

## The Magnificent Seven in DX11

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– Shari

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Presented by Shari Kraber, Statistical Consultant  
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## Stat-Ease, Inc.

- Provider of DOE software, training & consulting
- Founded in 1982
- Headquartered in Minneapolis, MN USA near the University of Minnesota
- Employs over a dozen professionals plus a worldwide network of resellers
- Mission is “Statistics Made Easy”
- Honored multiple times by American Society of Quality (ASQ) Chemical and Process Industries Division with the Shewell Award, recognizing excellence in presentation, scientific quality and applicability



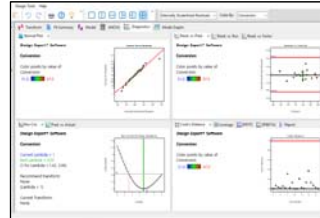
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## The Magnificent Seven in DX11



Design-Expert® software Version 11's (DX11) major focus is an amazing update to the **User Interface!** It features:

- a sophisticated new look
- dockable tool palettes
- multipane ANOVA and Diagnostics views
- improved graphics



In this webinar I will be demoing all my favorites!!!

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## The Magnificent Seven in DX11 Agenda



1. Navigation flow improved
2. Design Properties tool for runs and columns
3. Curvature analysis updated
4. ANOVA layout
5. Diagnostic layout
6. Model Graphs
7. Confirmation runs
8. DX11 demo
9. A few other things...



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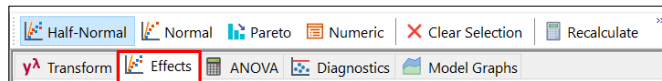
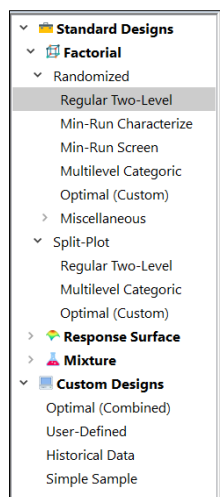
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## The Magnificent Seven in DX11 Navigation



The **Navigation** in Design-Expert has been improved by:

- Removing the factor type tabs
- Adding a view bar with layout options
- Dockable (moveable) tool palettes
- Maintaining the top-bottom, left-right flow

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## The Magnificent Seven in DX11 Design Properties Tool



Design Properties	
Run 1	
Row Status	Normal
Comment	
Numeric Factor	
Name	Temperature
Units	deg C
Format	General
Changes	Easy
-1 Level	24
+1 Level	35
Col Status	Normal

The **Design Properties** tool is a new alternative to the options that are also still available via right-clicking on a row or column header.

Row status can be changed, as well as Factor information.

The tool is dockable and stays out of the way!

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## The Magnificent Seven in DX11 Curvature Analysis



“Factorial designs with center points” now have a more intuitive analysis window.

Check for curvature. If significant, then augment the design. If NOT significant, click “Remove Curvature Term” button.

Advice provided along the way!

Curvature Check Analysis of Variance

**Curvature Check**

You have center points in your design, with a factorial model. These points are used to test whether there is curvature in the data. If curvature is detected, a factorial model may not be appropriate.

Term	Adjusted F-value	Model p-value
Model	56.86	< 0.0001 significant
Curvature	16.23	0.0014 significant
Lack of Fit	1.01	0.5639

Curvature Term

Curvature appears **significant**. Augment to a **Response Surface** design if you want to explain what is causing the curvature or if curvature is in a desirable direction for your goal. Proceeding with the analysis with the curvature term included is equivalent to ignoring the data from the center point runs.

Remove Curvature Term

Removing the curvature term is generally not recommended in this situation. It is likely that the center of the design space is poorly modeled.

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## The Magnificent Seven in DX11 ANOVA



The **ANOVA** takes advantage of the new interface with split panes that can be customized to your liking.

Note the pre-determined layout options at the top of the screen!

**ANOVA for selected factorial model**

Source	Sum of Squares	df	Mean Square	F-value	p-value
Model	5535.81	5	1107.16	56.86	< 0.0001 significant
A-Temperature	1870.56	1	1870.56	96.07	< 0.0001
C-Concentration	390.06	1	390.06	20.03	0.0006
D-Stir Rate	855.56	1	855.56	43.94	< 0.0001
AC	1314.06	1	1314.06	67.49	< 0.0001
AD	1105.56	1	1105.56	56.78	< 0.0001
Curvature	316.01	3	105.34	5.41	0.0014
Residual	253.13	13	19.47		
Lack of Fit	195.13	10	19.51	1.01	0.5639 not significant
Pure Error	58.00	3	19.33		
Cor Total	6104.95	19			

**Fit Statistics**

Std. Dev.	Mean	R <sup>2</sup>	Adjusted R <sup>2</sup>
4.41	72.05	0.9563	0.9395
	CV %	6.12	Predicted R <sup>2</sup> 0.9559
			Adq Precision 21.5952

The **Predicted R<sup>2</sup>** of 0.9559 is in reasonable agreement with the **Adjusted R<sup>2</sup>** of 0.9395, i.e. the difference is less than 0.2.

