SAGATA
business statistics

Sagata® DOE Toolset

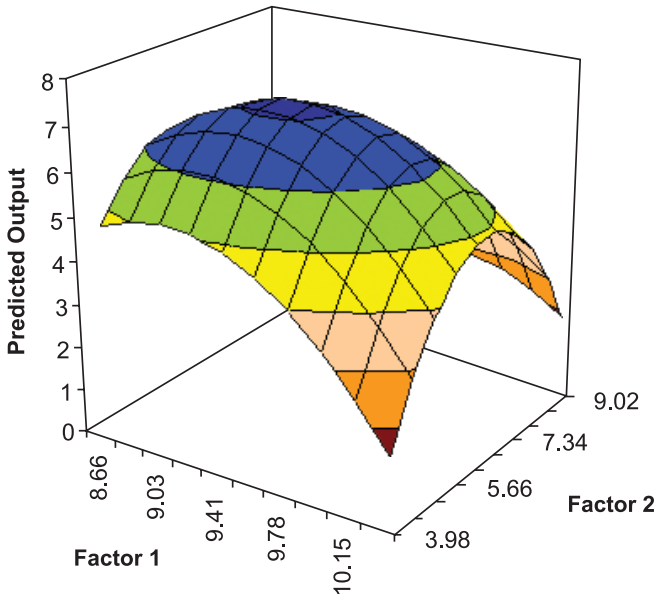
Easy-to-Use Powerful Design
of Experiments Software

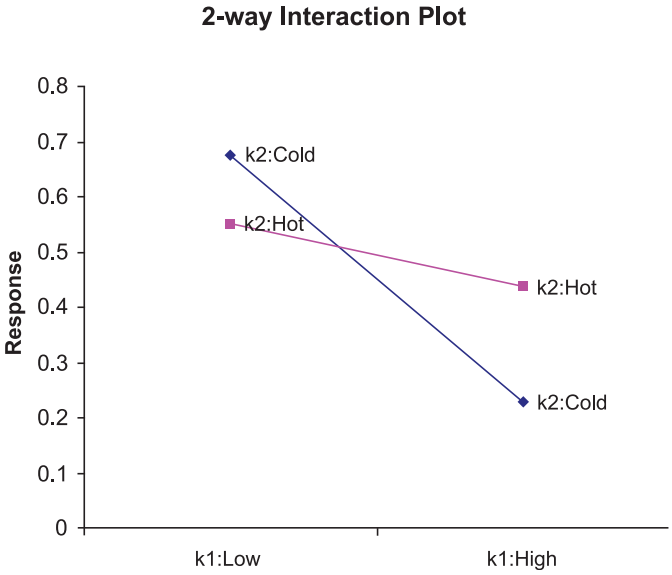
Sagata® DOE Toolset

[Overview]

Design of experiments (DOE) methods help improve products and processes. Experimenters perform specially planned tests, analyze results, and improve systems.

- Using fractional factorial, it is possible to prove which settings improve quality and reduce cost.
- Through **response surface methods (RSM)** it is possible to thoroughly optimize addressing interactions.





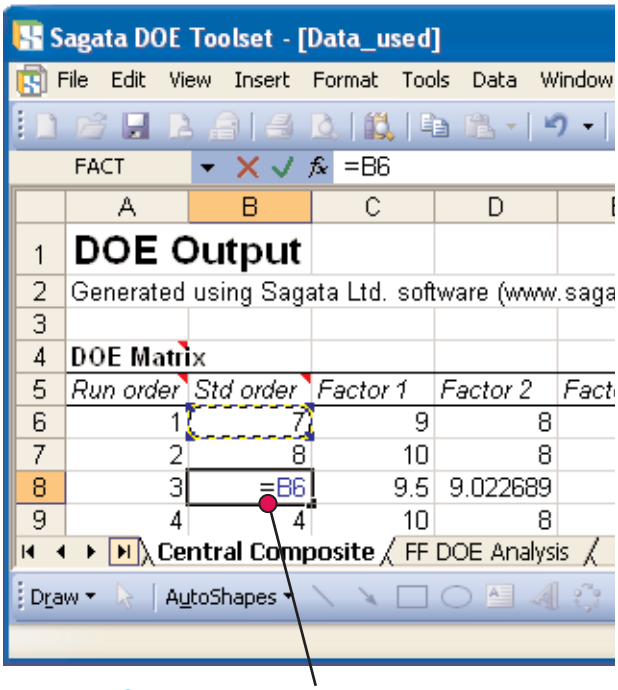
This brochure overviews many of the functions of **Sagata® DOE Toolset**:

- Working with Data
- Fractional Factorials
- Response Surface Methods
- Regression
- Help & Support
- Standard vs. Pro Versions.

For additional information, see www.sagata.com or contact us at info@sagata.com.

System Requirements:
Microsoft® excel 2000/2003 or higher
Windows® 2000/XP or higher

Familiarity of Microsoft® Excel



Fully functional Excel spreadsheet

- **Import, Export,** and Save As… options permit easy transfer of data and results between Sagata software and Microsoft® Excel.
- **Copy** and **Paste** enable portability to all Windows-based programs.

