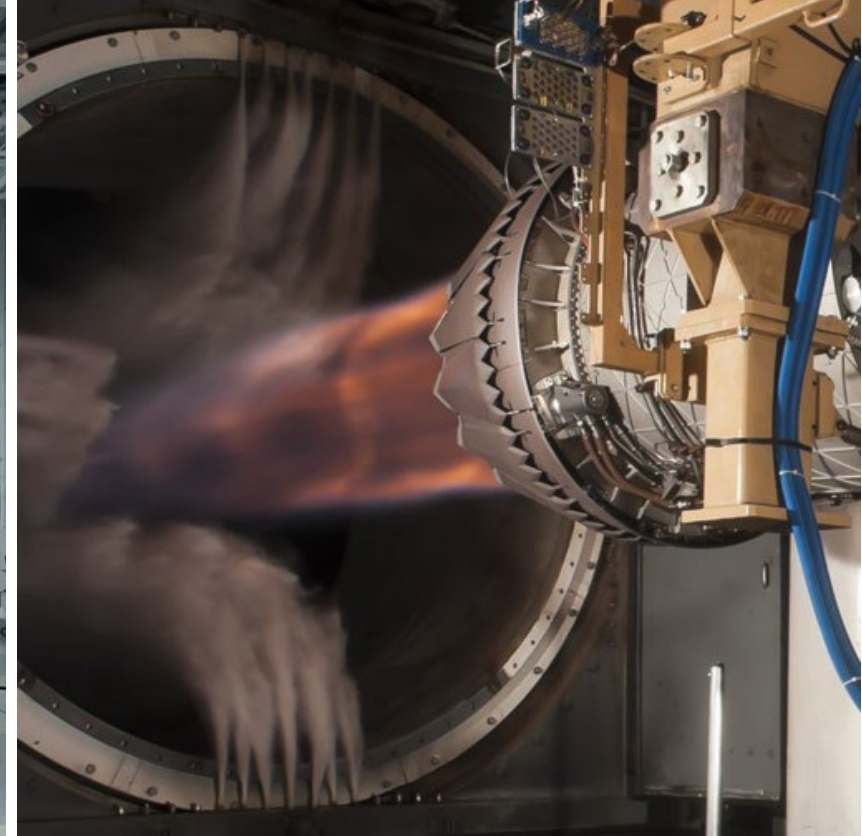




**Pratt & Whitney**  
An **RTX** Business

## Model-Based Design Implementation

Blake Gorowsky – Senior Technical Fellow

April 2026

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# Presenter Bio & Presentation Abstract



## Blake Gorowsky

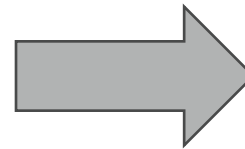
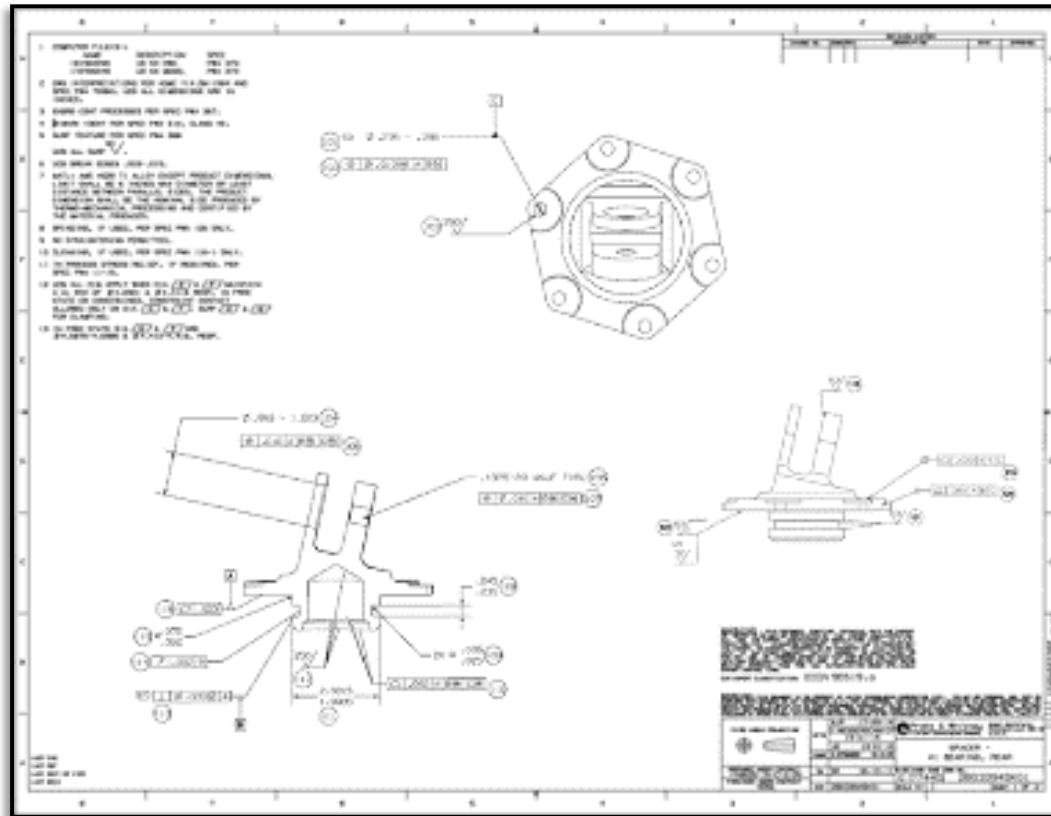
- 18+ years working in manufacturing, quality & design engineering across automotive, medical and aerospace industries
- MBD, MBM & MBQ transformation efforts for 15+ years
- Industry Standards Involvement:
  - DMSC Member – QIF & MBC Standards
  - ASME Y14.46 - Member
  - ASME Y14.47 SC – Member
  - MBE Main – Vice Chair
  - MBE/Y14 JWG – Member
  - MBE 2 – Member
  - MBE 3 – Interim Chair

