Roles and Responsibilities of Plant Commissioning, Hydrocarbon Introduction and Acceptance Test Run

Introduction

There are many parts of a grass root chemical plant construction. They include

1. Basic Process Engineering
2. Detailed Engineering
3. Procurement
5. Construction
6. Operations Training
7. Commissioning
8. Hydrocarbon Introduction and Acceptance Test Run.

The construction is considered complete with the signing of the "mechanical completion". Operations Training should be completed as the plant is being constructed. This is typically done by the technology licensee. Additional courses such as Project Management or Unit Commissioning can be provided by KLM Technology Group as "in house training" or in regional conferences.

Our next planned regional conference is 25 January 2010 – "Perfecting Process Plant Performance" in Kuala Lampur, Malaysia. This conference will include courses on Plant Commissioning, Project Management, Process Equipment Design, and many others. Please review the conference at the web sites.

Then the commissioning commences, which can be done in phases as the construction is completed. Typically commissioning packages (details of how the commissioning is to be carried out) are planned and completed. The trained operators execute the commissioning as a second phase of their training. This gives them plant experience and ownership.

At the completion of commissioning, hydrocarbon introduction is planned and commenced. "On Specification" products should be made within a reasonable period of time, after which an Acceptance Test Run is planned and commenced.

Plant operations personnel are employed by the Operations Company and will follow the construction, do the Commissioning, Hydrocarbon Introduction, and acceptance Test Run. External

Advisors are employed by the operating company, construction company, and the technology licensee to provide advice and assistance to the operations personnel. In most countries only the personnel employed by the Operations Company may actually operate the equipment for safety, liability, and insurance requirements. KLM Technology Group can provide experienced personnel for the operations, advice and assistance.

A successful plant commission has at least three parts, which out which cannot be considered a success.

1. No Loss Time Accidents. No commissioning can be considered a success if it is not done safely. Safety has to be stressed from the very beginning of the design, construction and commissioning.

2. No equipment damage – this function of many disciplines, design, construction and commissioning team.

3. On test product within a reasonable period. Less than two days would be considered very good, seven days would be acceptable, and above fourteen days would be less than acceptable.

Operations Training

The objective of operations training is to instruct the operators to safely commission, introduce hydrocarbon and to make on specification production. This is typically includes several weeks of training and many times with a similar plant site visit.

Step to ensure the operators are properly trained:

Ensure the start up and commissioning procedures are reviewed and understood by the operators by written test. Strive to have all procedures be comprehensive, yet easily understood.

Help the operators learn through experience.

Teach them to not just to walk through a poor procedure, work with your supervision to get it improved and updated.

Teach them to always keep the importance of routine jobs in perspective. Don't let their routine nature diminish their role. Routine jobs such as vibration and corrosion inspection can help to detect problems early and prevent a serious incident.

The local staff needs general instruction in the following fields;

1. Safety
2. Hazard analysis
3. Furnaces,
4. Boilers and Steam Systems,
5. Steam Turbines, Pumps, and Compressors,
6. Distillation,
7. Piping and Heat Exchangers,
8. Process Control Systems,
9. Electrical Systems,
10. Catalyst and Molecular Sieve Systems,
11. Cooling Water Systems and Treatment,
12. Process Utilities
13. Relief Valve and Flare Systems.

If the local staff has some operations experience this can be covered quickly, but with limited operations experience the fundamentals need to be understood to optimized and received the full benefit from the plant investment. With experienced operations staff this can be completed in 5 days.

One typical way to complete the operations training is called "train the trainer". A selected group of the engineers and experienced operations personnel is given training by the senior commissioning manager. Then these trainers train the local staff.

Specific Plant Training for the "Train the Trainer" Group would include;

1. Pre Commissioning Procedures
2. Commissioning Procedures
3. Plant Specific P&ID Review
   A. Tower Review
   B. Reactor Review
   C. Process Control Review

4. Distillation Overview
5. Plant Specific Process Variables
6. Normal Start Up and Shut Down Procedures
7. Emergency Shut Down Procedures

The "Train the Trainer" should be completed in 10 days, and then followed by 15 to 20 days training of the local staffing by the trainers. KLM can provide Senior Commissioning Managers to provide training.

Pre Commissioning

The objective of commissioning is to ensure that the plant is brought into production without risk to 1) the personnel, 2) the environment and 3) the equipment.

There are accepted industry list, such as API Publication 700 – "Checklist for Plant Completion" which is a list generic procedures for commissioning and safe hydrocarbon introduction. This check list has a work responsibility item which can be itemized to either the contractor or plant owner.

Attached is a small list of Commissioning Items

Commissioning Items	Constructor	Operations	Advisors
1. Leak and Pressure Test	Perform	Witness	
2. Equipment Inspection (Towers, Reactors, Ect)	Perform	Perform	Witness
3. Flushing, Chemical, Mechanical Cleaning		Perform	Witness
4. Temporary Screens, Strainers and Blinds		Perform	Witness
5. Purging and Inerting		Perform	Witness
6. Drying Out		Perform	Witness
7. Instrumentation Verification	Perform	Perform	Witness

The Pre Commissioning should be able to be completed in 15 days for a small unit like a Hydrotreater. KLM can provide commissioning specialist to advise the Pre Commissioning.

