

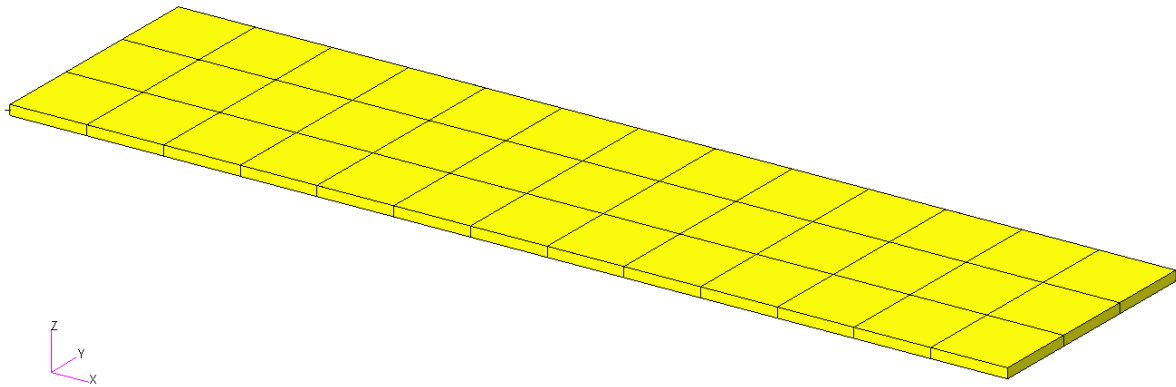
MSC Nastran Topometry Optimization of a Cantilever Plate

PRESENTED BY CHRISTIAN APARICIO

Goal: Use Nastran SOL 200 Optimization

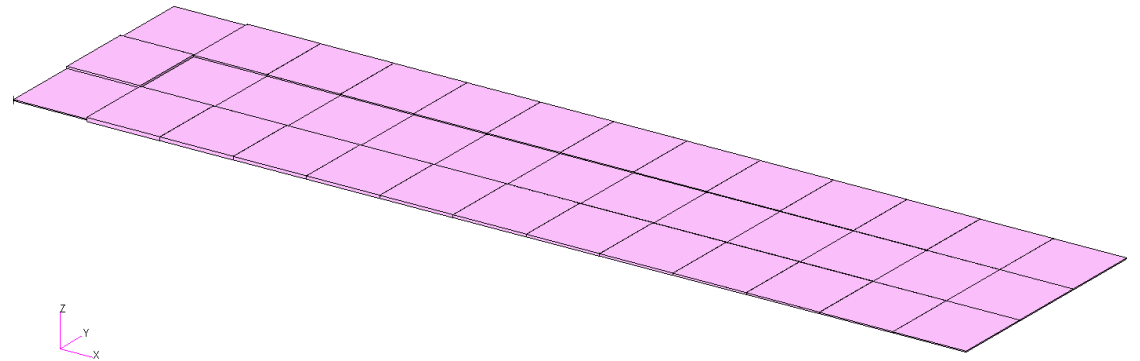
Before Optimization

- Mass: 19.5 kg



After Optimization

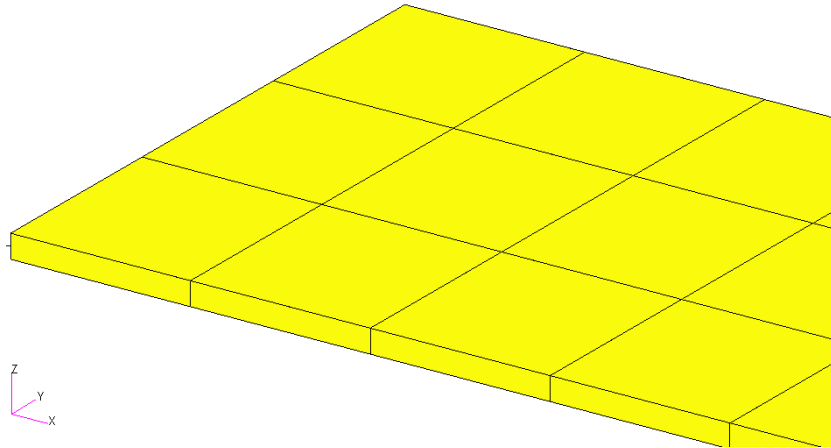
- Mass: 3.97 kg
- Vary the thickness of each element



