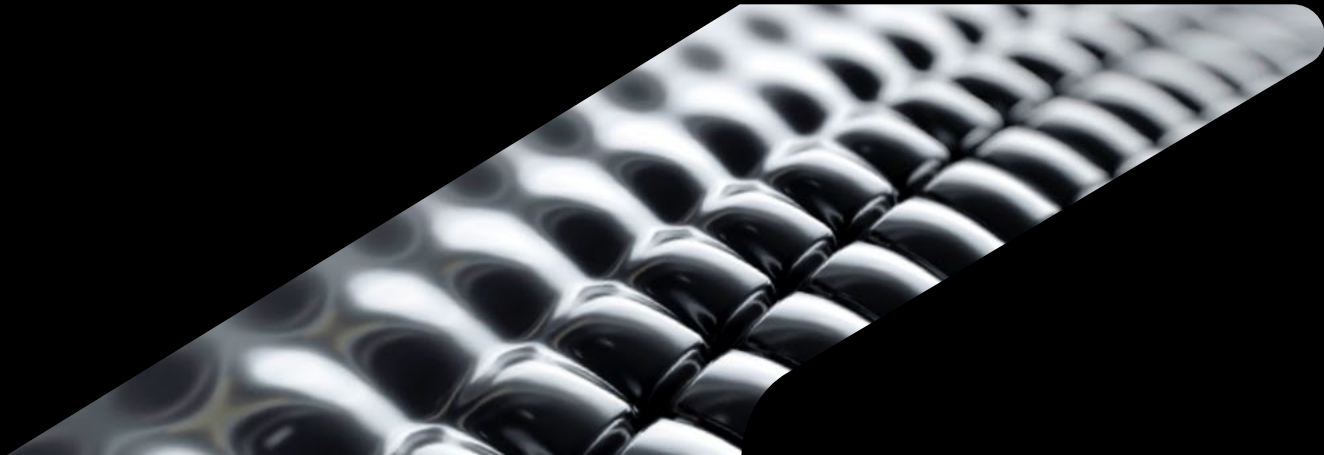


Basics Generative Design in Fusion 360

MFG500646

Alessandro Gasso
Fusion 360 Adoption Specialist





About the speaker

Alessandro Gasso

Alessandro Gasso is currently employed as Fusion 360 / Generative Design Adoption Specialist within the Customer Success Organization at Autodesk, Inc. Over the past 21 years with Autodesk, Ale has worked in various roles including product support specialist for Inventor, the lead for the EMEA Inventor Product Support Team, EMEA technical lead of Inventor software, premium support specialist leading the PSS Manufacturing Team, manufacturing industry technical lead, and Enterprise Solutions leads manager. Ale was the co-author of the Being Inventive Inventor blog, and he has spoken at Autodesk University from 2012 to 2020. Before Autodesk, Ale worked for 7 years as a mechanical designer for a company in the defense industry. Ale is a native of Italy who speaks English, Italian, French, Spanish, and Portuguese, and he holds a master's degree in electromechanical engineering from the University of Naples (Napoli).

Learning Objectives

- Change the way you design using Generative Design
- Define, generate, and explore a generative design study
- Build knowledge of what generative design is and how it could change the way we think of design
- Learn how to increase product performance on components

Safe Harbor Statement

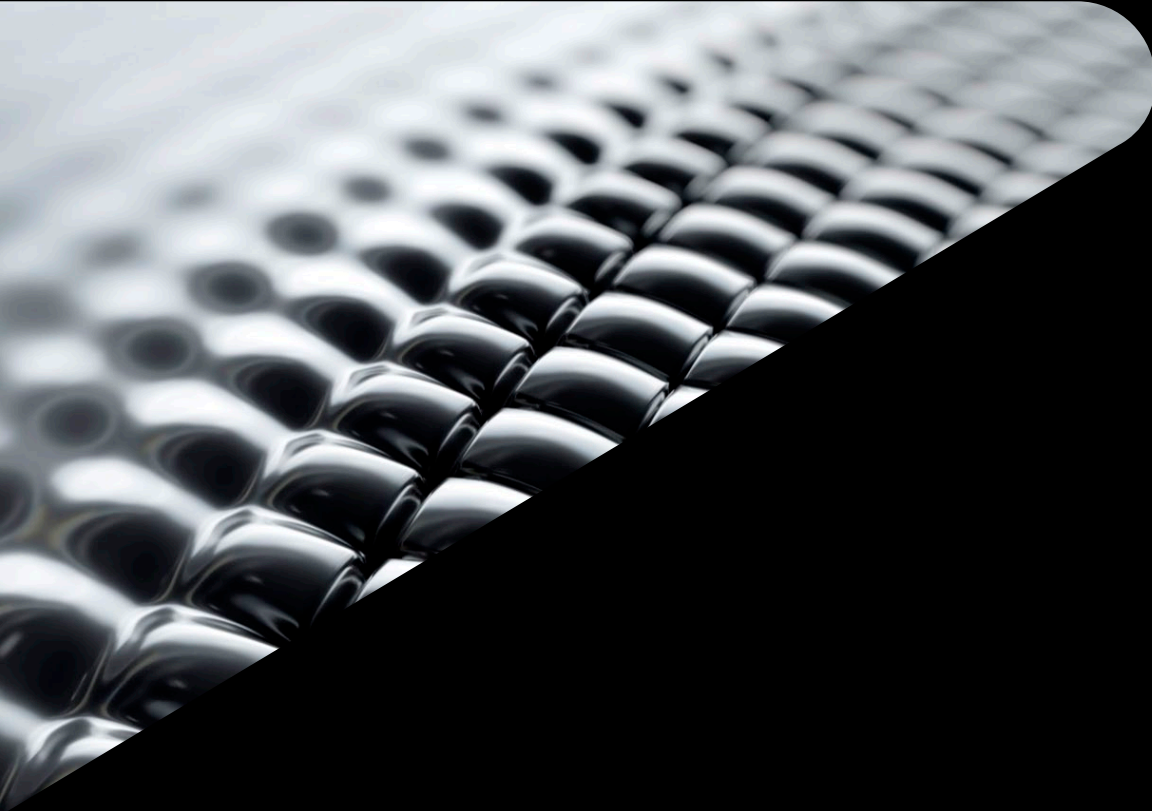
We may make forward-looking statements regarding planned or future development efforts for our existing or new products and services and statements regarding our strategic priorities. These statements are not intended to be a promise or guarantee of business results, future availability of products, services or features but merely reflect our current plans and are based on factors currently known to us. These planned and future development efforts may change without notice. Purchasing and investment decisions should not be made based upon reliance on these statements.