## Abstract

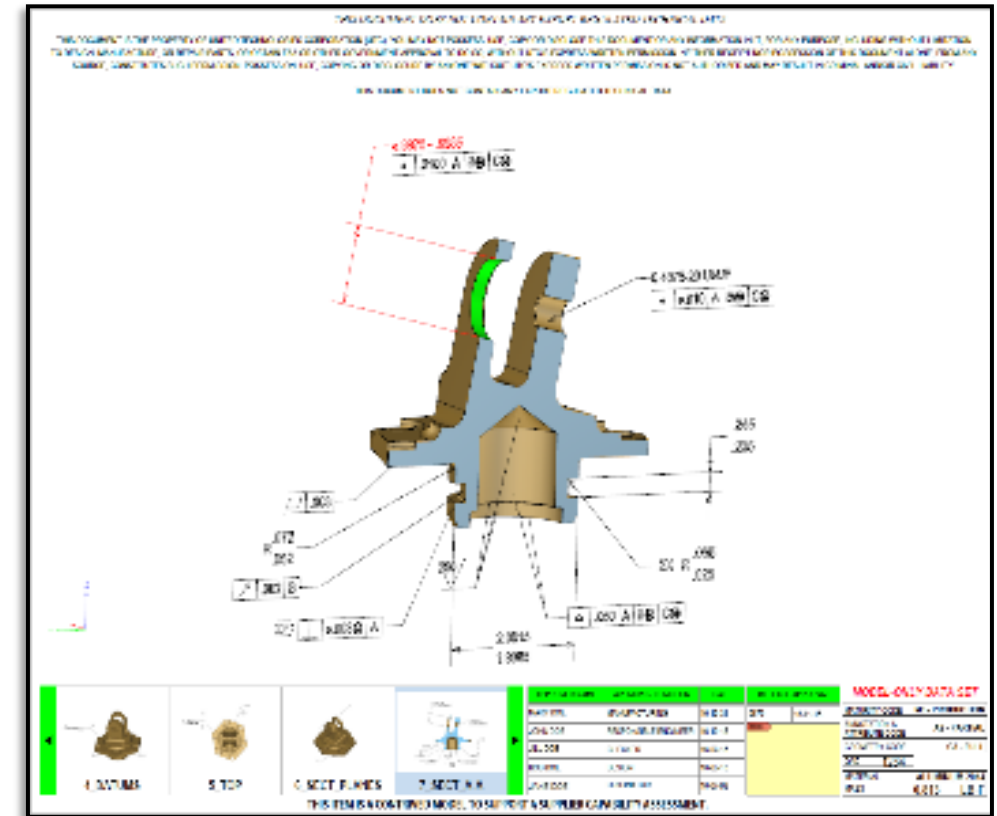
A case study investigating how model-based definition affects mechanical engineering workflows across system, design, manufacturing, inspection, risk, and analysis processes. How the digital thread implementation can improve traceability, efficiency and enhance design intent or create interoperability and process challenges - including summarized lessons learned and recommended implementation strategies.

# Model-Based Definition – Typical Transformation

## 2D Drawings

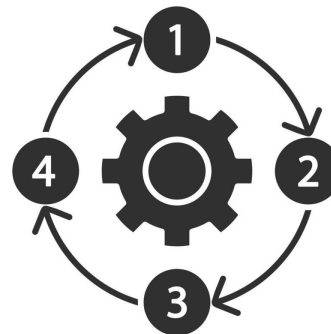
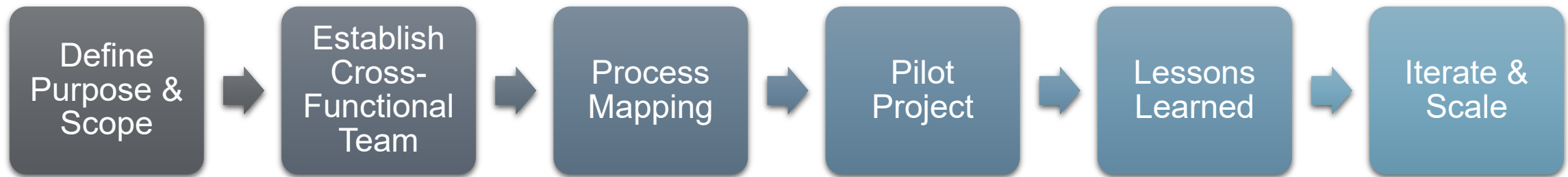
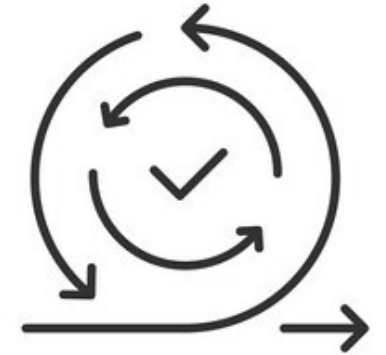


## Model-Based Definition



***A comprehensive transformation - paper to semantically enabled design intent  
Complexity (made clear) via MBD & the Digital Thread***

