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Sixth International Conference on Sensitivity Analysis of Model Output

Determination of the Uncertainty Bounds of a Continuous Distillation Code: Effect of Input Variability and Model Uncertainty

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Abstract

In this work, the effect of input variability and model uncertainty on the distillate composition of a continuous distillation tower is studied. To do that, we developed a stationary distillation code by combining mass and energy balance equations with a liquid-vapor equilibrium model and tray efficiency correlations. Feed and model uncertainties were modeled by using normal and uniform distributions respectively. A Monte Carlo propagation method was used to determine the upper and lower uncertainty margins of the distillate composition. The results of the application to a methanol-water distillation showed that the model uncertainty is as high as that of the feed variability. The information can be useful for the robust design of distillation towers.

Keywords: Uncertainty analysis; Monte Carlo method; Continuous distillation

1. Main text

The configuration and operation parameters of continuous distillation units are usually optimized for a specified feed and a required distillation composition. However, the control of the operation parameters is always necessary to counteract the effects of feed variability and other influent variables like external temperature. Current designs are made using process simulators whose calculations are based on thermodynamic models and correlations. The results predicted from these models and correlations can be inaccurate when the conditions differ from those that were used to fit the model parameters. A robust design of a distillation tower considering these two sources of uncertainty could reduce the number of control actions leading to a higher energetic efficiency.

In the paper, we study the effect of input variability and model uncertainty on the uncertainty margins of the distillate composition. The case of study is the distillation of a methanol-water mixture with a methanol fraction of $x_F=0.36$ in a distillation tower of 10 trays.

Due to the impracticability of modifying the parameters of a commercial code, we developed a multi-compartment model of a distillation tower. In the model, the mass and energy balance equations for the lumped

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Experiment 1

Simple Distillation of Ethanol-Water Mixture

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Conclusion

As an overall conclusion I would say that I am very surprised that such books can be published and received at the same time so many positive feedbacks. For me there are here two critical missing parts which can really reversed the context of this book.

One thing is sure giving right to Microsoft and monopole to this company is a serious problem and diversity has to raise up. This is not by writing such favorable books which will help.

The earlier change will be made the better it will be. The recent news published <http://www.zdnet.fr/actualites/informatique/0,39040745,39387636,00.htm> showed clearly that things are moving in this field (the deactivation of Internet Explorer will be possible on new computers) but I guess it is one more time a bit too much in favor of Microsoft. When will it be the time when going to your vendor you could choose "à la carte" what you want in your computer and that you do not want.

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