Goal: Use Nastran SOL 200 Optimization

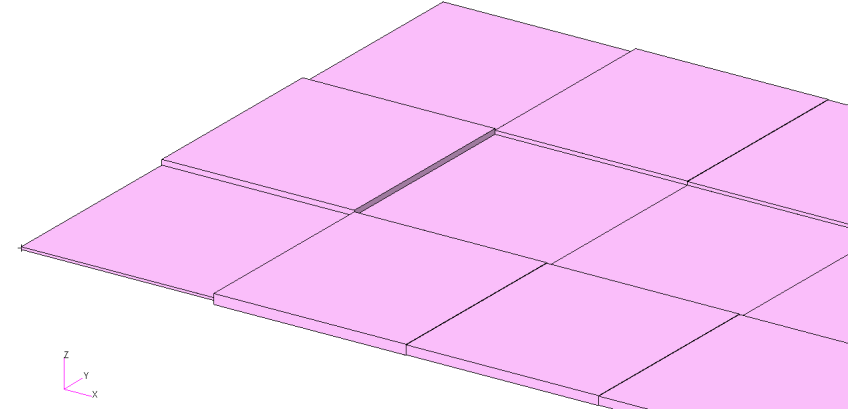
Before Optimization

- Mass: 19.5 kg



After Optimization

- Mass: 3.97 kg
- Vary the thickness of each element



Agenda

Details of the structural model

Optimization Problem Statement

Steps to use Nastran SOL 200 (Optimization)

- Convert a .bdf file to SOL 200
- Create:
 - Design Regions/Variables
 - Design Objective
 - Design Constraints
- Perform optimization with Nastran SOL 200

View optimization results

- Online Plotter
- Topometry Optimization and Structural Results

Contact me

- Nastran SOL 200 training
- Nastran SOL 200 questions
- Structural or mechanical optimization questions
- Access to the SOL 200 Web App

christian@ the-engineering-lab.com

Do you have questions? Email me:
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The SOL 200 Web App is now available through MSC**One**^{XT}.
Contact your Hexagon sales representative for access.

Details of the structural model

Units: m, N, MPa

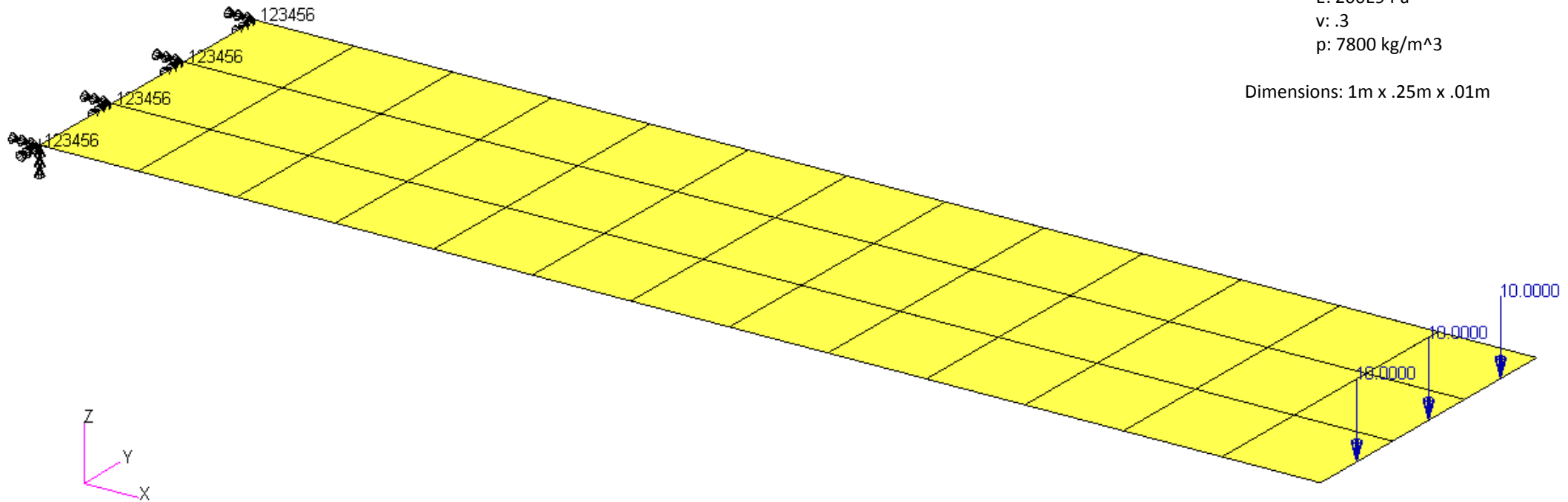
Material:

