IChemE ADVANCING CHEMICAL ENGINEERING WORLDWIDE

Practical Distillation Technology

15–17 October 2018, London, UK

Practical Distillation Technology

Field-tested techniques for distillation processes and equipment

15–17 October 2018, London, UK

Recognised expert Henry Kister presents this comprehensive course on distillation technology, with particular emphasis on the problems that can occur and how to solve them.

You will develop a working knowledge of key techniques that can promote trouble free operation and reduce distillation costs. You will also receive a copy of the *Distillation Operation* and *Distillation Troubleshooting* textbooks.

Learning outcomes

Develop a working knowledge of key techniques that can promote trouble-free operation and reduce distillation cost, including:

- how to trouble-shoot a distillation column and determine what may cause poor performance
- how to evaluate existing performance and develop new designs
- how to validate your tower simulation
- how to avoid common causes of capacity bottlenecks, tray damage, downcomer sealing problems, packed tower distributor malfunctions and many other operating difficulties
- how to de-bottleneck a column to improve capacity and/or separation
- how to control and operate a distillation column

Who will benefit

Engineering and supervisory personnel who are involved in operating, designing, trouble-shooting, de-bottlenecking, or start-up of distillation processes and equipment.

Course outline

Note: this programme is provisional and may be subject to change.

Avoiding fractionation pitfalls

Vapour-liquid equilibrium (VLE): key concepts and simulation traps. Should we believe the simulation? Issues with close-boilers and non-idealities: why some heavy components go up while the simulation thinks they go down. VLE data: to trust or not to trust? Are distillation trays ideal stages? Reflux-stages relationship. Multi-component distillation: composition profiles, sidedraws, accumulation, and cycling problems. What you need to watch out for.

Troubleshooting distillation simulations

Does your simulation reflect the real world? How poor simulation leads to incorrect problem diagnosis. What validation checks are needed? How far should we go? Sensitivity analysis and graphics for simulation troubleshooting: useful hints.

Tray hydraulics and limits

Visualisation of vapour-liquid dispersions on trays, flooding, entrainment, weeping, dumping. Flood mechanisms: jet (entrainment), system limit, downcomer backup, downcomer choke. Which one limits your tower capacity? Common tray types: sieve, moving valve, fixed valve, sheds: pros and cons. Which works well in fouling applications? Small holes, valves: benefits and traps. Flood: what causes it, what affects it, and how to predict it. Are the predictions reliable? Tray efficiency: are simulation predictions reliable? Can it be enhanced by tray modification?

Troubleshooting tray towers

Gamma scans: application for diagnosing flood, missing and damaged trays, foaming, and downcomer flooding. How to combine gamma scans with process checks to get the most out of the scans: the four keys to success. Do gamma scans ever lie? Flooding and foaming symptoms: high dPs, reduced bottoms, others. Which can be trusted? Liquid and vapour sensitivity field tests: identifying the correct flood mechanism.

Troubleshooting packed towers

Rules of thumb for flood pressure drop and packing efficiency. Simulation hydraulic calculations: to trust or not to trust? Grid gamma scanning for detecting maldistribution, damage, distributor malfunction, distributor and collector overflow. Distributor overflow: death for packed beds. Some do's and don'ts for distributors. Can poor distributor feeding bottleneck towers? Circumferential surface temperature surveys: how to conduct, what to avoid, and the hidden secrets they reveal.

De-bottlenecking

State-of-the-art trays and packings: strengths and weaknesses. Factors that favour trays and factors that favour packings. The pressure drop bonanza: why packings win in non-fouling vacuum services and in compressor suction. Pitfalls unique to structured packings: high pressure application, oxidation, shutdown fires. High-capacity trays (eg Superfrac, VG Plus, MD): principles, tricks, and traps. Do they really give 30% more capacity than conventionals?

Distillation control

Assembling control loops into an overall scheme: what works, which is better, what causes instability, and what impairs efficiency. The three most common causes of control assembly failure: no material balance control, fighting between temperature controllers, and level control on a small stream. Tips for avoiding problems. Can controls affect revamp success? Best temperature control location: is there a reliable method for finding it? How can a temperature controller be fooled? Reboiler, condenser, and pressure controls: which loops work and which misbehave. How dead pockets in vapour overhead lines interfere with controls. Understanding hot vapour bypasses: why some work while others don't. Control systems that did not work.

Avoiding tower malfunctions

The 20 most common causes of distillation malfunctions: what trouble should we look for and prevent? Points of transition (feeds, draws, tower base): why these are some of the worst tower bottlenecks: how diagnosed and remedied. High tower base levels: how they induce premature flood, even tray/packing damage, and how you can prevent. Instrument issues at the tower base: what to watch out for. Tray/packing damage: pressure surges due to water entering a tower full of hot oil or insoluble organics, other sources of tray damage and ways to avoid. Some commissioning and startup watchouts: pre-startup inspection, blinding and unblinding, reverse flow, steam-water operation, washing, rapid pressuring/depressuring, drawing vacuum, introducing liquid. Chimney trays: do's, don'ts and how they bottleneck towers. Liquid outlets: choking in sidedraw rundown lines and how it restricts tower capacity. Why must self-venting flow be assured in the presence of entrained vapour? Siphon formation. Kettle and once-through thermosiphon reboilers: how they bottleneck towers.

Case studies

These operating experiences will be scattered throughout to illustrate the key principles and to distinguish good from bad practices.

Course presenter

Henry Z Kister, FIChemE

Henry is a recognised specialist with a vast background in all phases of distillation, including operation, troubleshooting, design, start-up, and research. At Fluor he designs, revamps and advises on distillation processes, equipment and controls for the chemical, petrochemical and oil industries. He is also extensively involved in field consulting, start-up and troubleshooting assignments and in developing Fluor's in-house distillation technology. He is the author of three textbooks, *Distillation Operation and Distillation Design* (McGraw-Hill Inc, 1990 and 1992), *Distillation Troubleshooting* (Wiley Interscience, 2006), the Distillation Equipment chapter in *Perry's Chemical Engineers' Handbook* (McGraw-Hill In, 2008), over 100 technical articles and has presented this course 450 times across the globe.

> "Henry is fantastic, the takeaway binder and books are so valuable. Very well done."
>
> Nicole Austin, William Grant and Sons

> "Wonderful. Top class teacher and good organisation."
>
> Laurent Ferrrari, Total

> "Has been a very enlightening event about distillation. Mr Kister's style, the content coverage and conciseness were just amazing. I am very happy that I participated."
>
> Laszlo Keresztury, MOL Plc.

Venue

Holiday Inn, London Heathrow M4, Jct 4

Sipson Road, West Drayton, UB7 0JU, UK

Tel: +44 (0) 870 400 8595
www.heathrow-m4.holiday-in.com

Fees

IChemE member	**£1600 + VAT**
Non-member	**£1750 + VAT**

Discounts

Discounts are available to companies booking more than one place:

2 places	**5% discount**
3 places	**10% discount**
4 or more places	**15% discount**

Multiple places must be booked at the same time to qualify.

Find out more and book

Read more details about the course and book your place at
www.icheme.org/distillation

t: **+44 (0)1788 534496**
e: **courses@icheme.org**

Accommodation

Accommodation is not included in the delegate fee. If you need any help with booking a hotel, contact our agent, Trinity Conferences on **+44 (0)1780 484050**. Remember to quote IChemE when booking.

CPD **23.25 hrs**

Maximum duration for CPD recording

In-company training

If you have several colleagues interested in this course, why not consider running it in-house?

For a quote or to discuss your requirements contact **courses@icheme.org**