioning in module yards, requirements and capabilities?
- P&ID notes, “Supplied by Others”, really??
Back to Front Best Practices Realized

- YEMGAS – Marine flare was utilized 12 months prior to first shipment of LNG
- Etileno XXI – Demineralized water quantities for steam blows were reflected in design, estimates and schedule
- QChem – Chemical cleaning solutions and hydrotest water disposal requirements were addressed, i.e., neutralization tanks and aeration ponds designed (sized)
- CPChem – Energization of utility substation, F&G requirements, required stand alone F&G panel for buildings prior to F&G panel connection to CCR
- SINCOR – Plant main piperack battery limit modules fabricated in Singapore and priority systems defined
- East Area Offshore Project – Molecular sieves loaded onshore rather than offshore, realized 8 week shorter schedule off critical path

“The Devil is in the Details” – Do the Homework!
Technip’s AWP process, developed from start-up packs, ensures always having the right materials and resources at the right place at the right time.

**START-UP AND CONSTRUCTION PROJECT REQUIREMENTS DEFINE THE WORK PACKAGES**

- **Start-up Work Package (SUP)**
  - Represents a well-defined scope that can be geographically located by Commissioning Area

- **Construction Work Package (CWP)**
  - Executable construction deliverables, includes Field Installation Work Package (FIWP) or Work Front Planning

- **Delivery Work Package (DWP)**
  - Engineering deliverables to Procurement so that right material is there to execute the CWP at the right time

- **Engineering Work Package (EWP)**
  - Engineering Deliverables (drawings, material take offs, material and equip. specs and vendor documents)

**PACKAGE DEFINITIONS HELP MANAGE WORK AND ENSURE DELIVERY**

- EWP ← DWP ← FIWP ← CWP ← SUP

- Start-up/commissioning equipment and requirements
- Utility equipment and requirements
- Process equipment requirements
- Mitigation requirements and/or temporary equipment
- Construction equipment and requirements interface
Back to Front Integrated Team
– Commissionability and Constructability

Lead by PC&CSO Personnel defining the SUPs, with close link to Construction, Module Yard Fabricators, Engineering, Procurement, Subcontractors, Vendors, and Client Personnel.

- Defines the Start-up Sequence and required predecessors and successors by PC&C Systems and Construction Area
- Develops timelines, identifying requirements for each commissioning system/subsystem at the onset of the
- Defines the Path of Construction both for the Site/Module Yards, in relation to the Start-Up Packages to facilitate the transition from one phase to another
- Defines the mitigations that may be necessary to secure the internal turnovers so as to reduce impact to Construction and PC&C activities, i.e., Instrument Air Compressor and Dryer Packages, design for SUP.
Back to Front Methodology
- Interface Definitions and Requirements

Major Areas and PC&C Systems are defined:

- Start-up requirements for each unit and system (utility and process) defined by utilizing the issued Block Flow Drawings, Process/Utility Flow Diagrams, P&IDs, Electrical Single Line Drawings, Plot Plans and Layout Drawings

- Interrelationship of each unit and system is addressed:
  - Utilities/products direct to downstream units – no tankage
  - Utilities/products to intermediate storage, products to pipelines, etc.
  - Routing of off-specification utilities/products, rerun?

- Review Plot Plans to minimize the SIMultaneous OPerationS (SIMOPS) impact on project completion from the onset of Engineering (FEED and EPC) and procurement

- Ensure that engineering registers are set-up to identify the following: WBS, PC&C Systems, Modules, Packages, for populating and mapping information to EasyPlant™ Quality Control Forms (QCFs)

**Note:** If the punch list is not categorized then time and effort is being wasted on clearing non-priority work
Back to Front – Gas Fired Generator Timeline

YEMGAS - CSU UTILITIES AND OFFSITES TIME LINE (Updated November 21, 2007)

Sequence of activities of PC&C – define temporaries, equipment, fuel, water, etc.
Back to Front Level 1 Schedule
Note:
Utilities must be tracked to ensure readiness to support the Process System commissioning and start-up
Back to Front
- Spares and Consumables Required

- The durations of the PC&C, start-up, operations activities must be determined so that consumables and spares can be quantified for each phase and ordered as required:
  - Boiler feedwater, chemicals may be required for one year or more prior to handover.

- Track PC&C, start-up and operating spares to ensure the reliability of the utilities systems for the CSO of the required Utility and Process Units.

- Identify, track and ensure the required special tools are on hand for CSO.

- Review vendors recommended commissioning and operating spares, with concise lists and established project Spare Parts Inventory Register (SPIR) forms.

- Review and approve the vendor and licensor Installation, Operations and Maintenance manuals and guidelines for CSO
SIMultaneous OPerationS (SIMOPS)
- Must Plan For Safety-

- SIMOPS Plans, requirements, mitigations are critical to the success of a project
- SIMOPS requirements are to be defined at the engineering phase, and updated and mitigated throughout the project
- Commissioning and Construction Areas need to be aligned
- Desktop reviews with construction, commissioning and operations personnel to identify the SIMOPS interfaces and requirements is critical
- SIMOPS Areas are tracked in EasyPlant™ Completion Database
- Definition of the path of construction and Start-up Packages must align, examples of SIMOPS Activities:
  - Substation energization for chilled water package operation
  - Steam blows for line cleaning, boiler operation
  - Construction tie-ins and hook-ups of units, modules, packages, etc.
Back to Front – Project Milestones (Example)
- Contract, Subcontractor and Vendor Milestones

