AUTODESK UNIVERSITY

How to Design Plastic Parts More Effectively with Autodesk Fusion 360

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Introduction

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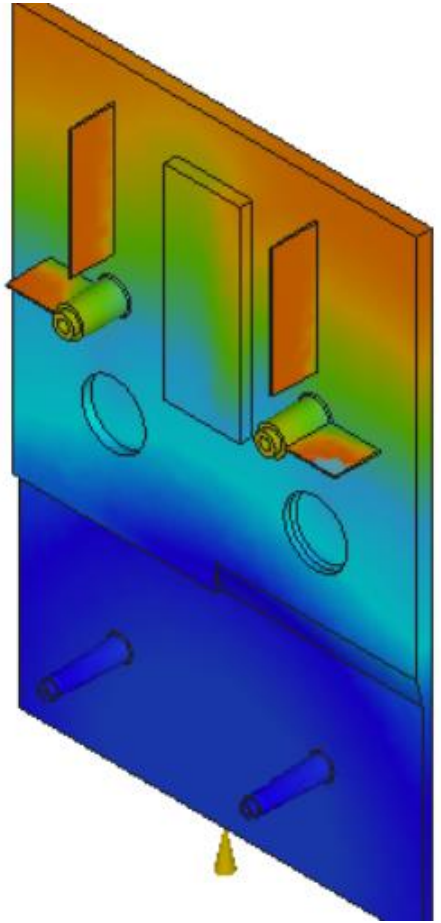
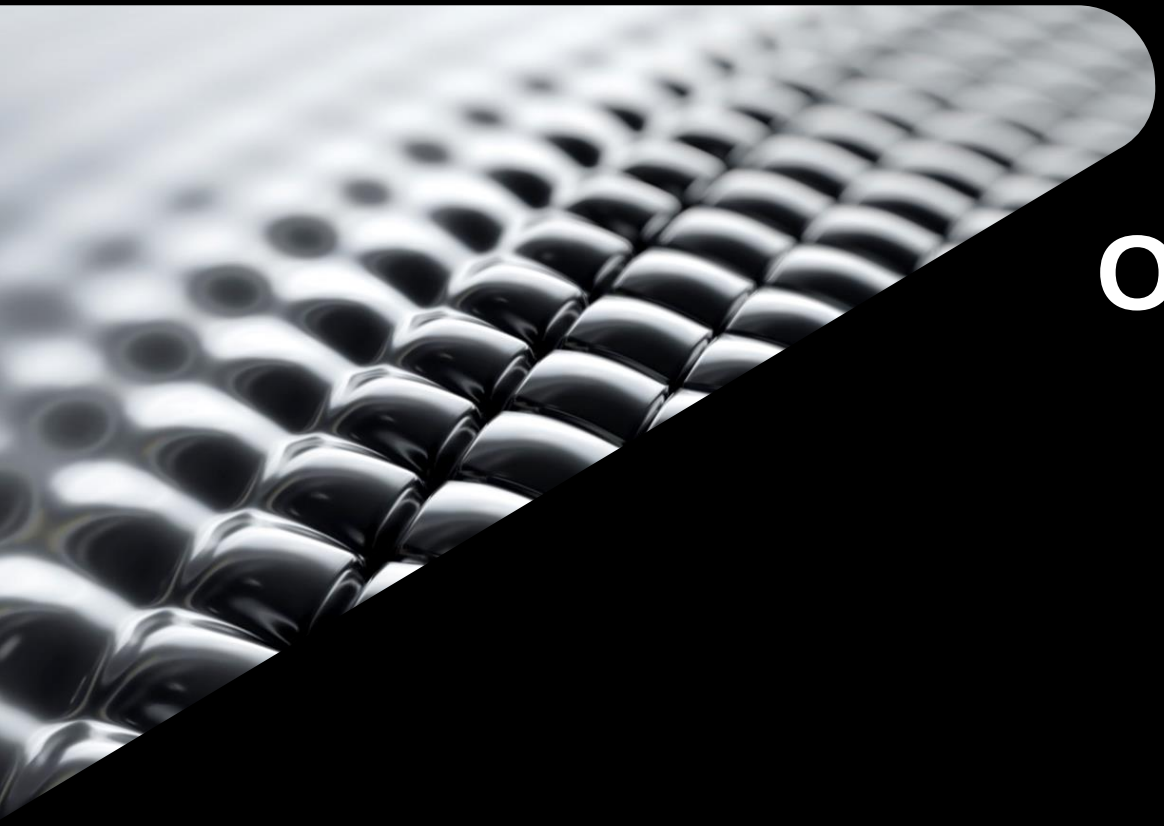
Synergis Technologies jim.swain@synergis.com

- Training and Implementations
- design engineer, test engineer, CAD administrator
- Using CAD tools since 1982

Learning Objectives

- Learn how to configure and apply plastic rules to a design, then how to interpret the design advice for a part.
- Learn how to add common plastic features to a part, such as snaps and bosses.
- Learn how to analyze a snap design for performance, including deformation during engagement.
- Learn how to determine the mold-filling characteristics for a part.





Overall Design Plastic Challenges

Overview

- Typical resins shrink as they cool during the injection molding process.

This can cause:

  - Sink marks on surfaces
  - Molded-in stresses
  - The part shrinking onto the core of the mold.
  - Warping

- Other challenges for the part designer include:
  - Undercuts
  - Weld lines
  - Surface finish

- *Note: Fusion 360 doesn't give results for molded-in stresses.*
  The simulation results show effects of the shrinkage.