E: 200E9 Pa

v: .3

p: 7800 kg/m³

Dimensions: 1m x .25m x .01m

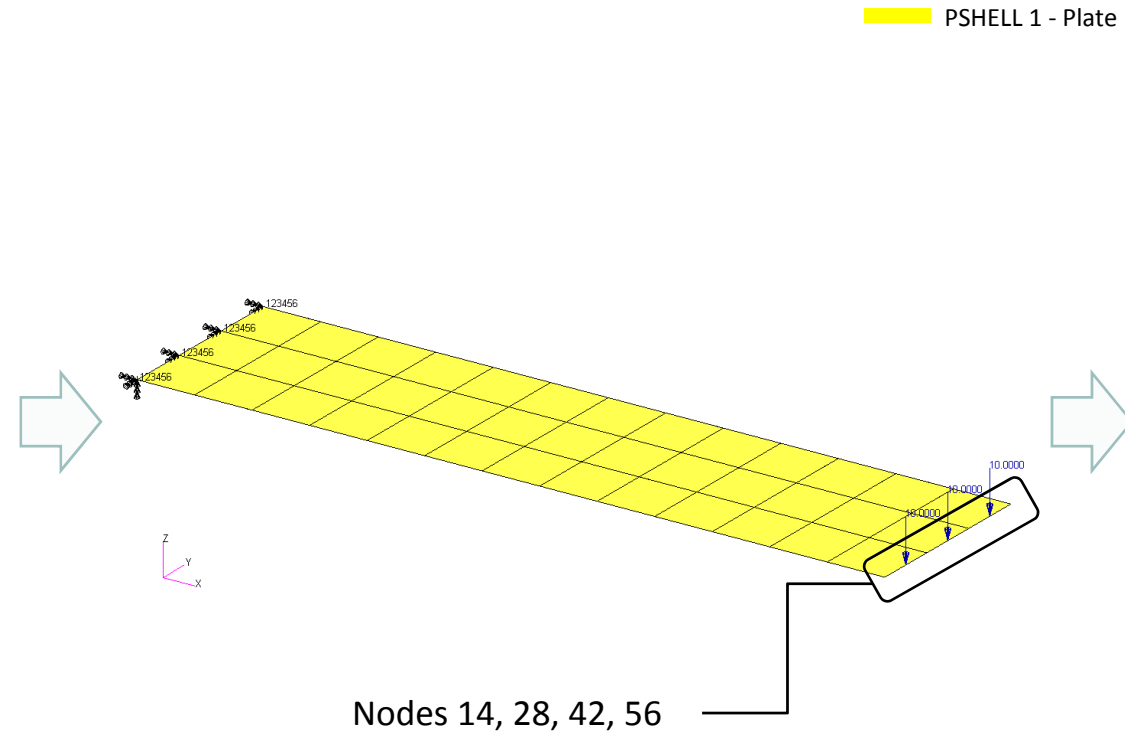


Optimization Problem Statement

Design Region/Variables

z1: Thickness (T) of PSHELL 1

$$.001 < z1$$



Design Objective

r0: Minimize weight

Design Constraints

r1: von Mises stress of PSHELL 1

$$r1 < 250E6$$

r2: Z Displacement of nodes 14, 28, 42, 56 (GRID IDs: 14, 28, 42, 56)

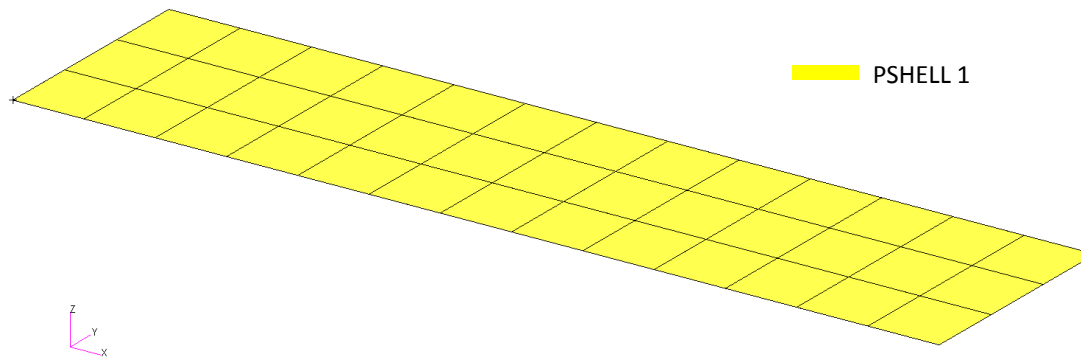
$$-.01 < r2$$

Difference Between Size and Topometry Optimization

Size Optimization

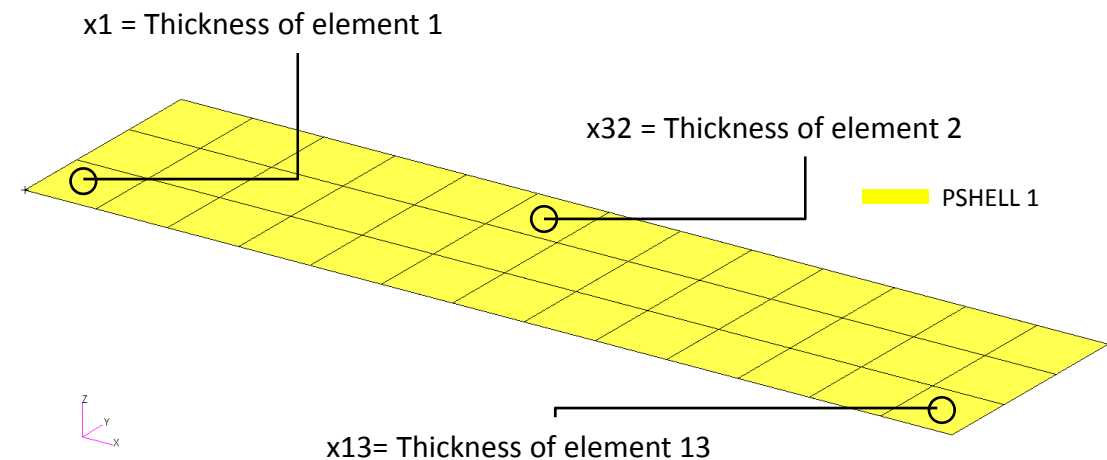
1. Select the parameter to optimize
2. One design variable (x1) is created and applies to all the elements

x1 = Thickness of every element related to PSHELL 1



Topometry Optimization

1. Select the parameter and design region
2. In the background, one design variable is automatically created for each element => Element-by-element optimization



Steps to use Nastran SOL 200 (Optimization)

1. Start with a .bdf or .dat file
2. Use the SOL 200 Web App to:
 - Convert the .bdf file to SOL 200
 - Design Regions/Variables
 - Design Objective
 - Design Constraints
 - Perform optimization with Nastran SOL 200
3. Review optimization results
 - Online Plotter
 - Topometry Optimization and Structural Results

SOL 200 Web App Capabilities

The Post-processor Web App and HDF5 Explorer are free to MSC Nastran users.

