Autodesk® Moldflow® Insight 2012

AMI Design of Experiment Analysis Results

Autodesk®

Revision 1, 23 March 2012.

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Contents

Design-of-experiments analysis results 1

This help topic specifies the results for a Design-of-experiments (DOE) analysis.

Text based results

The following table lists the text results generated for a DOE analysis.

Results
Analysis Log
Results Summary
Analysis Check

Graphical results

DOE results are presented under the **Optimization** heading in the **Results** section of the **Study Pane**. There are a variety of graphical outputs, which depend on the experiment type you have selected.

- *Fill+Pack analysis results*
- Warp results
- Cool results
- Shrink results
- Stress results
- Overmolding fill+pack
- Flow + wire sweep + paddle shift

Design-of-experiments analysis results

Use these dialogs to explore the solution space of the displayed DOE (Design of Experiments) result.

DOE Control Panel

This dialog allows you to explore the solution space of the displayed DOE plot result by varying one or more of the input factors scanned in the analysis.

To access this dialog, ensure that you have Optimization results. Select an optimization result then right-click and select **Properties** from the drop down list.

TIP: To use this dialog, specify which input variable you want to display on the X axis by selecting the check box, move the slider bar below the name of the input variable you want to change, and then watch the result plot change as you move the dialog slider bar.

DOE Control Panel - RS Plot

This dialog allows you to explore the solution space of the displayed DOE Response Surface plot result by varying one or more of the input factors scanned in the analysis.

To access this dialog, ensure that you have DOE analysis results, then right-click on a result in the DOE **Optimization** folder that is of type XY Plot and select **Properties**.

TIP: To use this dialog, specify which input variable you want to display on the X axis by selecting the check box, move the slider bar below the name of the input variable you want to change, and then watch the result plot change as you move the dialog slider bar.

DOE Control Panel—Contour Plot

This dialog is used to explore the solution space of the displayed DOE (Design of Experiments) contour result by varying one or more of the input factors scanned in the analysis.

To access this dialog, ensure that you have DOE analysis results, then right-click on a result in the DOE **Optimization** folder that is not of type XY Plot and select **Properties**.

DOE Log

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During a DOE analysis, information is written to the **DOE Log**, which is listed alongside other analysis logs below the model window. If the logs are not visible, click on **Logs** in the **Study Tasks** pane to view them.

The **DOE Log** lists a variety of important information, including:

- The type of DOE analysis being run, for example Double Analysis,
- The number of variables that have been selected,
- The number of quality criteria that have been selected,
- The range over which each variable is being analyzed,
- The weighting that has been assigned to each variable,
- The number of experiments that will be run to collect the required data,
- The number of studies that are waiting, running, have been completed or have failed,
- The ranking of the influence of each variable.

NOTE: The DOE Log is the primary location for this particular data.

- The optimum value for each quality criterion selected, within the boundaries of the DOE experiment,
- The length of time required for the experiment to run to completion.

DOE plots 3

Once a DOE analysis finishes, a set of results is listed under the **Optimization** folder in the **Results** section of the **Study Tasks** pane.

Three different results are possible. The results that are actually listed depend on the experiment type you selected in the **DOE Builder**.

DOE plots

The **DOE Control Panel** is used to see the results across the entire DOE range from the minimum value set in the **DOE Builder**, through the Middle Value set in the process settings, to the maximum value.

Using the DOE Control Panel to see the entire range of results

The DOE Control Panel is only available for contour plots, and Response Surface plots.

NOTE: *Plot properties* can also be edited for DOE contour plots.

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1. Select a contour plot or a response surface plot, then click **(Results tab > Properties panel > Plot Properties)**, or simply right-click the result in the **Study Tasks** pane and select **Properties**.
2. Move the scale downwards or upwards to view the effect on the results.
3. When you have finished, click **Close** to close the DOE Control Panel.

Changing the variable associated with the X or Y axes

This option is only relevant to response surface plots.

1. Select a response surface plot, then click  **(Results tab > Properties panel > Plot Properties)**, or simply right-click the result in the **Study Tasks** pane and select **Properties**.
2. To change the variable on the X axis, click the down arrow associated with the X axis and select the variable you would like to see.
3. To change the variable on the Y axis, click the down arrow associated with the Y axis and select the variable you would like to see.
4. Click **Close** to close the **DOE Control Panel**.