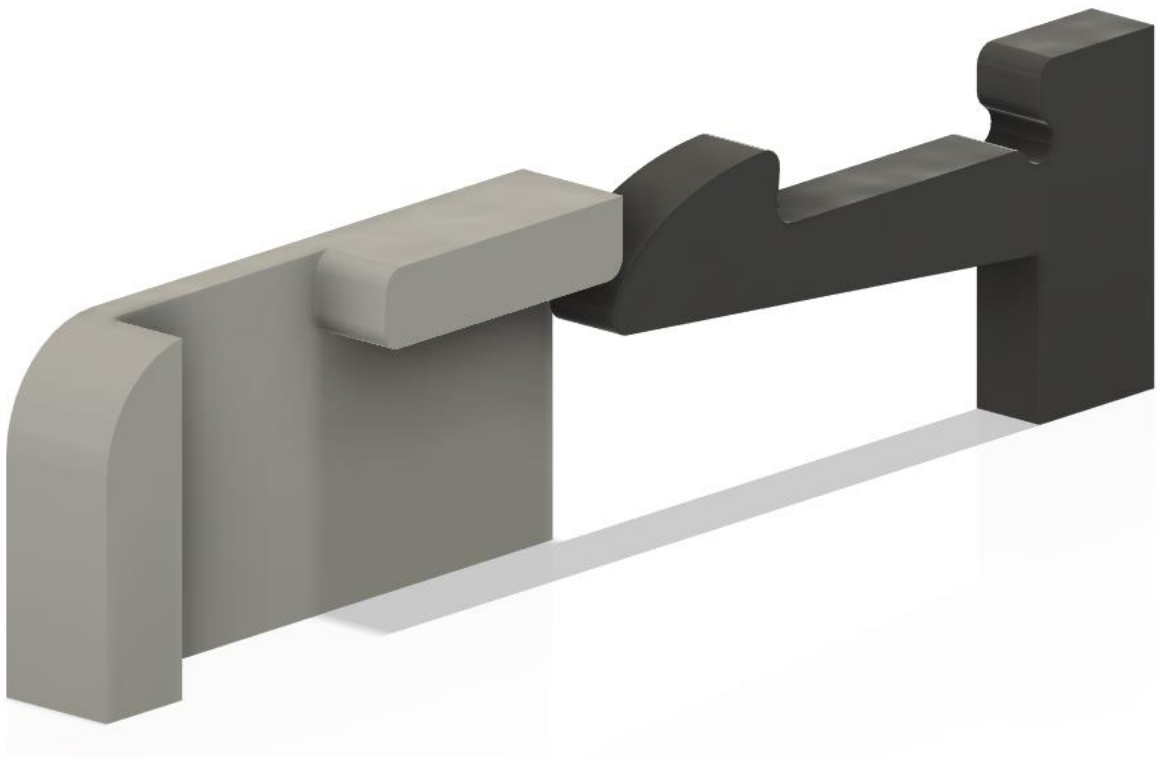
DESIGN CHALLENGES – In other words

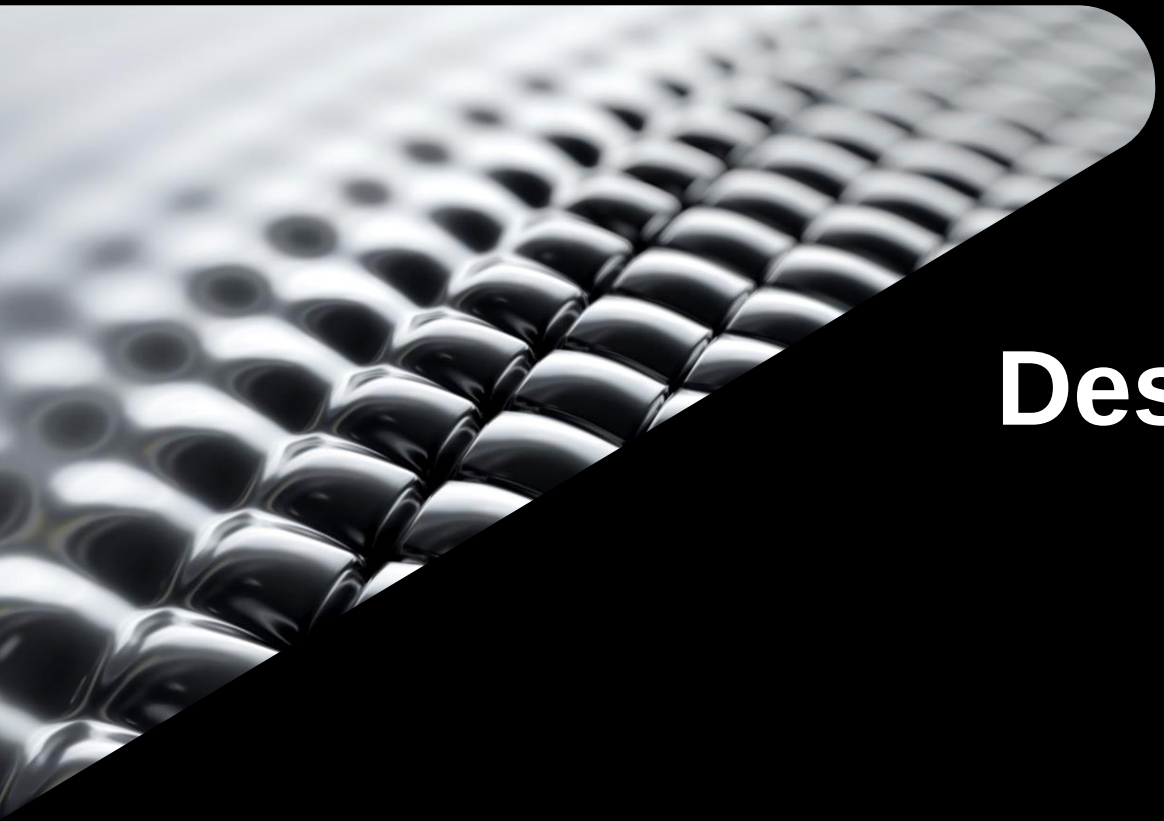
Will it work?

- Does do its job?
  - Is it strong enough?
  - Will it look good enough?

Can it be made?

- Will the cavity fill?
- Can the mold open?

