

Use your mouse to right click on individual cells for definitions.

Response: FDR

### ANOVA for Response Surface Cubic Model

#### Analysis of variance table [Partial sum of squares]

Source	Sum of Squares	DF	Mean Square	F Value	Prob > F	
Model	684.12	9	76.01	31.85	< 0.0001	significant
A	32.52	1	32.52	13.63	0.0008	
B	53.73	1	53.73	22.51	< 0.0001	
A <sup>2</sup>	22.07	1	22.07	9.25	0.0045	
B <sup>2</sup>	9.89	1	9.89	4.15	0.0494	
AB	0.20	1	0.20	0.082	0.7762	
A <sup>3</sup>	2.40	1	2.40	1.01	0.3228	
B <sup>3</sup>	5.16	1	5.16	2.16	0.1502	
A <sup>2</sup> B	9.17	1	9.17	3.84	0.0579	
AB <sup>2</sup>	18.69	1	18.69	7.83	0.0083	
Residual	83.53	35	2.39			
Lack of Fit	61.75	34	1.82	0.083	0.9985	not significant
Pure Error	21.78	1	21.78			
Cor Total	767.65	44				

The Model F-value of 31.85 implies the model is significant. There is only a 0.01% chance that a "Model F-Value" this large could occur due to noise.

Values of "Prob > F" less than 0.0500 indicate model terms are significant.

In this case A, B, A<sup>2</sup>, B<sup>2</sup>, AB<sup>2</sup> are significant model terms.

Values greater than 0.1000 indicate the model terms are not significant.

If there are many insignificant model terms (not counting those required to support hierarchy), model reduction may improve your model.

The "Lack of Fit F-value" of 0.08 implies the Lack of Fit is not significant relative to the pure error. There is a 99.85% chance that a "Lack of Fit F-value" this large could occur due to noise. Non-significant lack of fit is good -- we want the model to fit.

Std. Dev.	1.54	R-Squared	0.8912
Mean	6.63	Adj R-Squared	0.8632
C.V.	23.32	Pred R-Squared	0.8022
PRESS	151.83	Adeq Precision	18.805

The "Pred R-Squared" of 0.8022 is in reasonable agreement with the "Adj R-Squared" of 0.8632.

"Adeq Precision" measures the signal to noise ratio. A ratio greater than 4 is desirable. Your ratio of 18.805 indicates an adequate signal. This model can be used to navigate the design space.

Coefficient	Standard	95% CI	95% CI
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Factor	Estimate	DF	Error	Low	High	VIF
Intercept	6.20	1	0.44	5.30	7.10	
A-Concentration	-3.86	1	1.05	-5.99	-1.74	10.29
B-Time	4.88	1	1.03	2.79	6.97	8.32
A <sup>2</sup>	1.69	1	0.55	0.56	2.81	1.01
B <sup>2</sup>	-1.29	1	0.63	-2.57	-3.751E-003	1.01
AB	0.14	1	0.51	-0.88	1.17	1.00
A <sup>3</sup>	1.09	1	1.09	-1.12	3.30	9.03
B <sup>3</sup>	1.73	1	1.18	-0.66	4.11	6.91
A <sup>2</sup> B	-1.67	1	0.85	-3.41	0.059	2.43
AB <sup>2</sup>	2.51	1	0.90	0.69	4.34	2.34

#### Final Equation in Terms of Coded Factors:

$$\begin{aligned}
 \text{FDR} = & \\
 & +6.20 \\
 & -3.86 * A \\
 & +4.88 * B \\
 & +1.69 * A^2 \\
 & -1.29 * B^2 \\
 & +0.14 * A * B \\
 & +1.09 * A^3 \\
 & +1.73 * B^3 \\
 & -1.67 * A^2 * B \\
 & +2.51 * A * B^2
 \end{aligned}$$

#### Final Equation in Terms of Actual Factors:

$$\begin{aligned}
 \text{FDR} = & \\
 & +2.06347 \\
 & -12.34836 * \text{Concentration} \\
 & +0.13214 * \text{Time} \\
 & +0.53151 * \text{Concentration}^2 \\
 & -6.24214\text{E-}004 * \text{Time}^2 \\
 & -0.032017 * \text{Concentration} * \text{Time} \\
 & +17.05228 * \text{Concentration}^3 \\
 & +1.00039\text{E-}006 * \text{Time}^3 \\
 & -0.087172 * \text{Concentration}^2 * \text{Time} \\
 & +4.36539\text{E-}004 * \text{Concentration} * \text{Time}^2
 \end{aligned}$$