Commissioning - Hydrocarbon Introduction

A detailed procedure of how to introduce hydrocarbons to the plant should be developed. The procedure should be completed by the operations group with guidance from the advisors.

KLM can typically provide one Commissioning Manager, two on shift operations specialist (working 12 hours shifts) and one Acceptance Test Run (ATR) Engineer to assist and advise in the commissioning for a small unit like a Hydrotreater.

Acceptance Test Run (ATR)

The Acceptance Test Run will be held after commissioning and hydrocarbon introduction. An approved Acceptance Test Run procedure will be developed and utilized.

Advisors

The team of Advisors will include three categories;

1. Commissioning Manager
2. Commissioning Engineer
3. Commissioning Operator Specialist

Commissioning Manager

The Commissioning Manager typically is a Chemical / Mechanical Engineer with greater than 15 years operations experience. They will have been though several grass roots start-ups.

Responsibilities;

1. Be a liaison between the operating company and the Technology Licensee. Manage and work toward building a cohesive team for the most successful start up possible. Encourage open communication between all parties in the organization.

2. Attend meeting as required, typically there is a morning meeting to track progress. Answer and give guidance as required.

3. Issue written guidelines for planned task. The operating company can utilize these guidelines to develop the daily orders.

4. Manage the commissioning engineer and operator.

5. Ensure that site processes are monitored and controlled to achieve safe and economical operation while developing all operators to their full potential.

6. Coach the operators to complete the maximum possible amount of follow-up on their own when items are not as per normal operation. Be an approachable coach to those on your team. Help the operators learn and grow by enthusiastically sharing your knowledge with them and helping them solve problems.

7. Provide technical leadership and expertise to facilitate safe, reliable, and economical operation of the site processes.

Commissioning Engineer

The Commissioning Engineer typically is a Chemical / Mechanical Engineer with some design and operations experience. The Commissioning Engineers contribute to the team by performing a technically oriented service function. They must remember to respect the supervisory role of the operations supervisors and work through them on all issues related to operations.

The Commissioning Engineer will record and track the Acceptance Test Run procedure data and make recommendations where and when adjustments need to be implemented. They can be utilized on shift or on a straight day mode.

Responsibilities;

1. Encourage open communication between all parties in the organization. Communication is essential to the success of any organization. Continually strive to develop a positive relationship with open communication with the operators as well as the Production Supervisor.

2. Record Acceptance Test Run data.

3. Develop recommendations to improve Acceptance Test Run.

4. Ensure that site processes are monitored and controlled to achieve safe and economical operation while developing all operators to their full potential.

5. Coach the operators to complete the maximum possible amount of follow-up on their own when items are not as per normal operation. Be an approachable coach to those on your team. Help the operators learn and grow by enthusiastically sharing your knowledge with them and helping them solve problems.

6. If on shift;

   A. At the beginning of each shift exchange information - be inquisitive; fully understand the state of operations, problems, etc.

   B. Initiate any immediate action needed (recommendations for Maintenance, Operators, etc).

   C. Review the operation soon after shift change and several times throughout the day.

   Inside – review board operations and product specifications

   Outside - review outside route via round sheets immediately after completing each route. This helps to detect trends that may not have been noticed while collecting data.

   D. At end of shift be sure to effectively verbally communicate to your relief, be sure and record all significant items in the logbook.

Commissioning Operator

The Commissioning Operator typically is an operations personnel with greater than 10 years operations experience. They will have seen several chemical plant grass roots start ups. They must remember to respect the supervisory role of the operations supervisors and work through them on all issues related to operations.

The Commissioning Operator will record and track the Acceptance Test Run procedure data. They are typically utilized on shift mode.

Responsibilities;

1. Encourage open communication between all parties in the organization. Communication is essential to the success of any organization. Continually strive to develop a positive relationship with open communication with the operators as well as the Production Supervisor.

2. Record Acceptance Test Run data.

3. Ensure that site processes are monitored and controlled to achieve safe and economical operation while developing all operators to their full potential.

4. Coach the operators to complete the maximum possible amount of follow-up on their own when items are not as per normal operation. Be an approachable coach to those on your team. Help the operators learn and grow by enthusiastically sharing your knowledge with them and helping them solve problems.

5. While on shift;

   A. At the beginning of each shift exchange information - be inquisitive; fully understand the state of operations, problems, etc.

   B. Initiate any immediate action needed (recommendations for Maintenance, Operators, etc).

   C. Review the operation soon after shift change and several times throughout the day.

   Inside – review board operations and product specifications

   Outside - review outside route via round sheets immediately after completing each route. This helps to detect trends that may not have been noticed while collecting data.

   D. At end of shift be sure to effectively verbally communicate to your relief, be sure and record all significant items in the logbook.