Refinery & Chemicals Pre-Turnaround Activities Via Interface Management

(For Small-to-Medium sized Plants)

22-Sep-17: AIChE Meeting at Pipeline Grill, Spenser Hwy, Pasadena, TX

By:

Rick Khadimally, PMP
Consultant, Houston Consulting Group, LLC
1.0 - Safety Moment
- Safety First -

Confidential - Rafiq (Rick) Khadimally, PMP
Disclaimer: Plan-Proposal by Project Management Professional
2.0 - Mission & Vision Statement
Mission Statement
We are dedicated to delivering effective, efficient, respectful, quality and conforming to health, safety & environment; the projects with integrity & accountability using both the proven and innovative methods

Vision Statement
To make World the place of choice to live, work and grow
3.0 - What is this about?
Abstract & Summary
What is this about? . . . . Abstract & Summary

• This plan proposal offers an efficient mode for tracking Pre-Turnaround activities of small-to-medium sized Refinery & Chemical plant turnarounds, maintenance projects and Unit upgrades via Web-based Interface Management system coupled with Scheduling & Supply Chain Management, in similarity to the Offshore mega-Projects.

• This plan is meant for small-to-medium sized Plants where there is no regimented mode of operation for pre-turnaround activities and plant turnarounds.

  • Ps: Excluded are all the major Refineries & Chemical Plants that have their tested & regimented systems, web-based modes-n-procedures.

• It Ensures defect-free & picture-perfect completion of all requisites for the Pre-Turnaround activities prior to plant shutdown for the “Plant Turnaround”.

• The plan ensures absolute priority for smooth & efficient execution of “Plant Turnaround” by ensuring HES (Health, Environment & Safety), controlling the $-budget over-runs & schedule delays; & within the constraints of safety & quality.
What is this about? . . . . Summary – Contd/-

• The benefits achieved on Offshore mega-projects by the Operator-Clients & EPCI Companies from the effective “Interface Management” could be applied & are the optimum solution for ensuring successful execution of “Plant Turnarounds”, Maintenance projects & unit upgrades by regimenting the “Pre-Turnaround Activities”.

• This presentation is based on extensive Refinery experience as the backbone of this plan executing the Maintenance Projects & Unit Upgrade Projects during the “Plant Turnarounds”. This is an attempt to:
  • Amalgamate the “Interface Management” experience from the Offshore Oil and Gas mega-projects & apply to “Pre-Turnaround Activities” of Refinery & Chemical plant Turnarounds, thus merging the best lessons learned (LL’s) from both the Worlds.

• At the tail-end a Q&A session for more clarity and sharing of the comments.
Examples of typical Turnaround (T/A) Work Scope, List of Maint-Projects & Unit upgrades, etc.

• **Un-named Refinery 110k BPD CDU-2 (Crude Distillation Unit #2) Turnaround:**
  • Turnaround S.O.W included maintenance of all Stationary & Rotating Equipment; Plant inspection, etc. Crude Charge Pump, Crude De-Salter, Distillation Tower & Trays, Crude Heater Steam-Air De-Coking Connections, Inspection of R/D Pipelines to & from Tankfarm, etc.
  • Re-tubing of Heaters & Refractory Repairs; Re-Tubing of De-Butanizer Heater & Refractory – Burner & Cove Blocks and Target Wall, etc.
  • Maint-projects & Unit Upgrades include: Addition of Crude Charge Pump CP-210-C Assy & associated piping, Two Fin-Fan Coolers (F-6 A/B) Assy with Inlet & Outlet isolation valves w/Flushing capability; Storage Tanks retrofitting, etc.

Courtesy: Internet Illustrations ro.stockfresh.com, 123RF.com, es.123rf.com
4.0 – Presentation Overview
Presentation Overview:

- General Introduction
- Three (3) keywords (Elements):
  - Refinery & Chem Turnarounds
  - Pre-Turnaround Activities
  - Tracking via Interface Management
- Some Pictorial Illustrations, . . .

Key Messages:

- Refineries and Chemical Plants undergo “Routine”, “Planned” and/or “Emergency” Turnarounds for safe operation, also execute maintenance projects & unit upgrades.
- Picture-perfect Pre-Turnaround activities is key to successful ‘Plant Turnaround’ via web-based “Interface Management Module”.
- With Pre-Turnarounds success, apply the plan to ‘Plant Turnarounds’ as well for smooth startup & full-stream production.

