The Stat Teaser

DESIGN-EASE Tossed in Window (Mac too)

News flash! Just before this newsletter went to press, Stat-Ease programmers threw the disk and manuals for DESIGN-EASE version 3 "over the wall" for production. The program now runs beautifully on Windows and the Macintosh. It provides the same features as the existing DESIGN-EASE version 2 for DOS (which still will be sold), but with all the advantages that come with the graphical user interface, such as cut and paste to technical reports.

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"DESIGN-EASE V3 is vastly superior."
Mark Bruce
Wadsworth Labs

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Notices to users will be going out soon, but don't let this hold you up. Orders are now being taken for new packages ($395) or upgrades from users of DOS versions ($195 or less - depending on age of serial number).

DOE Success Story from *Quality in Manufacturing*

Tool Products of Plymouth, Minnesota reduced defects on diecast aluminum housing from 15 percent down to near zero. They used DESIGN-EASE to set up a series of factorial experiments. These led to break-through process improvements.

Editors from QM and other publications want more stories like Tool Products'. Contact Mark Anderson at 612-378-9449 (or by E-Mail to **Compuserve 72103,1436**) if you have a success story to tell about use of DESIGN-EASE/DESIGN-EXPERT. In addition to providing inspiration for potential experiment designers, published case studies offer a chance for positive publicity to you and your company.

DESIGN-EXPERT Version 4 Takes Regression A Step Forward and Backward - Automatically

Stat-Ease now produces a new version of DESIGN-EXPERT that offers powerful enhancements:

• Backward, forward or stepwise regression to automatically simplify your predictive models

• Correlation matrix to allow you to evaluate any design for potentially harmful aliases between input variables

• Simulation capability so you can set up realistic training models

• An equation-only feature you can use to take cost (and/or empirical functions) into account along with the experimental responses

• Multiple linear mixture constraints for complex formulations.

The unique ability of DESIGN-EXPERT to aid product formulators now becomes even more pronounced with the addition of mixture screening designs for up to 24 components. The program provides in-depth designs for 12 mixture components or 10 process factors.

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"DESIGN-EXPERT V4 is top-notch."
PLASTICS magazine
3/94 Software Review

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Those of you who use versions 1, 2 or 3 of DESIGN-EXPERT must act now to take advantage of special offers for upgrade to Version 4. New users are also urged to take advantage of this powerful package for response surface optimization (list price: $795).

Call Stat-Ease at **800-325-9816** (direct line 612-378-9449) to get cost details and place your order. To upgrade, you must provide the serial number for an older version. Give DESIGN-EXPERT version 4 a try. There's no risk. Return it within 30 days at no charge if you are not completely satisfied.
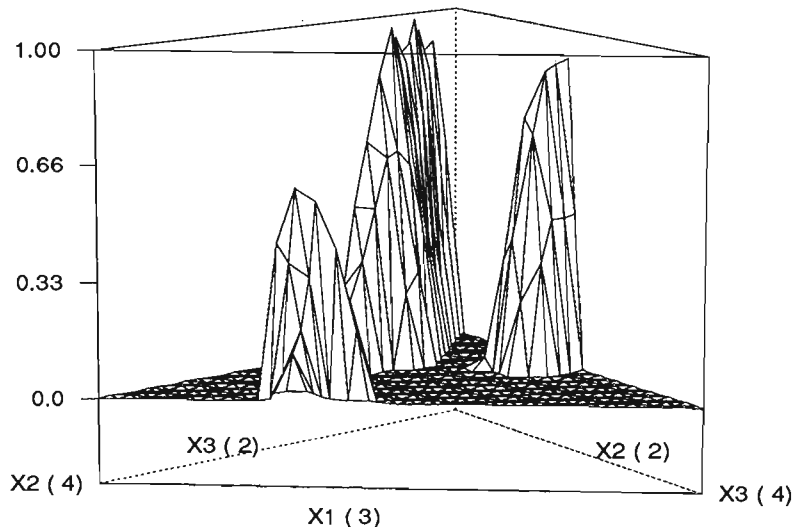
Desirability analysis from DESIGN-EXPERT shows how multiple responses can be simultaneously optimized.

Paper Clip Experiment Illustrates Statistical Design Principles

Breaking paper clips provides marvelous therapy for any number of problems: boredom, frustration, anger, or whatever. So it comes as no surprise that students enjoy doing in-class tests of clip strength.

Stat-Ease presents this exercise in their Experiment Design Made Easy workshops. The experiment builds understanding of variation and how it can be handled with simple comparative designs. For teaching purposes it works best if each student breaks two brands of clips. This provides data for a paired t-test, blocking out variability due to the tester. The procedure is shown below.

1. Randomly choose clip.

2. Gently pull it apart with the big loop on the right. The angle affects performance, so be precise.

3. Move the smaller loop of the clip to the edge of the table (the big loop should now overhang).

4. Hold the small loop down firmly with your left thumb. Grasp the big loop between right thumb and forefinger. Then bend the big loop straight up and back. (This angle also affects performance, so be precise). Continue bending the big loop back and forth until it breaks. Record the count for each clip. (Each back and forth movement counts as 2 bends.)

In the process of developing this exercise, several brands were tested (results shown in parentheses):

•WT Rogers #1 nickel (6,8,9,12, 18,3,9,13,7,4,7,9,8,11,8)

•Baumgardens #1 Golden (8,3,8, 10,7,8,8,10,10,4,11,8,9,6,11)

•Omni #1 Gem (4,28,12,12,27,1, 13,17,8,14,1,16,10,12,6)

•Acco #1 World (21,27,24,25,26, 25,20,28,27)

Analysis from DESIGN-EASE confirms what you can see from the raw data: the ACCO clips clearly outperform all the others. (If you have the software, you can verify this by entering data in a One-Factor design and computing the ANOVA. The new version 3 for Windows and Mac adds a very useful feature: post-ANOVA pairwise t testing.)

The first three brands all incorporate a metal plating that looks nice but reduces strength. (Non-skid clips also were considered, but the notches weaken them so much that they usually break on the first bend.)

After reviewing this data, Stat-Ease settled on the Rogers (nickel) and Baumgarden (gold) clips for its in-class experiment. (The Omni clips varied too much. The Acco clips performed too well - it takes too much work to break them.)

Several series of paired tests have been conducted so far with 10 to 20 students each. The results consistently favor the Rogers clip by a slight margin over the Baumgardens. The difference is so small that it will be obscured if each student tests only one clip. But by having each person test both clips, an example of blocking, a clear difference often emerges.

Stat-Ease finds the paper clips exercise to be a useful element in it's DOE workshops. It nicely illustrates how statistical design and analysis of experiments can overcome variation. Plus the materials fit in a pocket!

Is all this data on lowly paper clips making you tense and irritable? That's easily remedied. Grab a clip and break it into little pieces. By the way, could you get a count on that?

Mark J. Anderson

(The next Experiment Design Made Easy workshop will be held in Minneapolis on September 13-16. For a complete schedule on all workshops, including Response Surface Methods for Process Optimization as well as Mixture Design for Optimal Formulation, call Stat-Ease at 800-325-9816 (or direct at 612-378-9449).)