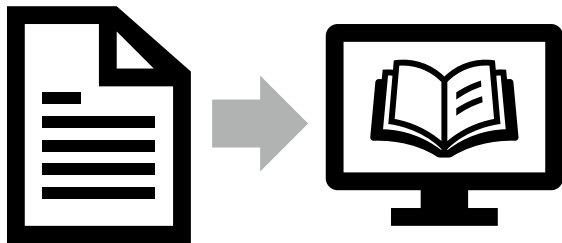
# Model-Based Definition – Typical Transformation



# Common Misconception “Digitize” vs “Digital”

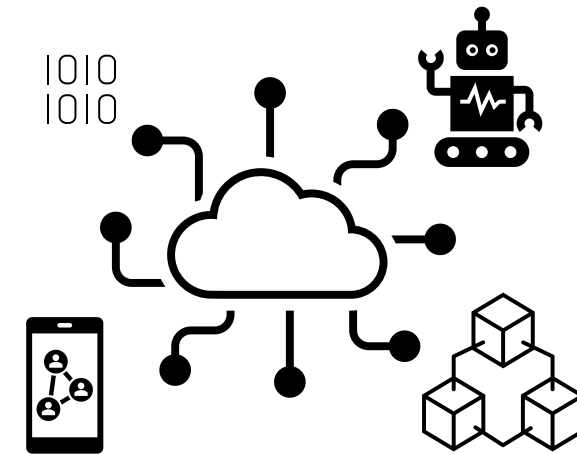
## Digitize

- “Digitize” Legacy Process
  - How to “Digitize” Paper to a PDF?
- Still Requires Human Interpretation
- Not Machine Consumable
- Easy to Develop, Limited Benefits
- Design Intent limited by the construct



## Digital

- Embrace New “Digital” Processes
  - What if paper never existed?
- Decompose PMI into discrete requirements in a BOC
- Design intent enabled



# So – What's the Big Deal?

Does this work?

What makes this hard?

What should we do differently?

Should we do something differently?

Do we get the outcomes we need?