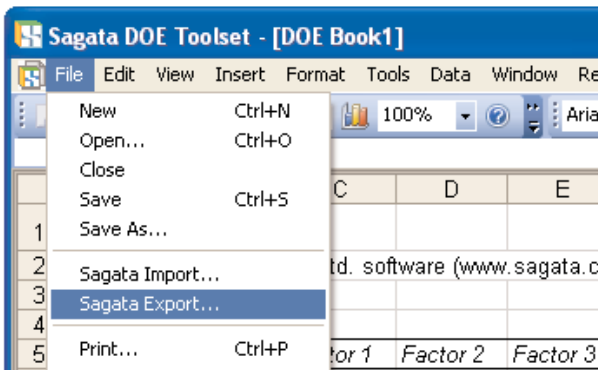
DOE users include thousands of engineers, marketers, and scientists who apply DOE to predict how their actions will affect business outcomes.

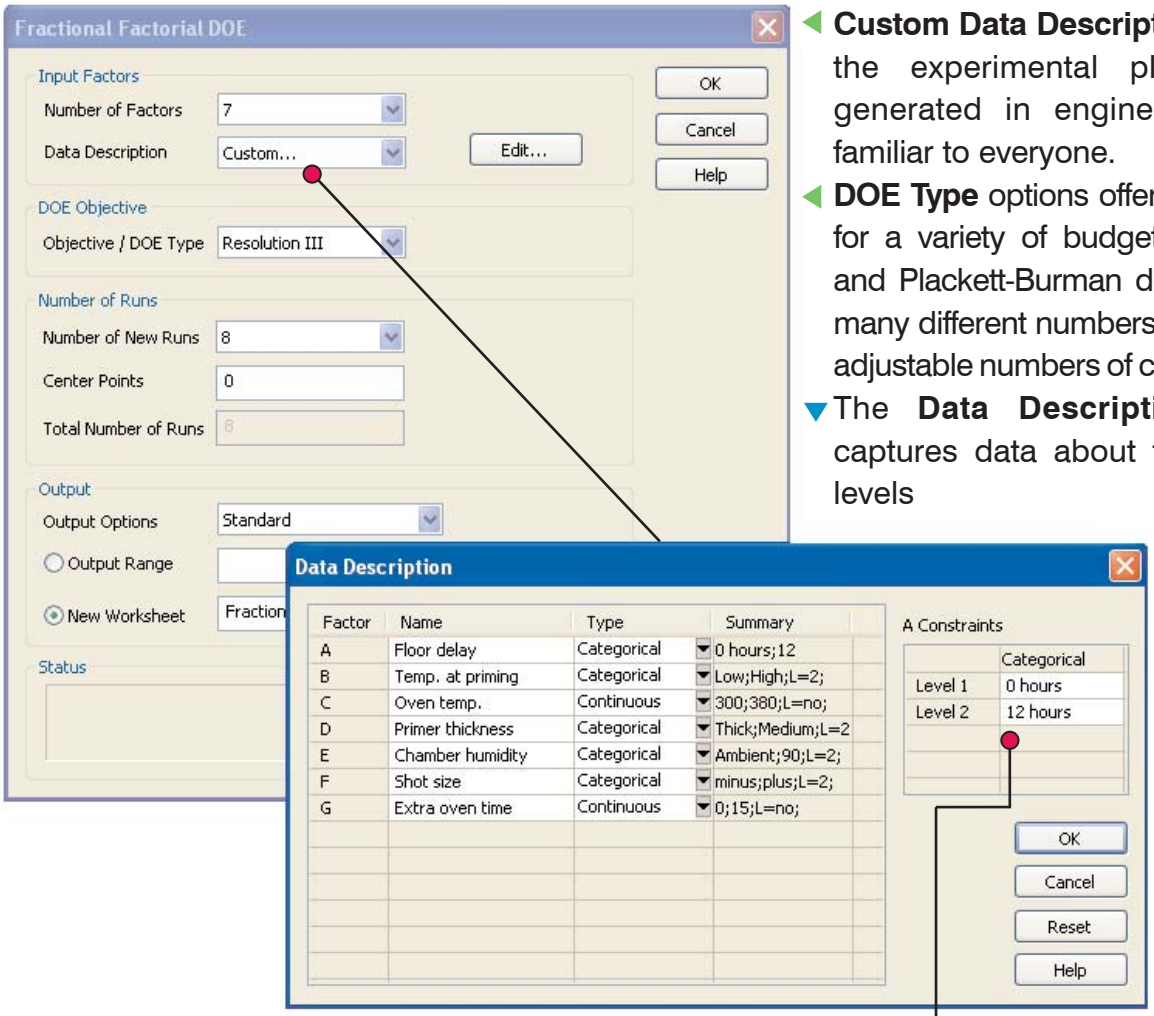
Generally speaking, these professionals:
(1) Have limited time to learn new software
(2) Need enough power to get the job done.

Comfort is the reason we utilize the Microsoft® Excel spreadsheet interface. That way, most users already know how to use their favorite Excel features.

Power derives from our features not found in current DOE packages. Our users tell us they need these to get the job done.

Unique include interactive plots to identify important factors in screening experiments, 3D Plot Engine, Prediction Engine, qualitative or categorical inputs in DOE and Regression, stepwise variable selection using PRESS cross-validation, and EIMSE optimal designs with fewer runs than standard arrays.

