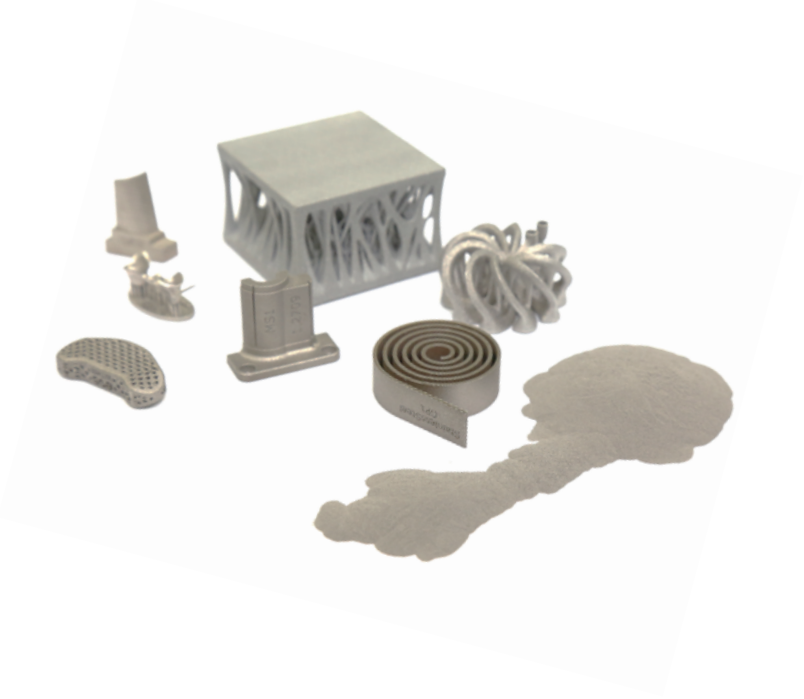
Additive Metal Manufacturing

# Additive Metal Manufacturing Inc.

## Concord, ON, Canada



www.additivemet.com

Additive Metal Manufacturing

# What we do…….

## Your 3D Additive Metal Journey
## …. STARTS HERE!!

| Design Consulting | Rapid Prototyping | Additive Production |
|---|---|---|
| Wide range of Applications | Local capability | Seamless production of the final solution in our local Additive Manufacturing facility. |
| Effective product solutions. | Fast track delivery | |
| Strong Team collaboration | Integrate with your supply base | |
| Work direct with your team:-<br>Innovators<br>Designers<br>Manufacturing Engineers<br>Toolmakers<br>Product Specialists<br>Validation/Quality specialists | Offer wide range of materials | Proud to be Canadian! |
| | Assist with product development | |
| | Real time scheduling support | |

TBM

Take Back Manufacturing

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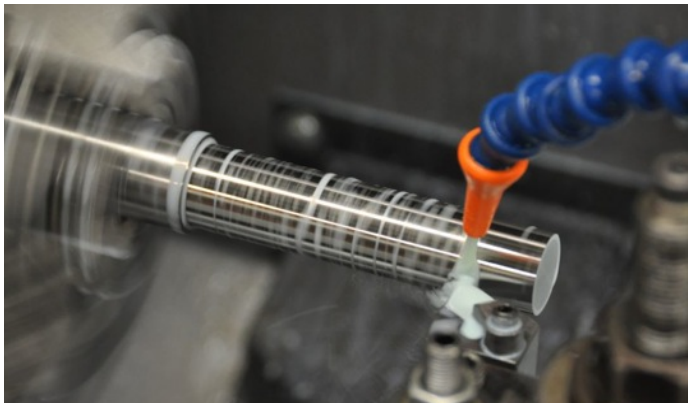
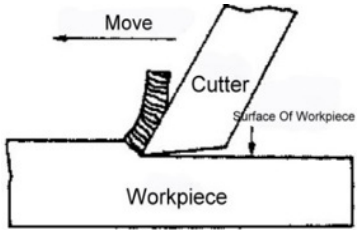
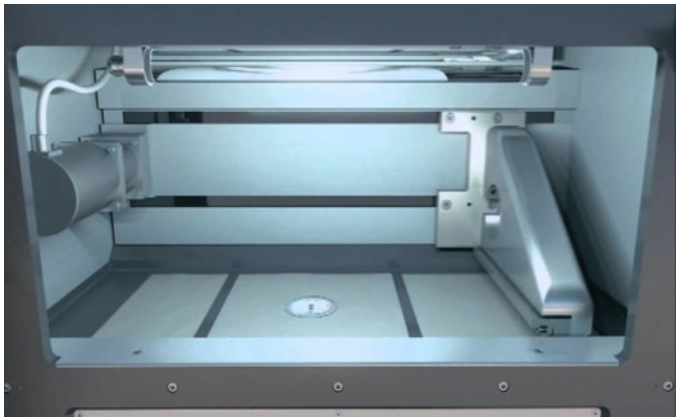
# Additive vs. Subtractive Manufacturing Technologies