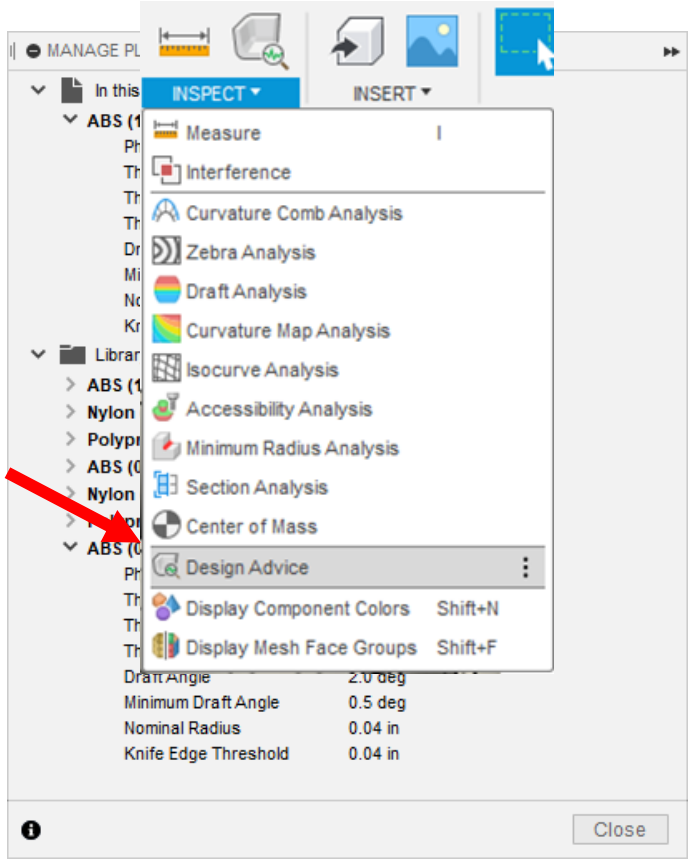


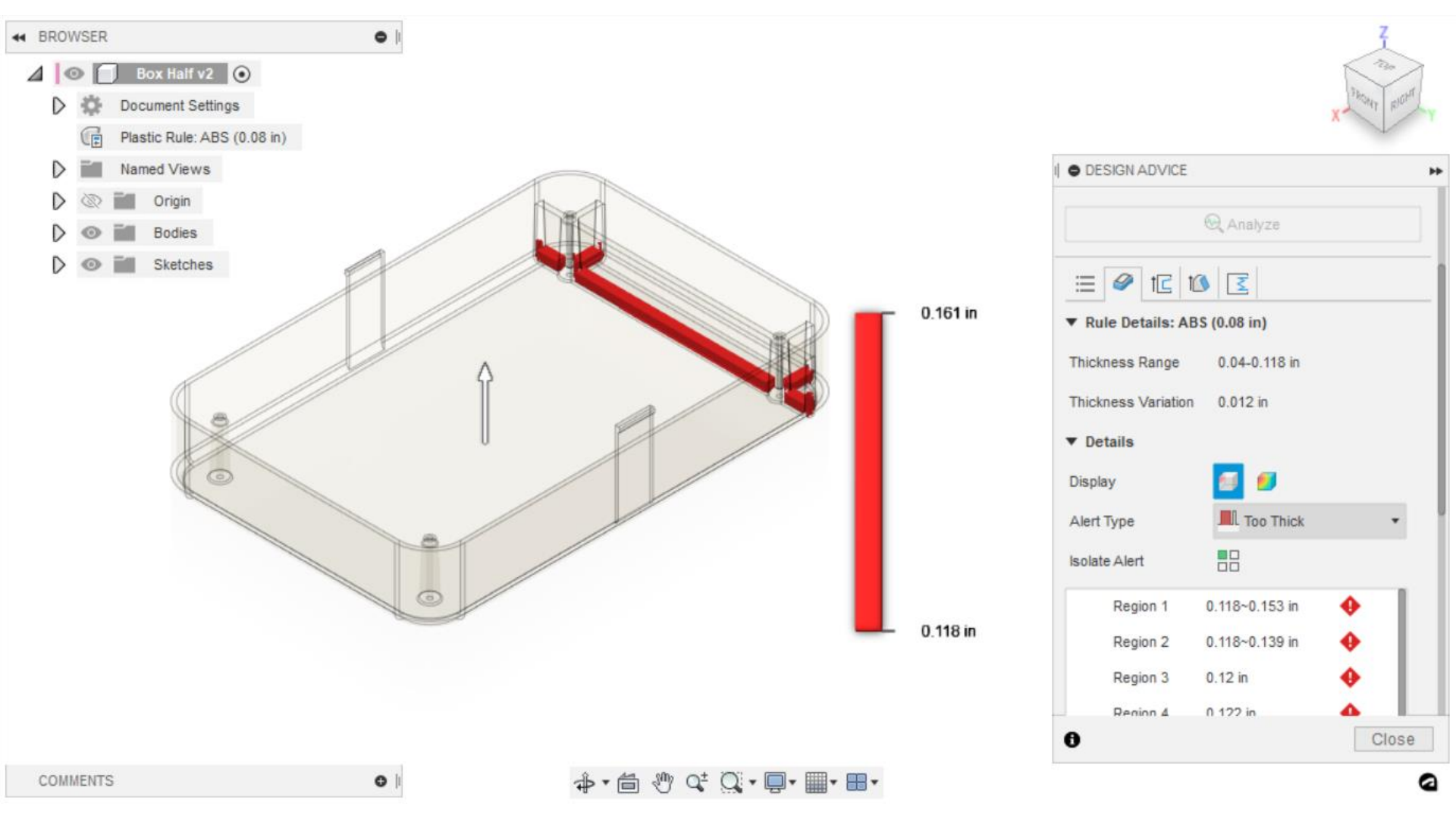


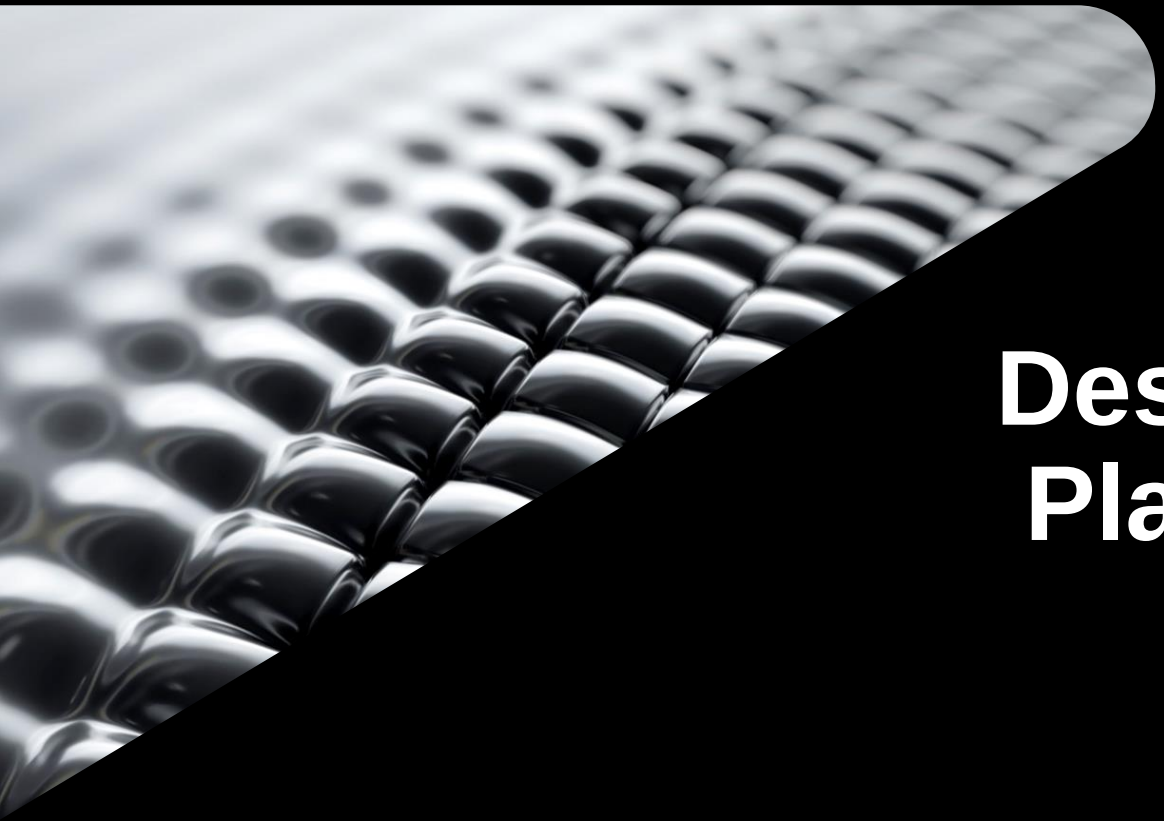
Designing Parts: Plastic Rules

PLASTIC RULES

- Physical Material
- Physical Values
  - Nominal wall thickness
  - Typical draft angle
  - Nominal radius
- Design Advice Values
  - Thickness range and variation
  - Minimum draft angle
  - Knife edge threshold




BROWSER
Box Half v2
Document Settings