# MB-Design Implementation – Case Study

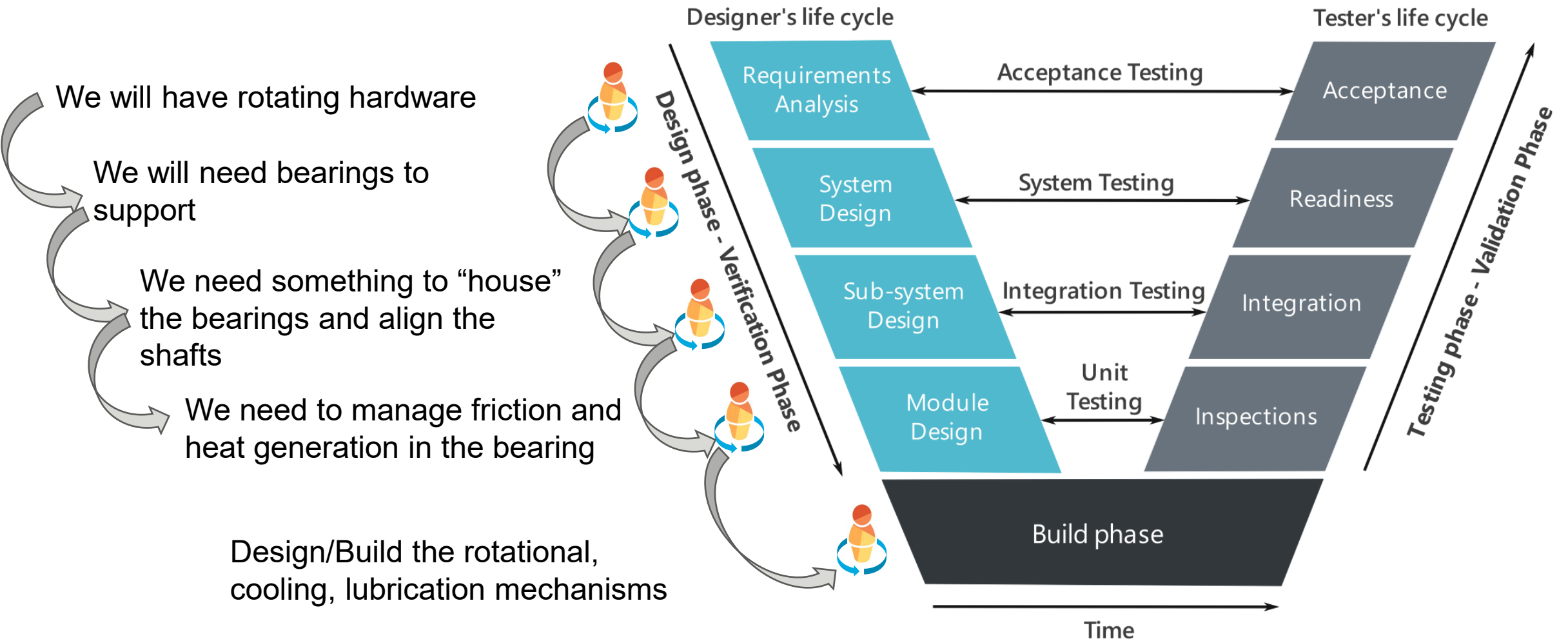
## Bearing Housing

A typical part, a typical conversion & implementation



**Should be simple enough**

# MB-Design Implementation – Case Study



Typical system design, decomposition, validation

# MB-Design Implementation – Case Study

We need to manage friction and heat generation in the bearing

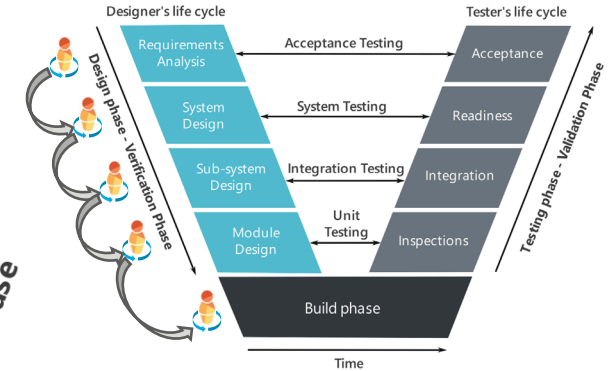
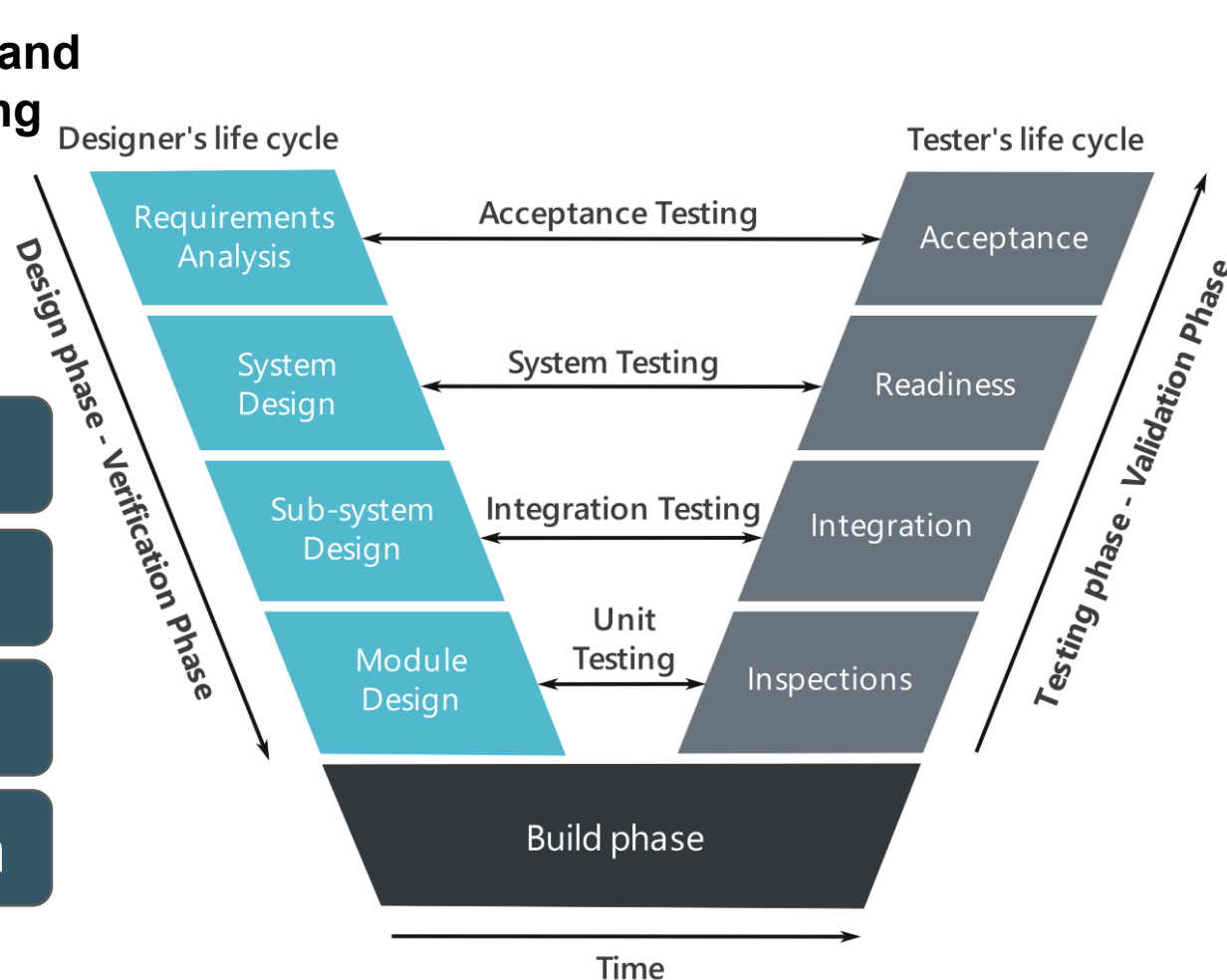
Oil Port