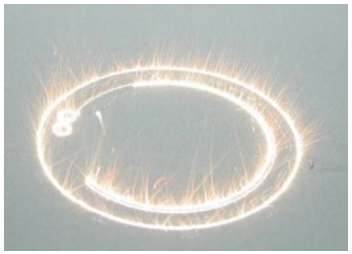
- Subtractive Process






- Additive Process





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# Additive Metal Technology - DMLS

What is DMLS?

- Definition: Direct Metal Laser Sintering
- Correct Definition: Melting not Sintering
- Powder melted locally, layer by layer, using a laser beam to create a 3D object
- Powder is removed when the object is complete

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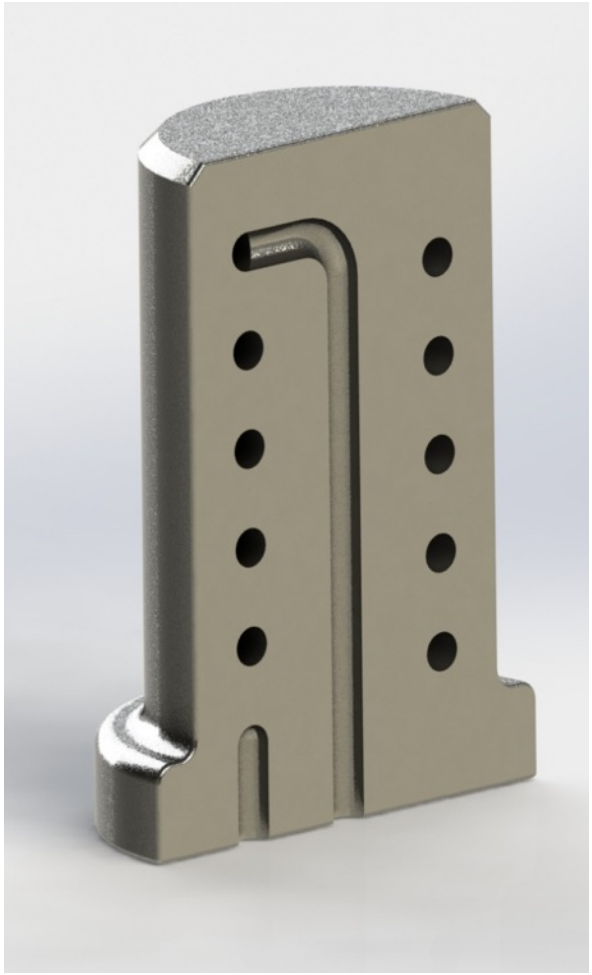
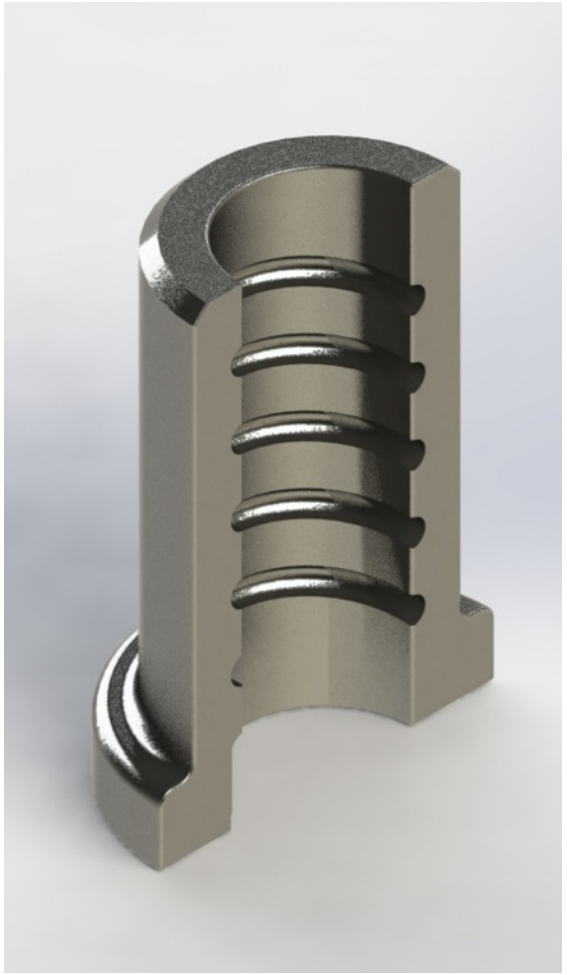
# Cut away examples of conformal cooling inserts