#### Diagnostics Case Statistics

Standard	Actual	Predicted	Student	Cook's	Outlier
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**Run**

Order	Value	Value	Residual	Leverage	Residual	Distance	t
1	11.03	11.22	-0.19	0.189	-0.134	0.000	-0.132
2	12.72	9.63	3.09	0.169	2.195	0.098	2.329
3	0.000	2.06	-2.06	0.554 #	-2.000	0.497	-2.094
4	10.55	11.55	-1.00	0.262	-0.753	0.020	-0.749
5	10.41	7.96	2.45	0.186	1.757	0.071	1.814
6	11.29	11.65	-0.36	0.558 #	-0.352	0.016	-0.348
7	7.52	5.49	2.03	0.247	1.512	0.075	1.542
8	11.29	10.66	0.63	0.169	0.447	0.004	0.442
9	0.000	-0.25	0.25	0.306	0.193	0.002	0.190
10	10.67	11.46	-0.79	0.212	-0.575	0.009	-0.569
11	1.66	2.96	-1.30	0.157	-0.918	0.016	-0.916
12	3.40	5.37	-1.97	0.150	-1.383	0.034	-1.401
13	6.40	7.13	-0.73	0.136	-0.511	0.004	-0.506
14	8.40	8.42	-0.019	0.127	-0.013	0.000	-0.013
15	9.03	9.38	-0.35	0.139	-0.248	0.001	-0.244
16	11.97	10.19	1.78	0.152	1.248	0.028	1.258
17	11.97	11.01	0.96	0.156	0.676	0.008	0.670
18	12.24	12.00	0.24	0.309	0.191	0.002	0.188
19	0.000	-1.70	1.70	0.282	1.298	0.066	1.312
20	0.68	1.08	-0.40	0.140	-0.282	0.001	-0.279
21	1.65	3.22	-1.57	0.125	-1.087	0.017	-1.090
22	6.59	6.20	0.39	0.083	0.263	0.001	0.259
23	7.44	7.37	0.071	0.099	0.049	0.000	0.048
24	7.91	8.54	-0.63	0.125	-0.434	0.003	-0.429
25	11.67	9.87	1.80	0.141	1.258	0.026	1.269
26	12.68	11.53	1.15	0.280	0.880	0.030	0.878
27	0.000	-1.47	1.47	0.315	1.150	0.061	1.156
28	1.38	0.68	0.70	0.157	0.496	0.005	0.491
29	3.10	2.33	0.77	0.155	0.540	0.005	0.534
30	3.97	3.66	0.31	0.145	0.215	0.001	0.212
31	6.24	4.83	1.41	0.133	0.983	0.015	0.982
32	3.93	5.99	-2.06	0.140	-1.436	0.034	-1.458
33	6.20	7.30	-1.10	0.151	-0.776	0.011	-0.771
34	8.44	8.94	-0.50	0.158	-0.354	0.002	-0.350
35	8.91	11.06	-2.15	0.311	-1.679	0.127	-1.726
36	0.000	1.26	-1.26	0.557 #	-1.221	0.187	-1.230
37	4.83	3.53	1.30	0.263	0.983	0.034	0.983
38	0.99	2.56	-1.57	0.287	-1.202	0.058	-1.210
39	6.12	9.63	-3.51	0.169	-2.492	0.126	-2.708
40	6.02	5.11	0.91	0.238	0.672	0.014	0.667
41	5.47	6.06	-0.59	0.227	-0.431	0.005	-0.426
42	7.71	7.31	0.40	0.225	0.292	0.002	0.288
43	9.82	9.05	0.77	0.264	0.582	0.012	0.577
44	11.74	11.42	0.32	0.554 #	0.307	0.012	0.303

**Order**

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45	4.09	4.87	-0.78	0.100	-0.534	0.003	-0.528
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# Obs with Leverage > 2.00 \*(average leverage)

Proceed to Diagnostic Plots (the next icon in progression). Be sure to look at the:

- 1) Normal probability plot of the studentized residuals to check for normality of residuals.
- 2) Studentized residuals versus predicted values to check for constant error.
- 3) Outlier t versus run order to look for outliers, i.e., influential values.
- 4) Box-Cox plot for power transformations.

If all the model statistics and diagnostic plots are OK, finish up with the Model Graphs icon.