Plastic Rule: ABS (0.08 in)
Named Views
Origin
Bodies
Sketches
0.161 in
0.118 in
DESIGN ADVICE
Analyze
Rule Details: ABS (0.08 in)
Thickness Range
0.04-0.118 in
Thickness Variation
0.012 in
Details
Display
Alert Type
Too Thick
Isolate Alert
Region 1
0.118~0.153 in
Region 2
0.118~0.139 in
Region 3
0.12 in
Close
COMMENTS

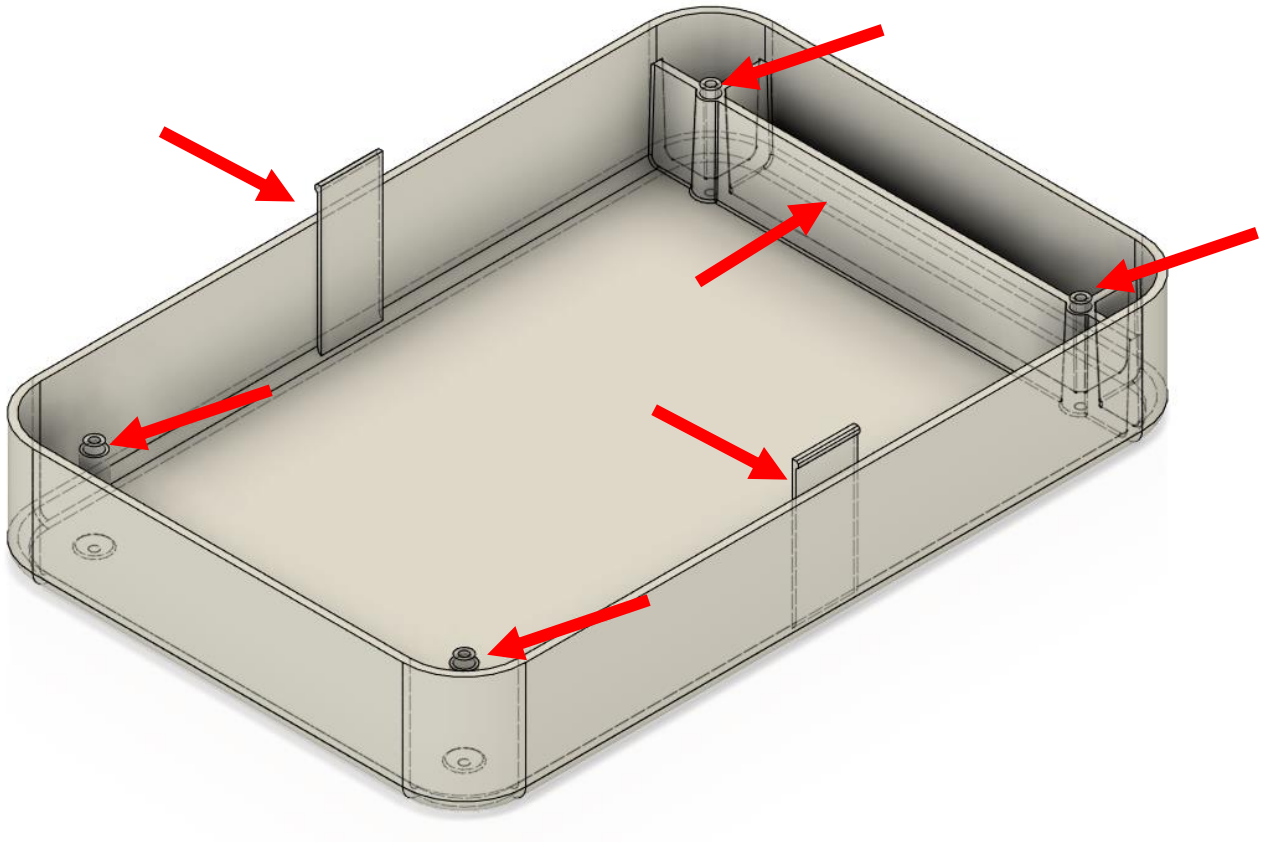


Designing Parts: Plastic Features

DESIGN FEATURES - Overview

Special Feature Types:

