Generative Design to Build an Optimum Model for Autodesk CFD

Heat-Sink Modelling

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About the speaker

Gilberto Fernandez

Gilberto Fernandez is a Designated Support Specialist within the Autodesk Customer Services organization. Having an engineering background, he has vast experience in the field of Simulation and Computational Fluid Dynamics. Mainly Gilberto's role is to lead the way technically with Autodesk Premium Customers, in terms of Simulation solutions. He is based in Barcelona, and is heavily focused now in Design Optimization through Simulation

AUTODESK® FUSION 360™

AUTODESK CFD

Summary

This demo will show how to generate a model for a heat sink to be simulated in Autodesk CFD, optimizing the model with Fusion 360 software and Generative Design.

Generative design is a process of iterative design that uses the power of computing to give a large number of permutations and possibilities that we can fine-tune to get an optimum-performing design.

This demo will apply this to a real-world model of a heat sink, where we can vary the layout and the geometry of our item quite a lot, based on different constraints.

We will go through the decision-making process to achieve the best-performing design.

Agenda

SUMMARY

INTRODUCTION TO GENERATIVE DESIGN

- Why do we care?
- What makes it different?

HEAT SINK MODELLING DETAILS

- Fusion initial model
- CFD model
- Comparison in CFD

GENERATIVE DESIGN WORKFLOW DEMO

RUNNING ALTERNATIVES IN CFD

CHALLENGES AND LIMITATIONS

LOOKING INTO THE FUTURE

ADDITIONAL RESOURCES

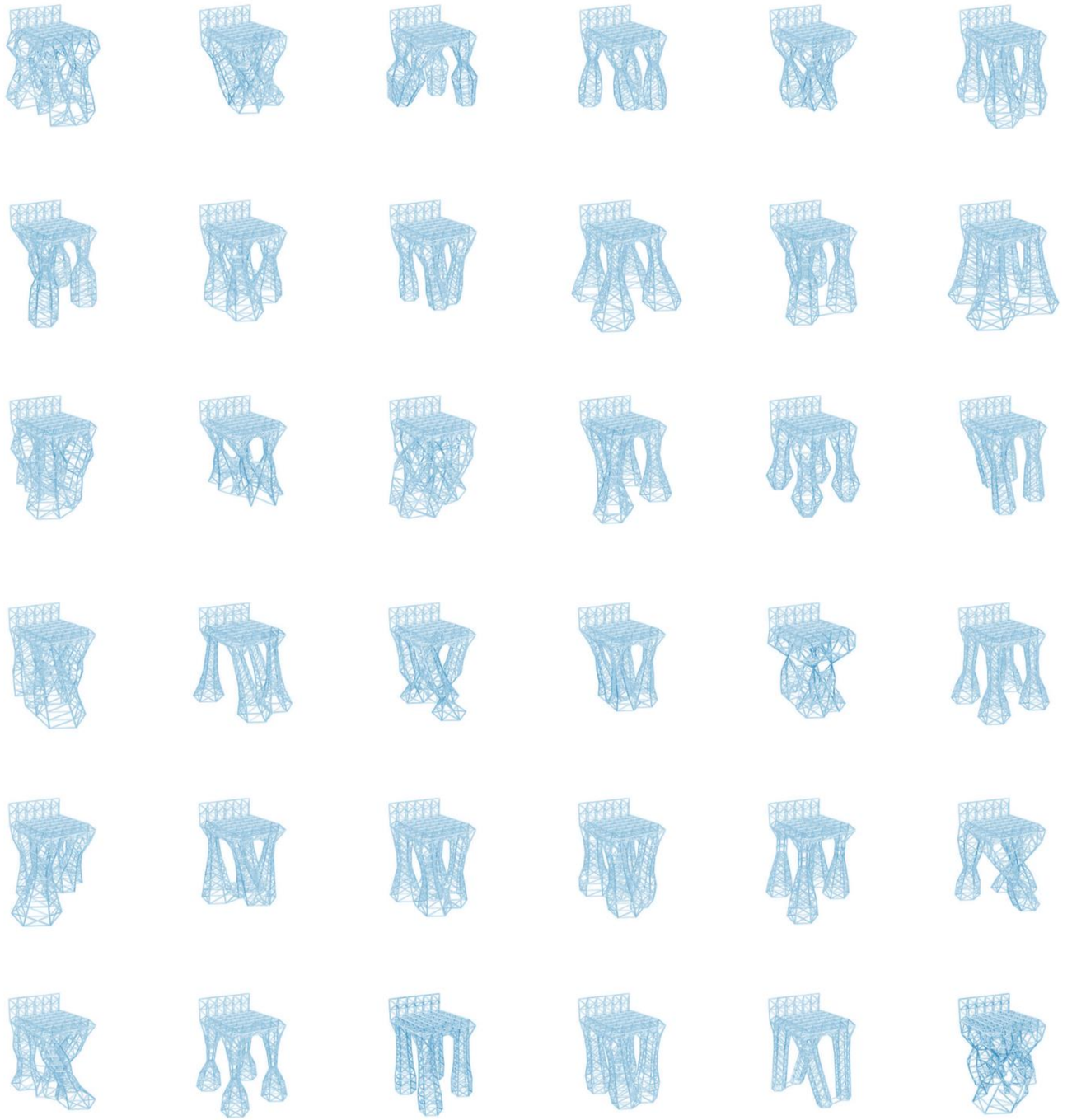
Q&A

Design is thinking made visual

SAUL BASS (1920-1996)

Introduction to Generative Design

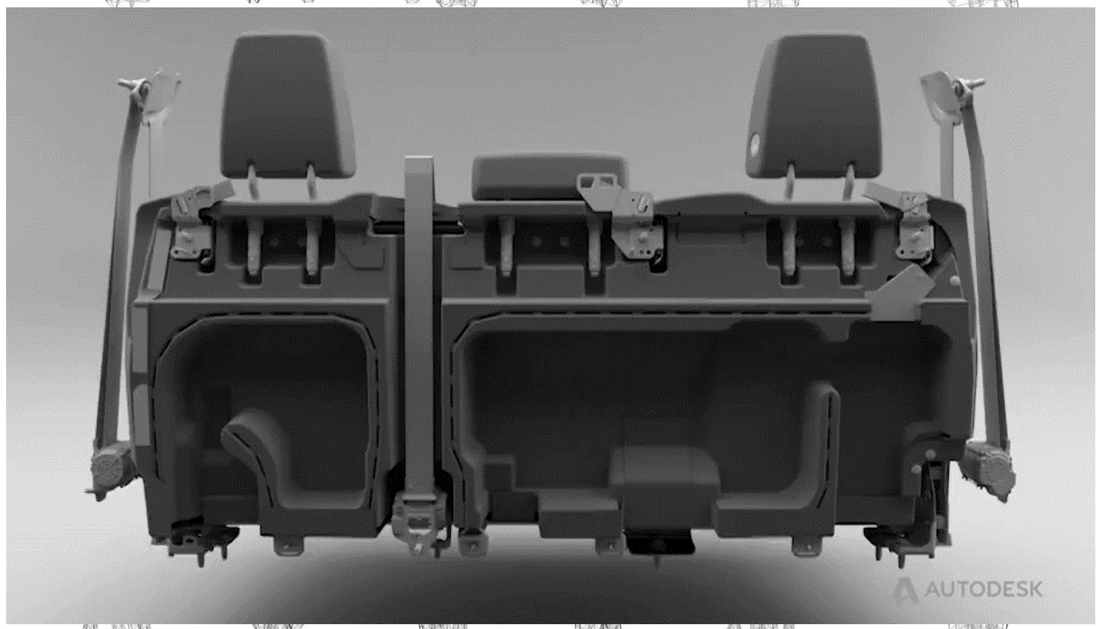
What is Autodesk Generative Design?



Autodesk generative design is a **design exploration** technology.

Simultaneously generate multiple CAD-ready solutions based on real-word manufacturing constraints and product performance requirements.

Why do we care?



Part consolidation is a twofold motivator

Optimize for mass

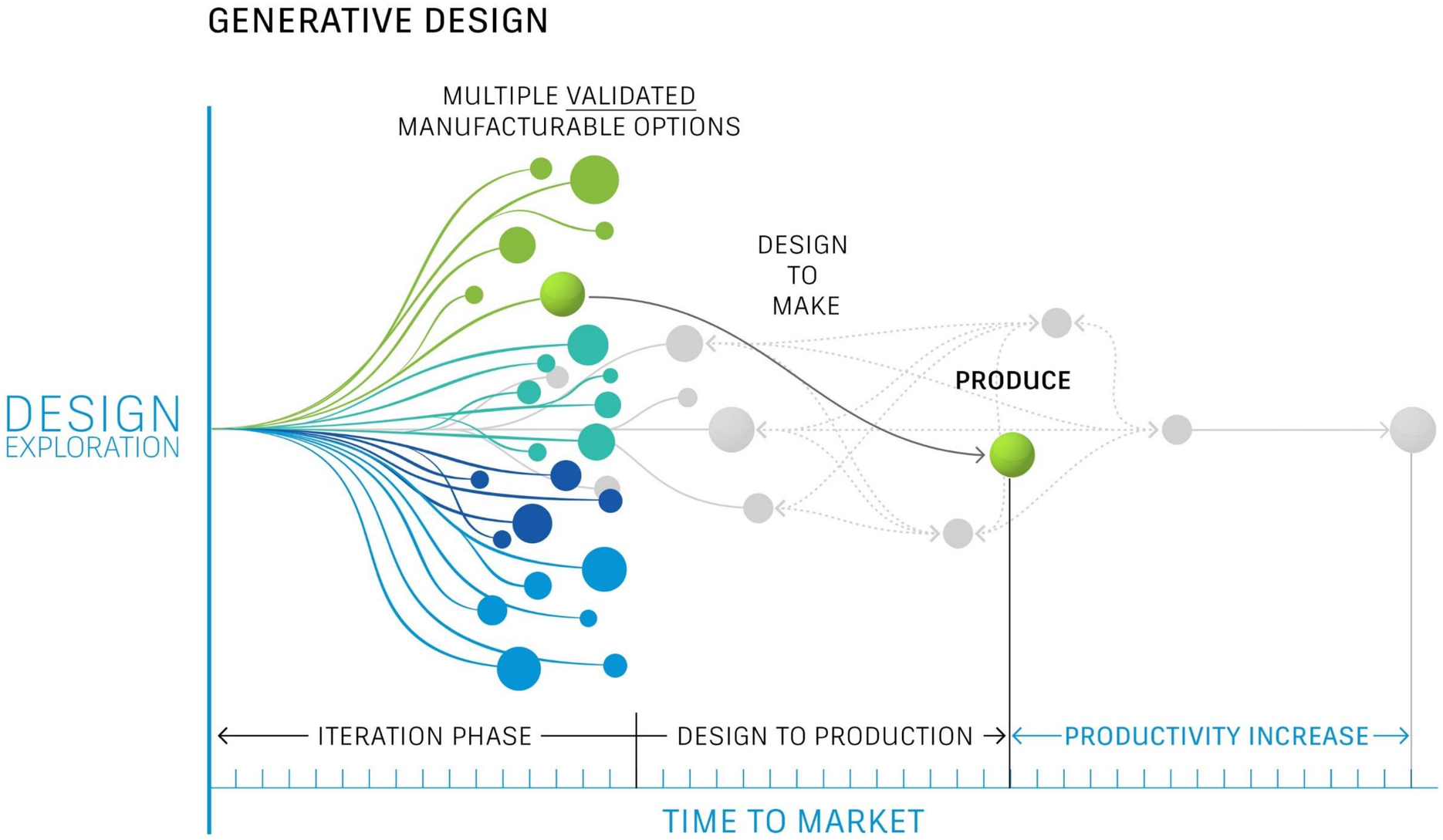
Reduce supply-chain costs associated with each part and its unique supplier

Making wheelchairs more versatile, customizable and a fashion item

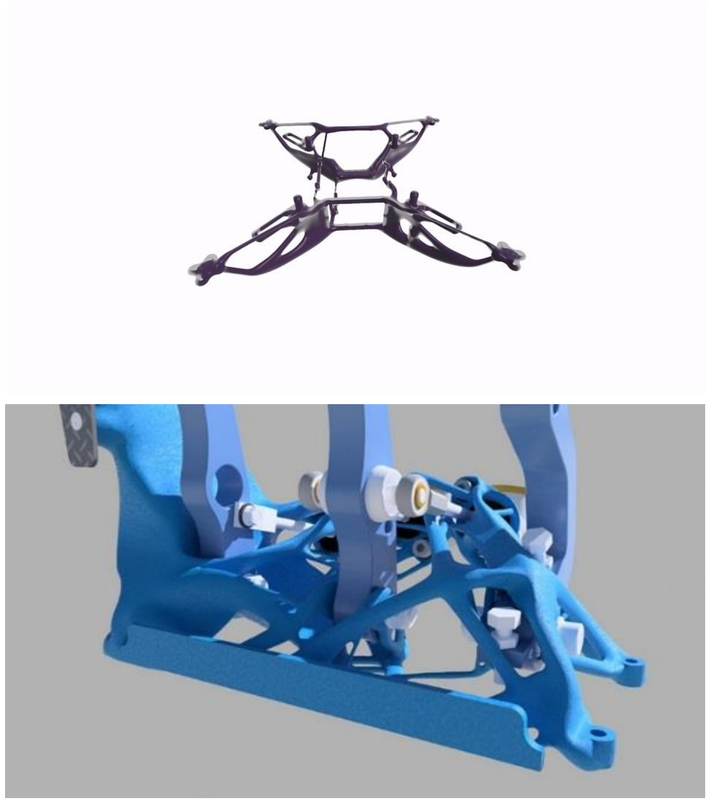
Tailored to unique persons measurements

Interchangeable parts based on needs

How does Generative Design help the product development process?



Where does Generative Design apply?