Contour plot

A contour plot from a Design Of Experiment (DOE) analysis provides similar information to one from a standard analysis, with the advantage that the value for each DOE variable can be modified via the plot property window and the effect observed on the part.

Response surface

The response surface plot is a 3D representation or 'surface graph' which shows the effect of two Variables on a Quality Criterion, keeping all other Variables constant.

Response XY plot

A Response XY plot is a 2D representation or 'curve plot' that shows the effect of a single Variable on a Quality Criterion, keeping all other Variables fixed.

CSV Analyzer for response analysis

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The CSV analyzer is a macro that takes your DOE data and translates it into a series of reports so that you can study the effects of the variables you have selected on the quality criteria you have identified. The CSV analyzer is not localized and will appear in English regardless of which language pack you have installed.

The CSV analyzer is a macro that takes your comma delimited spreadsheet file (*.csv) and converts the data into tables and graphs so you can analyze the data more readily. The data is presented in a series of tabs at the bottom of the spreadsheet. The first tab, called Data, presents all the data recorded during the DOE analysis.

NOTE: Make sure that you run both the initial analysis and the DOE analysis on the same software version. If you import a study with existing results into a different software version, and subsequently run a DOE analysis, the DOE results will not be comparable.

Terminology	Definition
Number of Factors	The number of variables selected in the DOE Builder
Number of Qualities	The number of qualities selected in the DOE Builder
Number of Runs	The number of runs performed during the DOE analysis to produce the relevant data
Number of Terms	The number of terms in the response surface equations used.

Experimental data

This section contains two tables.

- The first table lists the variables you selected and records the value of each variable on every run.
- The second table lists all the quality criteria you selected, and the value of each quality criterion under the variables conditions listed for each run.

This information can be used to investigate the results shown in the analysis logs, and determine which values are having a significant impact on the results.

Response surface equations

This section contains two tables.

- The first table lists the variables you selected in the DOE Builder, and provides the power of that variable for that term in the response surface equation.
- The second table provides the value of the quality for each term of the equation.

These data and how they relate to the response surface equation can be seen in each of the Quality tabs.

Design of experiments

The DOE analyzer uses a linear equation to model the significant effects of the various variables you selected. The levels are coded by -1 for a low level and +1 for the high levels. This section provides a single table which lists the 'coded' values for each variable you selected in the DOE Builder for each run. The corresponding actual values can be found in the Experimental data table, or in the Quality tabs.

After analyzing the data and selecting an optimum set of operating conditions, it is important that you run an analysis under these optimum conditions to verify the results.

NOTE: You can open the .csv data file directly, without applying the CSV analyzer macro, by navigating to the location that you defined for saving project data, when you installed this program and double-clicking on the .csv file. The default path for Windows 7 is **Documents\My AMI xxxx Projects**.

CSV Analyzer for response analysis

The csv analyzer is a macro within Microsoft Excel, that takes your DOE data and translates them into tables and graphs that are more readily interpreted. Both the csv analyzer and the .csv file are not localized and will appear in English, regardless of the language pack you have installed.

Running the csv analyzer

You must have Microsoft Excel installed on your computer to run the csv analyzer.

1. Navigate to the folder in which you installed this program. The default for Windows 7 is **C:\Program Files\Autodesk\Moldflow Insight xxxx**.
2. Inside the **Moldflow Insight xxxx** folder, open the **data** folder, then open the **dat** folder.
3. Locate the doe_csv_analyzer.xslm file and double-click to open it.

NOTE: When you launch the csv analyzer, you will see a Microsoft Office Security Warning at the top of the window, informing you that

Macros have been disabled. Click **Options** and select **Enable this content**, then click **OK**.

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4 Select the **Introduction** tab at far left bottom of the spreadsheet.

5 Click **Clear** to remove any filepath already listed from a previous analysis.

6 Click **Load CSV file**, then navigate to the location that you defined for saving project data, when you installed this program. The default for Windows 7 is **Documents\My AMI xxxx Projects**.

7 Locate and open your project, select the .csv file associated with your study, then click **Open**.

8 In the CSV analyzer, click **Generate report**.
Several new tabs will appear at the bottom of the spreadsheet to the right of the **Introduction** tab.

The first tab lists all the data from the DOE analysis. The subsequent tabs show graphical representations of the data associated with each of the quality criteria and a summary of the important data for that quality criterion.