- Snaps
- Bosses
- Ribs
- Webs
- Draft



FUSION 360 CORE DESIGN TOOLS

CREATE

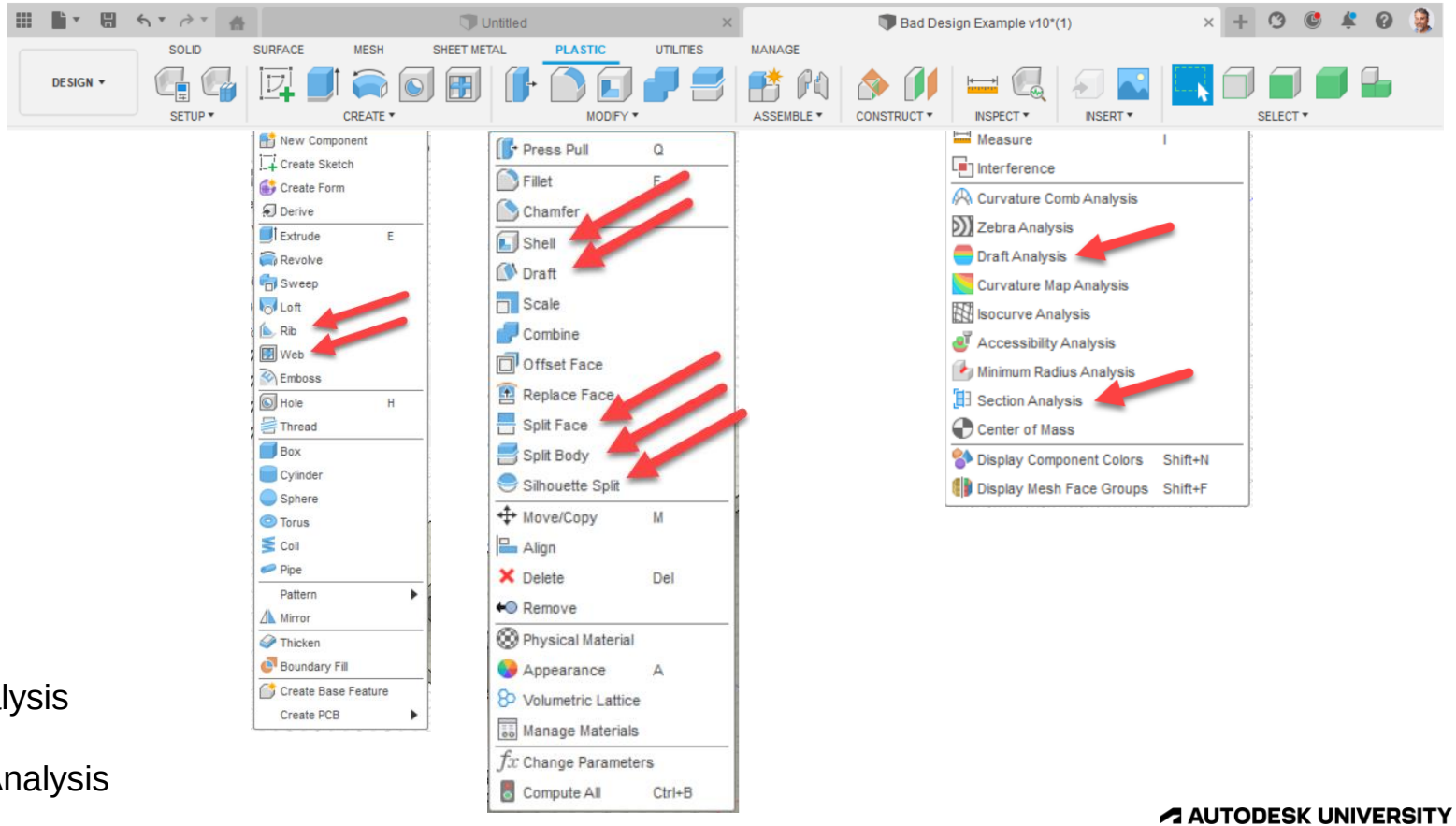
- Ribs
- Webs

MODIFY

- Shell
- Draft
- Splits

INSPECT

- Draft Analysis
- Section Analysis



PRODUCT DESIGN EXTENSION - PLASTIC

SETUP