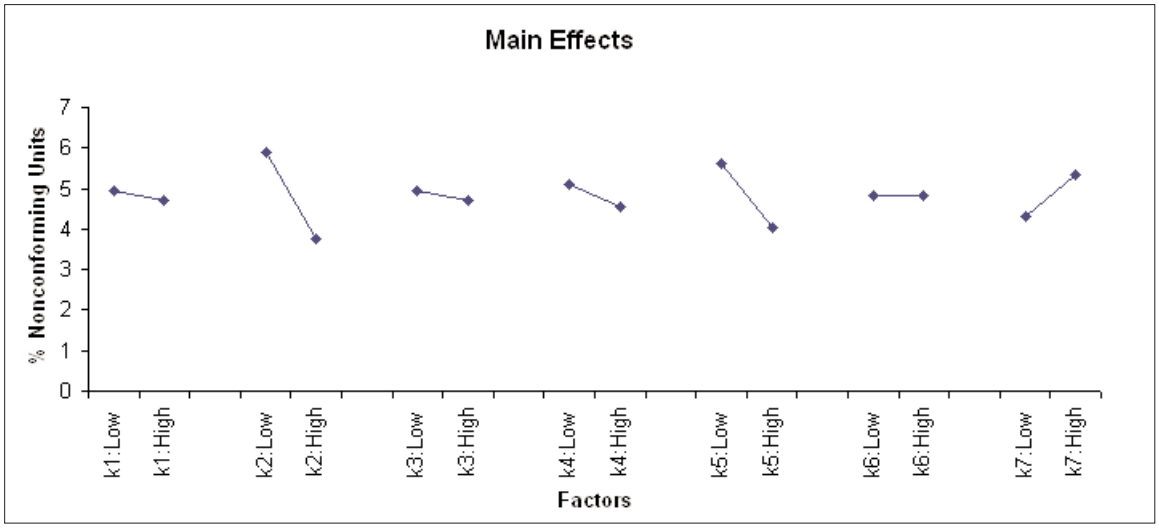




- **Custom Data Description** permits the experimental plan to be generated in engineering units familiar to everyone.
- **DOE Type** options offer alternatives for a variety of budgets. Regular and Plackett-Burman designs have many different numbers of runs and adjustable numbers of center points.
- The **Data Description** dialog captures data about factors and levels

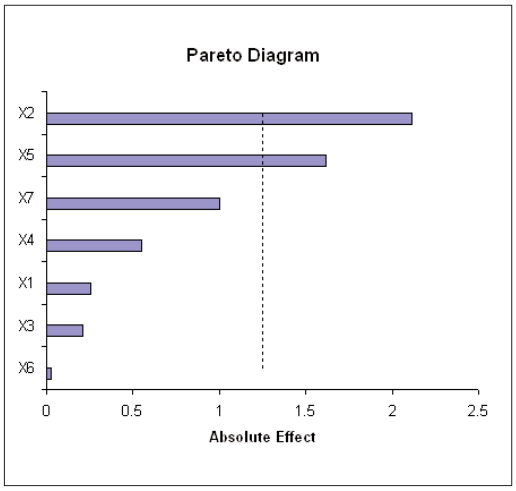
- **DOE Matrix** is output using a standard spreadsheet format.

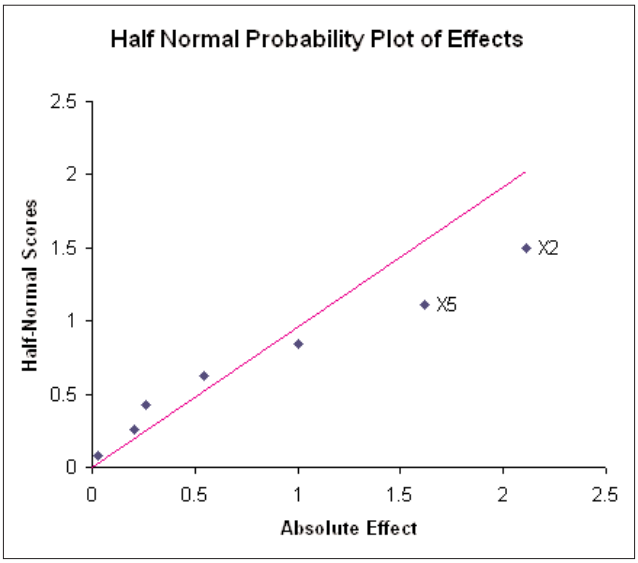
1	**DOE Output**									
2	Generated using Sagata Ltd. software (www.sagata.com)									
3										
4	**DOE Matrix**		*A*	*B*	*C*	*D*	*E*	*F*	*G*	
5	*Run order*	*Std order*	*Floor delay*	*Temp. at p*	*Oven temp*	*Primer thic*	*Chamber h*	*Shot size*	*Extra oven*	*Y*
6	1	7	0 hours	High	380	Thick	Ambient	plus	0	8.6
7	2	8	12 hours	High	380	Medium	90	plus	15	1.7
8	3	4	12 hours	High	300	Medium	Ambient	minus	0	8.8
9	4	1	0 hours	Low	300	Medium	90	plus	0	6.6



- **Main Effects Plots** show predictions of the fitted model with each factor varied and the others averaged over.

- **Pareto Diagram** output clarifies which factors are significantly driving changes in the output response being measured.



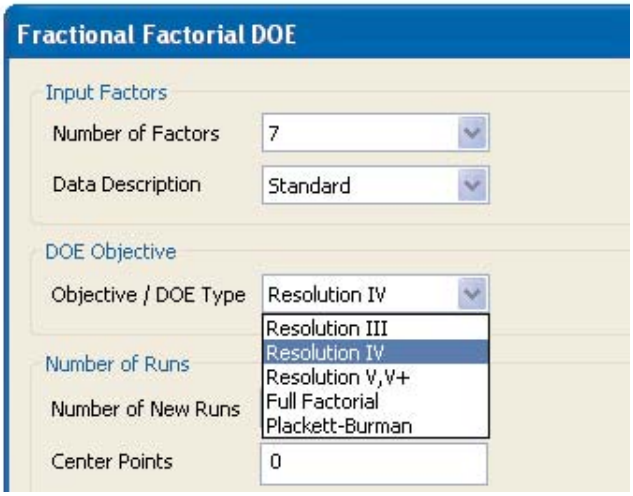


- **Half Normal** and Normal Probability Plots permit subjective evaluation of which effects are significant.