Desired Outcomes:

- Effective Interface Management system has record success in offshore Oil & Gas mega-Projects for HES, within budget & delivery schedule, and similar results could be achieved for Refinery and Chemicals pre-turnarounds as well thus facilitating the “Plant Turnaround”.
- Innovative trends in Interface Management is via web-based modules.
5.0 – Huge Market – Target Area
• **Huge Market – Target Area:**

• We in State of Texas Gulf Coast region and particularly in Greater Houston area along the Galveston Bay coastline, here is World’s largest Petroleum Refining and Chemicals processing hub.
  
  • An initial survey of small Refineries and Chemical Plants with no systems are in excess of nearly ~50 such facilities.
  
  • This effort demands an extensive dialogue amongst Turnaround Suptd & Team to weigh in the pros & cons to carve-out suitable and specific fit-for-purpose plan.

• Refineries and Chemical plants undergo “Routine”, “Planned” and “Emergency” Turnarounds (T/A’s):
  
  • **Routine T/A’s:** Are performed by the book.
  
  • **Planned T/A’s:** Are planned, couple with Maint-proj & unit upgrades
  
  • **Emergency T/A’s:** Are as a result of an emergency situation
6.0 – Nelson Complexity Index (NCI) 
(Mentioned only as a Reference for Refineries)
• **Nelson Complexity Index (NCI) for Refineries**: A measure to compare the secondary conversion capacity of a petroleum refinery with the primary distillation capacity:
  - \( F_i = \) Complexity factor
  - \( C_i = \) Unit capacity
  - \( C = \) Capacity of CDU
  - \( N = \) Number of all units
  - \( \text{CDU} = \) Crude Distillation Unit

**Formula**

\[
\text{NCI} = \sum_{i=1}^{N} F_i \times \frac{C_i}{C_{\text{CDU}}} \tag{5}
\]

Where:
- \( F_i \) is a complexity factor
- \( C_i \) is a unit capacity
- \( C_{\text{CDU}} \) is a capacity of crude distillation unit
- \( N \) is a number of all units

<table>
<thead>
<tr>
<th>Unit</th>
<th>1998 Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distillation capacity</td>
<td>1.0</td>
</tr>
<tr>
<td>Asphalt</td>
<td>1.5</td>
</tr>
<tr>
<td>Vacuum distillation</td>
<td>2.0</td>
</tr>
<tr>
<td>Thermal processes</td>
<td>2.75</td>
</tr>
<tr>
<td>Catalytic hydorefining</td>
<td>3.0</td>
</tr>
<tr>
<td>Catalytic reforming</td>
<td>5.0</td>
</tr>
<tr>
<td>Catalytic cracking</td>
<td>6.0</td>
</tr>
<tr>
<td>Catalytic hydrocracking</td>
<td>6.0</td>
</tr>
<tr>
<td>Alkylation / Polymerization</td>
<td>10.0</td>
</tr>
<tr>
<td>Oxygenates</td>
<td>10.0</td>
</tr>
<tr>
<td>Aromatics / Isomerisation</td>
<td>15.0</td>
</tr>
<tr>
<td>Lubes</td>
<td>60.0</td>
</tr>
</tbody>
</table>

**Example**

If an oil refinery has a crude distillation unit (100 kbd), vacuum distillation unit (60 kbd), and catalytic reforming unit (30 kbd), then the NCI will be \( 1 \times (100/100) + 2 \times (60/100) + 5 \times (30/100) = 1.0 + 1.2 + 1.5 = 3.7 \).

Courtesy: Internet Information via [www.wikipedia.com](http://www.wikipedia.com)
7.0 – Plant Turnaround is basically a ‘Project’
• **Turnaround is basically a ‘Project’:**

  • Refinery and/or Chemicals Turnaround (T/A) is basically a “Project”, its a ‘unique’ endeavor executed with a ‘budget’, ‘resource’ and within ‘time’ frame. Turnaround is treated as a project and should also be executed like a project, and hence Pre-Turnaround activities are so crucial to be tracked perfectly.

  • Turnaround Superintendent (T/A Suptd) is the Project Manager, & tracking of Pre-Turnaround Activities via Interface Management systems via web-based Module is similar to managing a mega-project in Offshore Oil & Gas industry.

  • T/A Suptd or Maintenance Manager lead the T/A Team called Work-Groups (WG’s) in the Interface Management terminology and constitutes the team.

