BEACON Newsletter - July 2024

DESIGN STUDY IN SOLIDWORKS SIMULATION

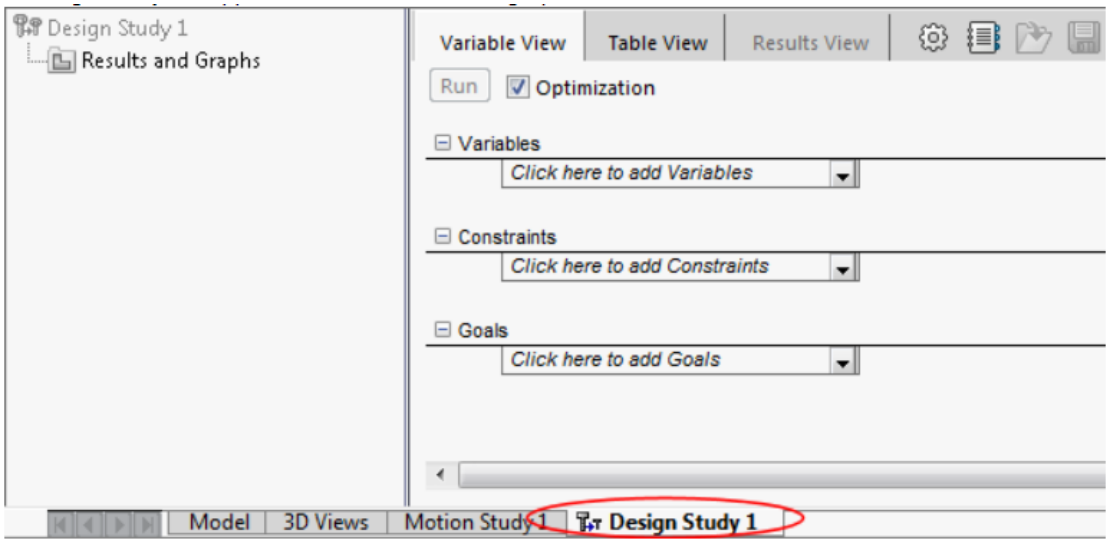
DESIGN STUDY:

It is an automated process for studying different types of design scenarios for an assembly / a component. This study is of two modes, Evaluate and Optimization study.

In evaluate mode of study, several geometrical and/or simulation parameters are varied, and the obtained results are then compared with each other or with the benchmark if available, whereas in optimization mode, the user can get an optimized design for your requirements through series of iterations with multiple parameters and constraints such as Stress, Strain, Displacement, Mass etc.,

You can work on several problems by using a design study. You can:

- Define multiple variables using any simulation parameter or driving global variable.
- Define multiple constraints using sensors.
- Define multiple goals using sensors.
- Analyze models without simulation results. For example, you can minimize the mass of an assembly with the variables, density, and model dimensions, and with the constraint, volume.
- Evaluate design choices by defining a parameter that sets bodies to use different materials as a variable.