1 | New Product Design Creation

- Use Generative result as design guide. *Where is material needed?*
- *What type of material and how much?*
- Use Generative result, manipulate for production

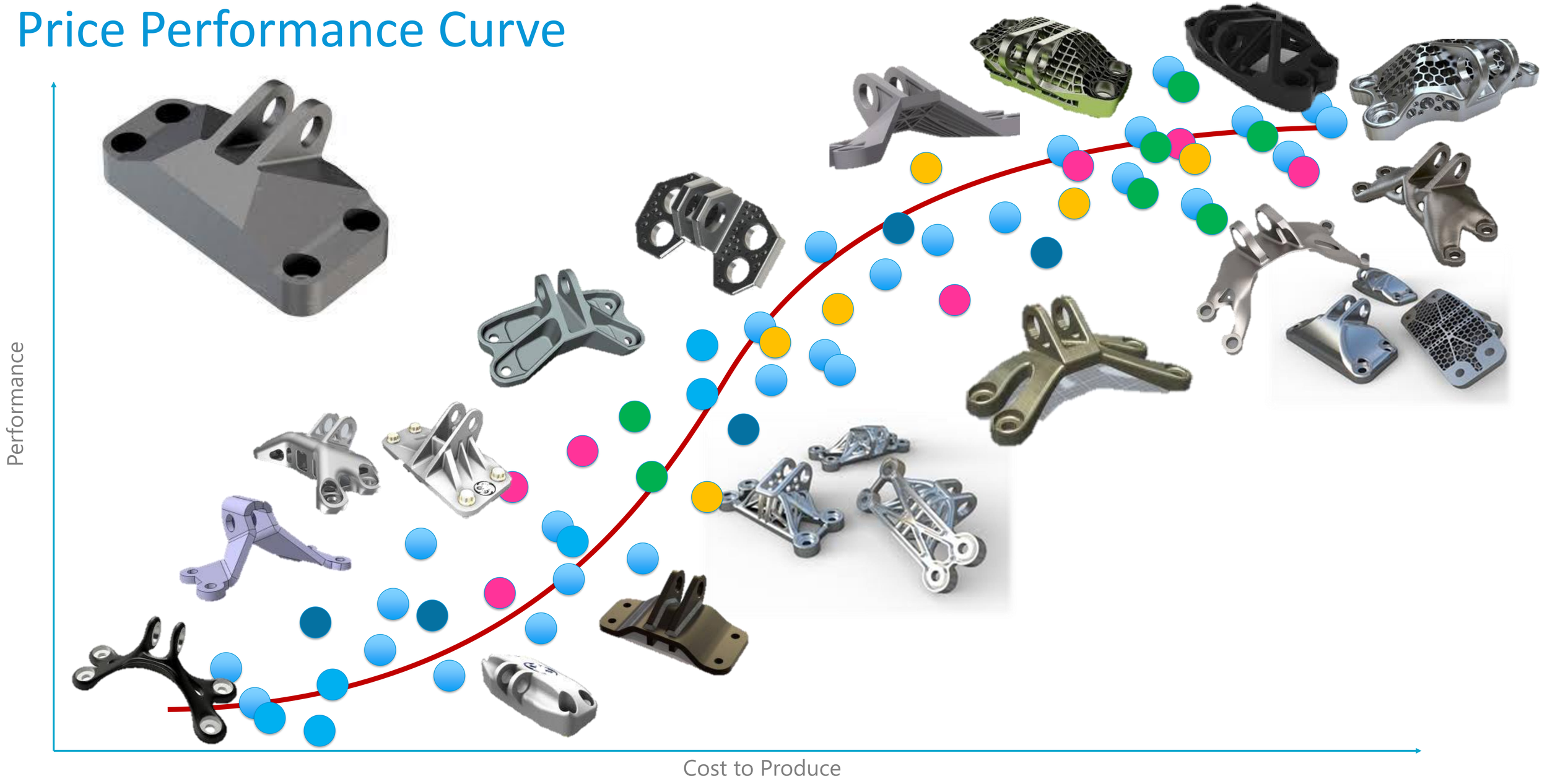
2 | Part Consolidation

- Explore costly, or hard to manufacture assemblies – *how can multiple parts be consolidated to one?*

3 | Part Enhancement

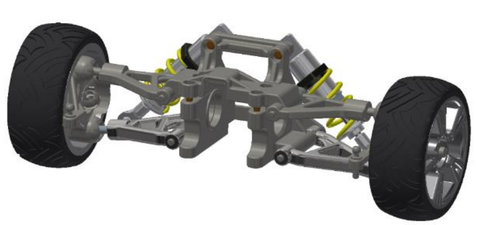
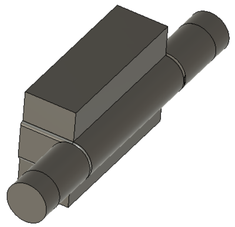
- Enhance existing parts to improve strength-to-weight ratio, reduce material cost, improve manufacturability
- *Am I using the correct material?*

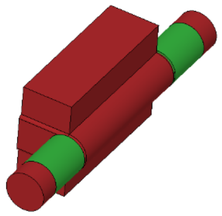
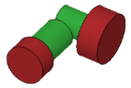
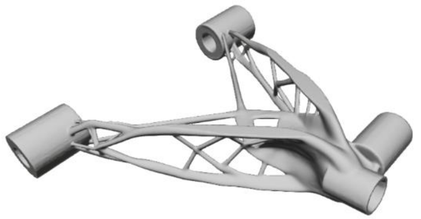
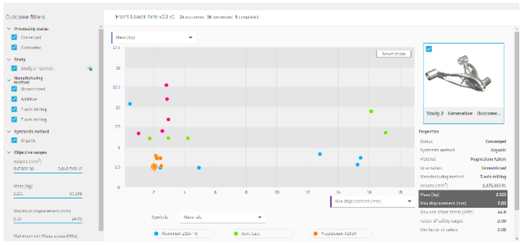
Price Performance Curve



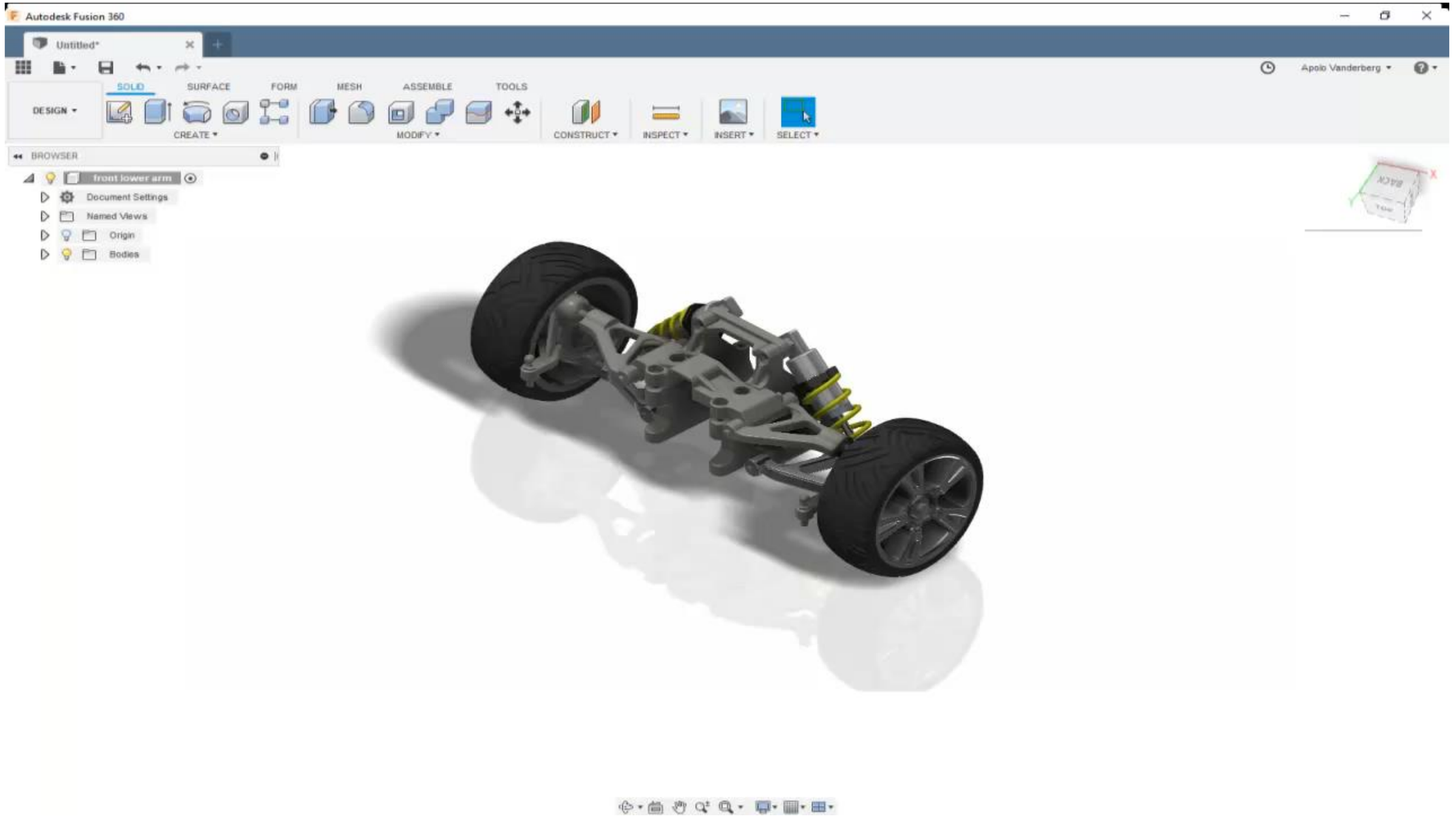
Autodesk Generative Design - Workflow

1. In CAD model appropriate Preserve and Avoidance Regions
2. Start Project in Generative Design
3. Import Geometry
4. Setup Study - Geometry, Constraints, Loads, etc
5. Generate Outcomes
6. Explore Outcomes
7. Export desired outcomes for use

Demo


Autodesk Fusion 360
Untitled*
Apolo Vanderberg
DESIGN
SOLID
SURFACE
FORM
MESH
ASSEMBLE
TOOLS
CREATE
MODIFY
CONSTRUCT
INSPECT
INSERT
SELECT
BROWSER
front lower arm
Document Settings
Named Views
Origin
Bodies


FREE
STUFF

Free Generative Design Until 2020

Autodesk has teamed up with AWS and NVIDIA to offer unlimited generative design in Fusion 360 from November 18th through December 31, 2019.

Learn more

autodesk.com/free-generative-design

Sponsors

Design 1 - 51 Pins v2

Fins_Gen_Design_study v7*

Gilberto Fernandez

SOLID SURFACE FORM MESH SHEET METAL TOOLS

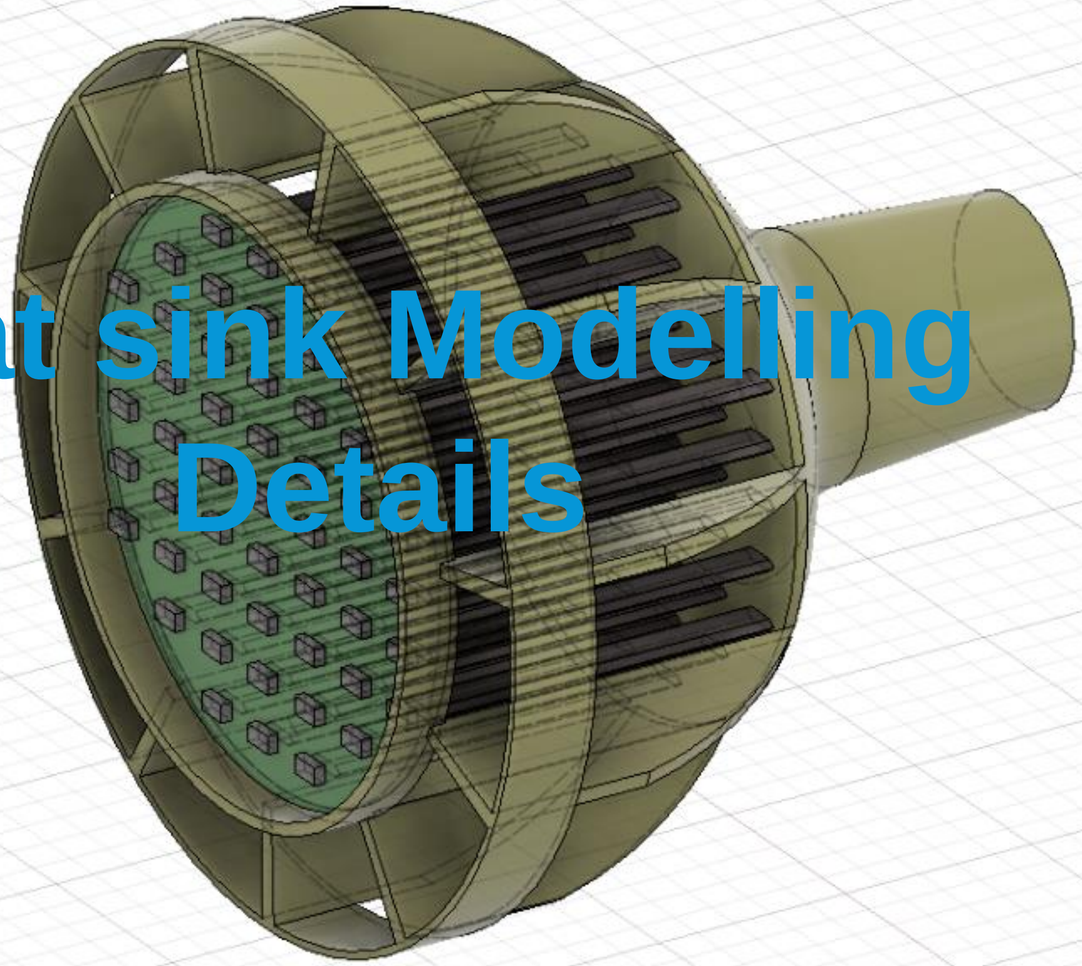
DESIGN

CREATE MODIFY ASSEMBLE CONSTRUCT INSPECT INSERT SELECT

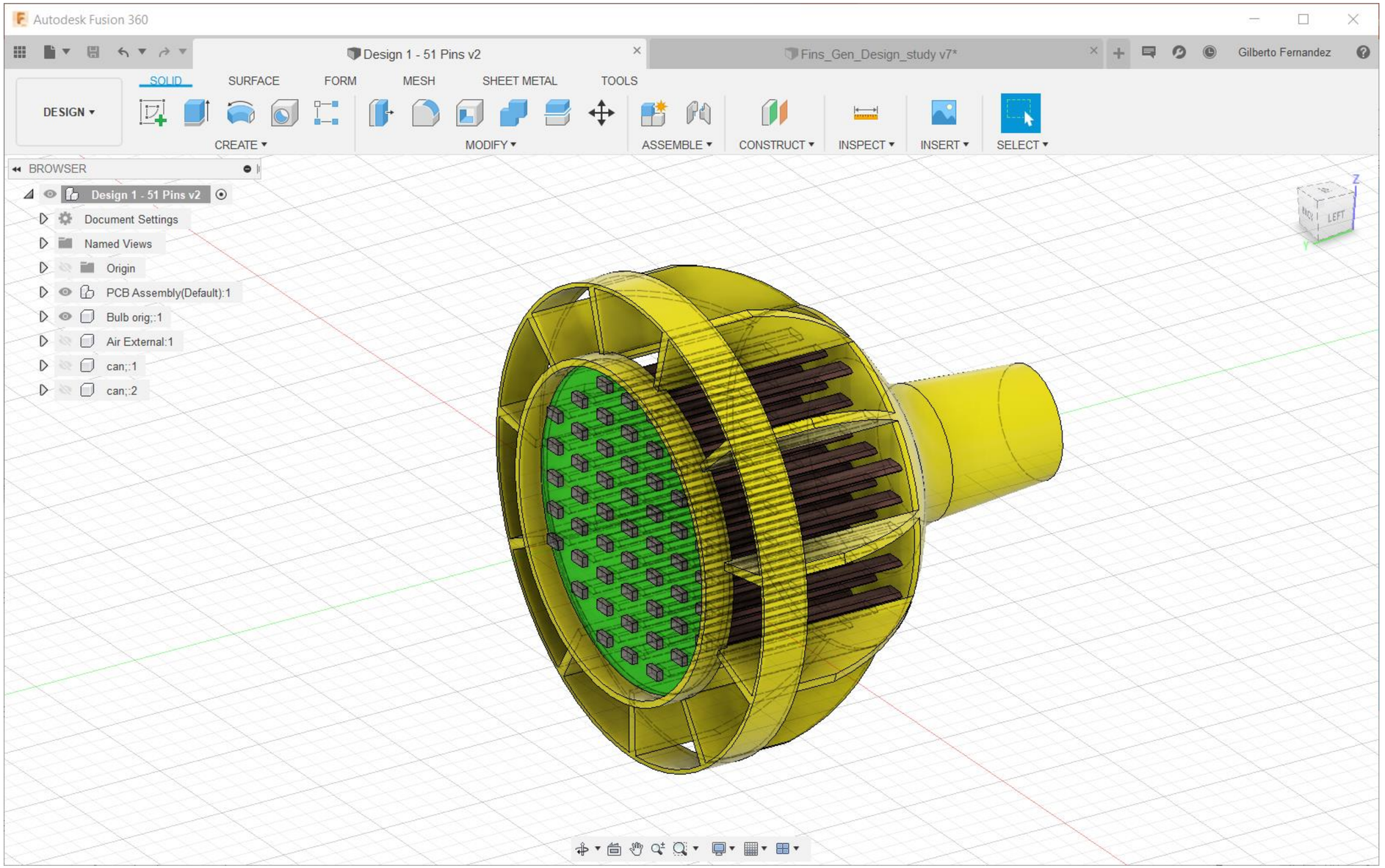
BROWSER

- Design 1 - 51 Pins v2
  - Document Settings
  - Named Views
  - Origin
  - PCB Assembly(Default):1
  - Bulb orig;:1
  - Air External:1
  - can;:1
  - can;:2