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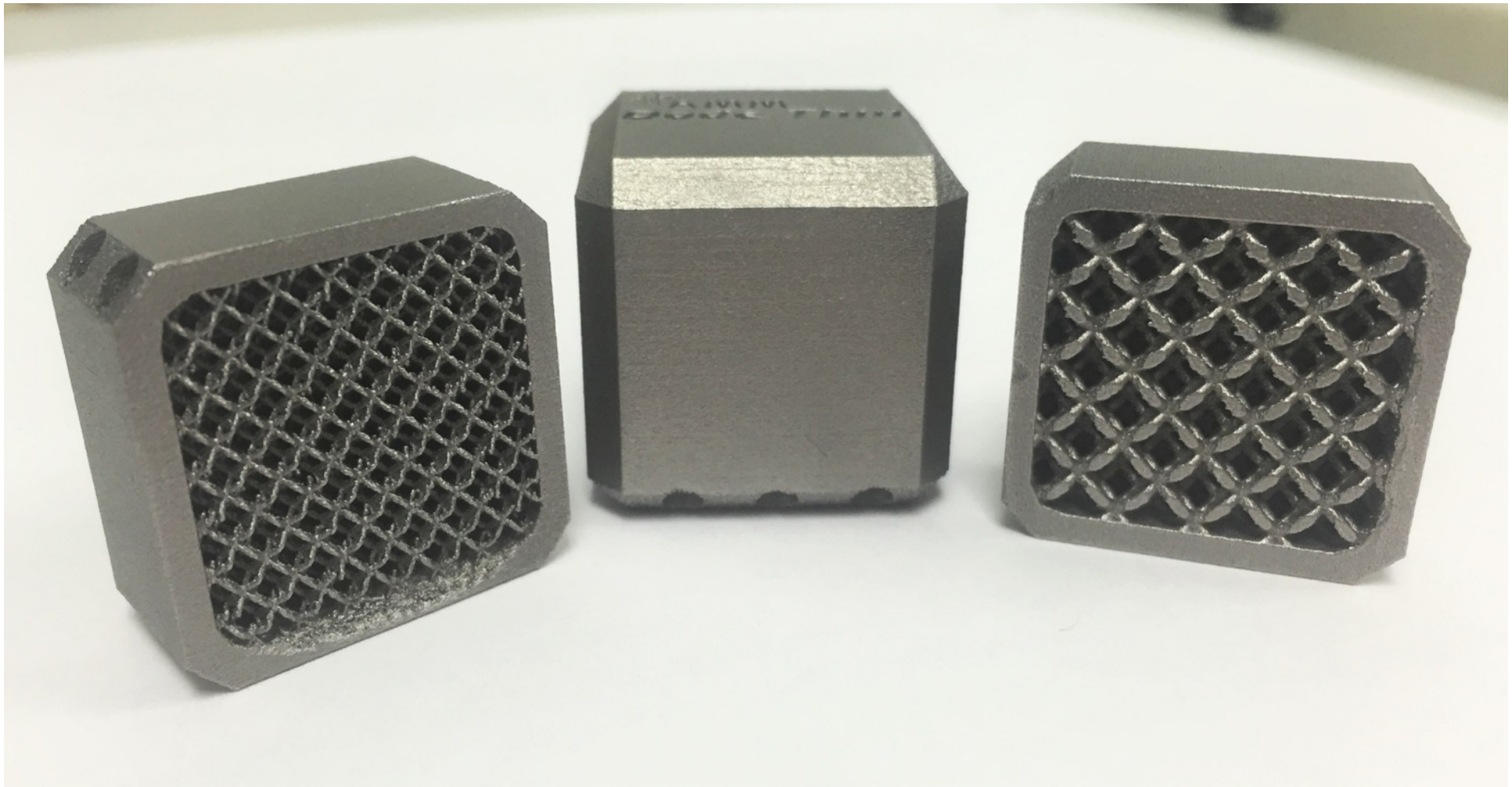
# Mass Reduction Techniques (Weight Saving)