- **ANOVA** output (not shown) permits lack of fit checking and hypothesis testing.

[Advanced Features]

- **Objective/DOE Type** options permit custom selection of the extent of effect confounding familiar to advanced users.



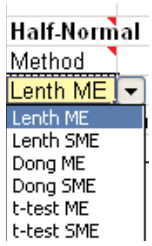
- **Effect p-values** are a unique feature that is based on the well-known "Lenth's Method". They provide significance information analogous to standard regression p-values.

Effects

Term	*Effect*	*Coefficient*	*p-value*
const		-0.50	
Factor 1	1.50	1.50	0.41
Factor 2	1.00	1.00	0.56
Factor 3	0.00	0.00	1.00
Factor 4	0.00	0.00	1.00
Factor 5	-1.00	-1.00	0.56
Factor 6	11.50	11.50	0.01
Factor 7	1.50	0.10	0.41

Note: p-values are calculated based on Lenth's ME value

- **Method** options in the interactive output permit the users to explore alternative testing techniques.



- **Power Rate** tables provide information about effect detection probability estimates before experimentation. These estimates provide an indication whether the planned runs meet the experimenters criteria.

Power at 0.05 Type 1 Error Rate

Term	*1/2 stddev*	*1 stddev*	*2 stddev*
A	0.10	0.24	0.70
B	0.10	0.24	0.70
C	0.10	0.24	0.70
D	0.10	0.24	0.70
E	0.10	0.24	0.70
F	0.10	0.24	0.70
G	0.10	0.24	0.70

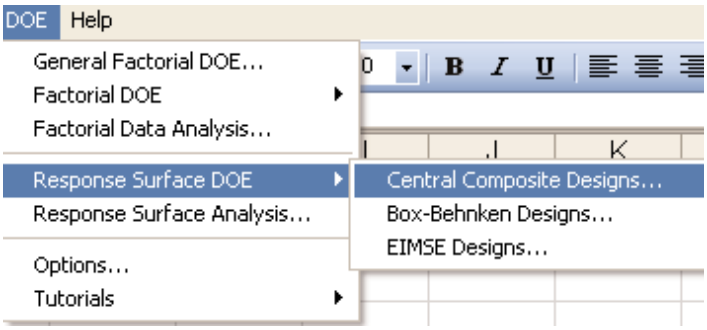
- **Alias Table** shows which effects are indistinguishable from one another.