Heat sink Modelling Details

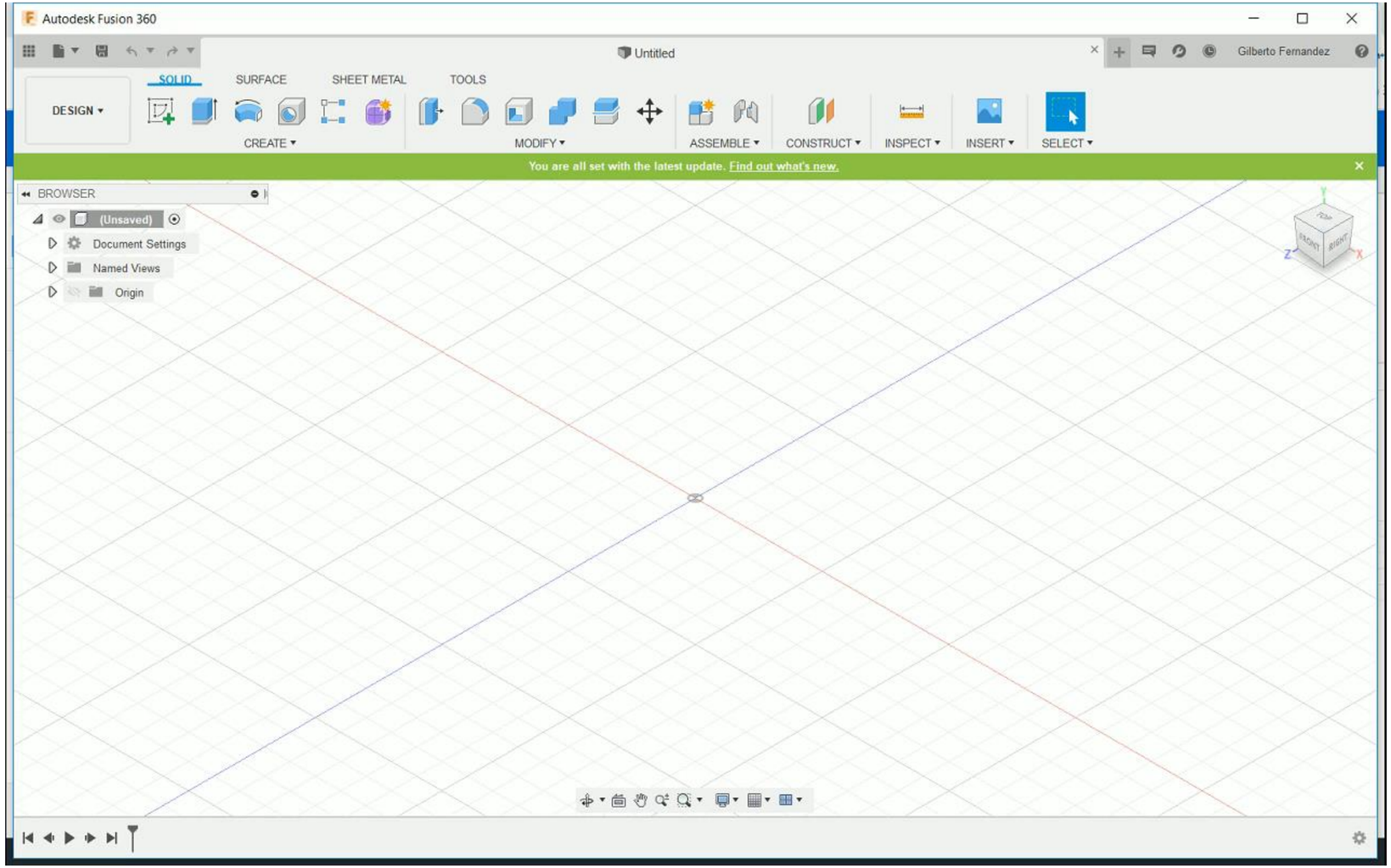


Fusion initial model



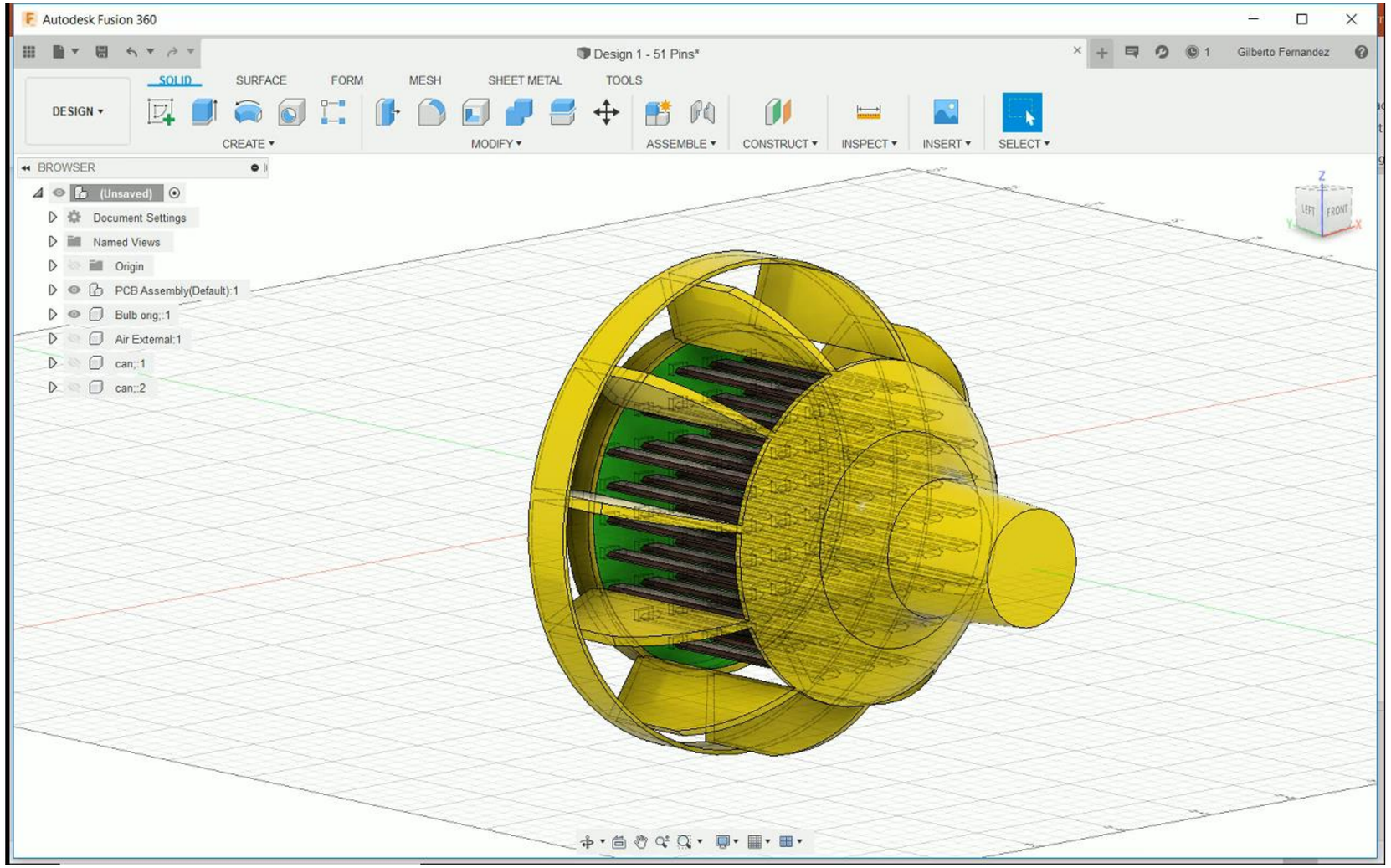
Generative Design Workflow DEMO

Step 1 – Opening the model



https://autode.sk/36XCjA2

Step 2- Geometry preparation in Fusion



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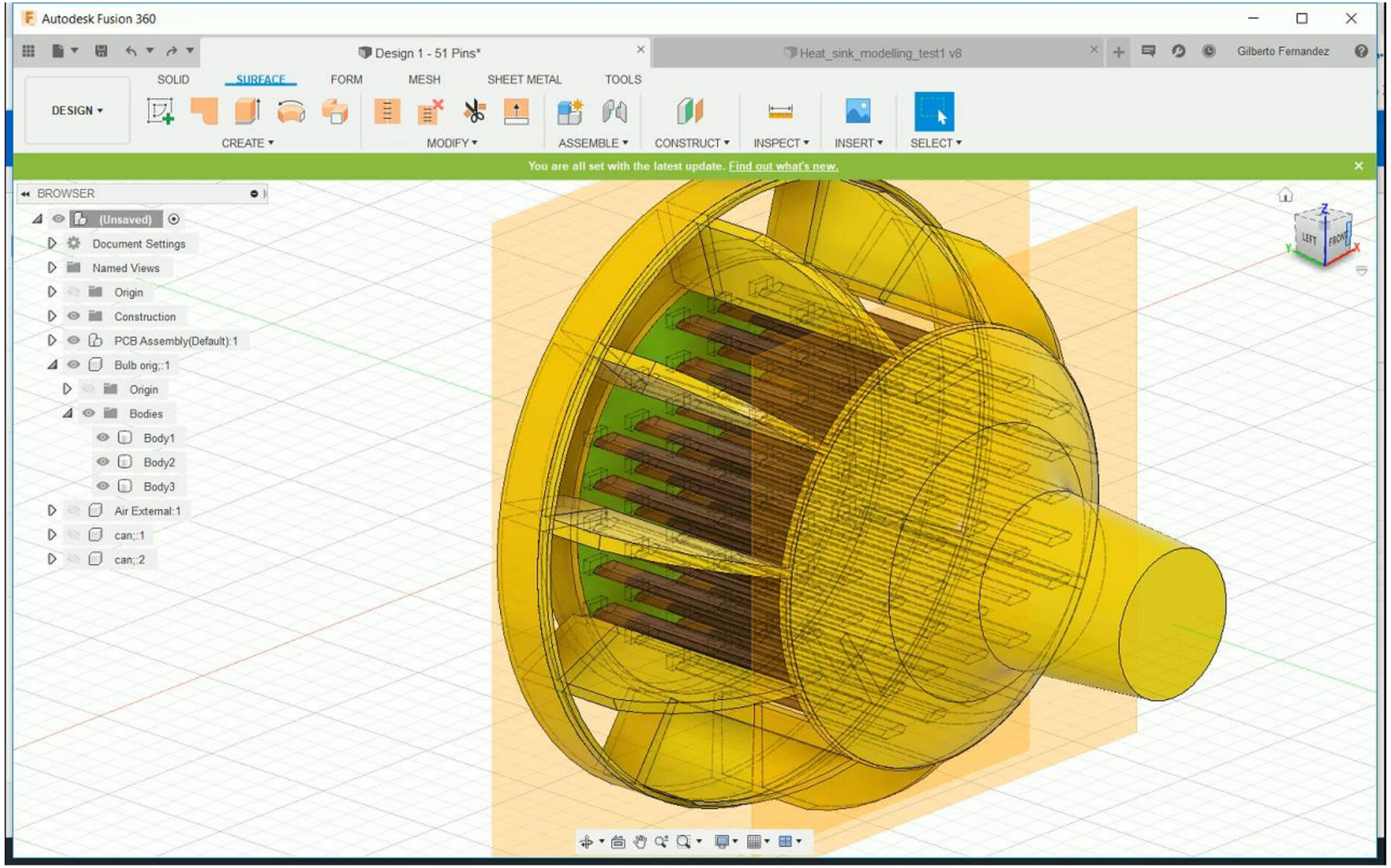
Step 3- Geometry preparation – Obstacle Geometry