A discussion of factors that may affect future results is contained in our most recent Form 10-K and Form 10-Q filings available at www.sec.gov, including descriptions of the risk factors that may impact us and the forward-looking statements made in these presentations. Autodesk assumes no obligation to update these forward-looking statements to reflect events that occur or circumstances that exist or change after the date on which they were made. If this presentation is reviewed after the date the statements are made, these statements may no longer contain current or accurate information.

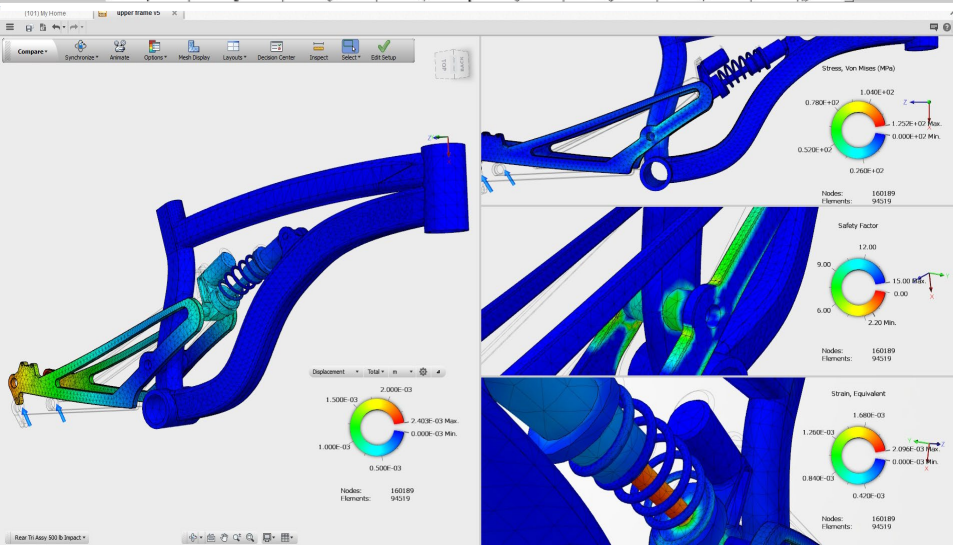
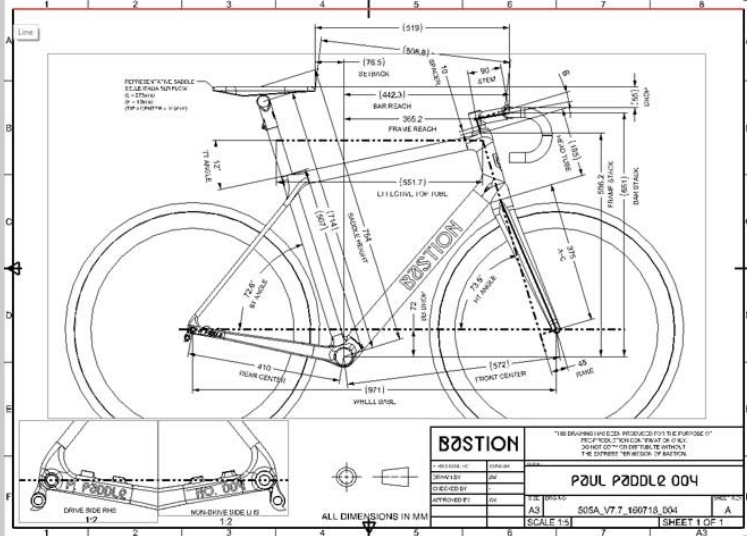
This presentation also contains information, opinions and data supplied by third parties and Autodesk assumes no responsibility for the accuracy or completeness of such information, opinions or data, and shall not be liable for any decisions made based upon reliance on any such information, opinions or data.

Autodesk's partners frequently compete against each other in the marketplace, and it is critically important that all participants in this meeting observe all requirements of antitrust laws and other laws regarding unfair competition. Autodesk's long insistence upon full compliance with all legal requirements in the antitrust field has not been based solely on the desire to stay within the bounds of the law, but also on the conviction that the preservation of a free and vigorous competitive economy is essential to the welfare of our business and that of our partners, the markets they serve, and the countries in which they operate. It is against the policy of Autodesk to sponsor, encourage or tolerate any discussion or communication among any of its partners concerning past, present or future prices, pricing policies, bids, discounts, promotions, terms or conditions of sale, choice of customers, territorial markets, quotas, inventory, allocation of markets, products or services, boycotts and refusals to deal, or any proprietary or confidential information. Communication of this type should not occur, whether written, oral, formal, informal, or "off the record." All discussion at this meeting should be strictly limited to presentation topics.