Alias Table

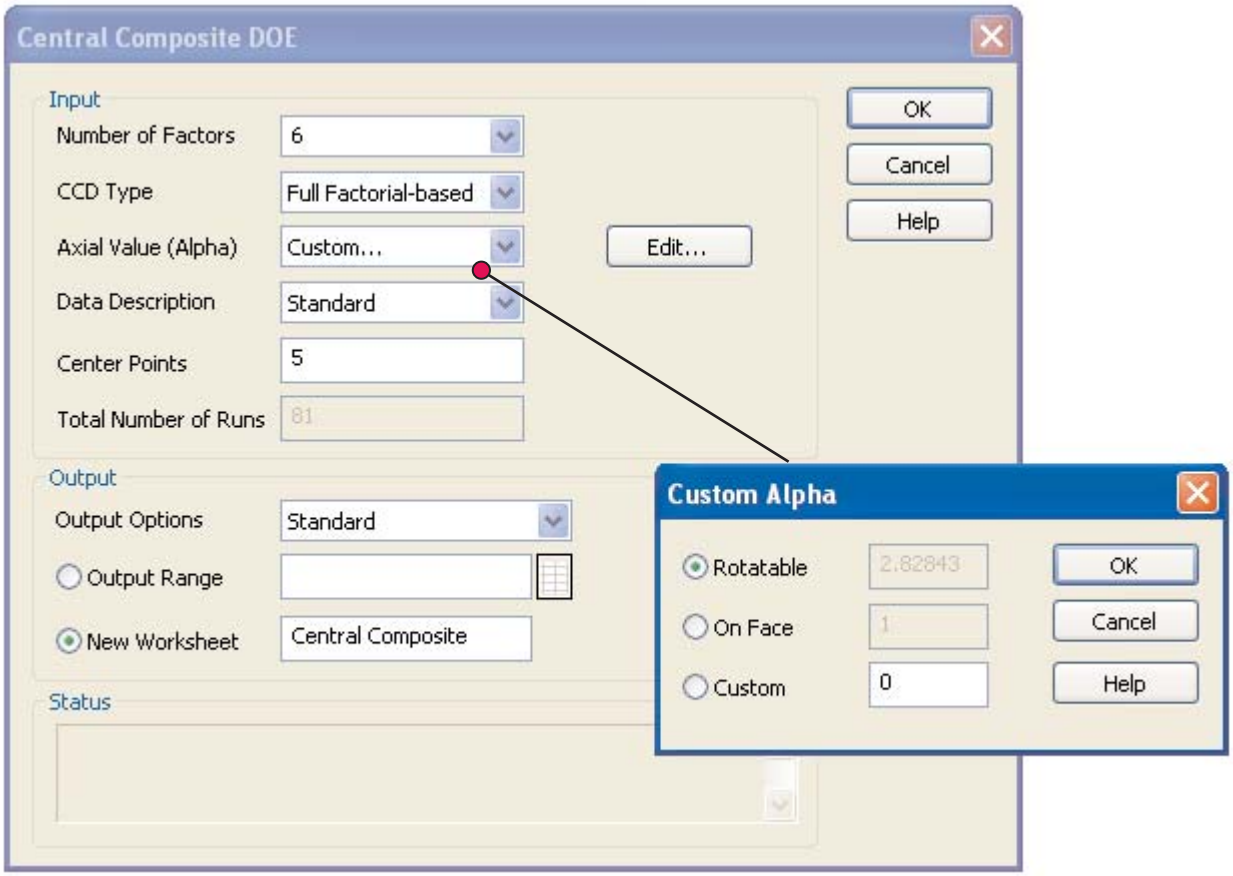
Alias groups of primary interest

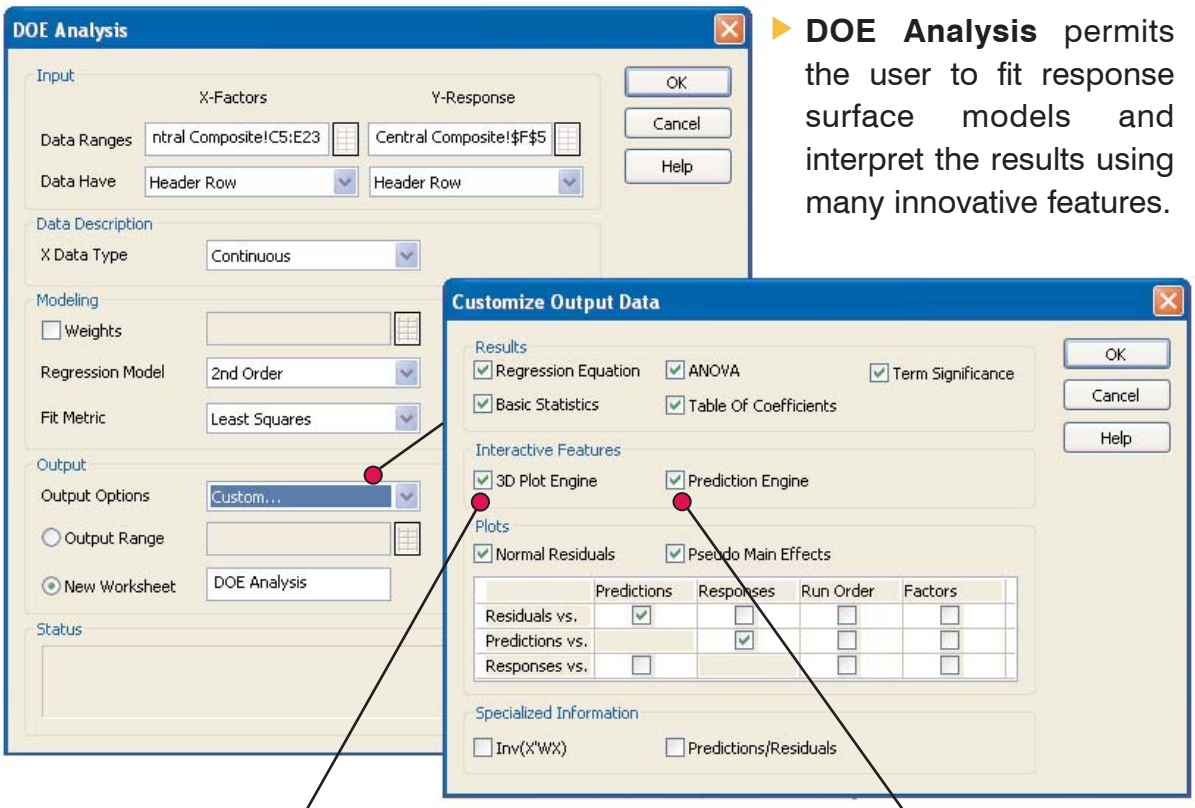
I = ABCE = ABFG = ACDG = ADEF = BCDF = BDE
A = BCE = BFG = CDG = DEF = ABCDF = ABDEG
B = ACE = AFG = CDF = DEG = ABCDG = ABDEF
C = ABE = ADG = BDF = EFG = ABCFG = ACDEF
D = ACG = AEF = BCF = BEG = ABCDE = ABDFG
E = ABC = ADF = BDG = CFG = ABEFG = ACDEG
F = ABG = ADE = BCD = CEG = ABCEF = ACDFG

- **Response Surface DOE** options include Central Composite Designs, Box-Behnken Designs, and EIMSE Designs giving a wide variety of number of experimental runs versus accuracy trade-offs.

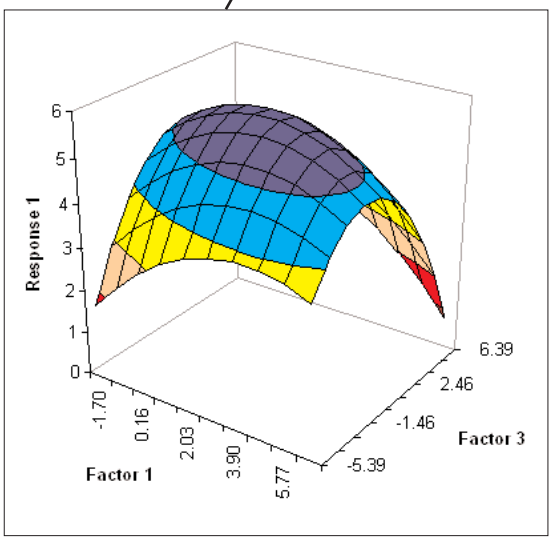


- **Central Composite DOE** options include various types of fractionation offering additional options. Also, by adjusting the custom alpha level, specific level settings of interest can be selected.





