Control of Non-Key Compositional Bulges in Industrial Distillation Unit Operations

Abeykoon Udugama, Isuru Sampath Bandara; Taube, Michael A. ; Gernaey, Krist V.

Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

Control of Non-Key Compositional Bulges in Industrial Distillation Unit Operations

Tuesday, October 30, 2018 | 8:25 AM - 8:50 AM | *David L. Lawrence Convention Center - 301*

Abstract

In modern chemical plants distillation units are increasingly put under pressure with the requirement to achieve greater throughput while ensuring higher product purities. Most of these distillation units also contain with multi-component feed streams and often has demanding high purity requirements both at the distillate and bottoms streams. These tight product and bottoms purity specifications together with the multi-component nature of the feed streams can result in the accumulation of non-key components in the distillation columns. This is particularly an issue when the feed stream to the column consists of both polar and non-polar components, which can create polar and non-polar regions with the column. These regions can potentially “trap” the non-key component in the middle of the distillation column between the polar and non-polar regions of the column. From a design point of view, this accumulation of non-key components is managed by introducing a side draw where the accumulated non-key middle boiling components can be extracted to maintain steady state operations.

However, from a process control point of view managing this accumulation and maintaining a steady state operation can be challenging, and requires a sound understanding of process fundamentals, process dynamics and control. This work will employ three industrial case studies on high purity methanol distillation, Propylene Oxide/ Ethyl Benzene separation and C3/C4 as the basis to identify the practical difficulties faced in industrial operations when managing the on specification operation of these type of distillation units. To this end, the shortfalls in employing classical measurement techniques such as temperature measurements and the inadequacies of classical distillation control configuration in operating these columns would be discussed. This

will be followed by the historical reasons behind the use of these measurement techniques and control structures would be discussed followed by a discussion on the relevance of these reasons with the recent advances made in both process monitoring and control domains. This work will finally present alternative process control schemes to the standard classical distillation control configurations that also takes advantage of the recent advances in measurements techniques.

Authors

Isuru A. Udugama
Technical Univeristy of Denmark

Michael A. Taube
S&D Consulting LLC

Krist V. Gernaey
Technical University of Denmark

View Related

Distillation Processes Fundamentals, Developments, and Applications I ›

Distillation and Absorption ›

Separations Division ›

Similar Abstracts

Molecular Tracking: An Alternative Computer-Aided Concept for Multi-Component Distillation Column Design

Nima Nazemzadeh, Department of Chemistry, Materials and Chemical Engineering, Politecnico di Milano, Milan, Italy, ***Isuru A. Udugama****, PROSYS, Technical Univeristy of Denmark, Kgs. Lyngby, Denmark, Jens Abildskov, Process and*

Systems Engineering Center (PROSYS), Department of Chemical and Biochemical Engineering, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark and Seyed Soheil Mansouri, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

Implementation of a Control Strategy for a Multitasking Reactive Distillation Column with an Intermediate Condenser

*Miguel E. Ortega-González[1], **Nelly Ramírez-Corona**[1], Adriana Palacios-Rosas[1] and Juan Gabriel Segovia-Hernández[2], (1)Universidad de las Americas Puebla, San Andres Cholula, Puebla, Mexico, (2)Universidad de Guanajuato, Guanajuato, Mexico*

Understanding Distillation Curves and Pseudocomponents

***Andrew W. Sloley**, Advisian (WorleyParsons Group), Houston, TX*

Design of an Automated Control System for a Continuous Distillation Column and Its Implementation into the Unit Operations Laboratory Experimental Program

*Patrick L. Mills, Dept of Chemical & Natural Gas Engineering, Texas A&M University-Kingsville, Kingsville, TX, **Alexander Jess**, Chemical & Natural Gas Engineering, Texas A&M University-Kingsville, Corpus Christi, TX and Brian West, West Automation Consulting, Newark, DE*

Process Intensification, a Promising Approach in Separating a Ternary System Using Distillation to Reduce Energy Consumption: Case Study

***Ameen AlGhamdi** and **Jagan Mohan Rallapalli**, Functional Chemicals, SABIC, Riyadh, Saudi Arabia*