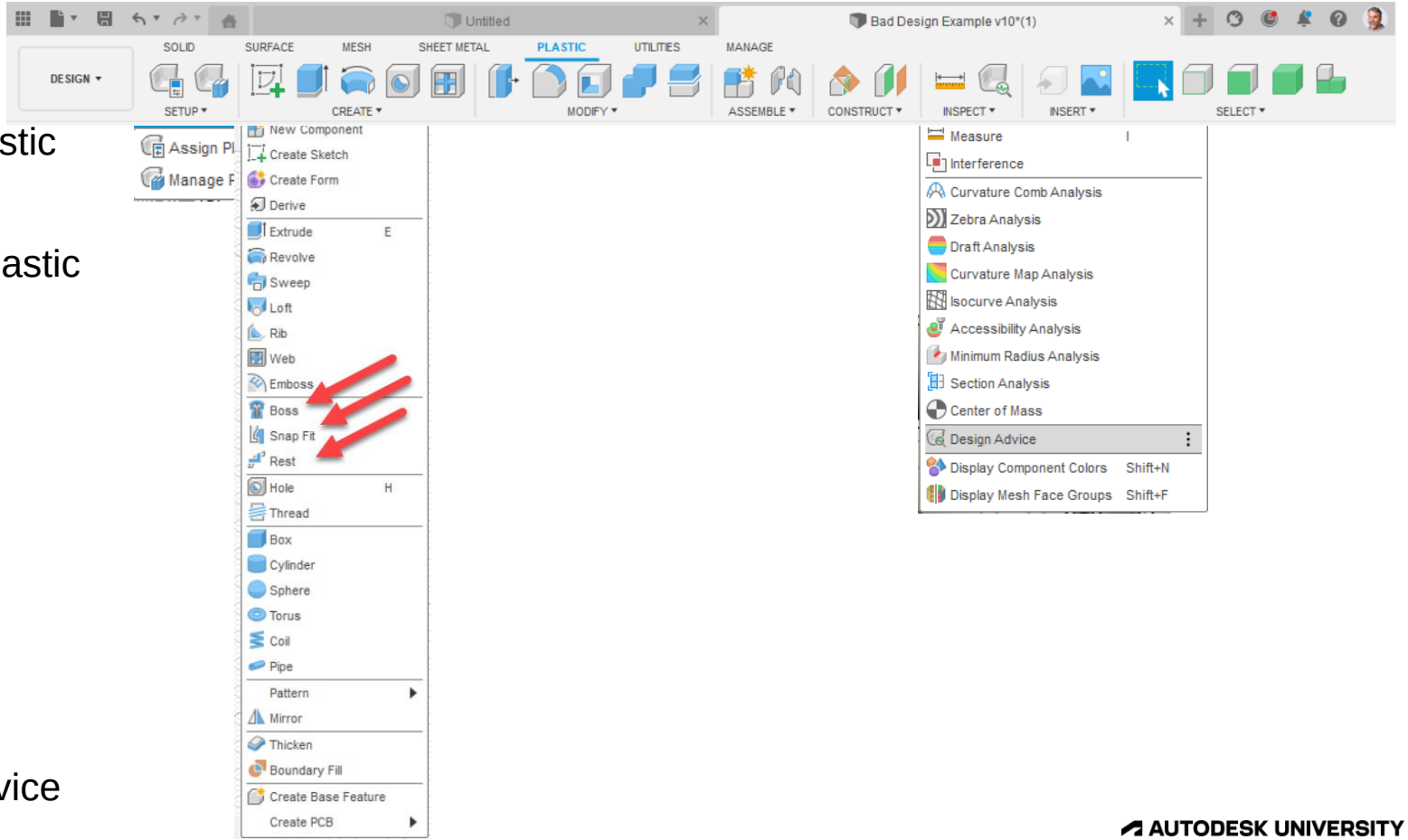
- Assign Plastic Rule
- Manage Plastic Rules

CREATE

- Boss
- Snap Fit
- Rest

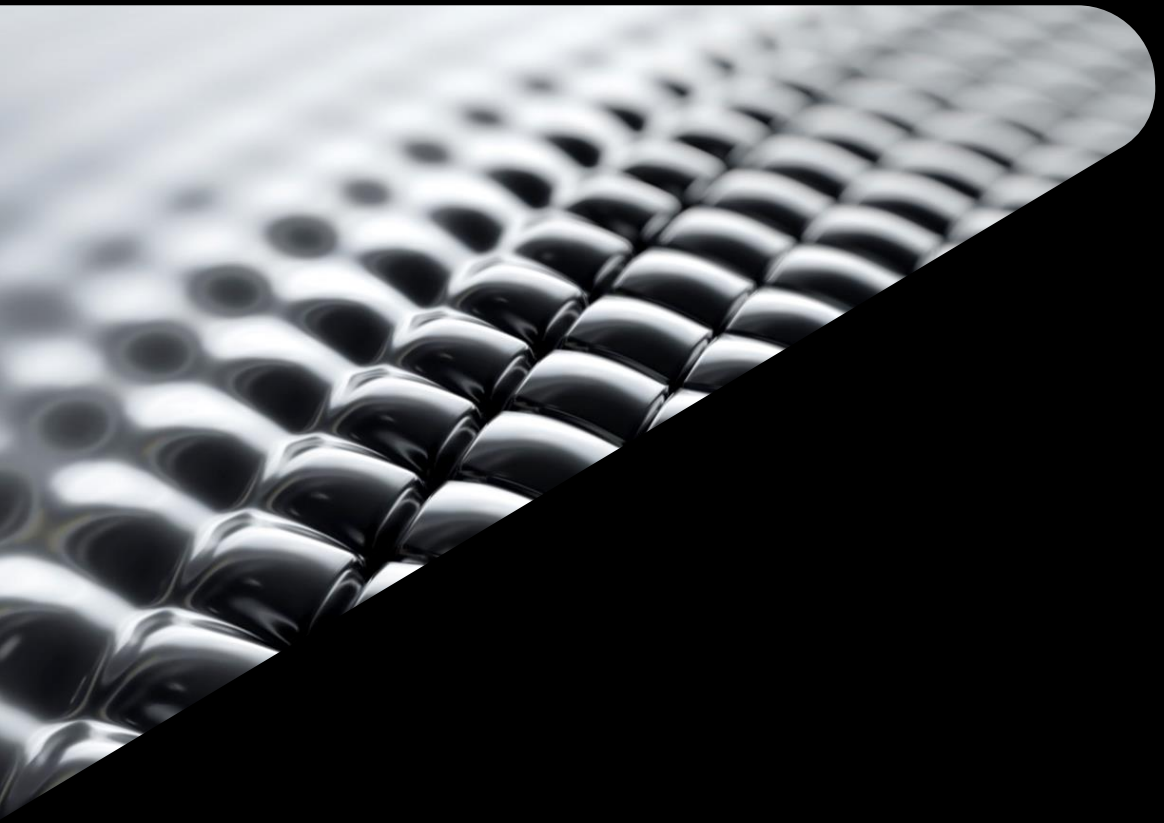
Inspect

- Design Advice



Example 1: Creating a basic plastic part

- Applying plastic rules.
- Creating basic plastic features.