**Coefficients in Terms of Coded Factors**

Factor	Coefficient Estimate	df	Standard Error	95% CI Low	95% CI High	VIF
Intercept	70.06	1	1.10	67.68	72.45	
A-Temperature	10.81	1	1.10	8.43	13.20	1.0000
C-Concentration	4.84	1	1.10	2.55	7.32	1.0000

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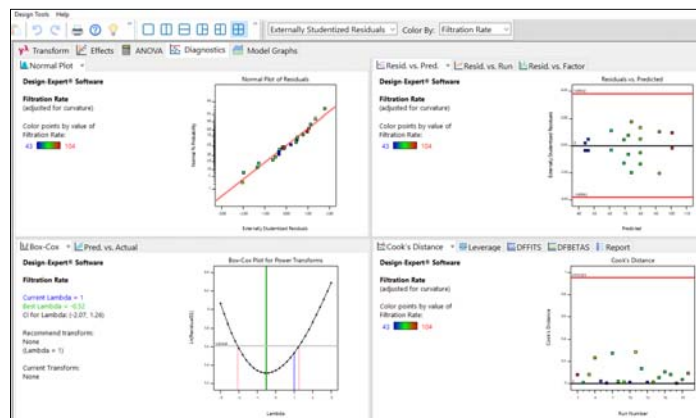
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## The Magnificent Seven in DX11 Diagnostics



The **Diagnostics** are now visible in a sleek multi-pane view!  
Customize by dragging tabs. Sort the Report.



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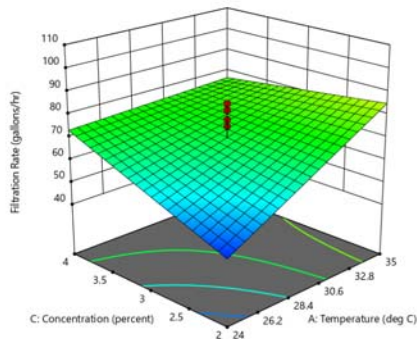
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## The Magnificent Seven in DX11 Model Graphs



The Model Graphs are updated with smoothing features, thicker lines and a more modern look. The Factors Tool can be docked wherever you like.



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## The Magnificent Seven in DX11 Confirmation Runs



The Confirmation node interface now allows multiple sets of confirmation runs to allow tests at more conditions.

Confirmation Location #1 Confirmation Location #2 Factors

**Confirmation Location #2**

Temperature	Pressure	Concentration	Stir Rate
29.5	12.5	3.5	22.5

**Response data**

Runs: 4

Filtration Rate
66
68
75

**Confirmation**

Two-sided Confidence = 95%

Response	Predicted Mean	Predicted Median	Observed	Std Dev	n	SE Pred	95% PI low	Data Mean	95% PI high
1. Filtration Rate*	70.0625	70.0625		4.41261	3	2.73202	64.1603	68.6667	75.9647
2. Filtration Rate*	72.5312	72.5312		4.41261	3	2.78715	66.51	69.6667	78.5525

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## The Magnificent Seven in DX11 Demo



Let's look at all these new features live in Design-Expert!



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## The Magnificent Seven in DX11 A few more things...



Other new features:

1. Unicode and UTF-8 character sets (allows Asian characters)
2. Ctrl-scroll wheel zooms in and out
3. Many tables now sortable
4. Split-plot designs can be built with I or A-optimality
5. Response simulator expanded with new functions
6. Maximum model order in Fit Summary can be limited to speed up calculations for large designs

**Apple Mac OS version will be released in Spring 2018!**

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## The Magnificent Seven in DX11 Recap



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If you haven't done so already, download the 30-day free trial and check it out for yourself!



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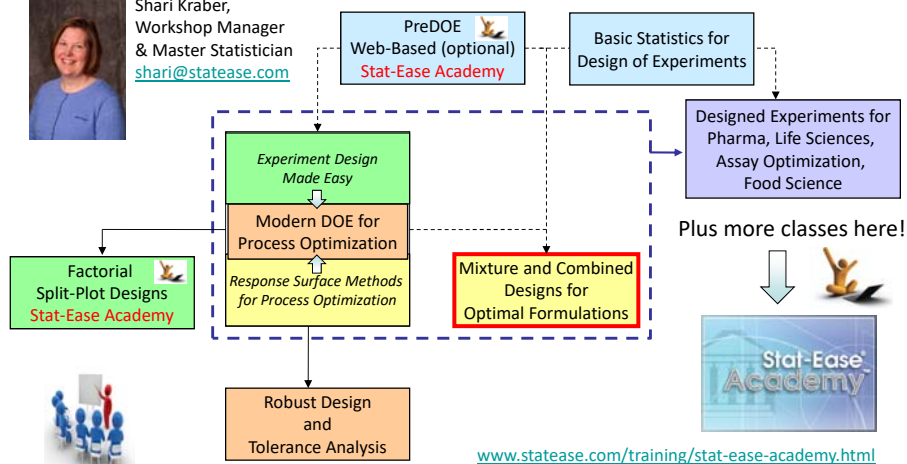
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Formulation Simplified

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If you have additional questions e-mail them to:

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***Thank you for joining us today!***