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Casting Replacement Solutions / Part Consolidation

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# ADDITIVE METAL TECHNOLOGY – The Offering……..

- Emerging - high degree of hype!
- Hi barrier to entry - capex/know-how - **Not push button as media says!**
- Provides more process options and design solutions (subtractive still has a place)
- Changes the dynamics of some product designs
- Rapid prototype of parts and rapid/improved tooling solutions
  - ➢ Metal components of all kinds where AMT applicable
  - ➢ Plastic injection mold tooling inserts
  - ➢ Metal casting molding segments
  - ➢ Inserts for press and punch tooling
- Moves us closer to Computer Integrated Manufacturing
- Places manufacturing closer to the customer in some cases.

# Why Additive Manufacturing ?????

**Function**

Product weight savings

Ability to create thermal management features

Replace Impossible machining or casting tasks (internals)

Tooling features that are impossible in other technologies

**Delivery**

Rapid time to market of first product samples

Rapid Tooling time to market

Low Volume usage that precludes tooling costs

**Cost**

Replace extensive/expensive machining tasks

Eliminate assembly time by combining parts

Cost of material can be less than subtractive processes

**Quality**

Eliminate assembly fit-up issues by combining parts

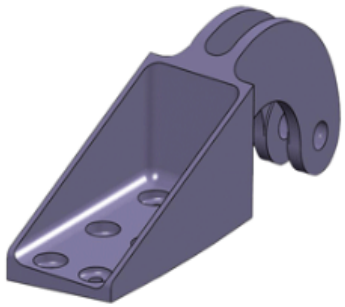
Reduce thermal distortion due to fabrication weldments

Able to develop structures without machining stresses

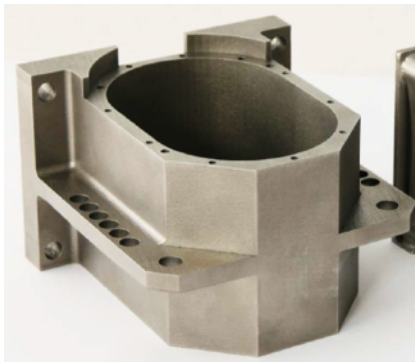
http://www.surveygizmo.com/s3/2319990/Technology-Assessment-Survey

# Additive Technology – Part Function / Weight Saving

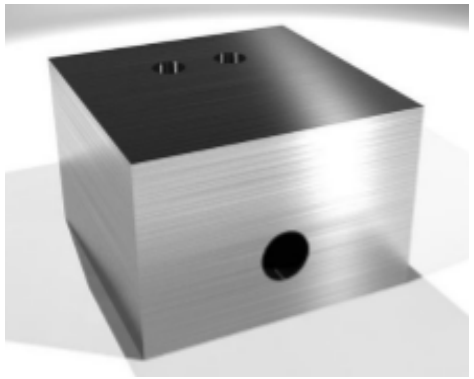
Weight reduction in an airplane hinge helps reducing the fuel burn



