

## **9e Effect of Feed Composition on the Selection of Control Structures for High-Purity Binary Distillation Columns**

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This paper discusses the selection of an effective control structure for a binary distillation column producing high-purity products. Results show that this selection depends on the feed composition. If the concentration of the light component is large, the reflux ratio is small. Control of a single appropriate tray temperature by manipulation of reboiler heat input and using a fixed feed-to-reflux ratio provides effective control for both feed rate and feed composition disturbances. Reflux-drum level is controlled by distillate flowrate. For intermediate concentrations of the light component and for high-purity products, this study shows that a two-temperature control structure with reflux and reboiler heat input manipulated is required to handle feed composition changes. Small concentrations of the light component yield small distillate flowrates and high reflux ratios. Conventional distillation control wisdom advises reflux-drum level should be controlled by reflux flowrate when the reflux ratio is larger than about two. A control structure is frequently recommended in which flowrate of the distillate is ratioed to the reflux. However, in many columns a constant-reflux ratio strategy is not effective as a constant reflux-to-feed strategy for maintaining product purity at both ends of the column in the face of feed composition disturbances when a single tray temperature is controlled. An alternative control structure is proposed in this paper that achieves the preferred constant reflux-to-feed strategy by controlling reflux-drum level with reboiler heat input and manipulating the small distillate flowrate to control a tray temperature.