Molding Simulation

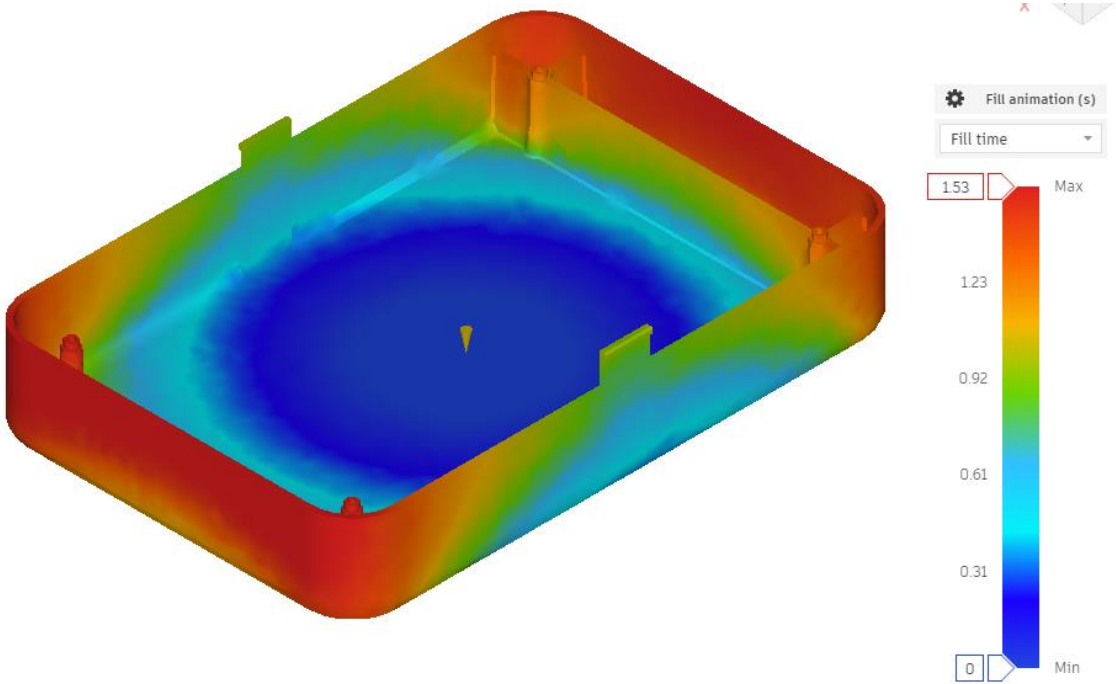
SIMULATION - Overview

Given:

- Material properties
- Injection gate location(s)
- Injection process parameters

Calculate:

- Fill characteristics
- Likely visual defects
- Likely warpage

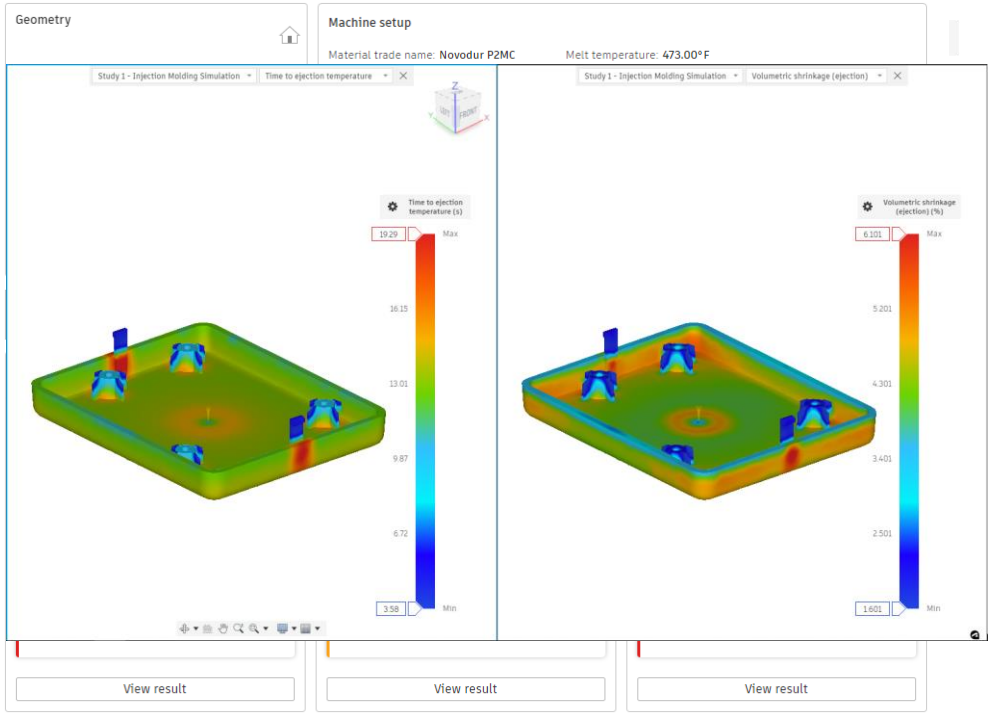


SIMULATION RESULTS

Result styles include:

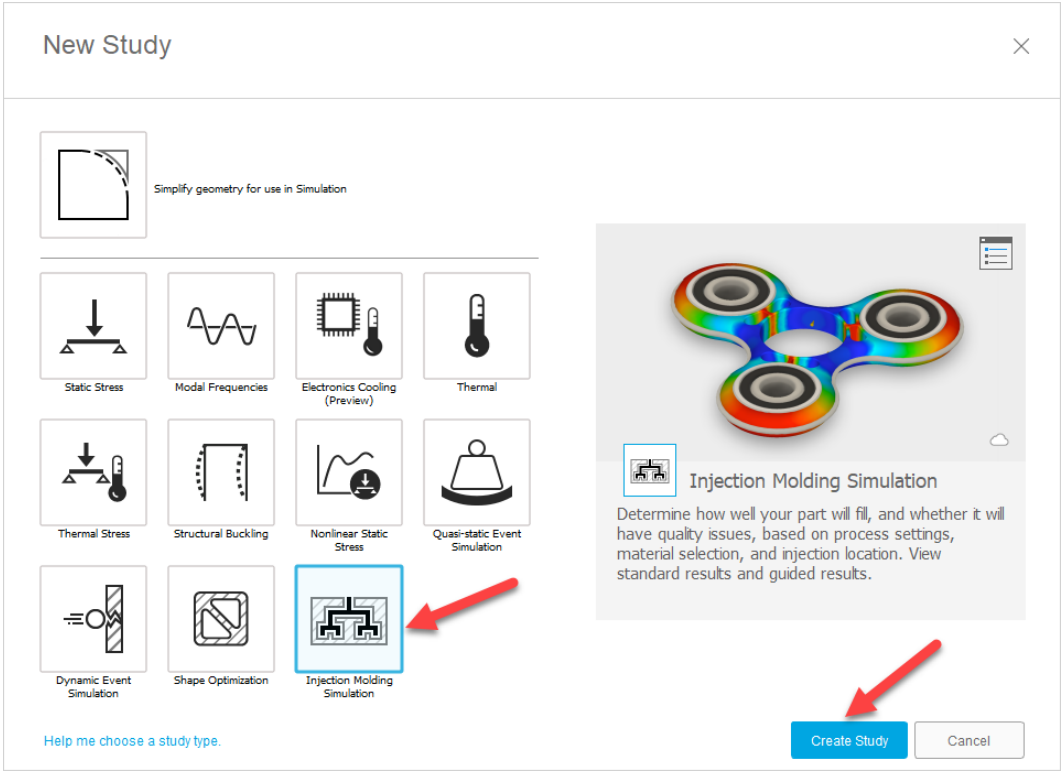
- **Guided Results**: Areas with molding concerns are highlighted, and suggested next steps are offered.
- **Results:** Basic Fill+Pack and Warp results from the study.
- **Molding Process**: Processing results, with links back to the Guided Results.