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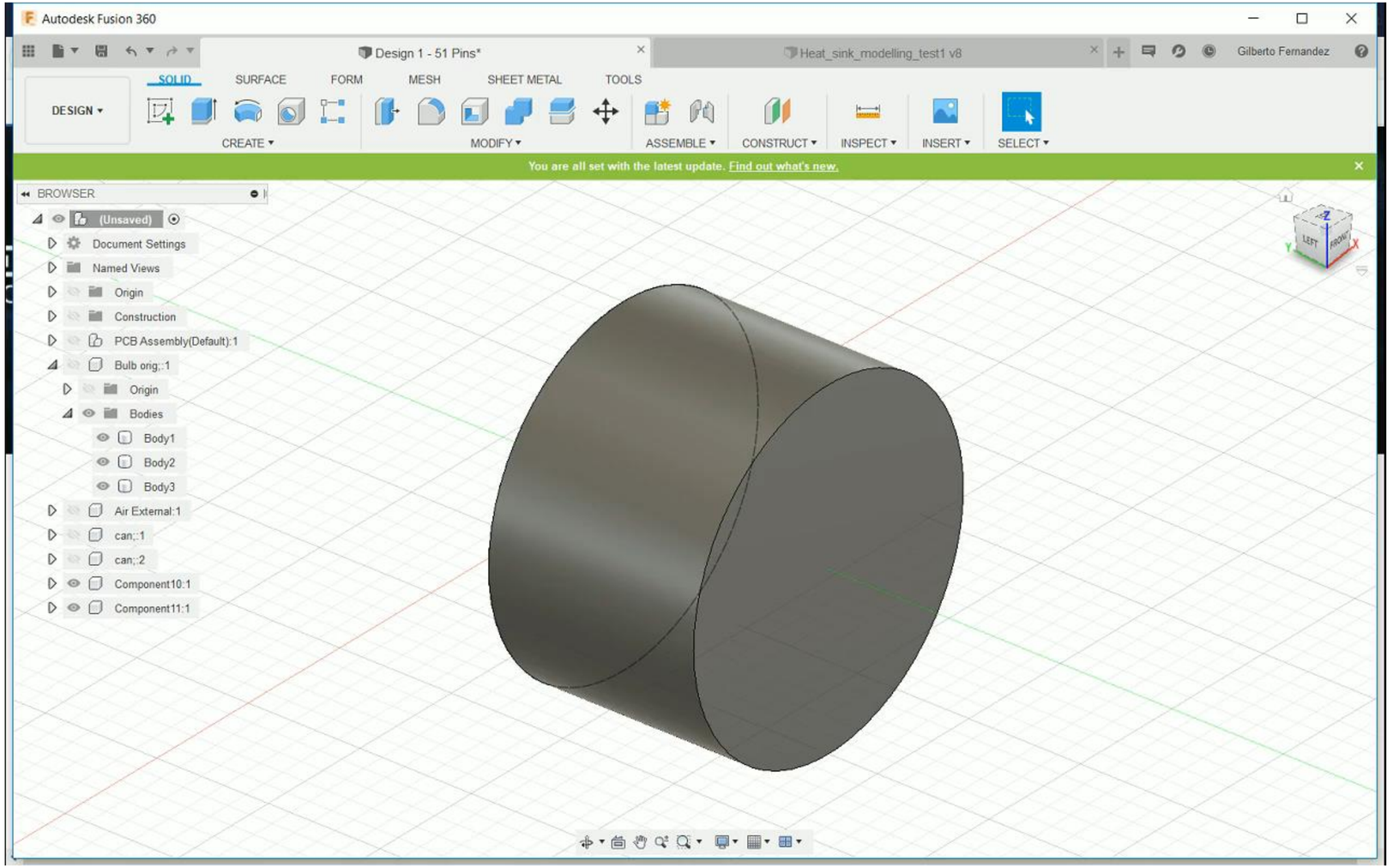
Step 4 – Generative Design – Design Space



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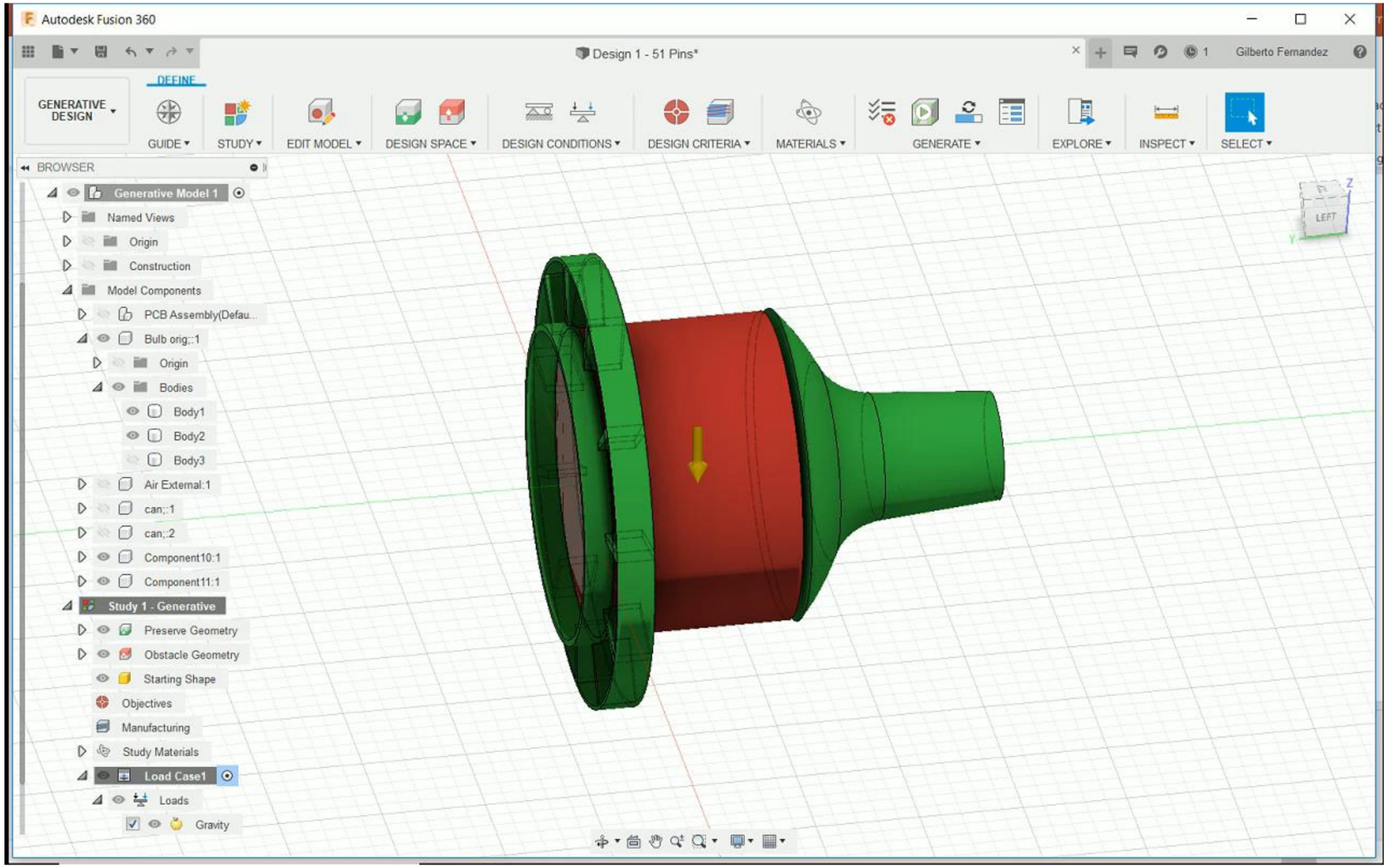
Step 5 – Generative Design Set up II



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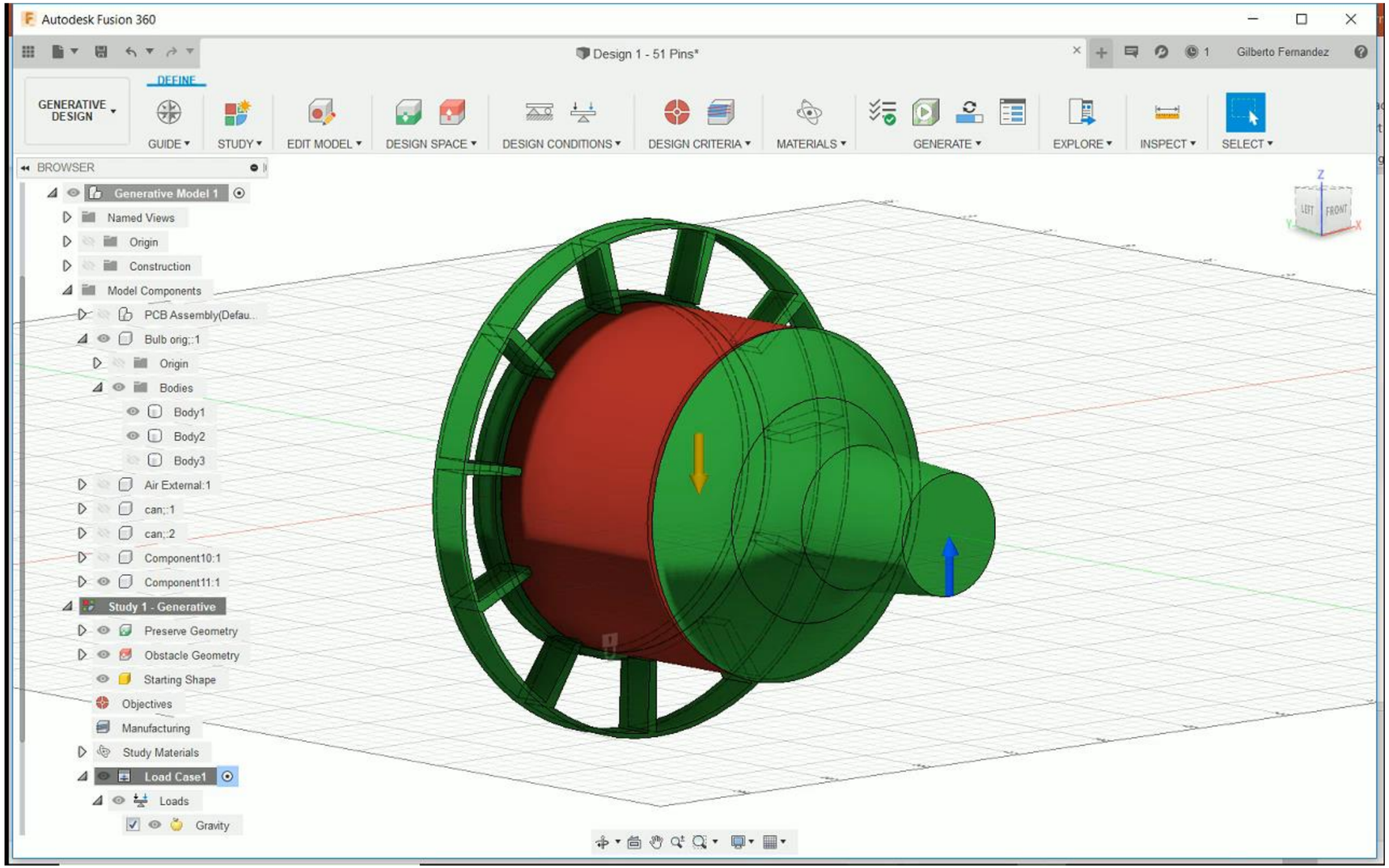
Step 6 – Generation – Choice and Export



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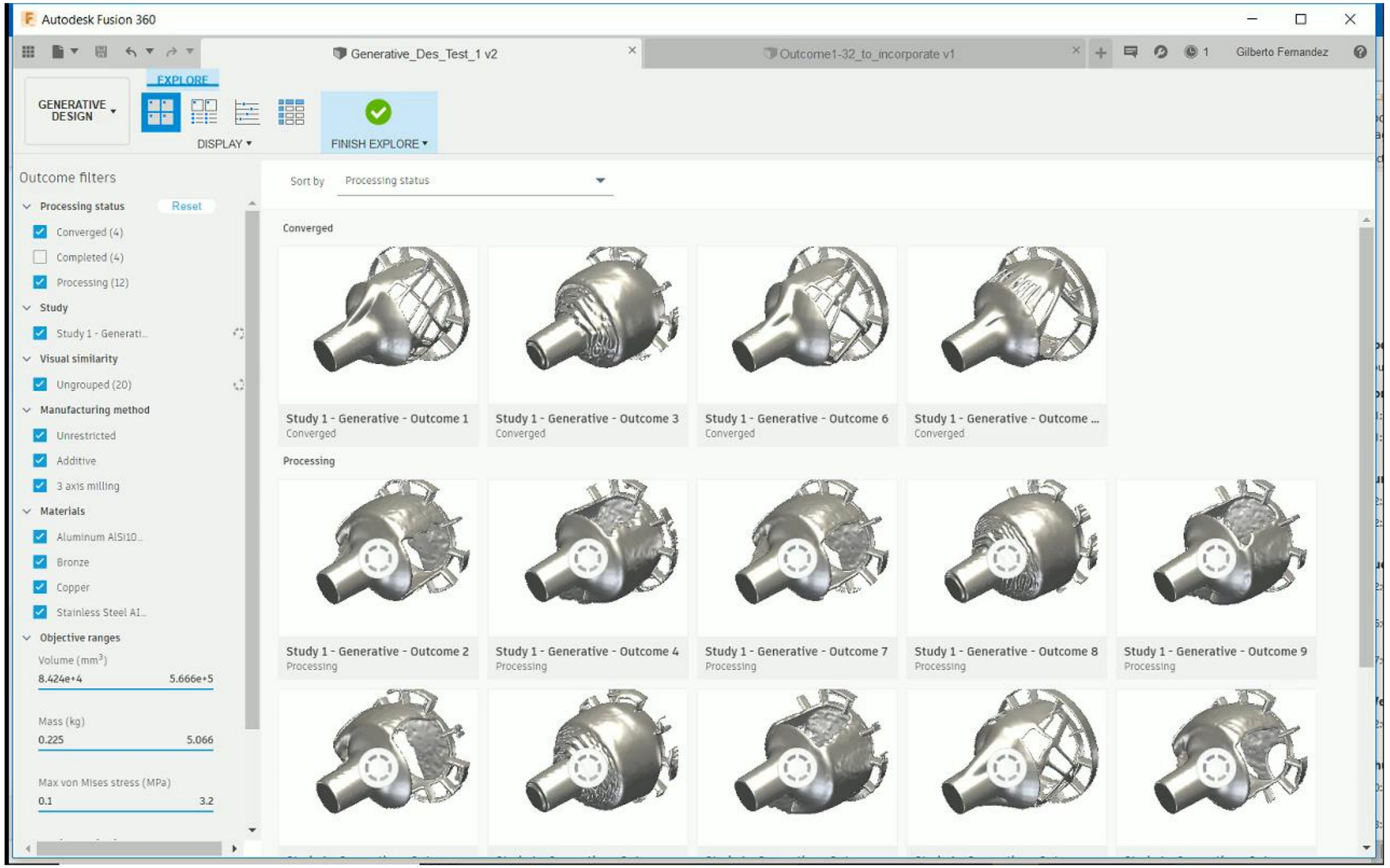
Step 7 – Generation – Further exploration - Results