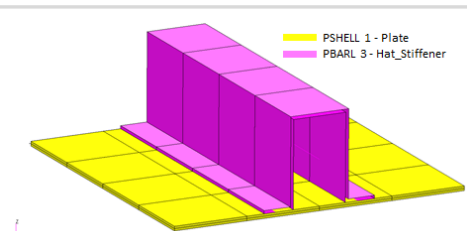
Compatibility

- Google Chrome, Mozilla Firefox or Microsoft Edge
- Windows and Red Hat Linux
- Installable on a company laptop, workstation or server. All data remains within your company.

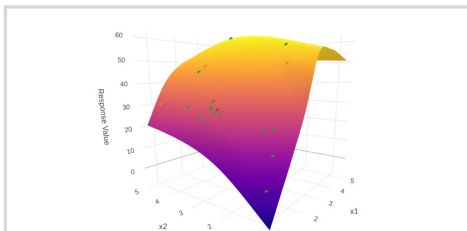
Benefits

- REAL TIME error detection. 200+ error validations.
- REAL TIME creation of bulk data entries.
- Web browser accessible
- Free Post-processor web apps
- +80 tutorials

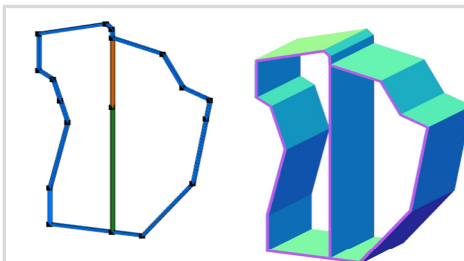
Web Apps



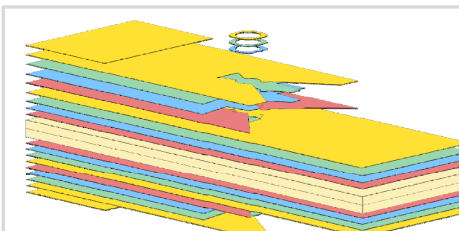
Web Apps for MSC Nastran SOL 200
Pre/post for MSC Nastran SOL 200.
Support for size, topology, topometry, topography, multi-model optimization.



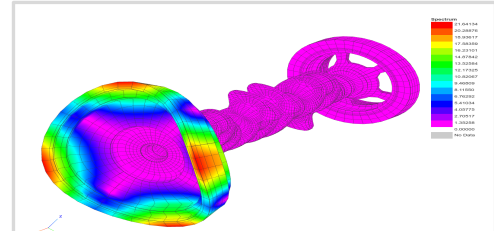
Machine Learning Web App
Bayesian Optimization for nonlinear response optimization (SOL 400)



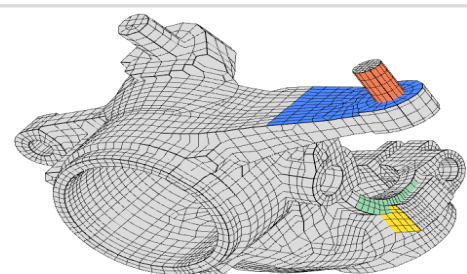
PBMSECT Web App
Generate PBMSECT and PBRSECT entries graphically