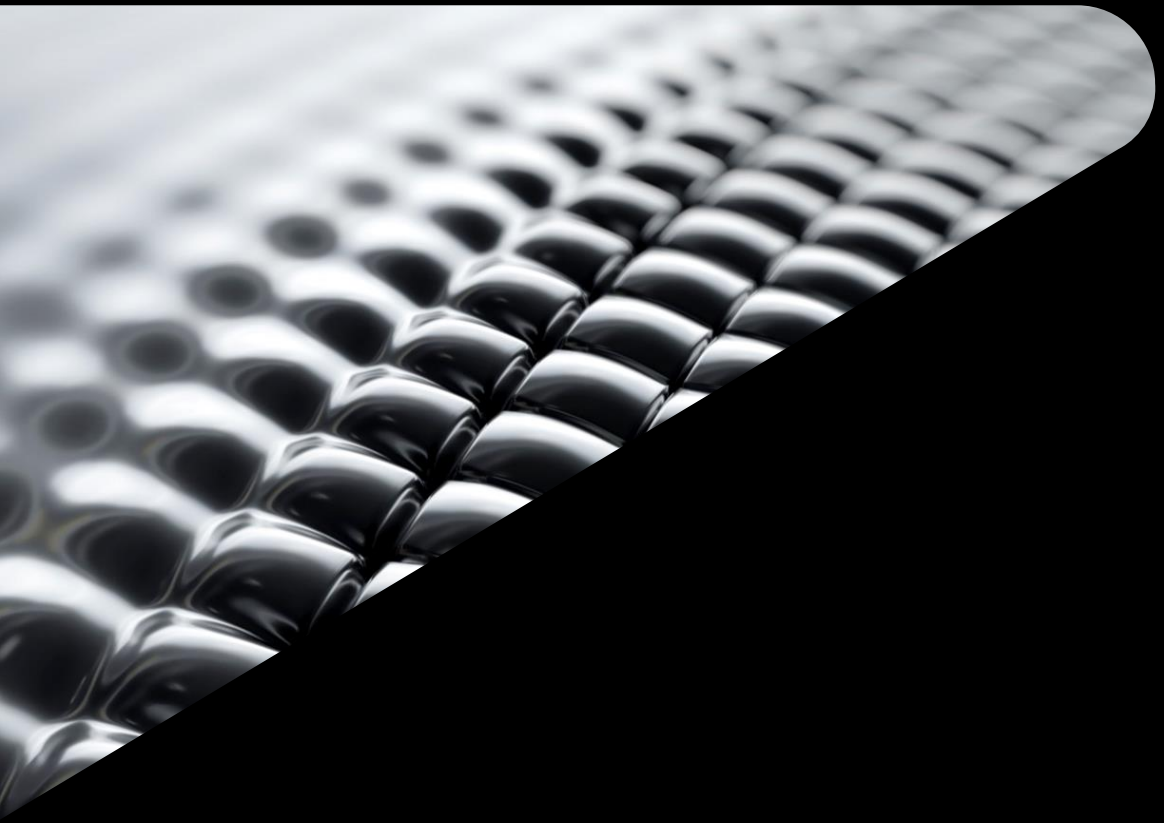
Results from different studies, or different results from the same study can be displayed next to each other.



Example 2: Simulating the molding process.

- **Injection Molding Simulation** for filling and warping.

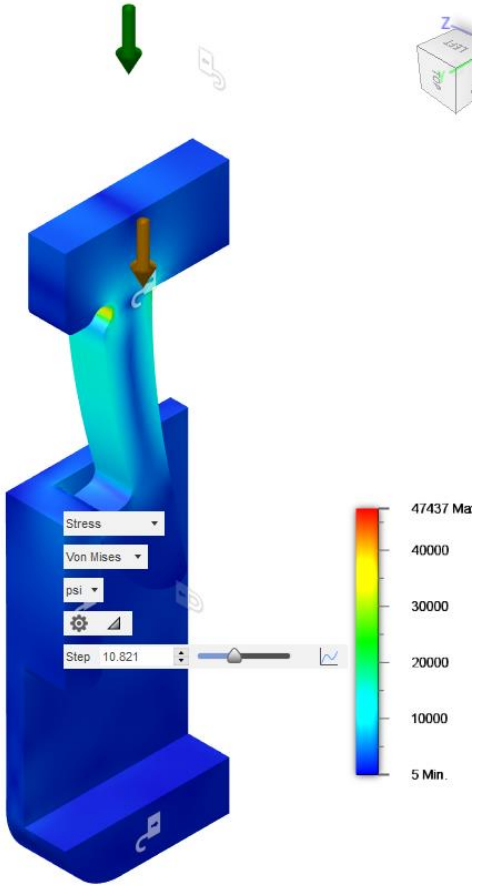




Strength Simulations

Example 3: Strength Simulations

- Static Stress
- Dynamic Event Simulation
- Quasi-static Event Simulation

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