- Milestone can be defined by each tag, system, WBS, module, subcontractor, vendor, etc.:
  - Milestone – Requirements Substation 7 Energization
  - Milestone – Requirements Instrument Air Available for Loop Checks
  - Milestone – Undergrounds Available for Module Installation
  - Milestone – Module Ready for Sailaway
  - Milestone – Main Piperack Modules on Site
  - Milestone – Utility Systems Battery Limit Modules Hook-up Complete
  - Milestone – Steam Available for Turbine Runs, Condensate, Chemicals

- Itemized tracking defines the milestone precisely

Note: Assign main piperack to one subcontractor with milestone for completion
Technip’s EasyPlant™ Platform
“IF YOU CAN’T MEASURE IT, YOU CAN’T MANAGE IT”

- Technip has developed a robust tool, EasyPlant™ to measure and compare:
  - Planned Progress vs. Physical Progress vs. Certified Progress

- EasyPlant™ tracks every tag, QCF, punch list, assigned to every subcontractor, vendor, to ensure their Scope of Work is complete as and when it is required

- The subcontractor’s, vendor’s and fabricator’s work processes (steps) are incorporated into EasyPlant™ to facilitate the “Ready to Go” Module, i.e., there are 15 test packs ready for reinstatement, the ready to paint

- EasyPlant™ tracks the work process of the various parties for a seamless transfer of information and status by system/area:
  - Status by system/area
  - Minimizing the impact to Construction, Commissioning and Operation of unknowns, as well as the requirements such as preservation, punch lists, etc.
  - Status by discipline
  - Status by module
  - Status by subcontractor

Note: If the punch list is not categorized then time and effort is being wasted on clearing non-priority work
Progress Measurement
– Planned vs. Physical vs. Certified

- Measurement of the progress achieved from the most detailed level – progress by Item (Tag) – by Discipline, per Project WBS, per PC&C System, etc.
- At all levels, comparison between physical progress vs certified progress
- The gap between the curves is continually monitored so as to avoid negative impact on the plant completion date

Planned vs. Physical vs. Certified

![Graph showing overall progress with a gap to be monitored]
Technip’s in-house tool, EasyPlant™, has been developed to facilitate the management (Tracking and Reporting) of equipment prioritization, material, procurement, prefabrication, construction, pre-commissioning, commissioning, start-up and Handover Requirements and Activities.

The EasyPlant™ Platform is composed of integrated functional and discipline modules which share the same database.

Built in line with Technip’s standards, methods and procedures.

EasyPlant™ is a unique platform that gathers integrated functionalities of the required activities.

EasyPlant™ is extensively used on Technip projects

It is deployed, supported and upgraded by a dedicated Technip Internal Organization, the Construction Method Center (CMC) and dedicated IT support

Secure Web Based Tool – Internet access Worldwide
The EasyPlant™ architecture is web-based, modularized, scalable and integrated with Technip tools

EasyPlant™ Platform - Modules Overview

- **General Configuration and Collection**: such as: set-up information to prepare all functionalities, project title, which EasyPlant™ modules will be utilized.

- **EasySubcontract**: dedicated signatory features for subcontractor, Technip and client supervisors/inspectors, utilizing digital, bar code and wet signatures as required.

- **Collection of item tags information from Engineering Registers**: from Engineering, SCs, Vendors, Licensors, etc.

- **Quality Control Forms (Certificates)** follow-up, collection and status reporting for Construction, PC&C and Start-up.

- **Execution recording and status reporting of all assigned QCFs (Quality Control Forms)**, i.e., piping hydro test, instrument loop checks and functional test, PSV calibration.

- **Quality Control Forms (Certificates)** follow-up, collection and status reporting from fabrication yards, sites, vendors, subcontractors, i.e., equipment, spares, motors, all preservation activities prior to handover.

- **Management of the entire life cycle of piping construction activities**, including fabrication and QC activity in sequence.

- **Structural database, Laydown Areas, Material Follow-Up and Tracking, Status Reports and Charts**.

- **Work Packages and Job Cards creation, validation and follow-up**. To facilitate, module hook-up, vendor punch lists, completion of carryover work, etc.

- **Selected Site Activities Readiness status** – to match the SC/Vendor Work process.

- **Punch list management, project reporting, formal Turnover certificates – digital verification**.

- **Centralization of information and reporting available in other modules for the plant handover to Client**.
The Ready-To-Go is a fully flexible module developed in EasyPlant capturing and reporting specific information available in other EasyPlant modules, relevant to:

- Work step process as related to sequence
- Punch list status and category

- Foundations - steel structure
- Structure - piping erection
- Piping installation - instruments
- RIE - Instrument loop checks
- Inst Opp checks - functional tests
- Breaker - Motor solo runs
- Loading of equipment – Equip box-up

Used by Construction and PC&C to track the readiness of a task, item, area and/or system for the next phase.
All QCFs reside in EasyPlant™ with all work steps defined

• Each step is can be signed off by either digital, bar code and/or wet signature, of course once the inspection has been complete by authorized Inspectors from each organization

• RFIs (Request for Inspection) are tracked and managed by system as per the Quality Control Plan

• Quality Control Dossier are scanned and uploaded only at the end
Material Preservation Module is designed to track, schedule and notify the required preservation activities required/when.

Preservation follow-up is realized by tag, system, area, location and handover.
EasyPlant™ Projects and Users Worldwide

EasyPlant™ was derived from input and requirements of site personnel, Lessons Learned and Best Practices

33 Projects Online

2345 Users Profiled
Thank you – Questions, Comments?

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