PLEASE NOTE: OTC content is proprietary. Do Not Copy, Post or Distribute without expressed permission.



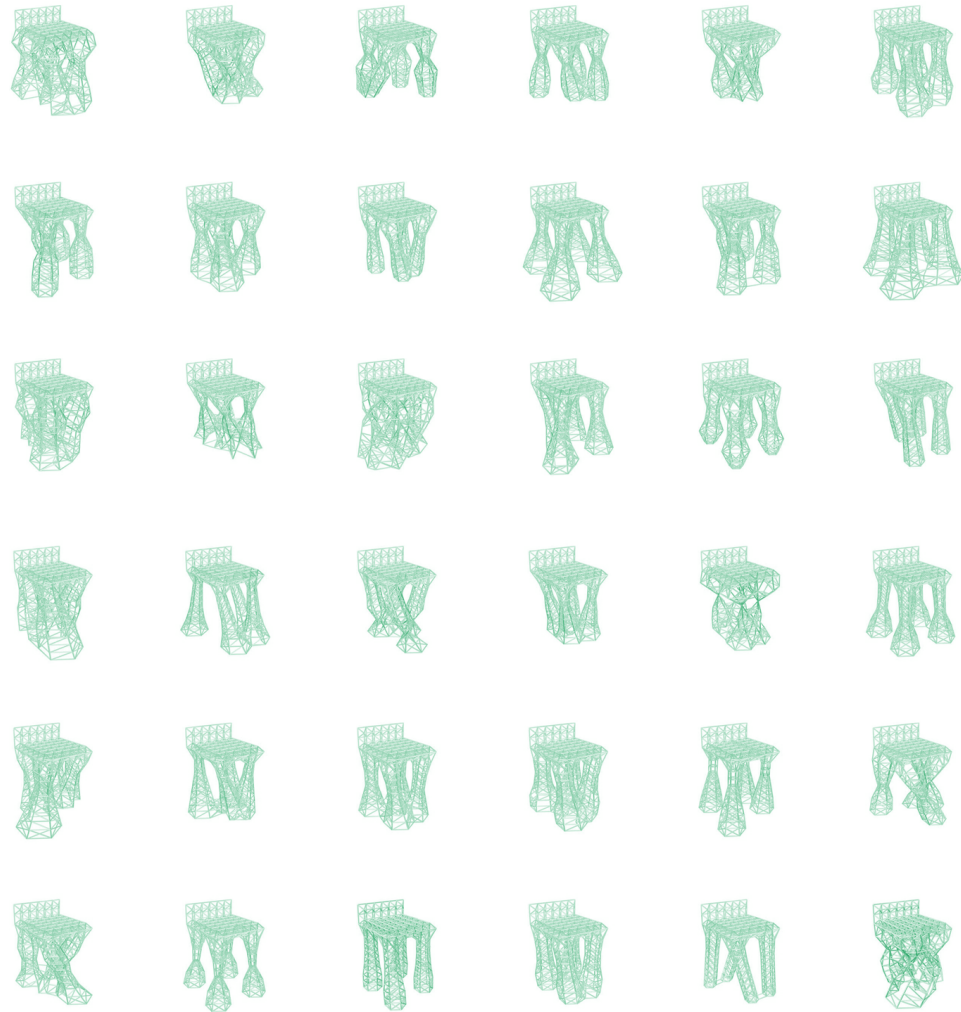
Generative Design



What is Generative Design

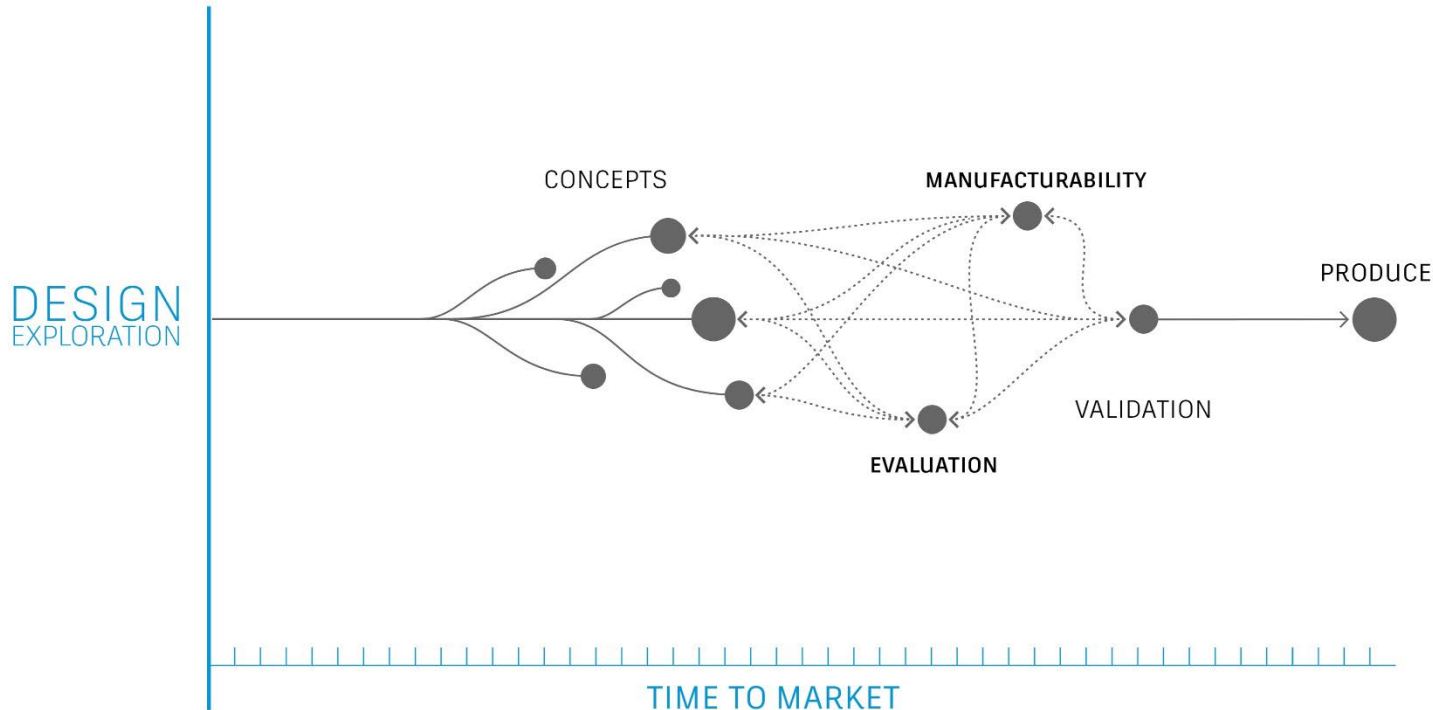
Autodesk generative design is a **Manufacturing-aware** technology.

