TROUBLESHOOTING DISTILLATION CONTROLS

5 SESSION PROGRAM

DAY 1, SESSION 1

DISTILLATION CONTROL OVERALL SCHEMES TROUBLESHOOTING

Assembling control loops into an overall scheme: what works, what causes instability, and what impairs efficiency. The 3 most common causes of control assembly failure: no material balance control, fighting between temperature controllers, and level control on a small stream. What may happen in the absence of adequate material balance control? The three most common column control schemes: pros and cons. Is it better to connect the column temperature (or composition) control to the boilup or to the reflux? Is there a control scheme that can handle ambient disturbances better? What can go wrong with controlling a liquid level on a small stream? What makes violation of this principle the No. 1 control problem in refineries (and in many chemical plants). Is your fractionator immune?

DAY 1, SESSION 2

TROUBLESOME TEMPERATURE CONTROLS AND SIDEDRAW CONTROLS

How does subcooling affect internal reflux flow rate and its control? Is internal reflux control useful? Why distillation control schemes often break down in the presence of a side draw and what can be done to make them work. Can internal reflux control help? Temperature control: is it better to have the control thermocouple in the liquid or in the vapor? Best temperature control tray location: is there a reliable method that can find? Using simulations to search and find. Application to several case studies: what does this method reveal about the tower in each case, and how it can guide the solutions. What is the effect of non-key components? Issues with enhanced distillation column controls: azeotropic distillation and extractive distillation, and what has achieved success in controlling them. Analyzer controls: is it the panacea for composition control? What has been the experience with an analyzer control cascading onto a temperature control?

DAY 2, SESSION 3

PRESSURE AND CONDENSER PROCESS CONTROLS TROUBLESHOOTING

What makes good pressure control so critical. A vapor top product: how pockets in vapor lines destabilize pressure controls. Flooded condenser pressure controls for total condensers: how can the piping connections to the reflux drum make or break the control stability. Why can flooded condenser pressure controls break down in the presence of non-condensables, undersized equalizing lines, slots in the dip pipe entering the reflux drum, and what can help avoid these issues. Does inert

padding help, and at what cost? Understanding hot vapor bypasses: why some work while others don't. Hot vapor bypass good and bad practices. Flooded reflux drums: pros and cons. Manipulating the coolant rate: when can it be troublesome? How manipulating the cooling water flow can accelerate fouling and corrosion. Liquid product with a small vapor vent stream: why controlling the cooling water may sometimes be unavoidable, and what can be done to overcome shortcomings. Interference between vacuum and coolant controls.

DAY 2, SESSION 4

REBOILER PROCESS CONTROLS TROUBLESHOOTING

Reboilers heated by condensing steam or vapor: a control valve is in the steam inlet line versus valve in the condensate outlet line. Is the dynamic response with the steam inlet valve always better? Reboiler seal loss with the condensate outlet valve and how avoided. When does the condensate outlet valve scheme have a major energy-efficiency advantage? Fouling, corrosion, and thermal stresses: which of the schemes can handle each of these issues better? Steam trap unreliability issues with the steam inlet valve scheme: how to overcome. Startup and low rate operation with the steam inlet valve scheme: reboiler "stall", instability, how to prevent. Hammering: how a scheme incompatible with your condensate system can lead to instability and hammering. Equalizing lines to the condensate pot: checking out for poor configurations that can induce instability, hammering. Tube leaks: which scheme is better suited to handle a potential tube leak in different circumstances? Reboilers heated by sensible heat: why are the controls of these far less troublesome, and a brief discussion of their few issues.

CASE STUDIES

Control systems that did not work case studies will be scattered throughout, brought in to illustrate the principles

DAY 3, SESSION 5

EXTRA DISCUSSION SESSION

This session provides an opportunity to briefly discuss plant issues with the instructor and with other participants. Participants who wish to discuss plant issues are encouraged to prepare presentation materials in a simplified form that everyone in the audience can easily follow. Avoid elaborate P&I's and detailed drawings, but have detailed information available of the configuration of lines connecting to drums and seal pots (enter from the top or bottom, via slotted pipes or bare nozzles, into the vapor or liquid space, etc.).

Participants who wish to discuss plant issues need to inform EDRC ahead of the course so they can be allocated discussion time in this session. This information should be accompanied with a problem statement and sketch to be forwarded to the instructor so he can review ahead of the session.

WHAT WILL NOT BE COVERED

Advanced controls of distillation columns, constraints controls, batch distillation controls, reactive distillation controls, and controls of dividing wall columns are outside the scope of this webinar. Setting tuning constants, control valve selection, actuators, and control hardware are also outside the scope of this webinar.

WHO WILL BENEFIT

- Engineers and operation personnel having responsibility operating, troubleshooting, designing, and revamping distillation columns in the chemical, petrochemical, and oil refining industries
- Process control engineers engaged in control system optimization and improvements
- Managers and supervisors endeavoring to get the best performance from an existing or new distillation unit

IN THIS WEBINAR YOU WILL LEARN TO

- Troubleshoot a distillation control system and identify causes of poor performance
- Evaluate existing column control performance and develop new designs
- Avoid common causes of instability, off-spec products, excessive energy consumption, hammering, fouling, and other operating issues resulting from deficiencies in the control system
- Incorporate lessons from past experience for developing or improving a column control system

THE WEBINAR LEADER: HENRY Z. KISTER

Henry Z. Kister is a highly recognized specialist with over 30 years of vast expertise in all phases of distillation, including troubleshooting, operation, design, start-up, and control. As a senior fellow and director of fractionation technology 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 troubleshooting, field consulting, start-up and debottlenecks. He is Fluor's representative on the Fractionation Research Inc. (FRI) Advisory Committee, serves on FRI's Design Practices Committee, and is a member of the US National Engineering Academy (NAE).

Before joining Fluor in 1999, he was Brown & Root's staff consultant on fractionation. He provided clients for over 17 years with designs, debottlenecks, troubleshooting and control expertise and field assistance on fractionation and absorption technology. Before that, he was with FRI, where he specialized in fractionator hydraulics. Prior to that, he was with ICI Australia Ltd., where his duties included start-up supervision, operation, debottlenecking, process and hydraulic design, troubleshooting, and commissioning of several distillation systems.

He is the author of over 120 published technical articles on distillation, and two textbooks titled, *Distillation Operation and Distillation Design*, both published by McGraw-Hill. He is also the author of the textbook, *Distillation Troubleshooting,* published by Wiley, the Distillation Equipment section of Perry's Handbook, and the chapter on Distillation in the Kirk-Othmer Encyclopedia of Chemical Technology. Many of his articles as well as significant sections of his books address distillation controls troubleshooting.

Henry Kister has conducted over 530 "Practical Distillation Technology" programs for major corporations in the U.S., Canada and 24 other countries on all six continents.