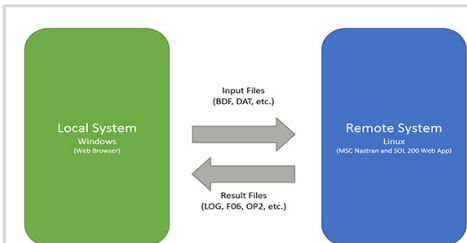
Ply Shape Optimization Web App
Optimize composite ply drop-off locations, and generate new PCOMPG entries



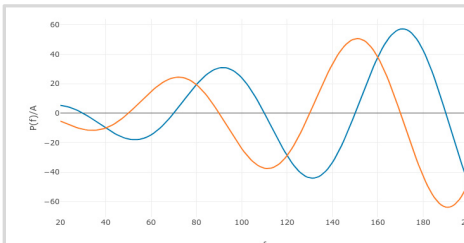
Post-processor Web App
View MSC Nastran results in a web browser on Windows and Linux



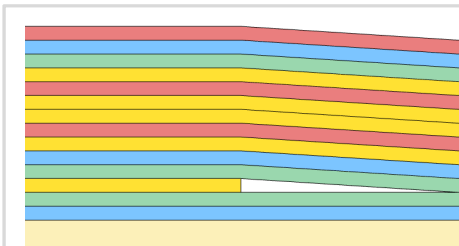
Shape Optimization Web App
Use a web application to configure and perform shape optimization.



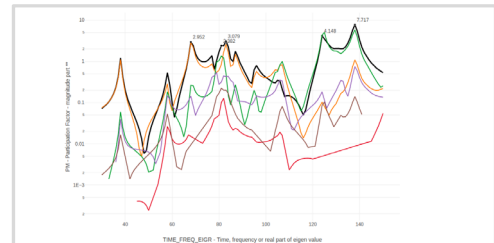
Remote Execution Web App
Run MSC Nastran jobs on remote Linux or Windows systems available on the local network



Dynamic Loads Web App
Generate RLOAD1, RLOAD2 and DLOAD entries graphically



Stacking Sequence Web App
Optimize the stacking sequence of composite laminate plies



HDF5 Explorer Web App
Create graphs (XY plots) using data from the H5 file

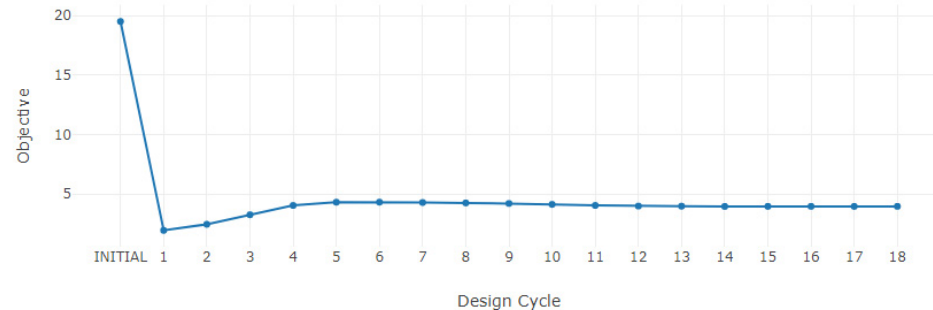
View Optimization Results

Online Plotter

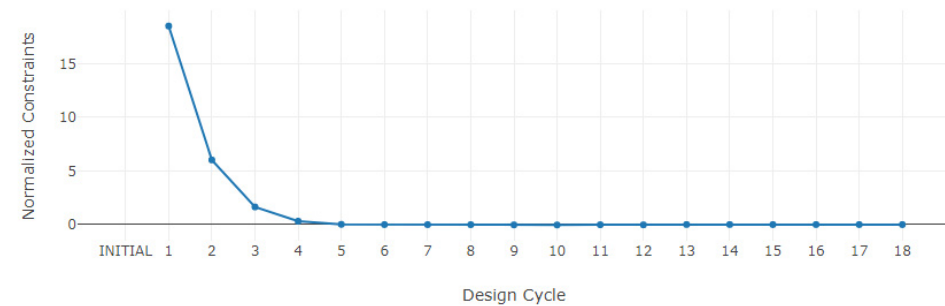
Final Message in .f06

✓ RUN TERMINATED DUE TO HARD CONVERGENCE TO AN OPTIMUM AT CYCLE NUMBER = 18.