- ✓ **Design Exploration** = 10's, 100's, 1000's of higher performing design options
- ✓ **Manufacturing Aware**
- ✓ **Multiple Materials**
- ✓ **Open Design Space exploration**
- ✓ **Multiple Production methods**
- ✓ **CAD-Ready Geometry**



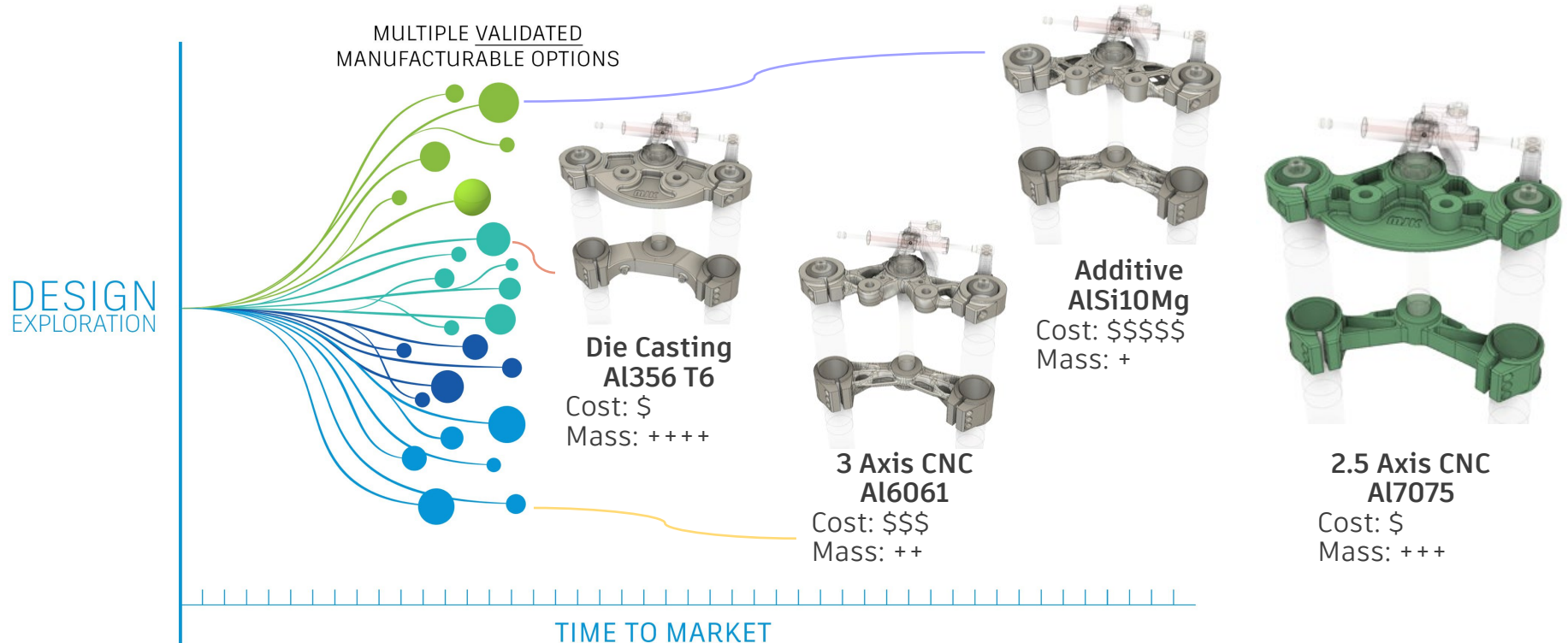
How Generative Design help the product development process