DOE Analysis permits the user to fit response surface models and interpret the results using many innovative features.

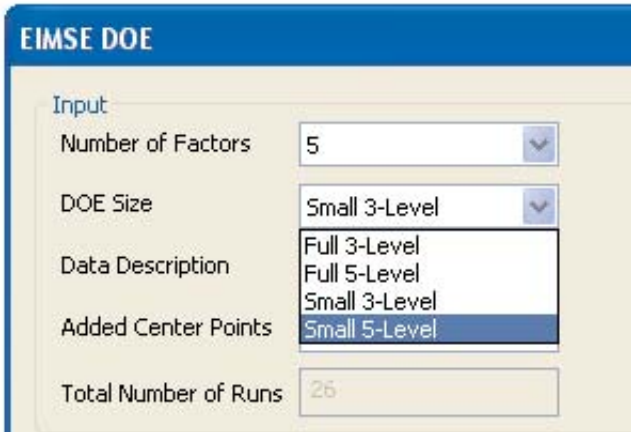


Prediction Engine (for Y)			
Prediction	5.428109		
Error	0.799136		
Variable	*Low*	*High*	*Fixed*
Factor 1	-1.70448	6.704482	3
Factor 2	0.613725	12.38627	7
Factor 3	-5.38627	6.386275	2

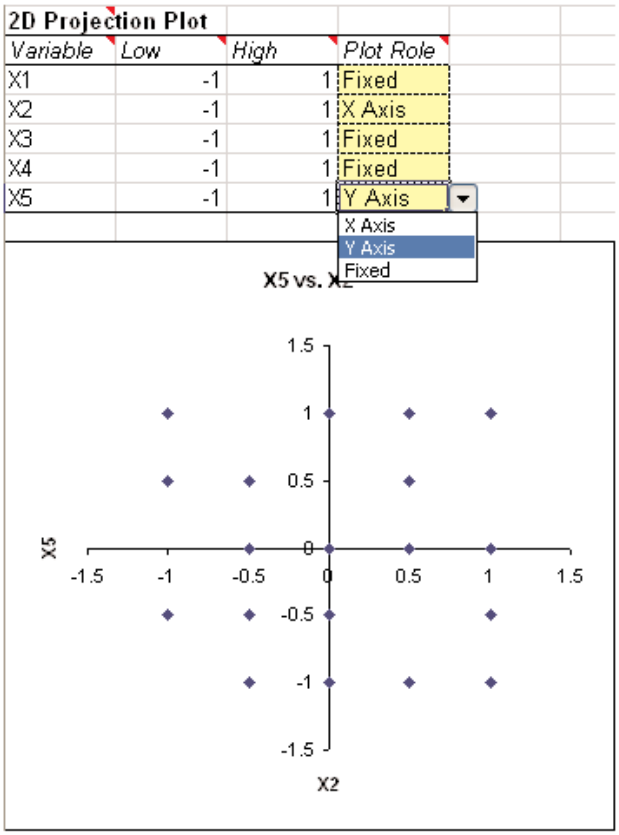
Prediction Engine generates predictions based on the model for values that the user can change.

3D Plot Engine shows the model predictions and permits interactive real-time selection of the axis factors.

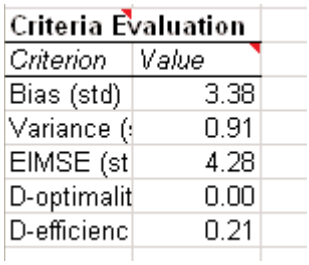
- **EIMSE DOE** options provide experimental array options with far fewer runs than standard response surface designs.



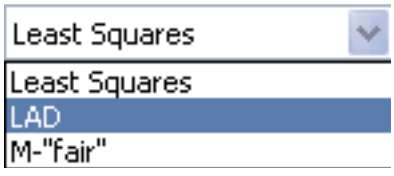
- **2D Projection Plots** help advance users study the properties of the array they are considering before costly investments in experimentation.