  • T/A Team (WG’s) mainly consists of but is not limited to: T/A Suptd, Refinery Manager, Operations Manager, Maintenance Manager, HES Engineer, Planning Engineer, Scheduler, Materials Engineer, Procurement Manager, QAQC Inspector, Contractor/s, etc.
8.0 – Organization Chart
(Typical)
Refinery & Chemicals Pre-Turnaround Activities Via Interface Management

T/A Org-Chart (Typical)
9.0 – T/A Scope of Work
• **Turnaround Scope Of Work:**

• The Scope of Work (S.O.W.) for the forthcoming T/A being targeted is based on the last or previous “Post Turnaround Report”.
  - It gives full details of what was done.
  - what is the condition of Equipment & Facilities.
  - what was not done in previous T/A & listed for next turnaround.

• This also lists all the “Projected” work scope that needs to be the part of overall scope of work for turnaround. This constitute to what’s called the “Known” scope of work.

• Additionally, the unforeseen & estimated work scope is also listed and termed as “unknown” scope of work.

• The “known” and projected “unknown” lists of works form the overall “Scope of Work” for the Turnaround.
10.0 – Procurement / Supply-Chain Group
• **Procurement / Supply Chain Group:**

  • Procurement / Supply Chain activities for T/A are based again as we stated, on the last “Post T/A Report”, and all required materials, equipment, facilities & services are listed.

  • The lists of all disciplines are evaluated with what is available in the warehouse and is reserved for the T/A. The rest of the materials, equipment & services are ordered thru Materials Requisitions (MR’s) by the Procurement Group. It includes Long-Lead Items, Owner Furnished Equipment (OFE’s), Ex: Pressure Vessels, Heat Exchangers, Fin-Fan Coolers, Engineered Packages, etc., for delivery by “Received on Site” (ROS) dates.

  • Contractor’s scope includes some Piping materials, fittings, Heater tube for retubing, Refractory retrofitting are sub-contracted, Service contracts for scaffolding, refractory, manpower supply, pipe-fitters, welders, craftsmen, etc.
Refinery & Chemicals Pre-Turnaround Activities Via Interface Management

11.0 – Preparation for RFQ’s – T/A Contractor/s
• **Preparation for RFQ’s - T/A Contractor/s:**

• T/A Suptd has already formed the T/A Team in preparation for forthcoming turnaround and generating the Organization Charts, Interface Responsibility (Scope) Matrices, etc. He also ensures that all Pre-Turnaround activities are complete prior to Plant Shutdown, that includes but is not limited to all Materials, Equipment, Services, Manpower, Contracts, etc.

• Allocate storage, laydown, pre-fabrication area for T/A contractors, construction equipment, cranes, etc.

• **RFQ for “Known” Scope of Work with materials list, dwgs, BOQ’s, etc., for:**
  • Fixed Lump sum for “Known” and projected work scope.
  • Cost Plus with Rates Sheet for:
    • List of “Unknown” work scope.
  • Hourly and Day-rates contracts as applicable for craftsmen & services.
12.0 – RFQ / Contract Award – T/A Contractor/s
• **RFQ / Contract Award - T/A Contractor/s:**

• Formalize list of T/A contractors, send pre-qualification forms, review and pre-qualify the T/A contractors who will receive the RFQ’s.

• Pre-qualify the T/A contractors, send RFQ’s to selected T/A contractors, conduct **joint** bid-explanation meetings to clarify the S.O.W. and respond to queries.

• Compile questions received from all bidders, review and generate responses. Send response to bidder’s questions to all the bidders at the same time.

• Receive bids, conduct detailed review and generate:
  • Technical Bid Evaluation (TBE)
  • Commercial Bid Evaluation (CBE)

• Generate recommendation letter with TBE & CBE for Management approval, and after Management approval the contracts are awarded.
13.0 – Pre-Turnaround Activities are over and Prep for Plant Turnaround
• **Pre-Turnaround Activities are Over / Prep for T/A:**

• Conduct kick-off (Alignment) meeting workshop with all and in attendance of T/A Suptd, Ops T/A Team, selected Contractors, subs-contr & vendors, etc.

• At this stage ensure all the pre-requisites for Turnaround are fully complete prior to plant shutdown for the Turnaround.