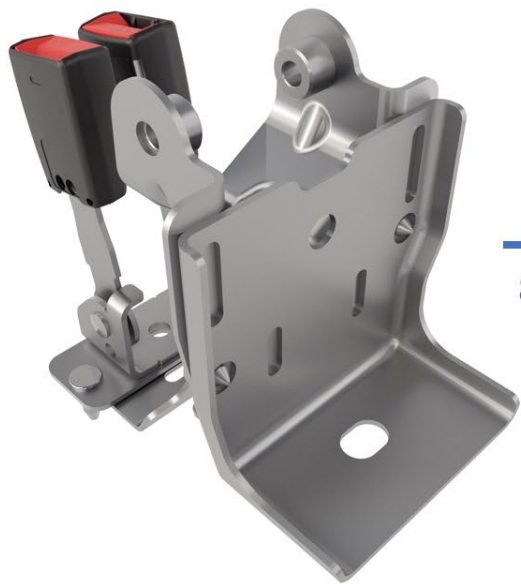
TRADITIONAL



How Generative Design help the product development process

GENERATIVE DESIGN





**Generative Design &
Additive Manufacturing**

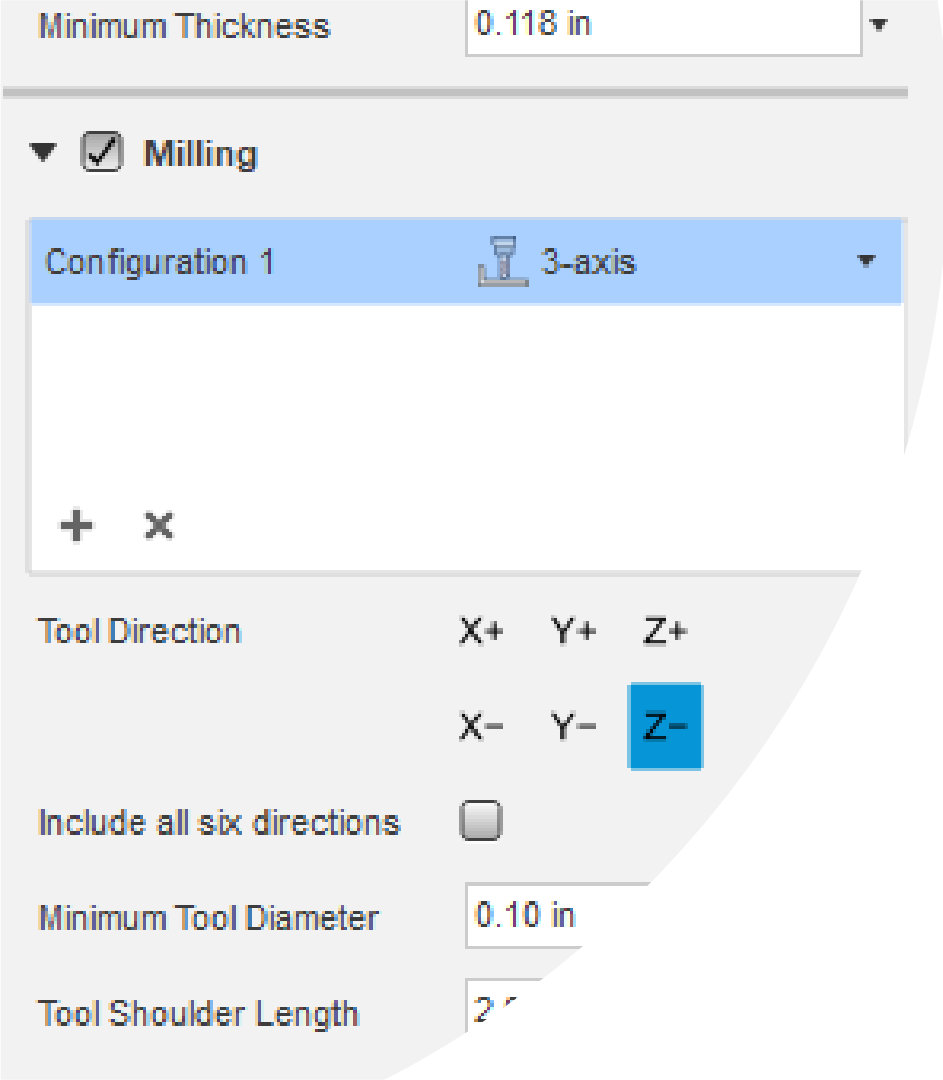
150 Design Options

8 components into 1 part
40% lighter
20% stronger



GENERAL MOTORS



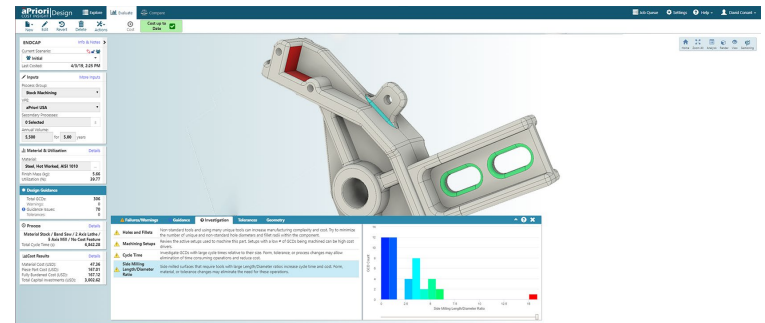
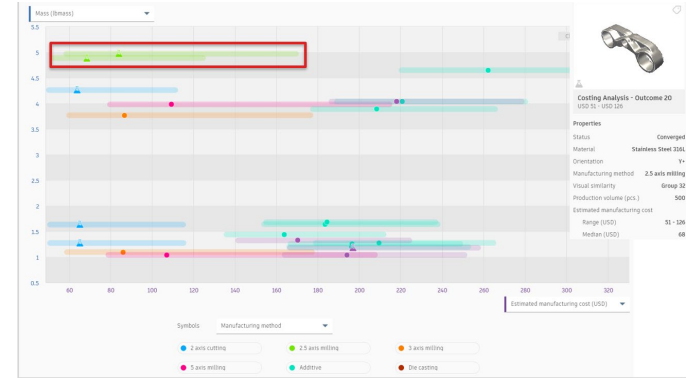
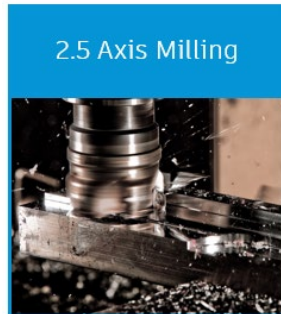
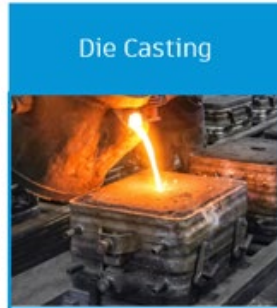