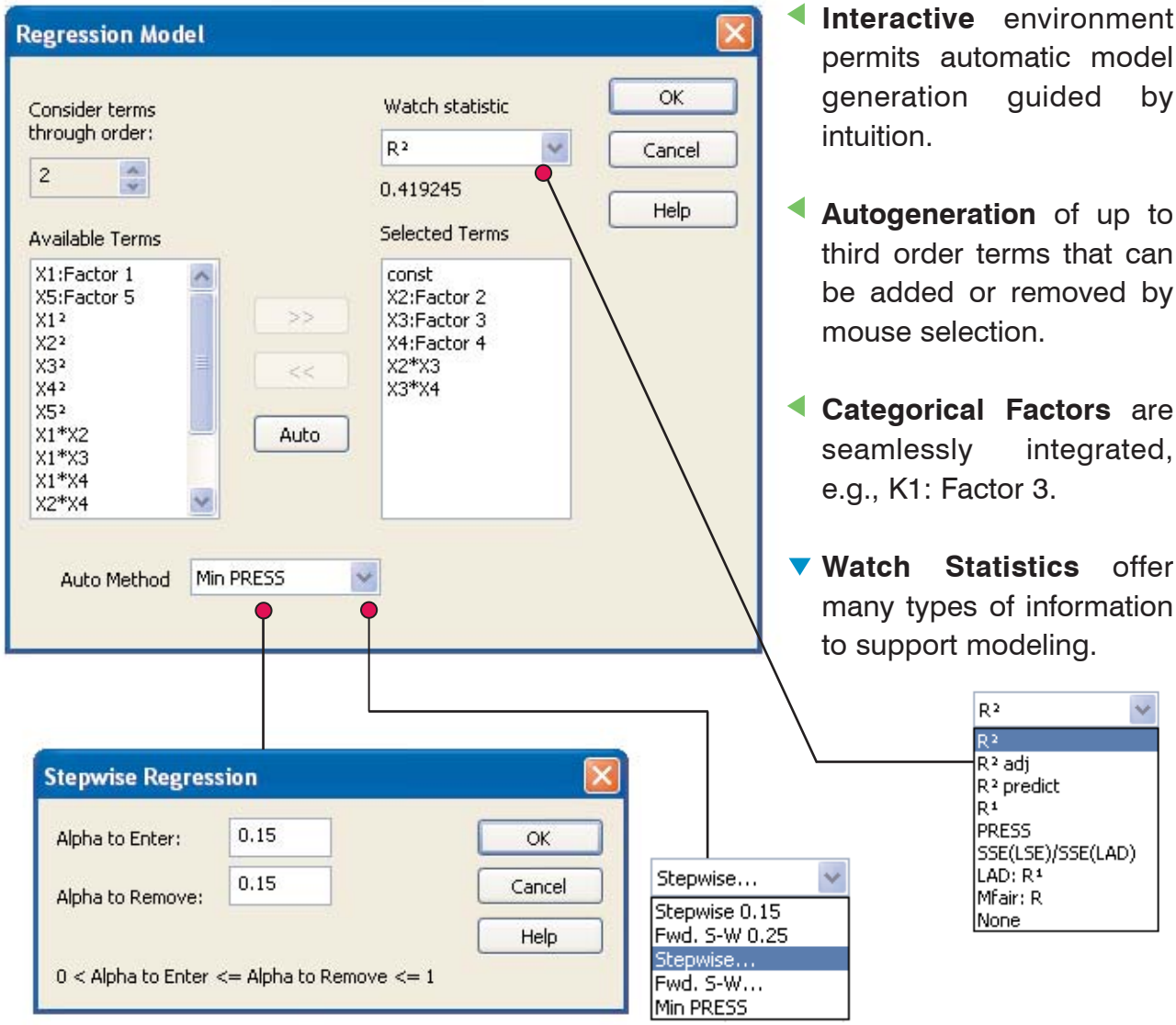
- **Criteria Evaluation** data help the user assess whether the experimental array being considered is likely to foster the desired level of prediction accuracy.



- **Least Absolute Deviation** (LAD) options permit the fitting of response surface models in a way that can mitigate the effects of any outliers or untrustworthy observations.



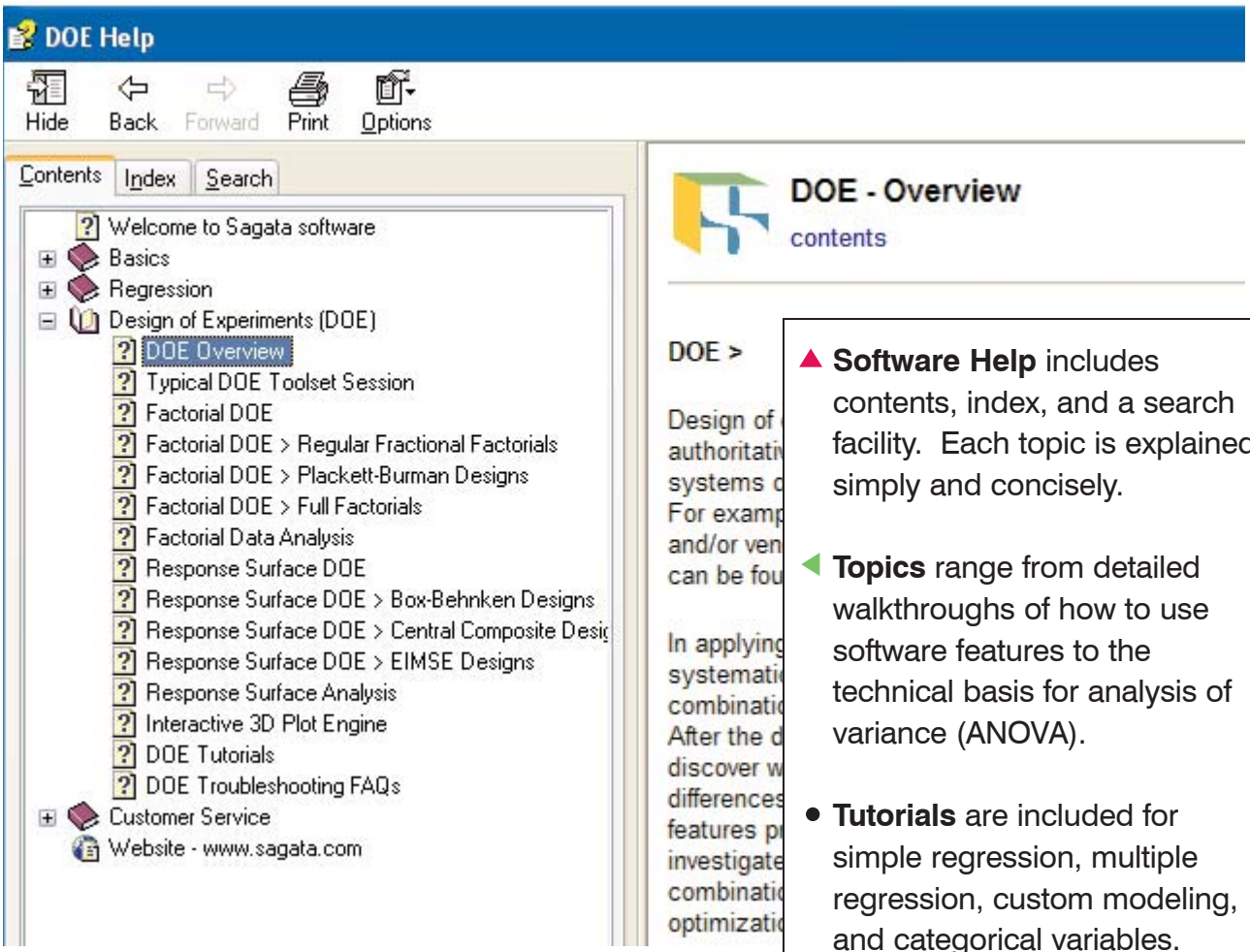
[Regression]