Typical design study tab interface

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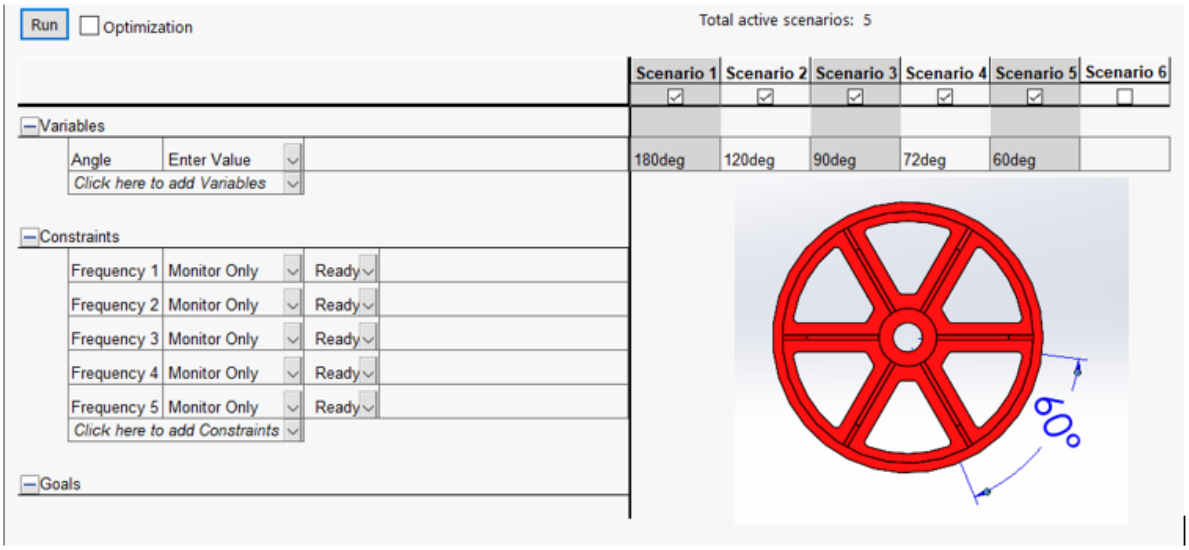
Variables: The inputs can be Model Dimension, Global Variable, Simulation parameters and Material properties.

Constraints: The inputs can be from Simulation data (Stress, Displacement, Frequency, Temperature, etc.,), Mass Properties, Dimension, Measurement and Costing data.

Goals: There are targets. The inputs for this are same as constraints. This data is required only for Optimization mode design study.

Example for Evaluation Design Study:
In the following example, the designer wants to understand the natural frequency and modes if there is a change in the geometry. To perform this analysis, the angle between two ribs is varied in a pulley. These angles were provided manually in the variables. For the constraints, the five natural frequencies are considered from the Frequency analysis.



The above picture is the setup for the evaluation design study.

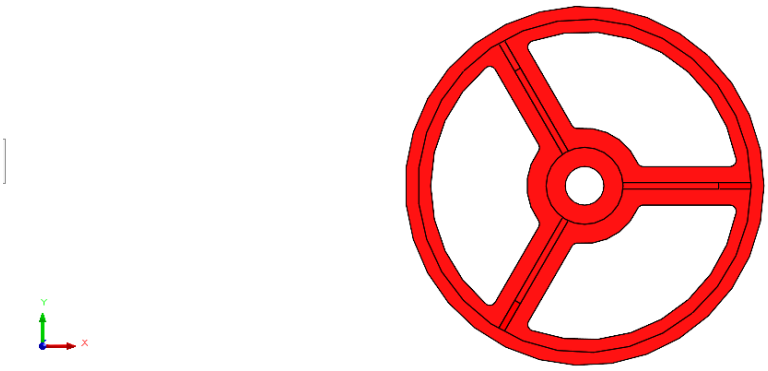
6 of 6 scenarios ran successfully. Design Study Quality: High

		Current	Initial	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Angle		180deg	180deg	180deg	120deg	90deg	72deg	60deg
Frequency 1	Monitor Only	7.154e+02 rad/s	7.154e+02 rad/s	7.154e+02 rad/s	2.203e+03 rad/s	2.680e+03 rad/s	2.972e+03 rad/s	3.211e+03 rad/s
Frequency 2	Monitor Only	2.150e+03 rad/s	2.150e+03 rad/s	2.150e+03 rad/s	2.204e+03 rad/s	2.682e+03 rad/s	2.972e+03 rad/s	3.211e+03 rad/s
Frequency 3	Monitor Only	2.161e+03 rad/s	2.161e+03 rad/s	2.161e+03 rad/s	2.772e+03 rad/s	3.163e+03 rad/s	3.470e+03 rad/s	3.717e+03 rad/s
Frequency 4	Monitor Only	2.576e+03 rad/s	2.576e+03 rad/s	2.576e+03 rad/s	3.093e+03 rad/s	3.681e+03 rad/s	4.118e+03 rad/s	4.472e+03 rad/s
Frequency 5	Monitor Only	3.467e+03 rad/s	3.467e+03 rad/s	3.467e+03 rad/s	4.325e+03 rad/s	4.065e+03 rad/s	4.620e+03 rad/s	4.790e+03 rad/s

The above picture shows the results view of the study. As the angle is decreased, the natural frequencies are increasing. One of the reasons for the raise in frequency is addition of mass to the pulley as the number of ribs are increased.