**Generative
Design is NOT
exclusive to
Additive
Manufacturing**

Design for MFG

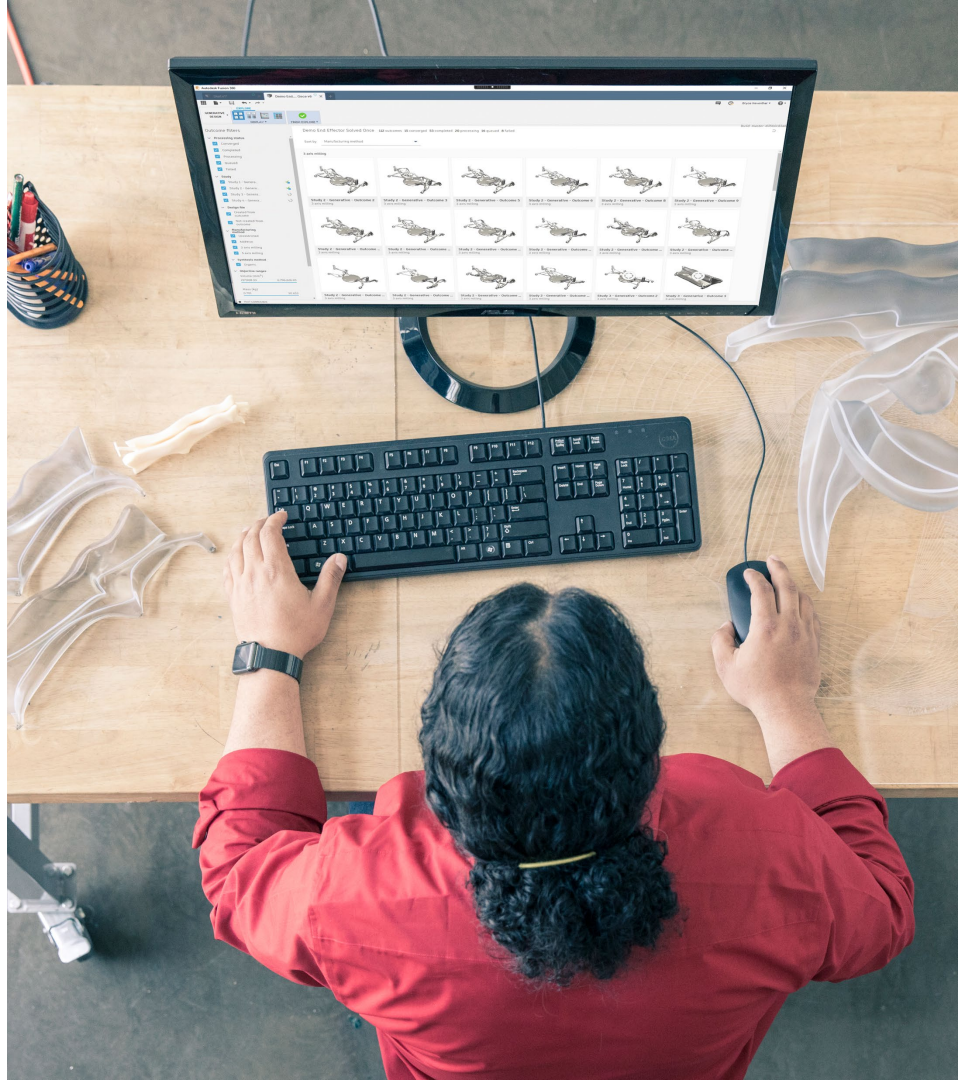
+

Cost Analysis



Challenges Today

- Limited time to ideate
- Increasing demand for engineering expertise
- Design and manufacturing disconnect
- Late-stage changes are cost prohibitive



Why Generative Design?

