



PE115: Crude Oil Distillation-Column Design, Operation, Control & Troubleshooting

Training Description:

The atmospheric and vacuum pipe stills are used to separate crude oil into fractions according to True Boiling Point ranges so that feed stocks will be available to meet the required specifications for downstream units. Crude oil fractionation is accomplished in two and up to four distillation steps. Typically, crude oil is fractionated by atmospheric distillation with the long residue being fed to the vacuum distillation portion of the unit. In initial design or revamps, it may be necessary to install a pre-flash column to reduce the load on the atmospheric column or furnace. Additionally, it may be economic to install a pre-flash vacuum column to unload the vacuum unit.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Design, operate, control and troubleshoot distillation-column in a professional manner
- ✓ Apply and gain an in-depth knowledge on distillation technology
- ✓ Identify the different distillation methods and implement distillation process involving the normal operation of bubble plate, vapor velocity and velocity distribution
- ✓ Determine the factors influencing plate efficiency and explain the scope of distillation column including flash stages, process design basic reflux ratio
- ✓ Demonstrate how tray works and explain types & function of reboilers
- ✓ Discuss the features and use of condensers in the operation of distillation columns and apply instrumentation & control
- ✓ Enumerate the importance of steam stripper and emphasize its efficiency
- ✓ Discuss the purpose of pumparound and become familiar with pumparound heat removal, vapor flow and fractionation

Training Designed for:

This course is intended for those who are involved in the design, operation, control and troubleshooting of such equipment in distillation-column. Process Engineers, Production Engineers, Operation Engineers and Maintenance Engineers. The course is also recommended for technical support engineers from industry supplier companies.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ PRE-TEST
- ❖ Introduction
- ❖ Overview of Crude Unit Design



- Process Flow Scheme
- Crude Oil Properties
- ❖ **Methods for Crude Oil Characterization**
 - TBP Distillation / Crude Assays
 - Product Properties
 - Impact of Crude Oil Contaminants
 - Carbon and Metals Distribution

DAY TWO:

- ❖ **Crude Unit Process Flow Scheme**
 - Distillation: Atmospheric and Vacuum
 - Pre-flash / Heat Exchanger Networks
- ❖ **Impact of Crude Oil Types**
 - Light, Medium, and Heavy Crude Oils
 - Product Yields and Heat Integration
 - Vacuum Gas Oil Carbon and Metals
 - Contaminants-Unit Metallurgy Requirements

DAY THREE:

- ❖ **Major Equipment Design**
 - Desalter
 - Pre-flash Column
 - Impact on Atmospheric Feed Composition
 - Atmospheric Column
 - Overhead and Pump around Systems
 - Fractionation - Product Stripping
 - Vacuum Column
 - LVGO / HVGO Fractionation
 - Wash Zone and Residue Stripping
 - Vacuum Ejector System
 - Fired Heaters
 - Pre-flash Vacuum Column
- ❖ **Process Control**
 - Process Design Impact on Process Control
- ❖ **Operation, Monitoring and Troubleshooting**
- ❖ **Refinery Crude Units**
 - Desalter Impact on Distillation Efficiency
 - Overhead System Wash & Corrosion Control
 - Pre-flash Column
 - Foaming-Black Distillate
 - Heat Exchanger Network
 - Atmospheric and Vacuum Columns
 - Atmospheric Column Wash Zone
 - Atmospheric Residue Stripping
 - Vacuum Column Wash Zone Coking

- Vacuum Column Stripping

DAY FOUR:

❖ Opportunities for Revamp / Debottlenecking

- Atmospheric Column
- AGO Quality - Direct Control of Over-flash
- Minimum Over-flash
- Maximum Residue Stripping Efficiency
- Vacuum Column
- Increasing HVGO Cutpoint
- Additional Pumparound
- Pumparound heat removal
- LVGO / HVGO Fractionation
- Balancing Atm. / Vac. Column Cutpoint

❖ Operating parameters of a distillation column:

❖ Definition and signification

- Relation between the different parameters involved in liquid-vapor equilibria: temperature
- Pressure, composition, distribution coefficients and relative volatility
- Material balance of the column: cut point, separation quality
- Setting column pressure and pressure profile along the column
- Heat balance - Reflux and re-boiling ratio
- Flow rates, concentration and temperature profiles

DAY FIVE:

❖ Separating power of an industrial distillation column

- Parameters related to the separating power:
- Liquid-vapor flow rates, reflux and re-boiling ratio
- Number of theoretical stages
- Position of feedstock inlet
- Separating power and energy consumption

❖ Process Control Parameters

- Survey of operating disturbances; origins and causes
- Process control strategy and optimization targets
- External or internal reflux control, re-boiling control by means of flow rates or duty.
- Material balance controls: sensitive tray, temperature control systems
- Optimization of the heat balance: additional energy through the feed or the reboiler, low pressure operation
- Implementation of control systems based on quality measurement
- Analysis of disturbances caused by the feed and systems for feed forward control
- Control of the multiple draw-off columns: quality tuning through material balance (temperature flow rate or level control)
- Heat balance and optimization of pump rounds and vaporizing refluxes

❖ Course Conclusion

❖ POST-ASSESSMENT and EVALUATION

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relativo - Training & Career Development Manager

aisha@cmc-me.com / training@cmc-me.com

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615