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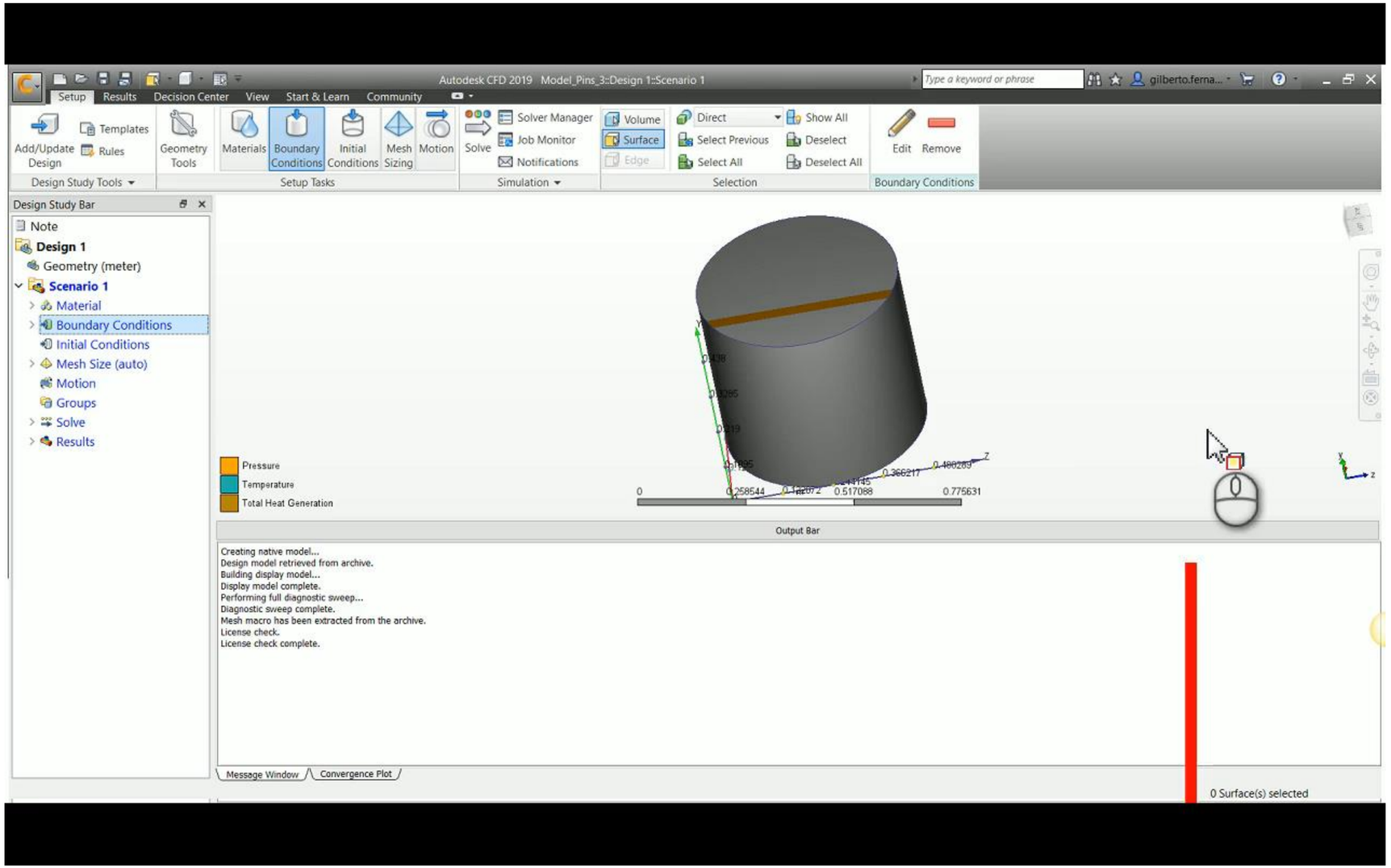
Running Alternatives in CFD

CFD Model – Lighting set up description



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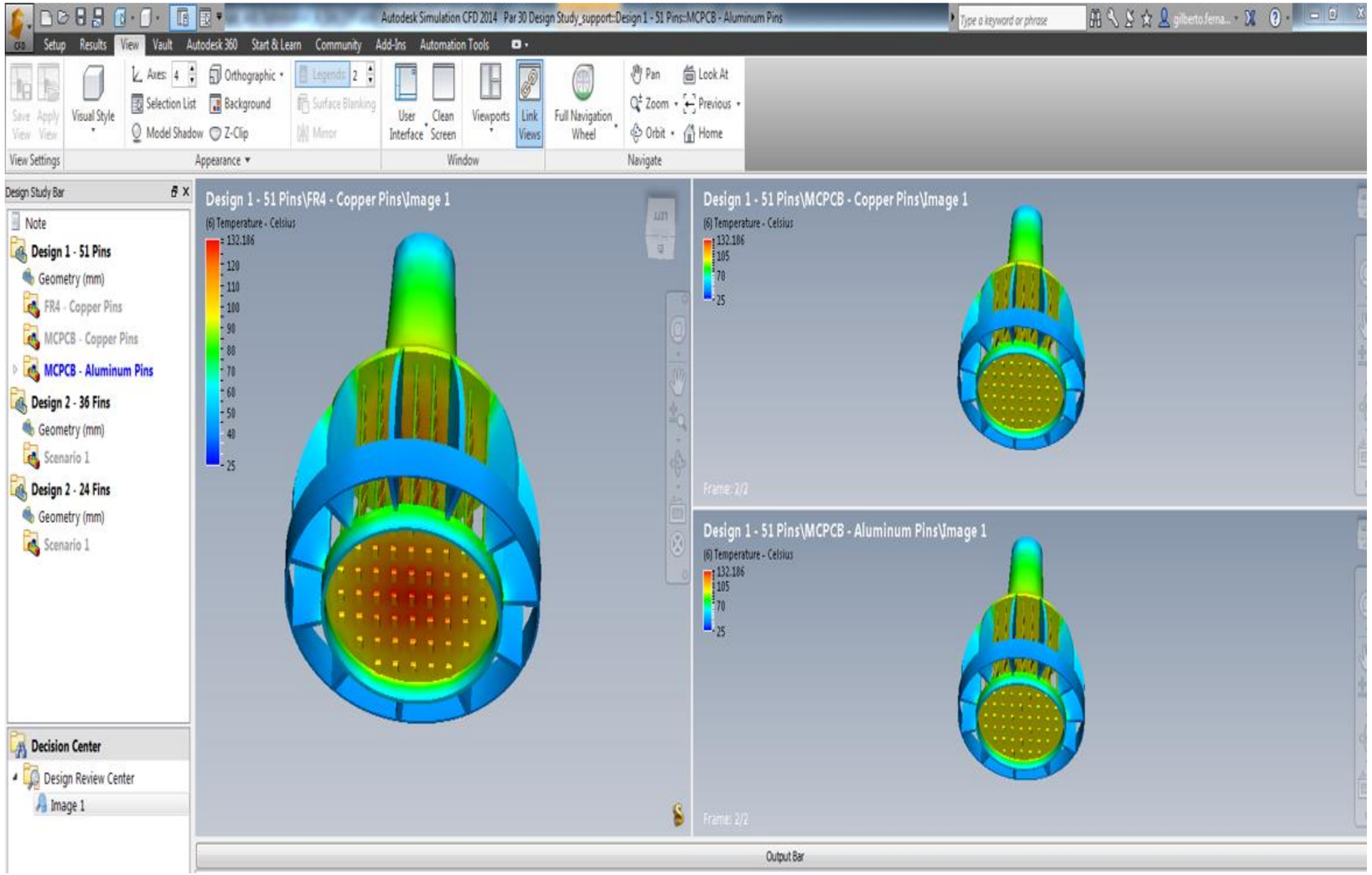
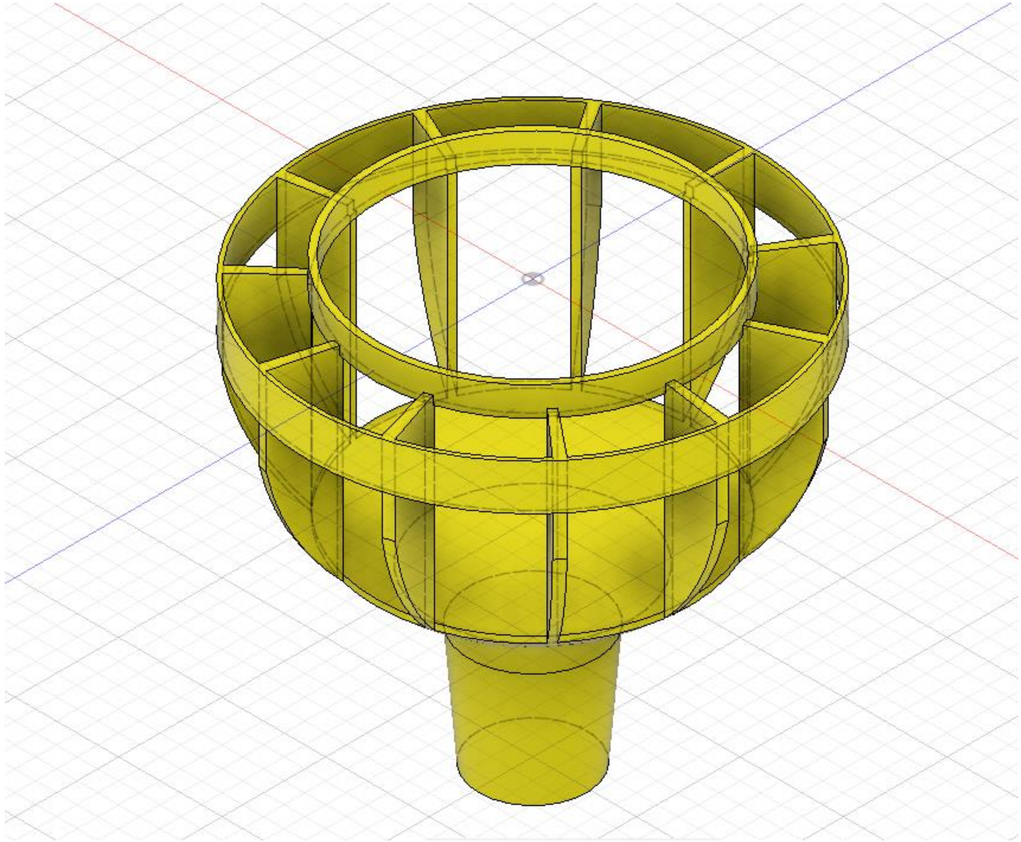
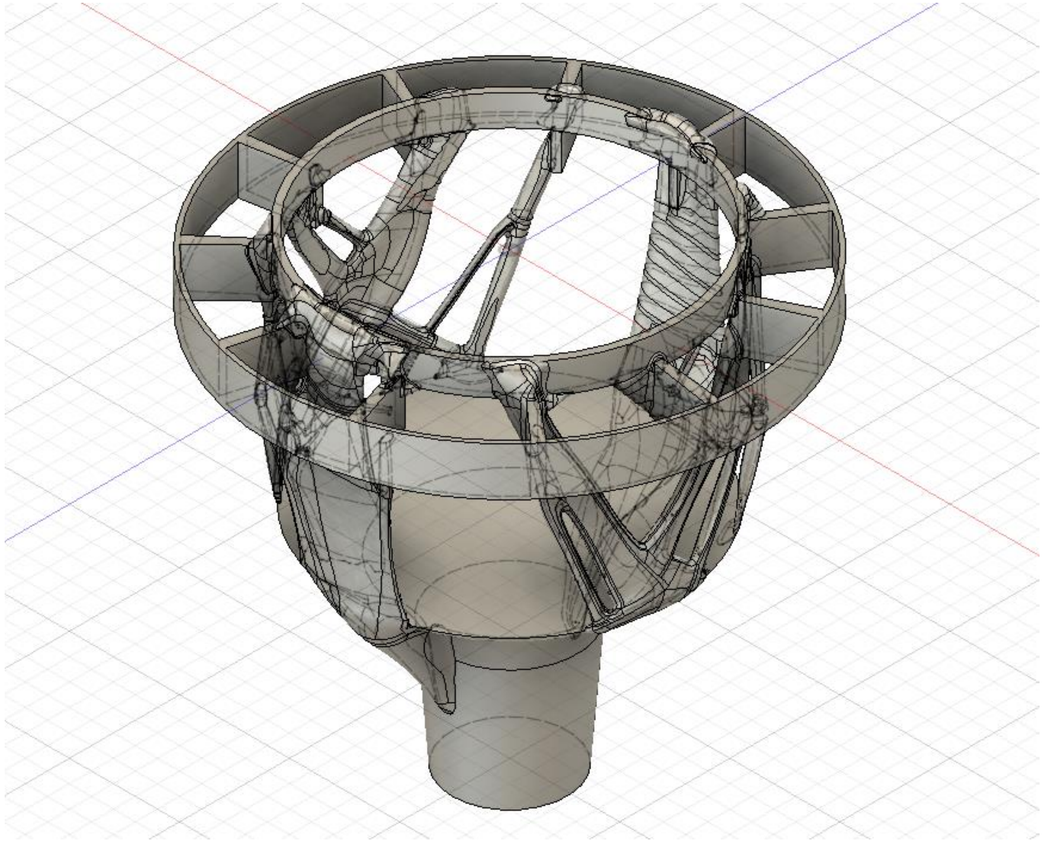
Comparison in original CFD- Possibilities