Weight reduction in a gear box through design optimization



Weight reduction in an engine block by design optimization



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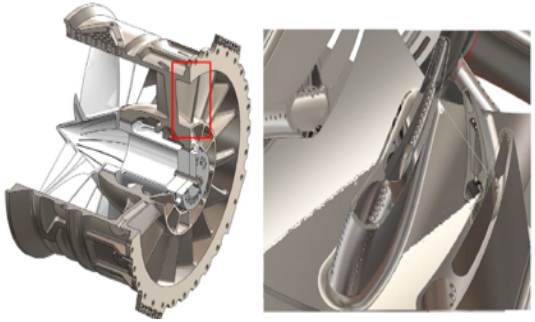
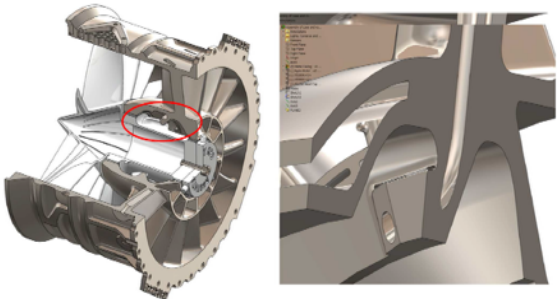
# Additive Technology – Part Function/Internal & Complex Features

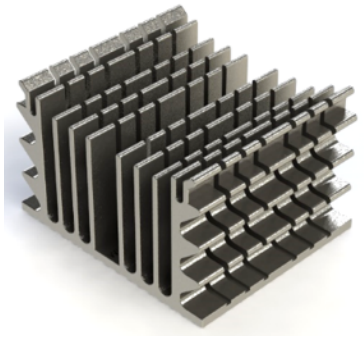
Internal features aerospace casing



Conformal cooling tooling inserts

Complex geometries thermal management





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# ADDITIVE Design strategy

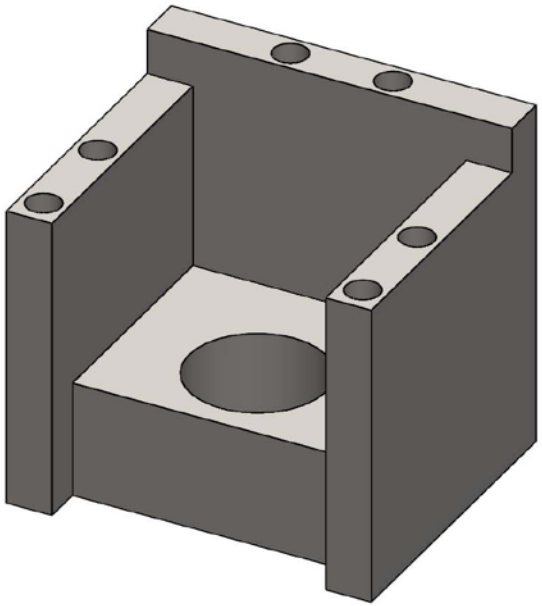
Remember…. it's reversed…..

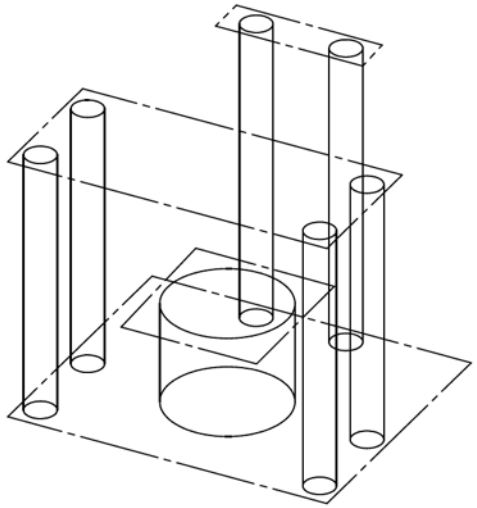
With Subtractive technology the more you remove the more expensive

With Additive technology the more you add the more expensive

- Forget old design rules and process constraints
- Learn a new set of rules
- Stop thinking metal removal or shaping
- Think metal adding without the constraints of molding or casting
- Think metal adding… additive manufacturing