Top benefits and outcomes customer realize



Improve profit margins



Improve time to market

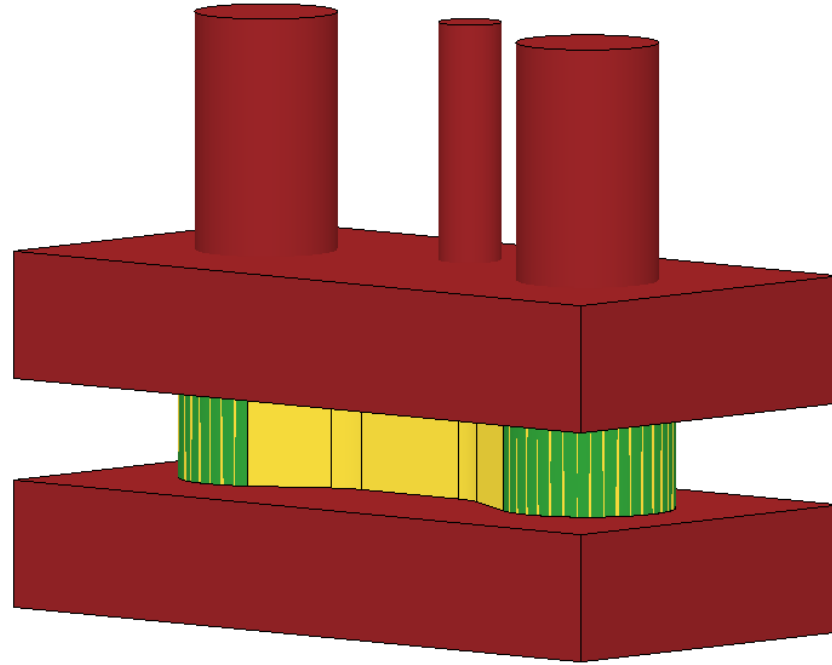


Win more business



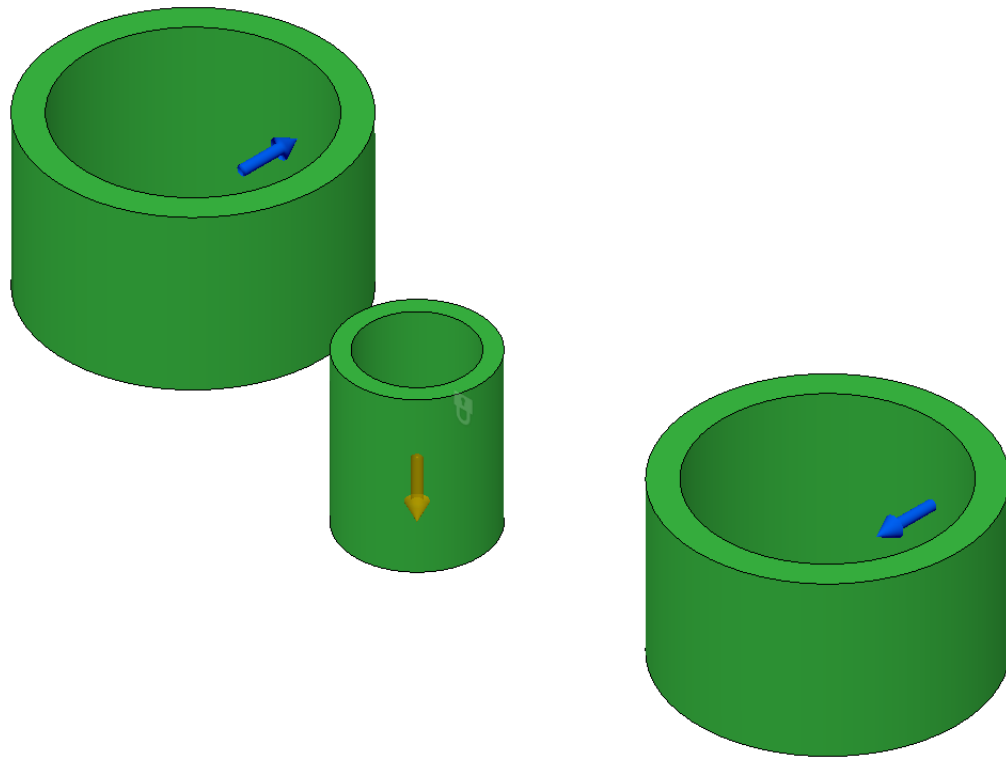
How Generative Design works

How Generative Design works



Preserve Geometry

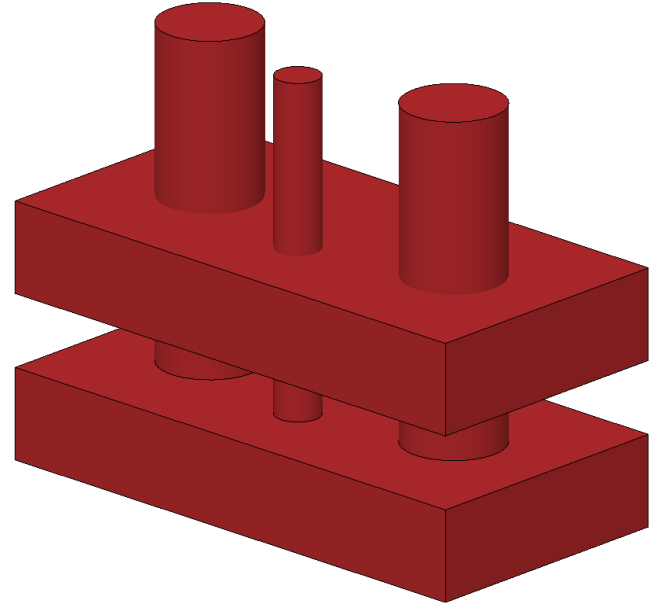
“Keep-ins”