Positioning

Size

Sealing

Heat Regulation



Typical system design, decomposition, validation

# MB-Design Implementation – Case Study

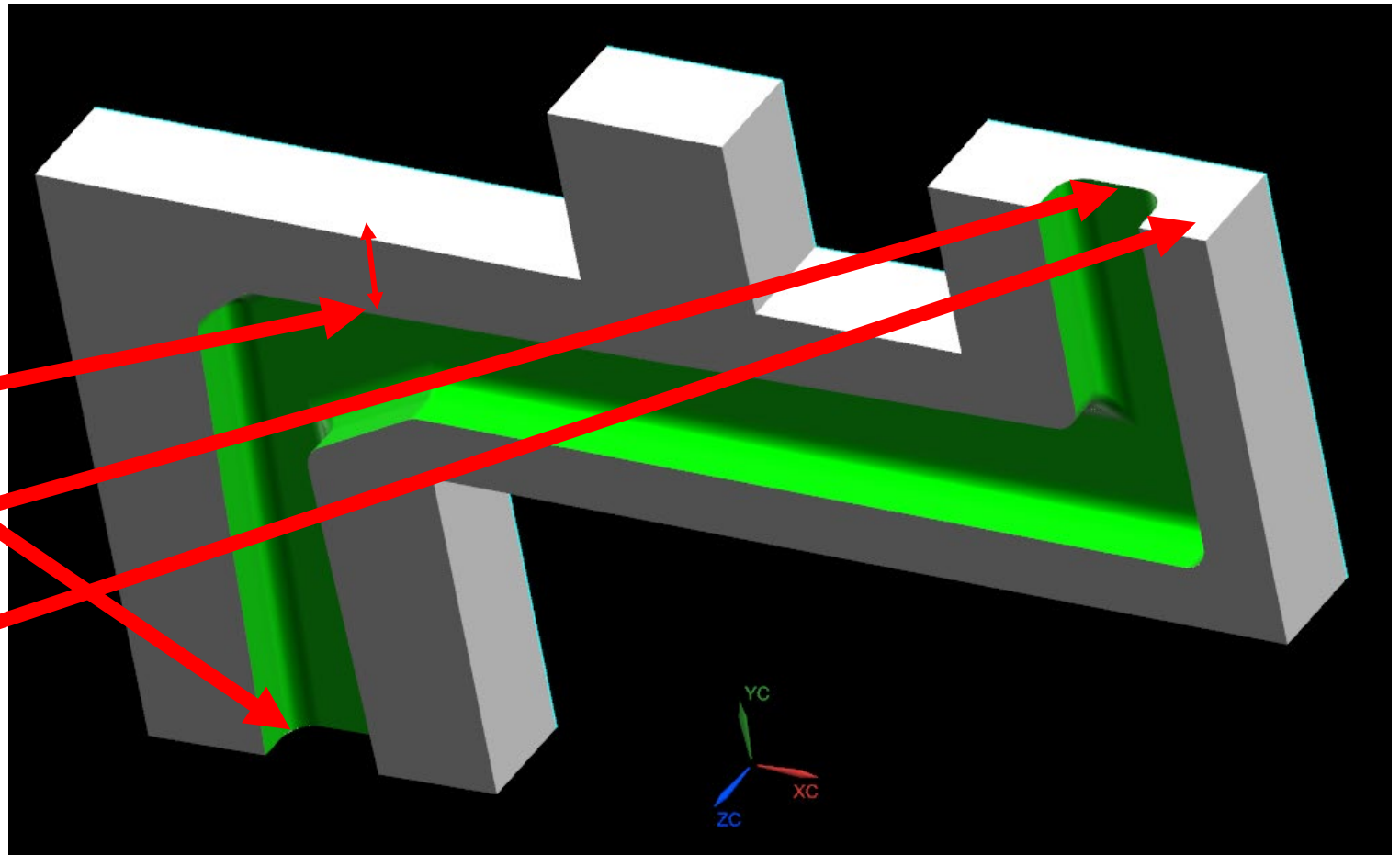
Product Definition

Positioning (i.e. location)

Size (i.e. Diameter)

Sealing  
(i.e. Surface Flushness, O-ring runout)

Heat Regulation  
(i.e. material)



Getting to design intent

# MB-Design Implementation – Case Study

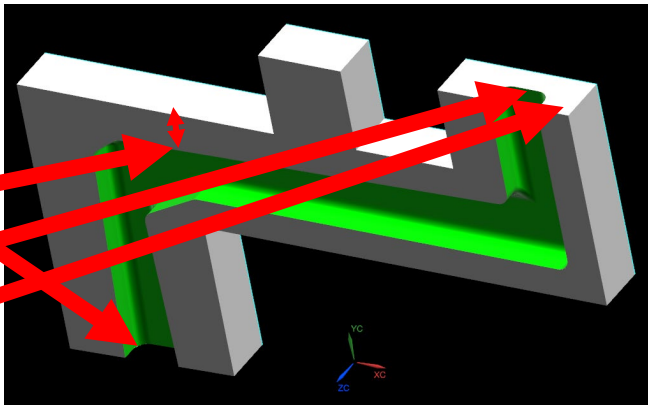
Product Definition

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(i.e. Surface Flushness, O-ring runout)

