

## Advanced Design of Experiments (DOE) Tools to Achieve Optimal Formulations

Short Course for the 2017 Sink or Swim Technical Symposium of the Cleveland Coatings Society

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### Abstract

In this short course, learn state-of-the-art tools for design and analysis of experiments on mixtures, including ways to incorporate process factors, categorical factors and hard-to-change variables. Gain an appreciation for statistically optimal designs and modeling methods that point the way to a "sweet spot" where you meet all your specifications at minimal cost. The techniques presented are very high level, but by laying them out via case studies from the coatings industry, the concepts will be readily grasped and appreciated by technical professionals.

The details: starting with a brief review of mixture designs as the proven method for making breakthrough improvements in cost and performance, we then engage in a discussion of the essential elements to create successful designed experiments. Via a case study, learn how mixture-process combined designs are used as a sophisticated tool to optimize both formulation and processing factors.

Experimenters recognize that the nemesis of easily-run designed experiments is complete randomization of all the runs! Discover how state-of-the-art split-plot designs can be used to reduce both the time required and the costs of experimentation and yet still achieve statistically valid results, leading to increased business profits. We will wrap up this high-impact short course by discovering how to design and analyze split-plot designs for combined mixture-process work.

### Outline

- Why use mixture designs for formulation?
- Mixture DOE keys to success
- Incorporating amounts and/or numerical factors and/or categorical variables
- Making DOE easier thru split-plot designs
- Integrated throughout the short course: real-life success stories!