In this way, the designer can quickly analyze the various designs in a short duration and can obtain the component design with that design variable. Also, the designer can export these results to Excel in the form of .csv file from SOLIDWORKS Simulation.

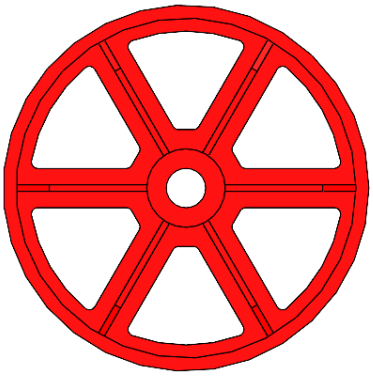
Results of Evaluation Design Study:



Variable View | Table View | Results View

6 of 6 scenarios ran successfully. Design Study Quality: High

		Current	Initial	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Angle		120deg	180deg	180deg	120deg	90deg	72deg	60deg
Frequency 1	Monitor Only	2.203e+03 rad/s	7.154e+02 rad/s	7.154e+02 rad/s	2.203e+03 rad/s	2.680e+03 rad/s	2.972e+03 rad/s	3.211e+03 rad/s
Frequency 2	Monitor Only	2.204e+03 rad/s	2.150e+03 rad/s	2.150e+03 rad/s	2.204e+03 rad/s	2.682e+03 rad/s	2.972e+03 rad/s	3.211e+03 rad/s
Frequency 3	Monitor Only	2.772e+03 rad/s	2.161e+03 rad/s	2.161e+03 rad/s	2.772e+03 rad/s	3.163e+03 rad/s	3.470e+03 rad/s	3.717e+03 rad/s
Frequency 4	Monitor Only	3.093e+03 rad/s	2.576e+03 rad/s	2.576e+03 rad/s	3.093e+03 rad/s	3.681e+03 rad/s	4.118e+03 rad/s	4.472e+03 rad/s
Frequency 5	Monitor Only	4.325e+03 rad/s	3.467e+03 rad/s	3.467e+03 rad/s	4.325e+03 rad/s	4.065e+03 rad/s	4.620e+03 rad/s	4.790e+03 rad/s



*Front

Variable View | Table View | Results View

6 of 6 scenarios ran successfully. Design Study Quality: High

		Current	Initial	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Angle		60deg	180deg	180deg	120deg	90deg	72deg	60deg
Frequency 1	Monitor Only	3.211e+03 rad/s	7.154e+02 rad/s	7.154e+02 rad/s	2.203e+03 rad/s	2.680e+03 rad/s	2.972e+03 rad/s	3.211e+03 rad/s
Frequency 2	Monitor Only	3.211e+03 rad/s	2.150e+03 rad/s	2.150e+03 rad/s	2.204e+03 rad/s	2.682e+03 rad/s	2.972e+03 rad/s	3.211e+03 rad/s
Frequency 3	Monitor Only	3.717e+03 rad/s	2.161e+03 rad/s	2.161e+03 rad/s	2.772e+03 rad/s	3.163e+03 rad/s	3.470e+03 rad/s	3.717e+03 rad/s
Frequency 4	Monitor Only	4.472e+03 rad/s	2.576e+03 rad/s	2.576e+03 rad/s	3.093e+03 rad/s	3.681e+03 rad/s	4.118e+03 rad/s	4.472e+03 rad/s
Frequency 5	Monitor Only	4.790e+03 rad/s	3.467e+03 rad/s	3.467e+03 rad/s	4.325e+03 rad/s	4.065e+03 rad/s	4.620e+03 rad/s	4.790e+03 rad/s

From the above two pictures, it is observed that the one of the Scenarios is selected and the respective design of the component is getting displayed. In one of the figures, the angle is 120 deg and hence, there are three ribs on the pulley whereas the other picture has 6 ribs as the angle stated is 60 deg.

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