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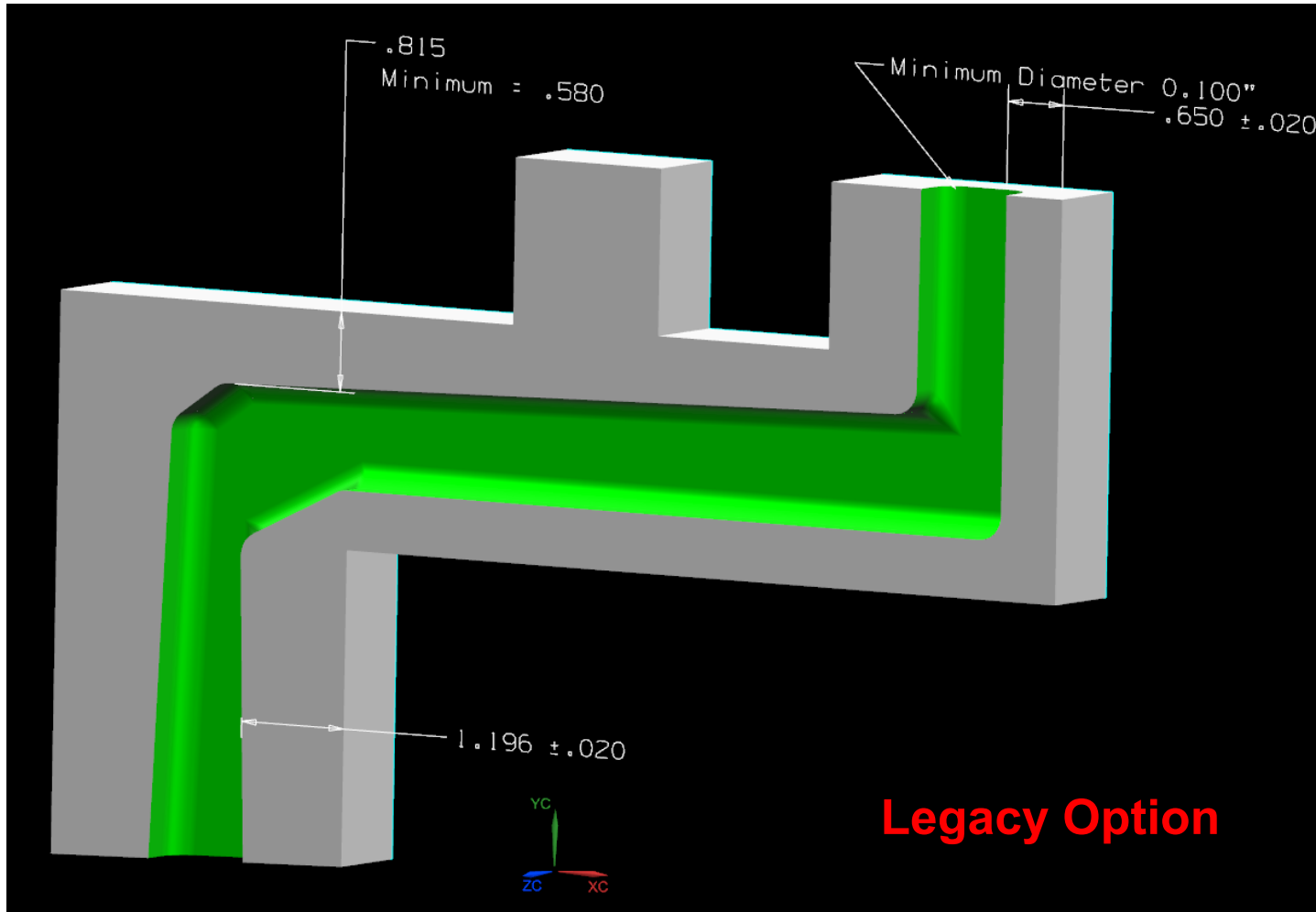
What's going to happen?

**Remember – It's a complex NURB surface with dozens of faces, edges, blends, radii, etc.**

- Transitioning from Functional requirements to Dimensional Tolerancing (DT)
- DT is less intuitive
- People think intuitively – but MBD is inherently Digital & Math
- The perception of gaps
- The instinctive need to close the gaps
- How to validate the resulting Product Definition and DT

Uh Oh – Something about to happen?

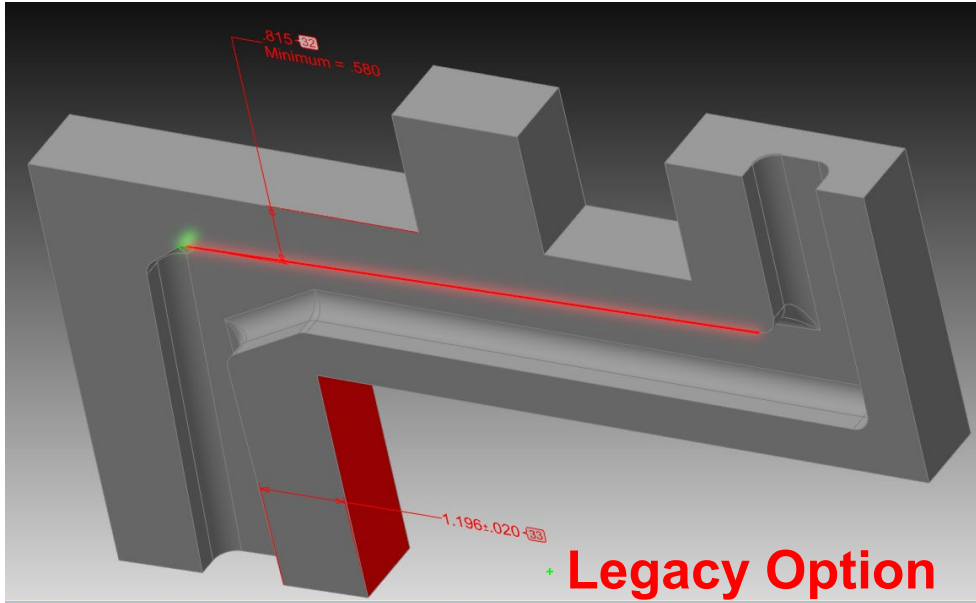
# MB-Design Implementation – Case Study



Done – Legacy Option

- Size, Form, Orientation, Location
- Wall Boundaries
- Design Criteria
- Requirement is interoperable  
– will translate to QIF
- Intuitive