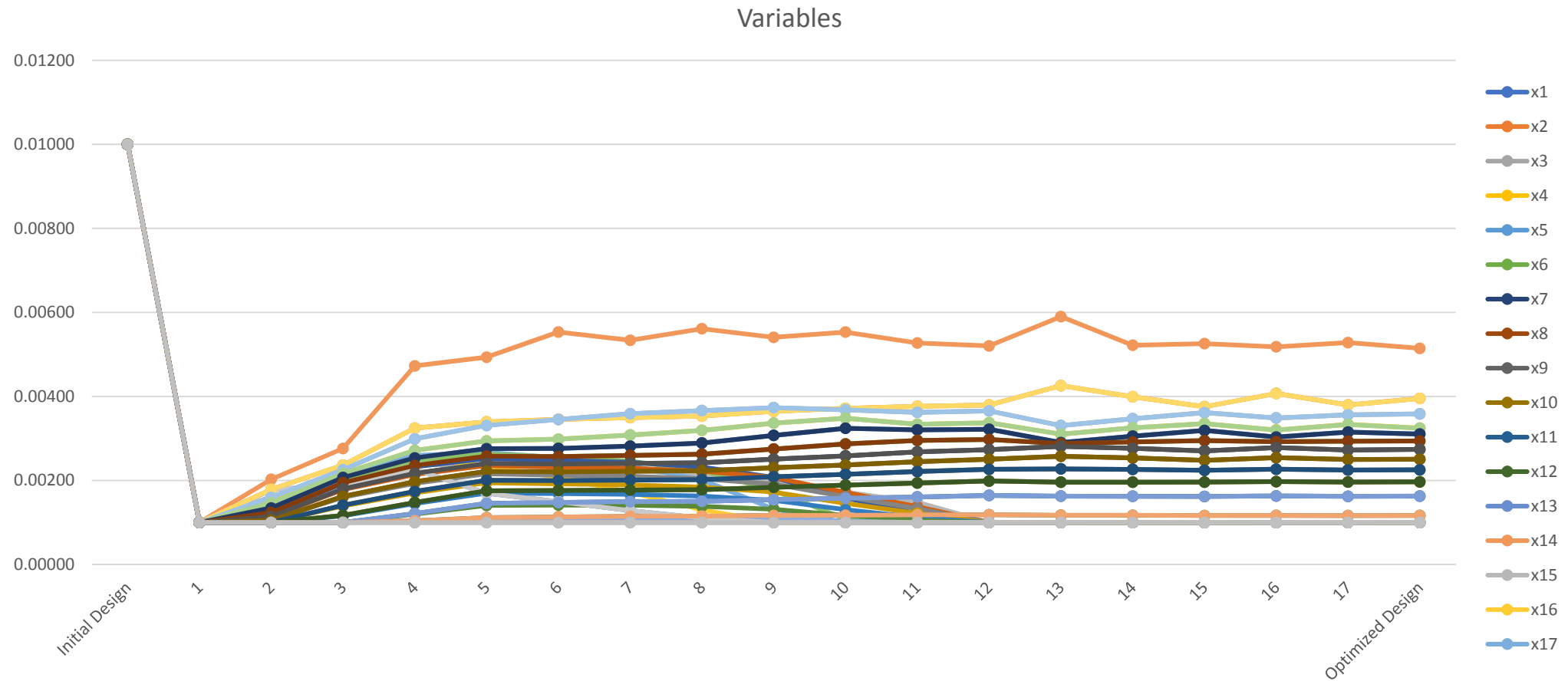
Objective



Normalized Constraints



View Optimization Results



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