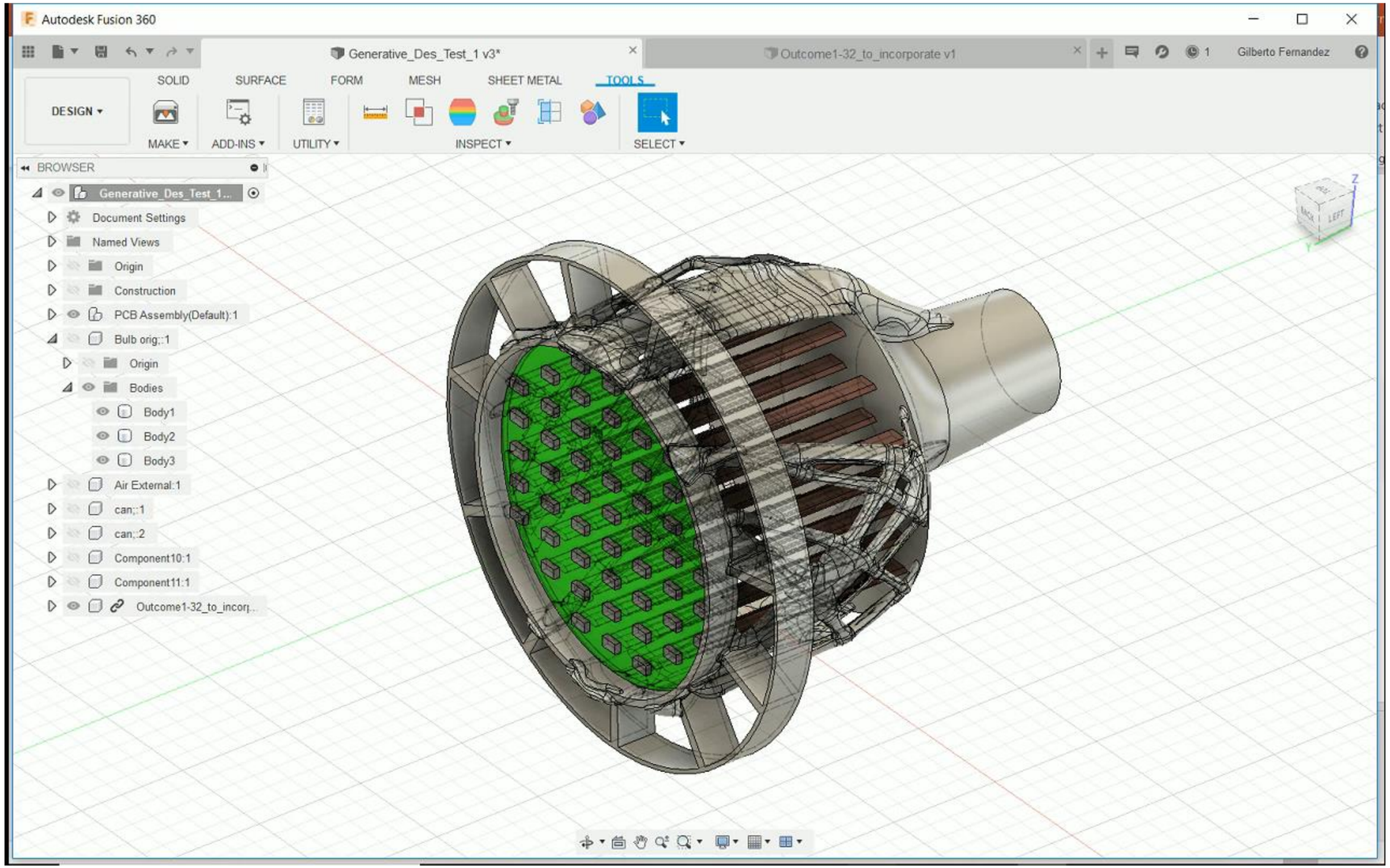


Alternatives for housing





CFD Model – Launching new geometry



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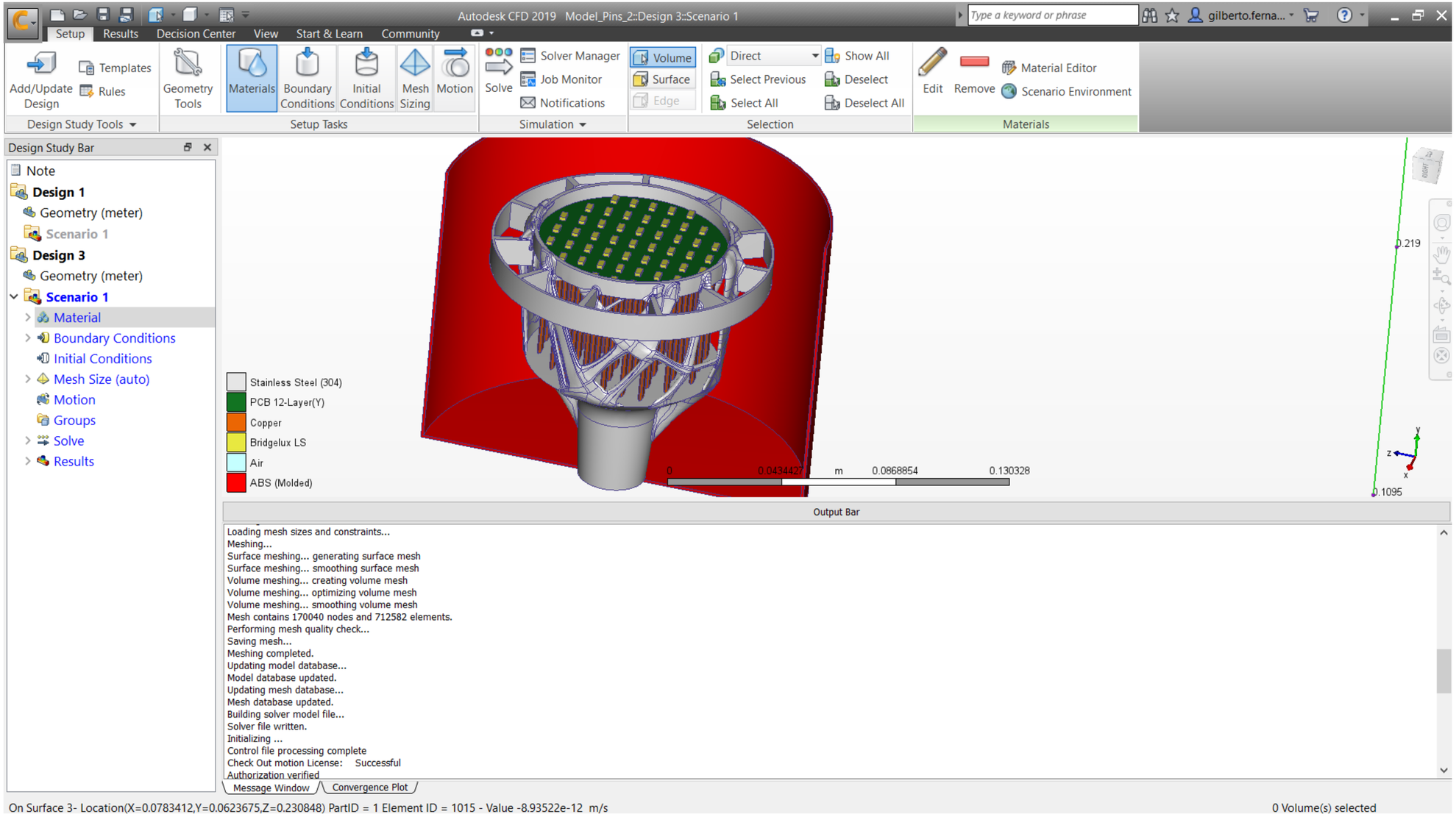
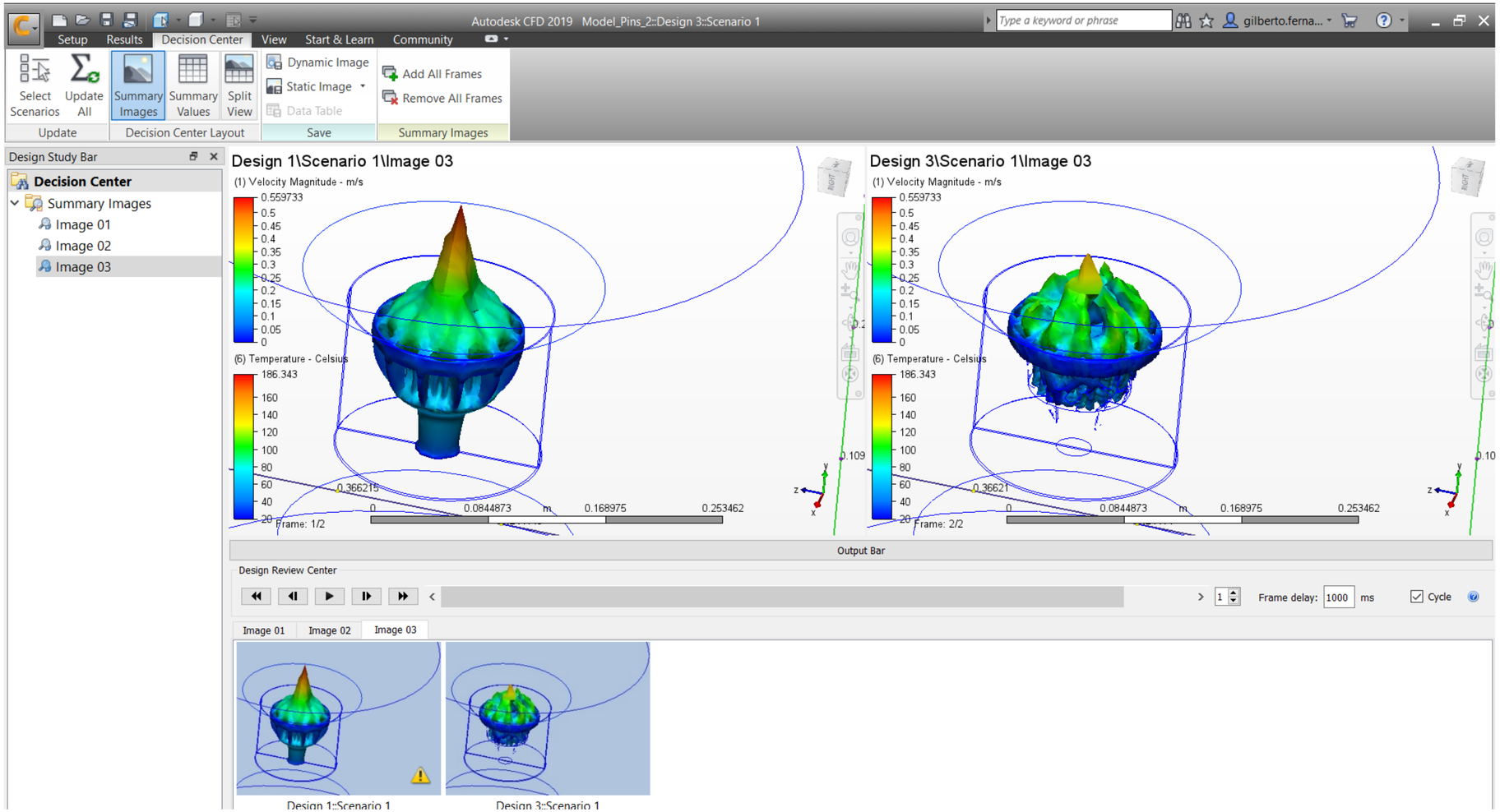
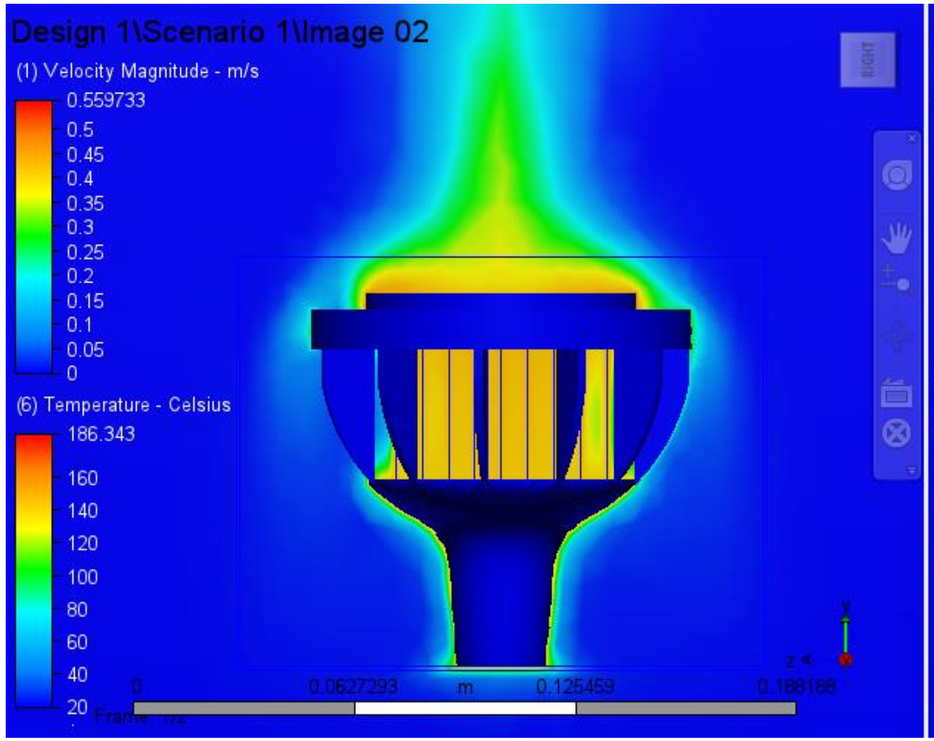
Comparison of performance – Multiple designs

