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Distillation column control is widely explored in literature due to its complexity and importance in chemical and petrochemical industries. In this process, pressure represents one of the most important variables to be controlled. However, there are few studies about how pressure affects the dynamic behavior of distillation columns and most research on distillation column control involve direct manipulation of cooling fluid through the condenser. Nevertheless, such an approach demands constant changes in cooling fluid flowrates that are commonly by the order of tons per hour, which can be difficult to work or even unfeasible in a real plant. Furthermore, this strategy is usually avoided, as it can cause fouling and corrosion acceleration. The hot-vapor bypass strategy fits well as a solution for these issues, eliminating the need to dynamically manipulate cooling fluid flowrates in the condensation unit. This work presents the modeling and simulation of a conventional distillation column for the separation of water and ethanol, in which a comparative study between a conventional pressure control and a control using hot-vapor bypass was performed. The main results were obtained through dynamic simulations which considered various disturbances in the feed stream, and demonstrated superior performance by the hot-vapor bypass system over the usual scheme proposed in literature, while evaluating the Integral Absolute Error (IAE) norm as the control performance index.

Keywords: Distillation, Pressure Control, Hot-Vapor Bypass.

1. Introduction and Problem Definition

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