Contribution ID: **78** Type: **not specified**

Broadening the Spectrum of OMARS Designs

Tuesday, 12 September 2023 16:40 (20 minutes)

The family of orthogonal minimally aliased response surface designs or OMARS designs bridges the gap between the small definitive screening designs and classical response surface designs. The initial OMARS designs involve three levels per factor and allow large numbers of quantitative factors to be studied efficiently. Many of the OMARS designs possess good projection properties and offer better powers for quadratic effects than definitive screening designs with similar numbers of runs. Therefore, OMARS designs offer the possibility to perform a screening experiment and a response surface experiment in a single step, and the opportunity to speed up innovation. The initial OMARS designs study every quantitative factor at its middle level the same number of times. As a result, every main effect can be estimated with the same precision, the power is the same for every main effect, and the quadratic effect of every factor has the same probability of being detected. We will show how to create "non-uniform-precision OMARS designs" in which the main effects of some factors are emphasized at the expense of their quadratic effects, or vice versa. Relaxing the uniform-precision requirement opens a new large can of useful three-level experimental designs. The new designs form a natural connection between the initial OMARS design, involving three levels for every factor and corresponding to one end of the OMARS spectrum, and the mixed-level OMARS designs, which involve three levels for some factors and two levels for other factors and correspond to another end of the OMARS spectrum.

Keywords

DOE, RSM,

Classification

Mainly methodology

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Session Classification: CONTRIBUTED Special Session: Design of Experiments

Track Classification: Design and analysis of experiments