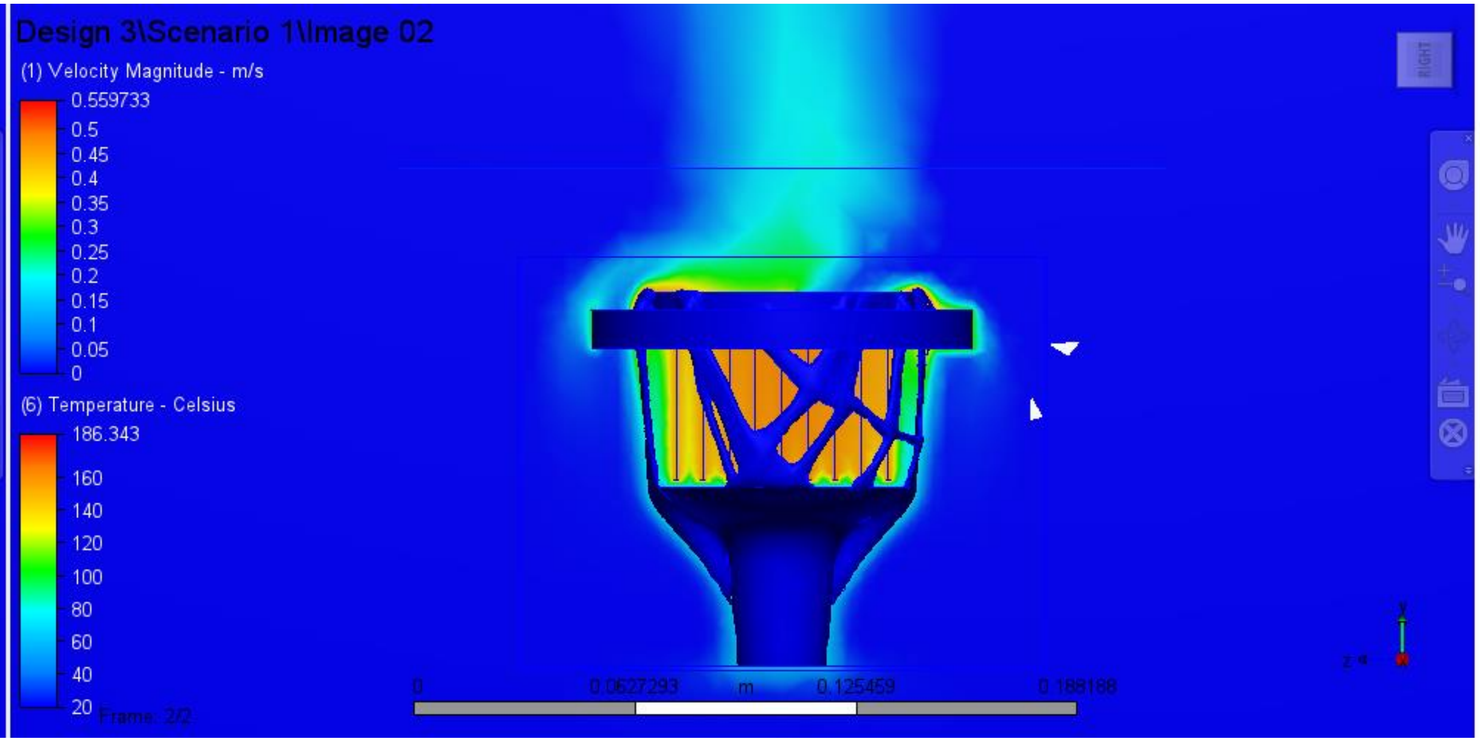


Comparison of performance – Decision Centre

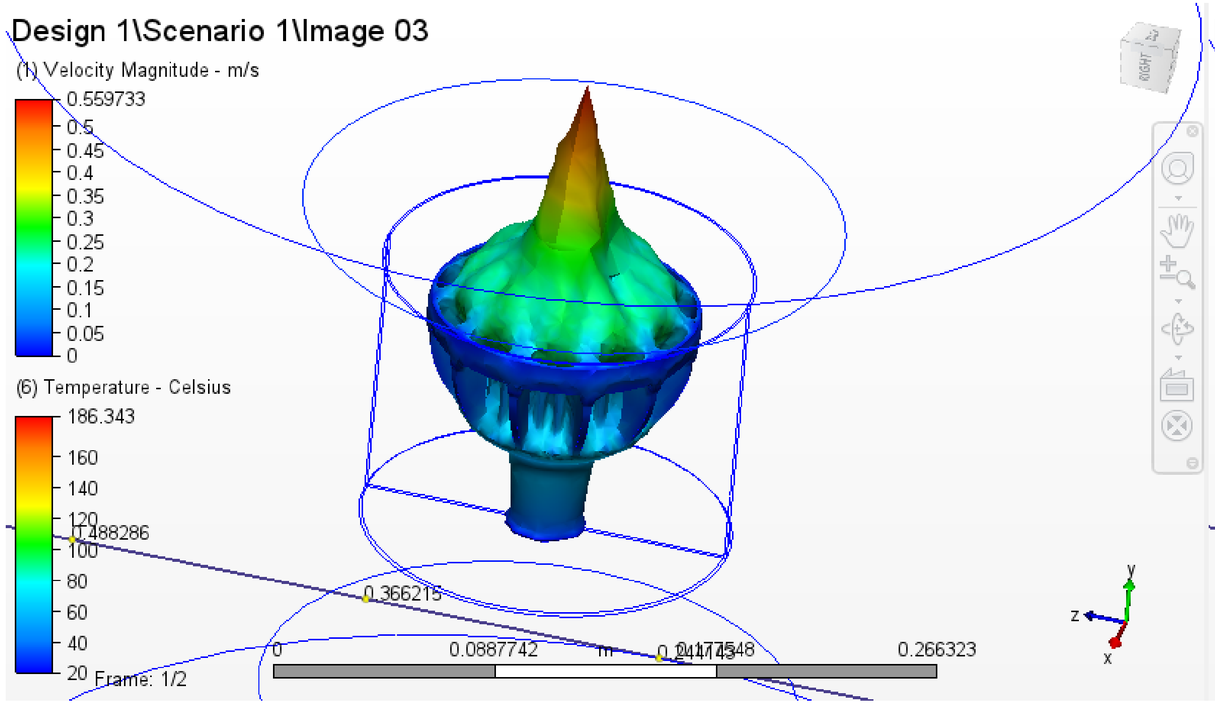


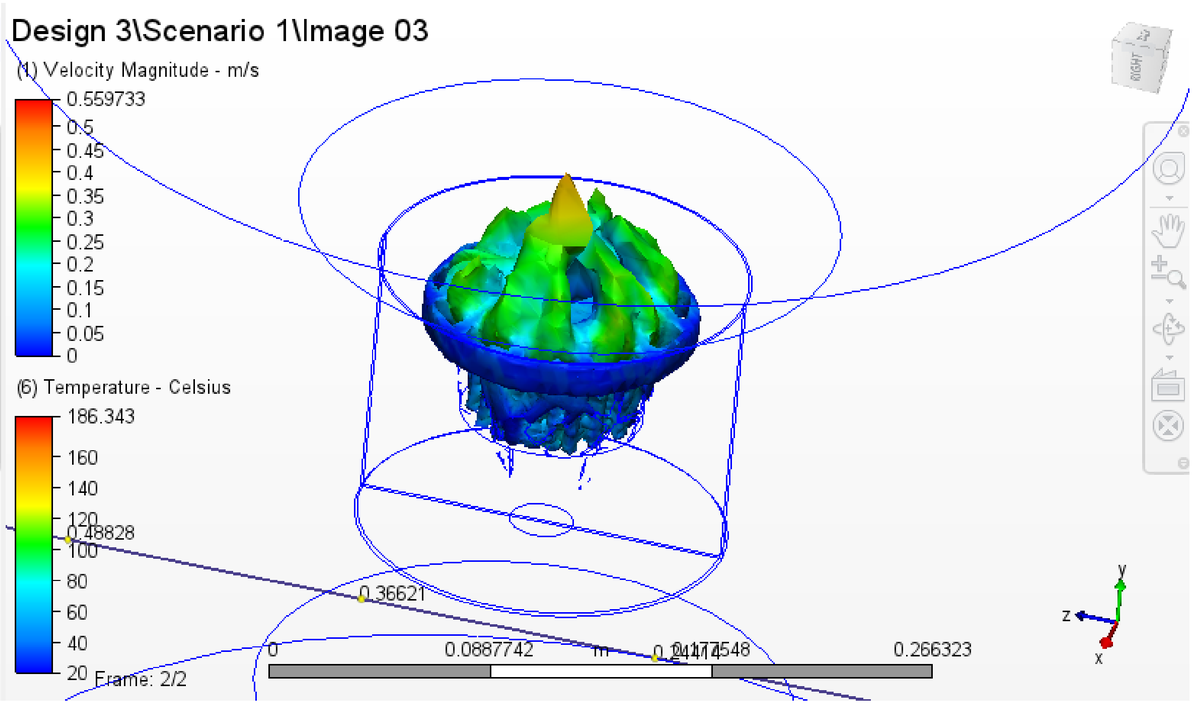
Comparison of performance



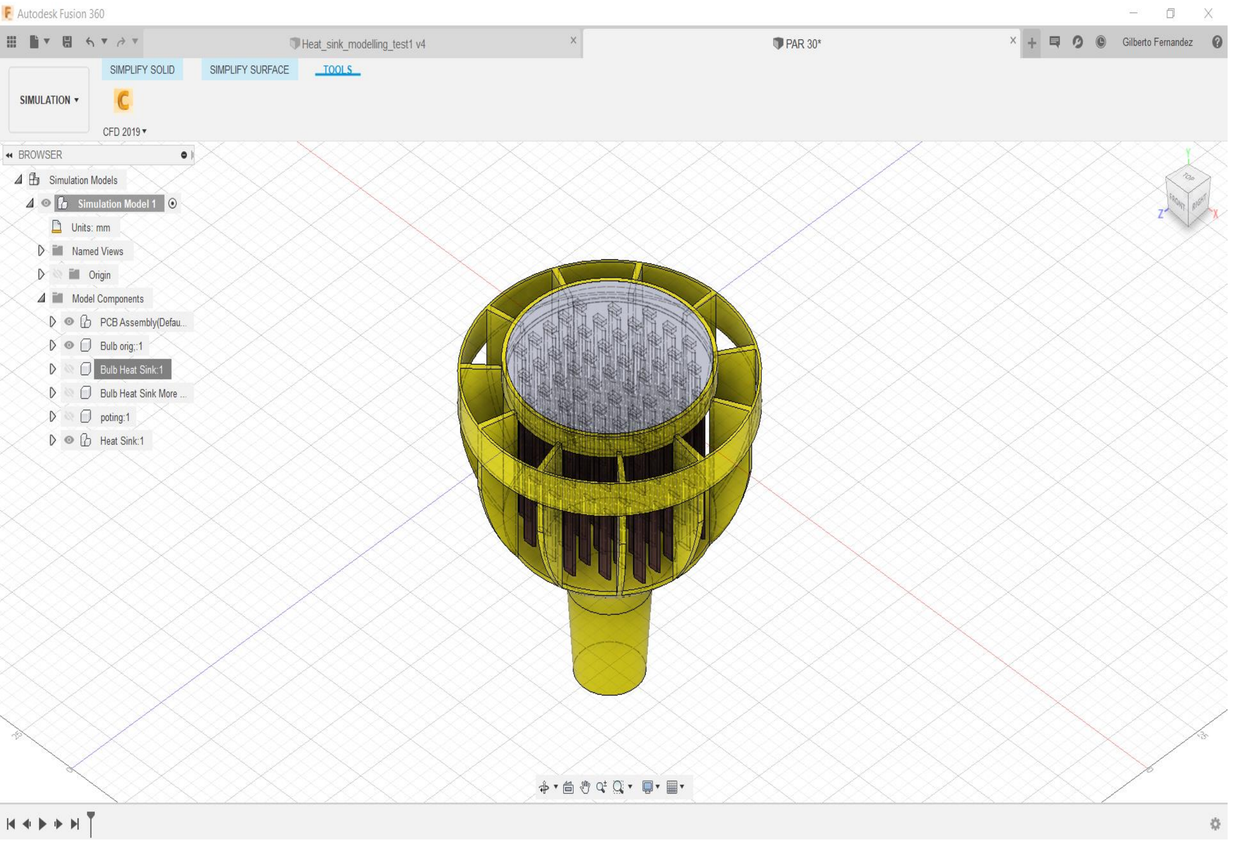


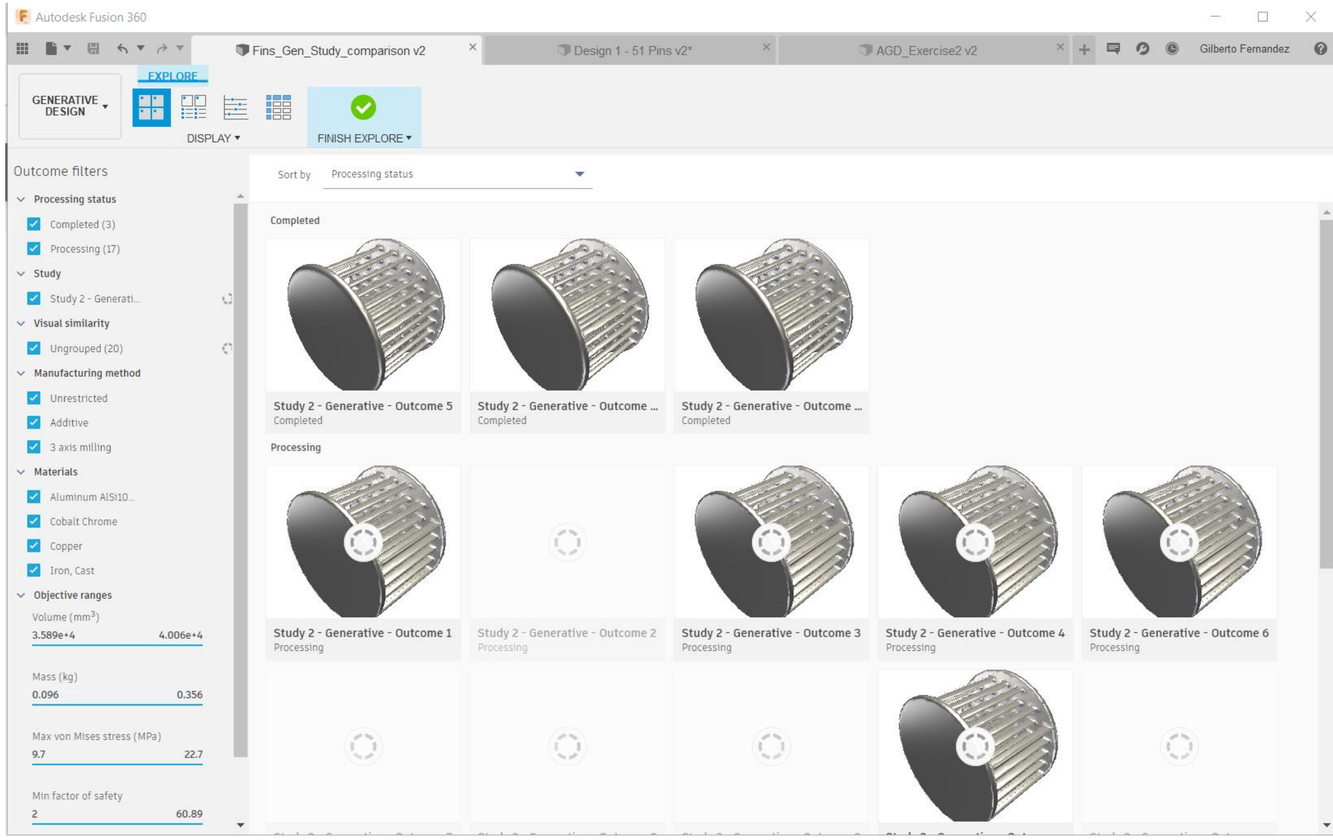
Comparison of performance





Alternatives for pins



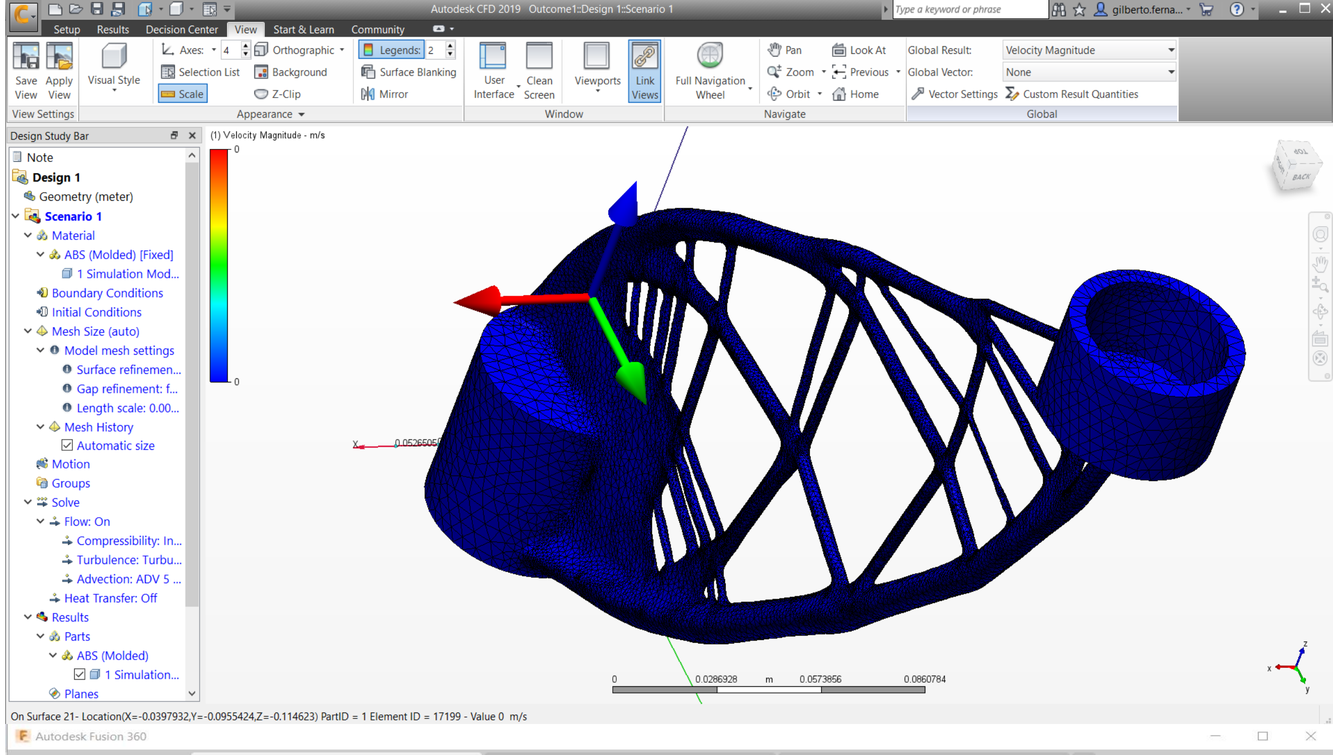


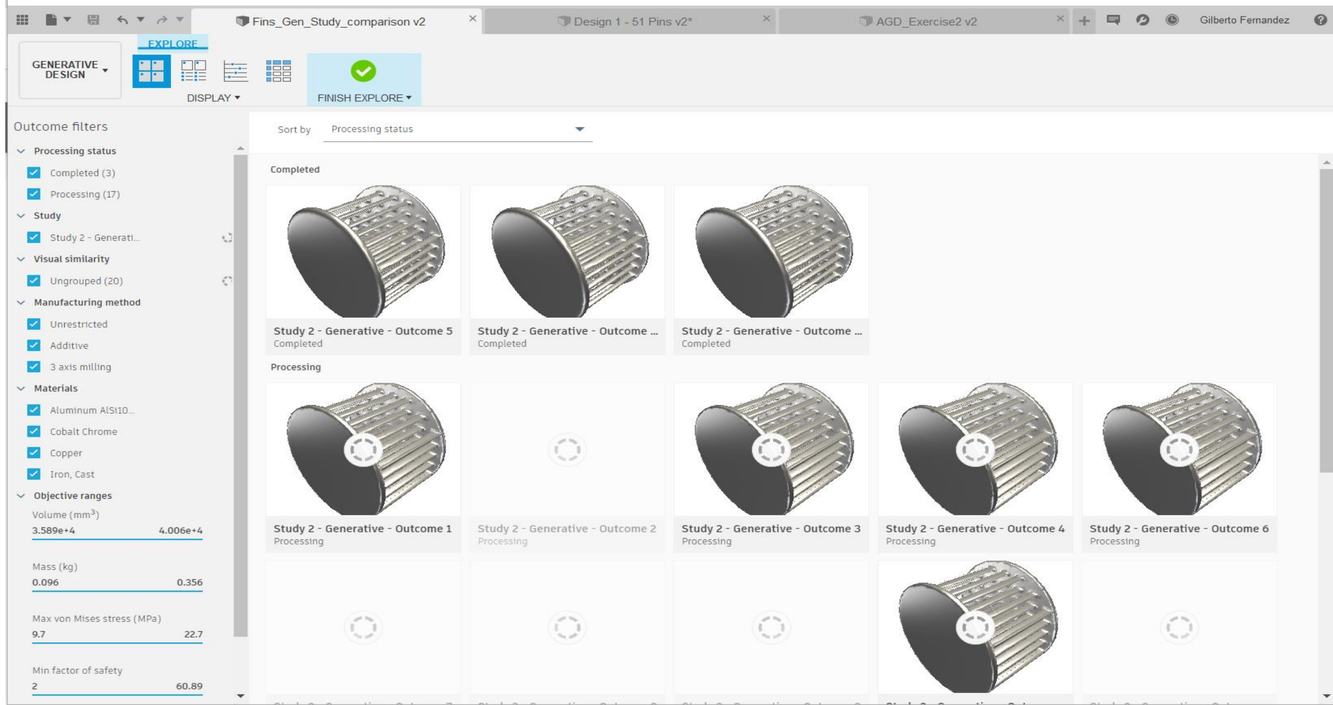
Video link to follow here -

Challenges and Limitations

Challenges and limitations

- Optimization vs Simplicity?
- Meshing challenges
- Generating Obstacle Geometry can be a difficult task
- Enveloping starting shapes
- Time to load geometry – long
- Fixing a “skeleton” guide – pins
- Objectives – mass – stiffness

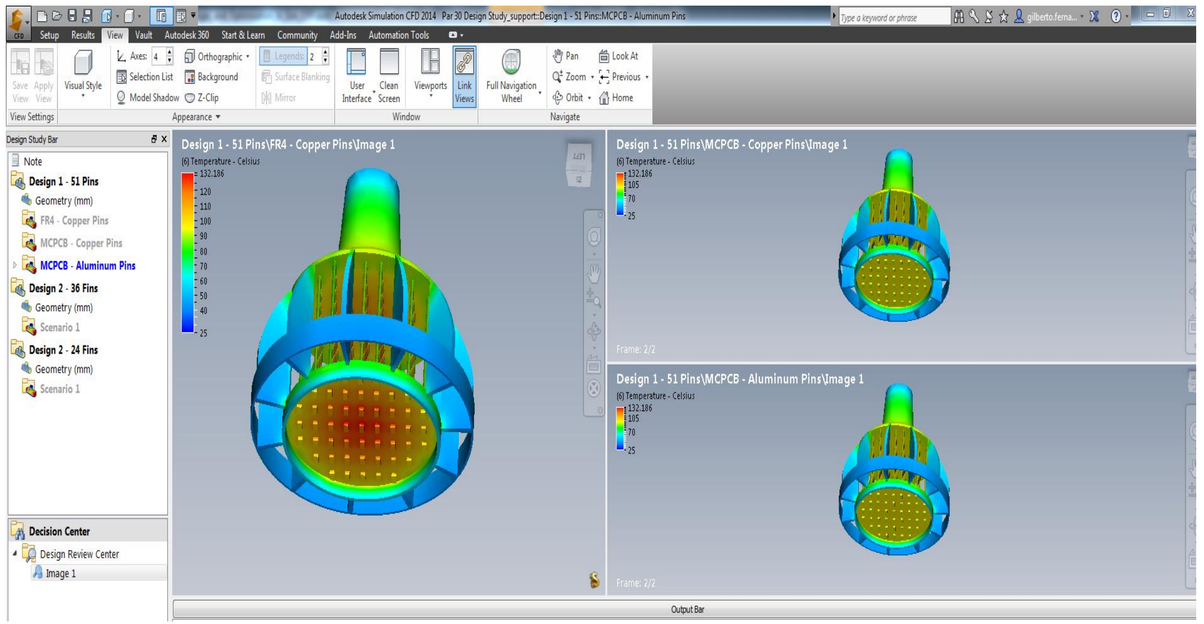


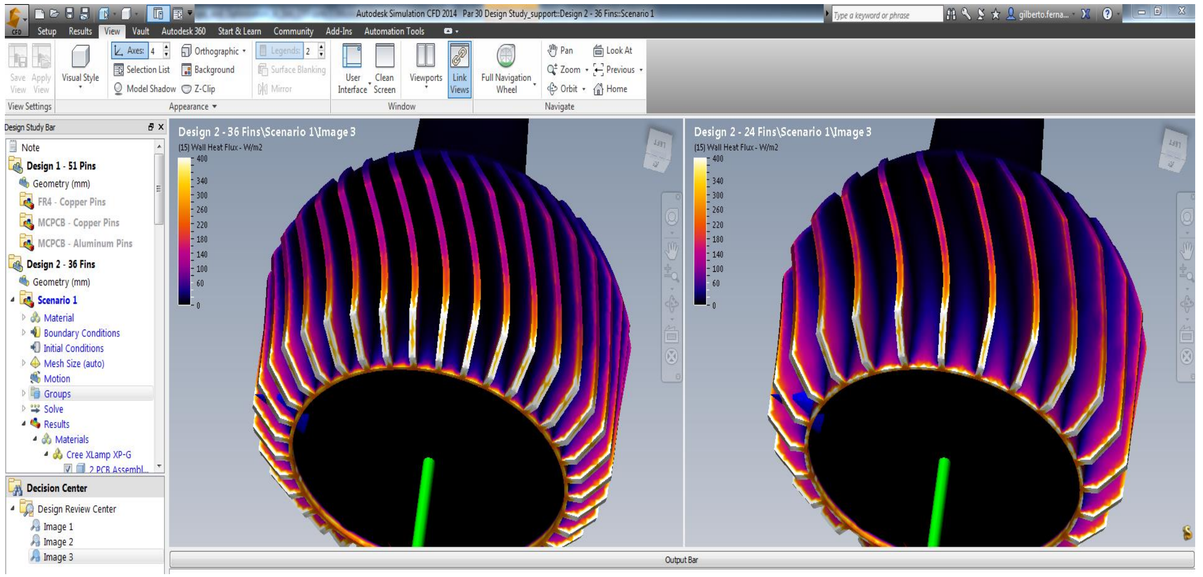


Looking Into the Future

Looking into the future – Better integration of CFD

- CFD Integration:
  - Integration so does not need launching