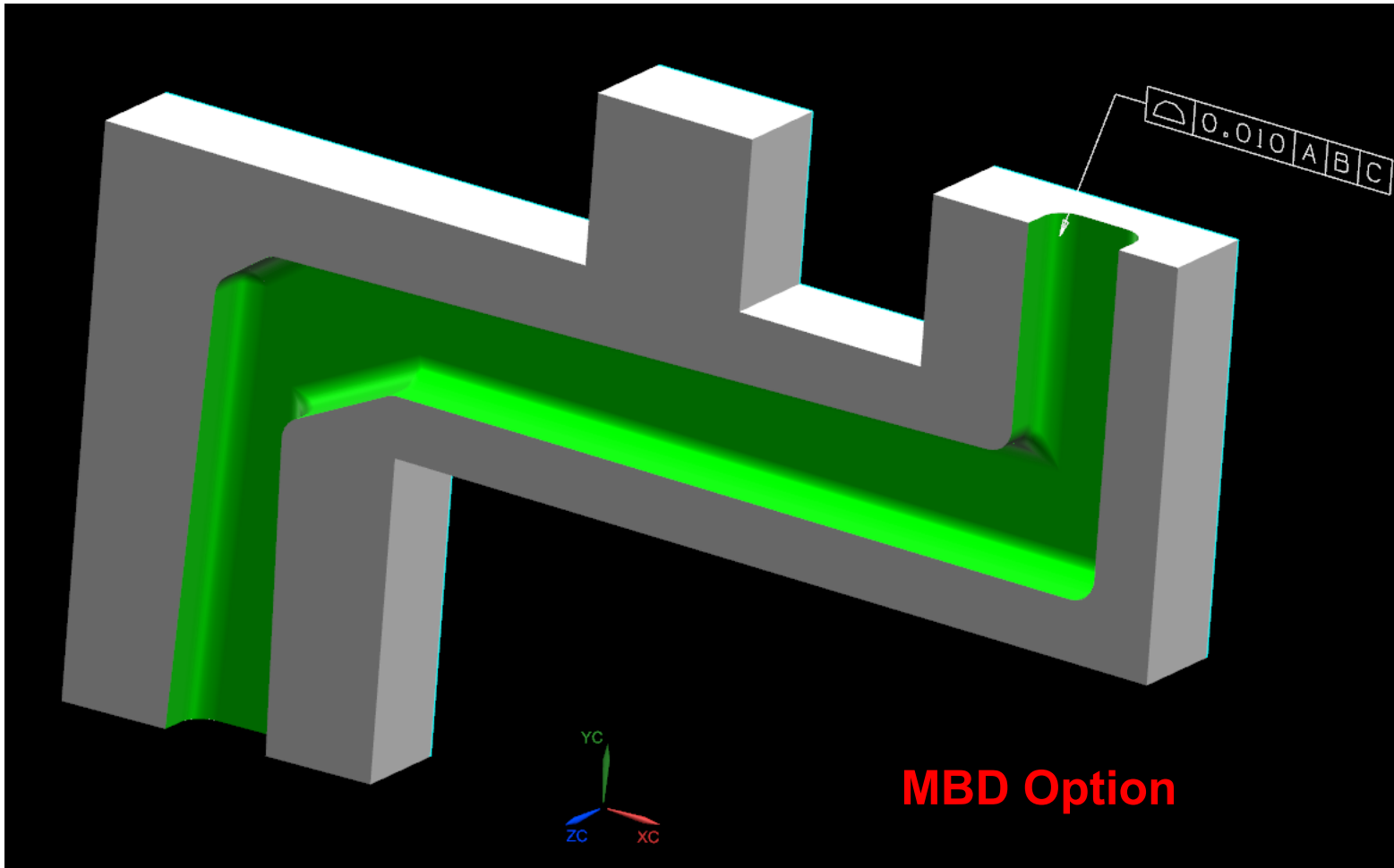
# MB-Design Implementation – Case Study



- Edge control is an interpretative control
- Associated surfaces are non-parallel
- Not fully controlling size, form, orientation – a lot of gaps

- Design Intent
- Manufactured
- Inspected
- Meaningful data
  - Understand/predict design performance
  - Allow for decomposition to Process Control

# MB-Design Implementation – Case Study

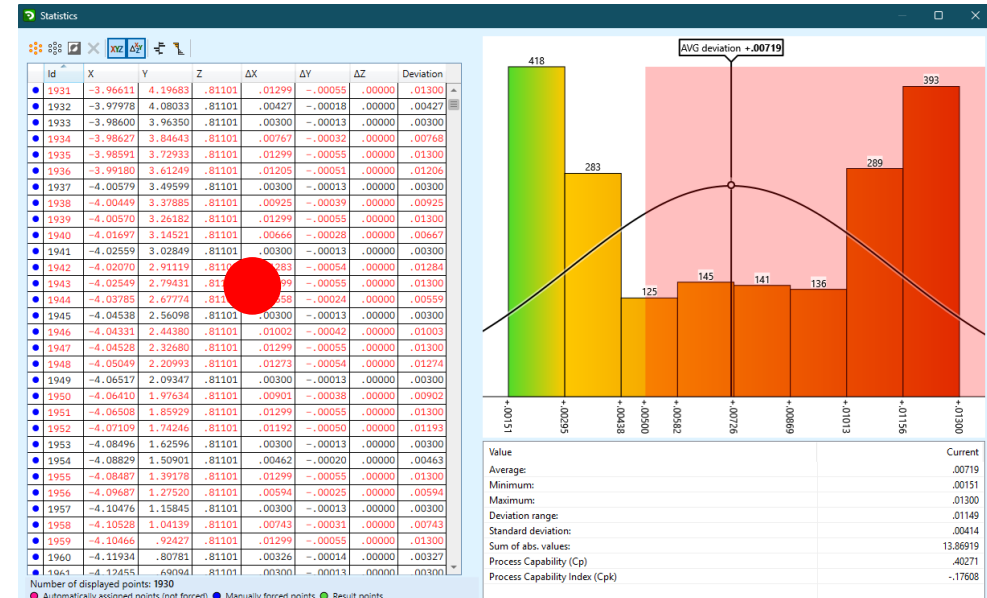
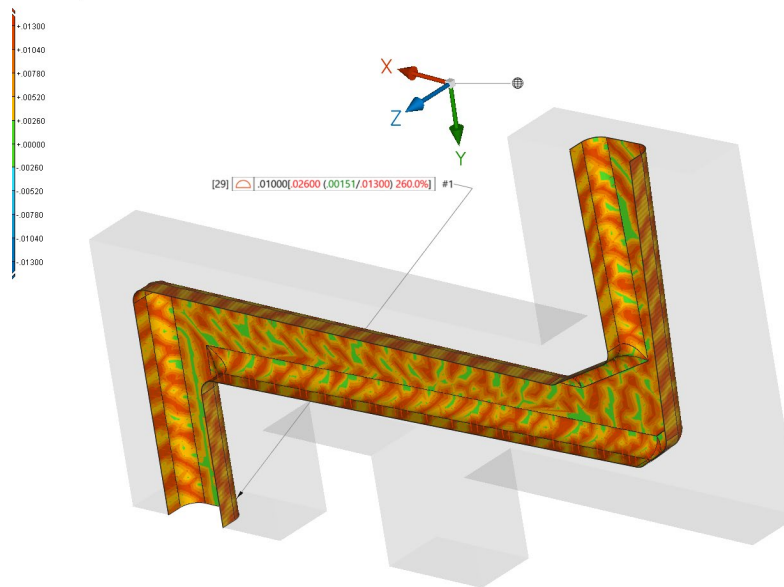