• Roll-over of pre-turnaround activities amongst WG’s, they are onboard for Plant shutdown for Turnaround

• From this stage onwards it’s the Operator T/A Team and Contractors managing their activities, monitoring their schedules & critical paths based on their standard modes & procedures, until the completion of turnaround, startup of plant & brought to full stream production.
14.0 - Track Pre-T/A Activities via Interface Management System on web-based Module
Interface Management

• Is an integral part of the overall “Project Management”, and mechanism to manage Internal & External interfaces

• It is a phenomenon wherein the T/A Team, (work-groups - WG’s in interface management terminology) liaise, commit & interact within T/A delivery team members to resolve actions needed for smooth “Plant Turnaround”.

Interface Management (Applied to Pre-T/A’s) / Encompasses All the Facets of Project Management

1. Integration Management
2. Scope Management
3. Time Management
4. Cost Management
5. HESQR Management (*
   ➢ (*) – Rick’s input on Health, Environment, Safety, Quality & Regulatory
6. Procurement Management
7. HR Management
8. Communications Management
9. Risk Management
10. Stakeholder Management

Courtesy: PMI.org / PMBOK / Presentations
Pre-T/A(*) Project Management

A project is a temporary endeavor undertaken to create a unique product, service or result.

(*) Applied to pre-turnarounds, & coupling with upgrades to an existing facility

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

Project management processes fall into five groups namely Initiating, Planning, Executing, Monitoring and Controlling, and Closing

Courtesy: PMI’s A Guide to the Project Management Body of Knowledge (PMBOK® Guide)
Interface Management within T/A Team

- Interface Management for Pre-Turnaround activities is the solution to highly complex “Planning-to-Execution” phase for “Plant Turnarounds” involving T/A Team (WG’s) as below but not limited to:
  - T/A Suptd, Refinery Manager, Ops-Manager, Maint-Manager
  - HES Engineer, Planning Engineer, Materials Engineer
  - QAQC Engineer, Inspectors, etc.
  - Selected T/A Contractor/s (A, B) and their T/A Sub-contractors, etc.

- This proposal is based on using Interface Management systems via Web-based Module for tracking “Cradle-to-Grave” all the Pre-T/A activities.

- Pre-Turnaround activities via web-based Interface Management Module is highly communicative tool as compared to emails and well-known issues related to tracking emails, . . .
Substantial $-Savings by shortening the Time-Line, & Efficient mode of
“Pre-Turnaround Activities”
Via Interface Management for
“Plant Turnaround”
(Typical)

Pre-T/A Activities by T/A Suptd, Planner, Materials Engineer, HES, QAQC, Procurement / Supply Chain, with T/A Contractors, etc., in coordination with Refinery Mgr, Ops-Mgr, Maint-Mgr etc.

Plant T/A

3 – 4 wks Duration – Typ.

Typical Example
Interface Management Enhances overall T/A Project Management

1. T/A Suptd at the Apex of Pyramid with original Footprint

2. Raise T/A Suptd’s position for high visibility

3. Insert T/A Interface Coordinator

4. Extended T/A Project Management Footprint

Reference: Rick’s presentation at RGF, modified for T/A’s

Disclaimer: Plan-Proposal by Project Management Professional
15.0 - About the Presenter, . .
About the Presenter, . . .

Rafiq (Rick) Khadimally, PMP
Consultant, Houston Consulting Group, LLC

Rick has managed the crucial aspect of Project Management and in Project Engineering capacities on several Oil Refinery Maintenance Projects during Turnarounds at LaGloria Refinery in Tyler Texas, Aramco-Petromin Jeddah Refinery & PRL. Throughout his career of nearly three decades of Project Management & Interface Management in USA and international he has performed this role on Offshore Jacketed Platforms, TLP, Semi-Submersibles, SPAR, Drilling Rig, Subsea Tieback, Floating LNG (FEED) projects. Rick served as Interface Manager on Bechtel projects and as Consultant Interface Coordinator on Chevron-Malange offshore project Angola, he also served as Interface Manager with SBM Offshore, McDermott Engineering and Wison Offshore. Rick holds an MBA degree in Global Energy from Bauer College of Business (University of Houston), an Executive Development Project Management program from Rice University, and BS degree in Mechanical Engineering from University of Engineering & Technology where he topped the list with two medals. He is Project Management Professional certified as PMP, is participative in PMI Chapters and Rice Global E&C Forum events, most recent are PMI-worldwide webinar on ‘Interface Management for Oil & Gas mega-Projects’ and RGF-presentation on ‘Interface Management Energized Concurrent Engineering’ respectively.
16.0 - Q & A Session