Obstacle Geometry

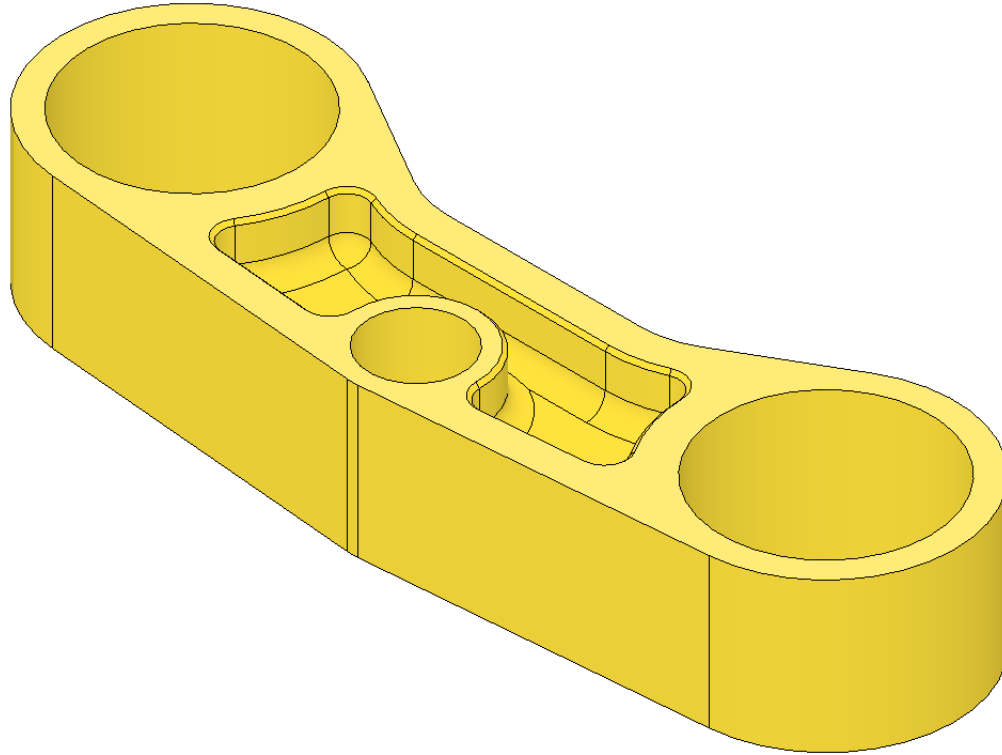
“Keep-outs”

- clearances
- fastener and tool access
- motion/state
- assembly



Starting Shape

“Optional”



Design Conditions, Design Criteria, Materials



Outcomes

Autodesk Fusion 360

Triple Clamp Start_1.v5

GENERATIVE DESIGN | EXPLORE | DISPLAY | EXPORT | CREATE | FINISH EXPLORE

Outcome filters

- Processing status
 - ☒ Converged (48)
 - ☒ Completed (8)
- Study
 - Visual similarity
 - Design file
 - Tech-Preview
- Manufacturing method
 - ☒ Unrestricted
 - ☒ Additive
 - ☒ 2 axis cutting
 - ☒ 2.5 axis milling
 - ☒ 3 axis milling
 - ☒ 5 axis milling
 - ☒ Die casting
- Materials
 - ☒ Aluminum 6061
 - ☒ Aluminum AlSi10...
 - ☒ Bronze, Cast
 - ☒ Stainless Steel AI...
 - ☒ Titanium 6Al-4V
- Objective ranges
 - Volume (mm³)
139,191,604 495,738.49
 - Mass (kg)
0.433 4.397
 - Max von Mises stress (MPa)

Sort by Fully burdened cost

Recommended outcomes Compare

 Structural Compon... - Outcome 52 USD 9 - USD 19	 Structural Compo... - Outcome 44 USD 30 - USD 65	 Structural Compon... - Outcome 41 USD 30 - USD 66	 Structural Compon... - Outcome 42 USD 30 - USD 63	 Structural Compo... - Outcome 45 USD 35 - USD 64	 Structural Compo... - Outcome 39 USD 30 - USD 70
 Structural Compo... - Outcome 36 USD 31 - USD 69	 Structural Compo... - Outcome 35 USD 31 - USD 77	 Structural Compo... - Outcome 38 USD 32 - USD 77	 Structural Compo... - Outcome 40 USD 35 - USD 77	 Structural Compo... - Outcome 43 USD 35 - USD 78	 Structural Compo... - Outcome 5 USD 36 - USD 49
 Structural Compon... - Outcome 37 USD 37 - USD 89	 Structural Compo... - Outcome 48 USD 40 - USD 109	 Structural Compon... - Outcome 47 USD 42 - USD 125	 Structural Compo... - Outcome 49 USD 43 - USD 105	 Structural Compo... - Outcome 46 USD 48 - USD 138	 Structural Compon... - Outcome 51 USD 48 - USD 119

Trade-off



HUMAN DESIGNED

3-AXIS GENERATIVE

2.5-AXIS GENERATIVE

FOS

5.7

3.0

3.0

Mass

389.7g

186.7g

204.2g

Cycle Time

51 min

123min

35min

**Design
Time**

Options

**HUMAN
DESIGNED**

3.5 Hours

3

**3-AXIS
GENERATIVE**

**20
Minutes**

100

**2.5-AXIS
GENERATIVE**

**20
Minutes**

100



Live Demo

Learning Objectives

- Change the way you design using Generative Design
- Define, generate, and explore a generative design study
- Build knowledge of what generative design is and how it could change the way we think of design
- Learn how to increase product performance on components

Learning resources

- Beginners
 - <https://help.autodesk.com/view/fusion360/ENU/courses/#generative-design>
- Advanced
 - <https://www.autodesk.com/certification/learn/course/fusion360-generative-design-manufacturing-applications-expert>
 - <https://www.autodesk.com/certification/learn/course/fusion360-generative-design-intro-expert>



Autodesk and the Autodesk logo are registered trademarks or trademarks of Autodesk, Inc., and/or its subsidiaries and/or affiliates in the USA and/or other countries. All other brand names, product names, or trademarks belong to their respective holders. Autodesk reserves the right to alter product offerings, specifications and pricing at any time without notice, and is not responsible for typographical or graphical errors that may appear in this document.

© 2022 Autodesk. All rights reserved.