- **Interactive** environment permits automatic model generation guided by intuition.
- **Autogeneration** of up to third order terms that can be added or removed by mouse selection.
- **Categorical Factors** are seamlessly integrated, e.g., K1: Factor 3.
- **Watch Statistics** offer many types of information to support modeling.

- **Stepwise Regression** permits automatic model generation. Options include forward, backward, and standard searches.
- **Min PRESS** automodeling gives the ease of an automatic model search with the comfort of knowing derived models are supported by cross-validation

[Help & Support]



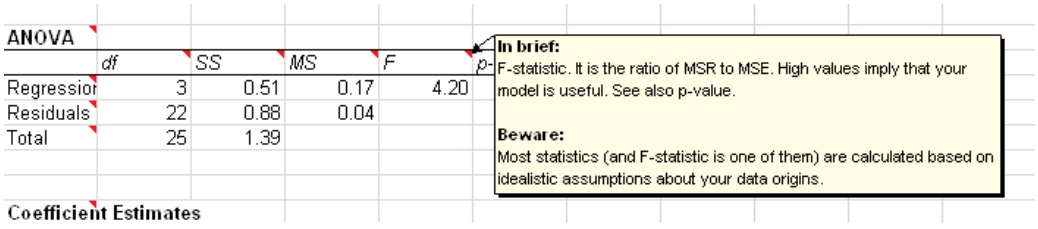
▲ **Software Help** includes contents, index, and a search facility. Each topic is explained simply and concisely.

◀ **Topics** range from detailed walkthroughs of how to use software features to the technical basis for analysis of variance (ANOVA).

● **Tutorials** are included for simple regression, multiple regression, custom modeling, and categorical variables.

▲ **Updates, FAQs, and Contact** information on the website: www.sagata.com

▼ Comments interpret cells in in the output providing both technical formulas and intuitive explanations.



Sagata®

[Product Matrix]

- **Precision Checker** is a proprietary technique to avoid misleading model fits from poor data.
- **Interactive Model Generation** lets the user test alternative models and apply stepwise regression.
- **3D Plot Engine** permits interactive visualization of the fitted model.
- **Prediction Engine** lets the user explore "what if" predictions based on their fitted model.
- **MinPress** is a stepwise method to maximize the a cross-validation statistic PRESS.
- **Data Weighting** lets the user insert information about the trustworthiness of certain data.
- **Efficient Data Processing** uses our fastest C++ code for automatic model generation.
- **Fit Metrics: Robust Regression** lets the user derive coefficients that are less likely to be influenced by outliers or small amounts of untrustworthy data.
- **Qualitative/Categorical Factors** are independent variables that take on non-numerical values.
- **Regular Fractional Factorials** and Plackett-Burman Designs help users perform few test runs and study many factor simultaneously.
- Analysis of Factorial Designs **permits** testing many factors simultaneously for significance.

Feature / Product	Sagata Regression Standard	Sagata Regression Professional	Sagata DOE Toolset*
Microsoft® Excel Interface	✓	✓	✓
Precision Checker	✓	✓	✓
Interactive Model Generation	✓	✓	✓
3D Plot Engine	✓	✓	✓
Prediction Engine	✓	✓	✓
Efficient Data Processing	✓	✓	✓
Data Weighting		✓	✓
Min PRESS Stepwise		✓	✓
Fit Metrics: Robust Regression		✓	✓
Qualitative/Categorical Factors		✓	✓
Design of experiments (DOE)			✓
DOE: Regular Fractional Factorials			✓
DOE: Plackett-Burman Designs			✓
Analysis of Factorial Designs			✓
DOE: Central Composite Designs			✓
DOE: Box-Behnken			✓
DOE: Small Response Surface EIMSE			✓
DOE: Large Response Surface EIMSE			✓
Analysis of Response Surface Data			✓

** Comment: with the release of Sagata DOE Toolset Pro the current DOE Toolset features will be the core of Sagata DOE Toolset Standard.*

- **Central Composite and Box-Behnken Designs** help users study factors thoroughly including interactions and diminishing returns.
- **EIMSE Designs** help users study the factors thoroughly for a variety of numbers of runs.
- **Analysis of Response Surface Data** give many options for thoroughly studying factor effects and optimization.