Done – MBD Option

- Size, Form, Orientation, Location
- Wall Boundaries
- Design Criteria
- Requirement is interoperable – will translate to QIF
- Intuitive

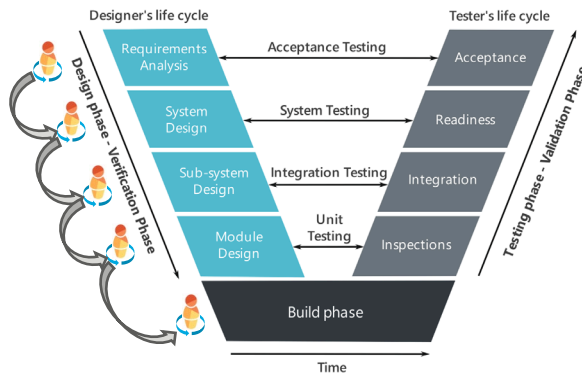
# MB-Design Implementation – Case Study

## MBD Option

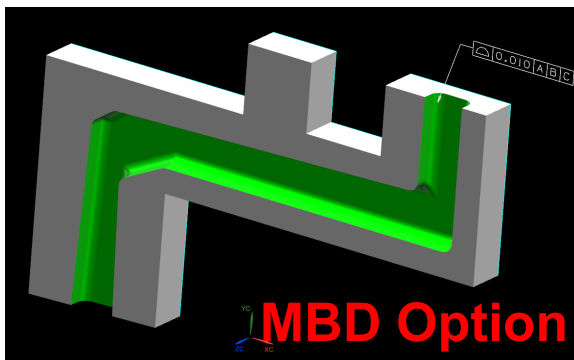


- Design Intent
- Manufactured
- Inspected
- Meaningful data
  - Understand/predict design performance
  - Allow for decomposition to Process Control

# MB-Design Implementation – Case Study



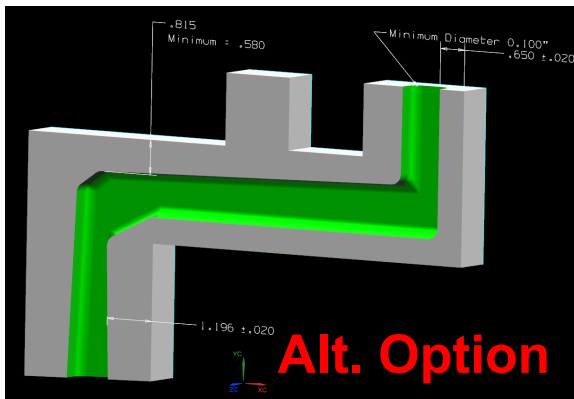
Remember – All activities run through the V



Do we need a CMM?  
These requirements aren't valid

.....

Validation – not Design  
Criteria are decomposed to  
Dimensional Tolerances, not  
Functional



There's a lot of dimensions  
I can't get Gage RR to pass

....

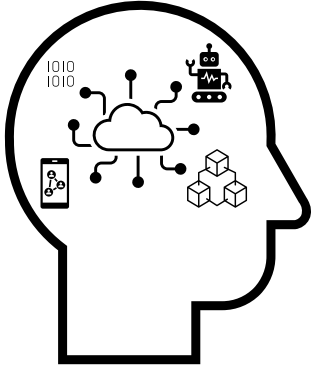
Validation – not Design  
Criteria are decomposed to  
Functional Tolerances, not  
Dimensional

# What has happened?

- We have confused design requirement decomposition with validation implementation
- Intermingled functional requirements with risk mitigation (i.e. design requirements to control a risk, not provide function)
- Not included digital interoperability as a requirement at the beginning of the project
- Spent \$
- Frustrated people
- Questioned if we need to change processes

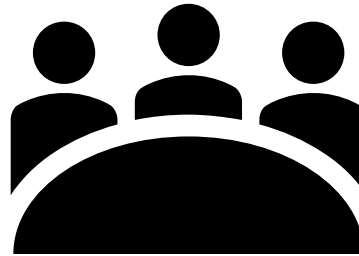
**This is hard!**

# Next Steps



## Mindset/Culture

Work for horizontal and vertical alignment on good systems engineering, requirement decomposition, validation methods



## Industry Standards

Develop traceable transformation methods from Design Requirements – Inspection Requirements – Manufacturing Controls



## Incremental Improvements

Do Pilots

Do Transform

Do not expect Technology to be the “easy” button