The Stat Teaser

(News of value for statistical experimenters)

Stat-Ease, Incorporated **Page 1 of 2** **Winter 1993**

Surging Enrollment Seen for Workshops

The California **Experiment Design Made Easy** presented in January proved popular, as attested by a full house of DOE students. If you missed out on this opportunity, attend the next presentation in Minneapolis on February 23-26. Enjoy Minnesota's winter wonderland, or if you don't like cold, explore the world's largest indoor mall.

Seats also remain for the **Advanced Experiment Design** workshop in Minneapolis on March 16-19. Students will use the new version of DESIGN-EXPERT software (see related article) to study simulated processes with advanced factorial techniques or response surface methods (RSM).

DESIGN-EXPERT version 3 will also be used in the next **DOE for Formulators** workshop scheduled for April 13-16. Attendees will learn the latest techniques to optimize mixtures.

Call Bonnie today at **800/325-9816** (direct line: 612/378-9449) to sign up. The cost of $995 includes text, notes and lunches.

DESIGN-EASE Named One of 5 Best by Scientific Computing Magazine

Scientific Computing and Automation magazine reported in their December issue that DESIGN-EASE ranked as one of the top five math/statistical software packages in 1992.

Version Three of DESIGN-EXPERT Makes Optimization Easier Than Ever

DESIGN-EXPERT software users jumped at the chance to get their hands on the new version 3, just released this past Fall. The upgrade provides a fabulous array of

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"I am really impressed with this new version [especially the feature of] desirability function."

- E. Oberrauch, Switzerland

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rotatable 3D graphs, as well as a nifty numerical optimization. Multiple responses can be optimized simultaneously by use of desirability functions.

DESIGN-EXPERT version 3 offers many other new features including mouse support, interactive 2D contour plots, trace plots and hypertext help.

This advanced DOE package for RSM and mixture designs retails for only $795. Purchase DESIGN-EXPERT on approval for a free 30 day trial.

Call us at **800/325-9816** (direct line: 612/378-9449) to place your order. Give DESIGN-EXPERT a try!

Bring Stat-Ease Expert in for Talk on Optimization

For a limited time, Stat-Ease offers to make a two hour presentation on entitled "Simultaneous Optimization of Multiple Responses". Learn how to use desirability functions for discovery of the ideal tradeoff within your window of operability. For more details contact Mark Anderson at 612/378-9449.

Thumbnail Handbook for Factorial Design Available

Software purchasers who send in their registration card now get a free copy of Stat-Ease's "Thumbnail Handbook for Factorial DOE", a collection of checklists and rule-of-thumb for design of experimenters. By popular demand, we now make this available for $1 per copy or $10 per dozen.

Mark Anderson and Alan Collins (QD Consulting UK) show Stat-Ease software to European computer users.

STAT-EASE® INC.

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2021 East Hennepin Ave, #191, Minneapolis, MN 55413

Statistical Design of Experiments Made Easy as Popping Corn

DESIGN-EASE software makes statistical design of experiments (DOE) as easy as making microwave popcorn. There's no excuse any more for taking a trial and error approach. To illustrate, let's look at an experiment on popcorn that I recently conducted at home. As in most processes, the prime objective is to maximize yield, in this case by reducing the residual of unpopped kernels.

The first step is to identify possible factors that could affect yield. I enlisted my son and daughter and conducted a free-wheeling brainstorm. We came up with many ideas but finally narrowed it down to five prime candidates: preheat, time, temperature, brand, and elevation. After a few range-finding trials, we then set low and high levels for an experiment.

With the help of DESIGN-EASE® software from Stat-Ease, I set up a two-level fractional factorial experiment. The program laid out a statistically desirable array of combinations of the low and high levels, for a total of 16 runs. I added 4 replicates of base line conditions to provide an estimate of pure error. The twenty factor combinations were then randomized and printed on to a run sheet. Randomization insures against lurking variables, such as changes in the environment, which otherwise could confound the results.

Using the DESIGN-EASE "recipe" sheet as a guide for setting factor levels, we made twenty bags of microwave popcorn. The unpopped kernels were weighed on a postal scale and recorded on the sheet. For a second response, we rated the taste of the popped corn. It took all weekend, a tolerant wife, and lots of neighborhood kids over to eat the product, but we finally completed the experiments.

I then entered the results in the response editor of DESIGN-EASE software. The program calculated the effect that each factor had on the two responses. It also calculated interactions of effects, such as time versus temperature. After reviewing the analysis of variance (ANOVA), and looking at various graphical outputs provided by the program, I came to the following conclusions:

1. Preheat has no effect. To save time, eliminate this step.
2. On our microwave, high temperature setting works best.
3. On our microwave, a time of 4 minutes worked best.
4. Elevating the bag off the floor of the microwave significantly improved yields.
5. The more expensive brand of popcorn gave best results.

As a result of this experiment, we reduced unpopped kernels by 80 per cent, a major gain in yield. We also improved the taste.

The same approach can be applied to any process problem, at home or at work. By systematically varying candidate factors in a statistically desirable way, you can greatly increase the efficiency of experimentation. More importantly, you will establish validity for your results so you can move forward with confidence. DESIGN-EASE makes it as easy as popping corn!

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