  - Key: CONDITIONS and constraints. Operating conditions such as maximise area exposure to heat, number of blades, etc…..
  - Flexibility in terms of shapes, and starting shapes- Error on intersections

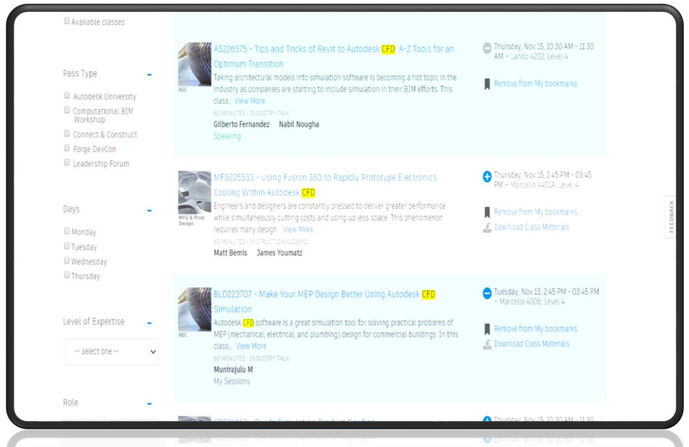




Additional Resources

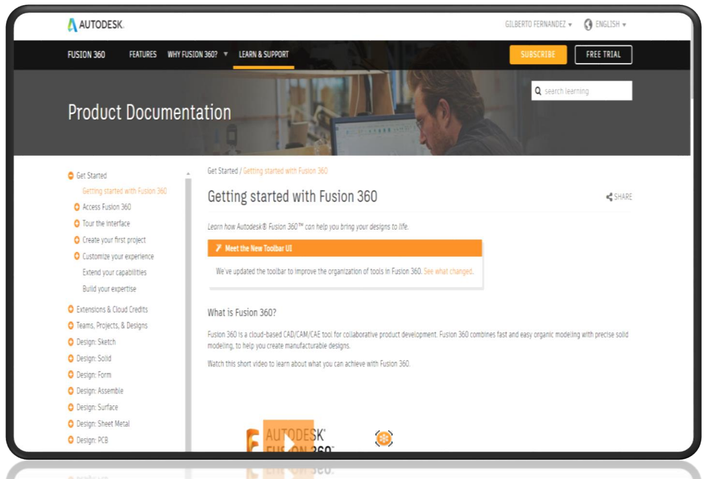
Further information

CLASS HANDOUT



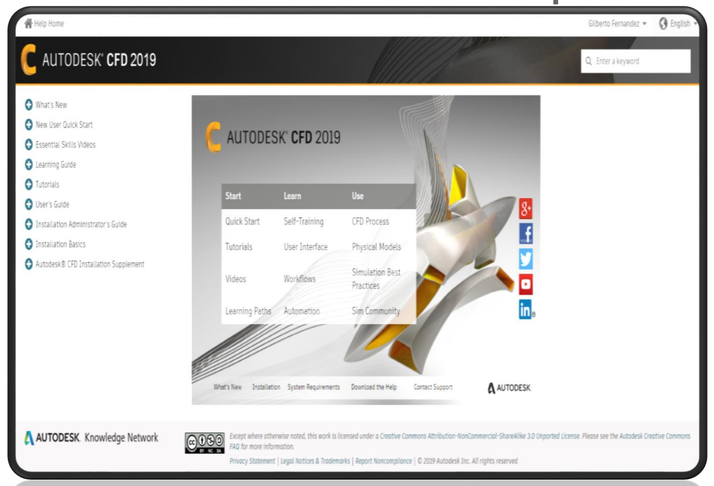
Class Handout

Fusion 360 Online Help



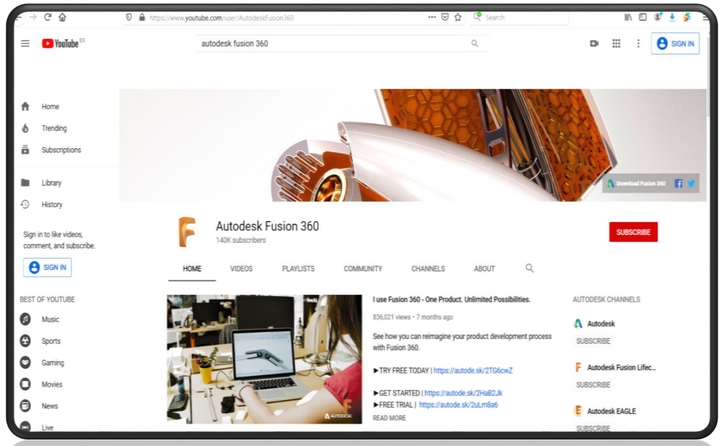
http://help.autodesk.com/view/fusion360/ENU/

CFD Online Help



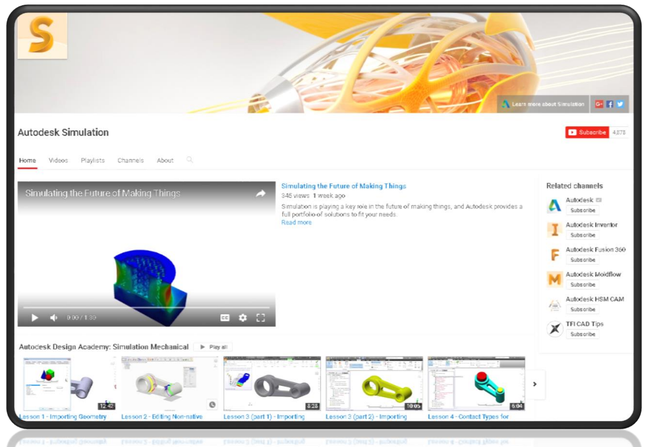
http://help.autodesk.com/view/SCDSE/2019/ENU

Fusion 360 YouTube



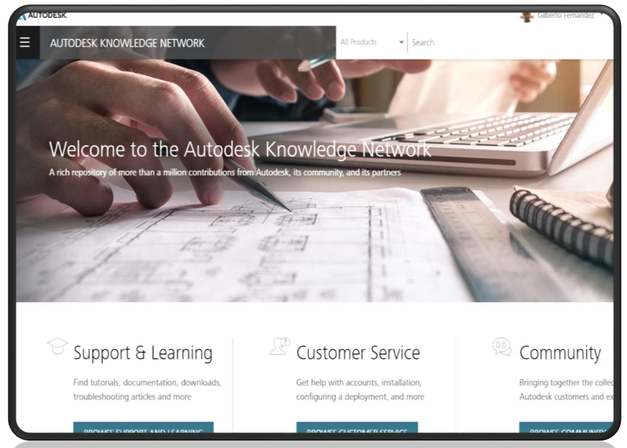
https://www.youtube.com/user/AutodeskFusion360

Simulation YouTube



https://www.youtube.com/user/AutodeskSim360

Knowledge Network



https://knowledge.autodesk.com/


Q&A

THANKS FOR ATTENDING!!!

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