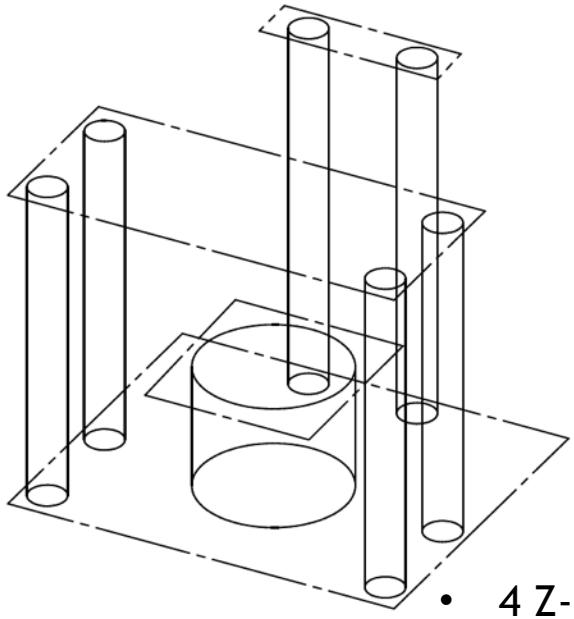
# ORIGINAL - Casting / Machining Design

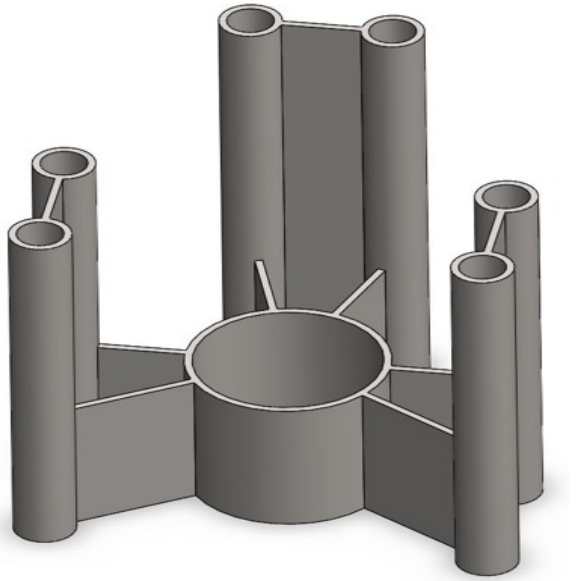




- 4 Z-Planes
- 4 Small Holes between 2 planes
- 2 Small Holes between 2 planes
- 1 large Hole between 2 planes
- All Z orientated in the X-Y

# New Additive Design





- 4 Z-Planes
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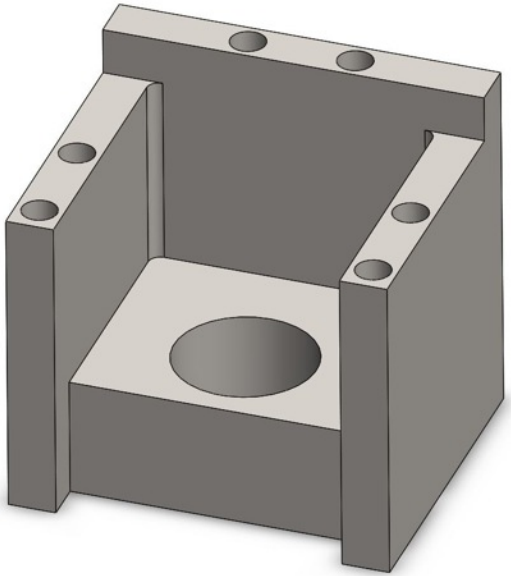
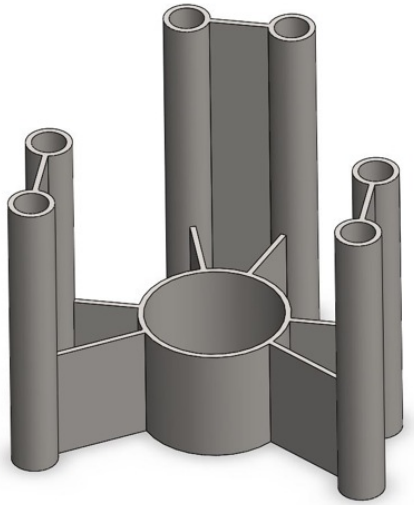
# Design Optimization

Casting or Machining Design



Additive Design



Same Mission…….. FIT FORM FUNCTION

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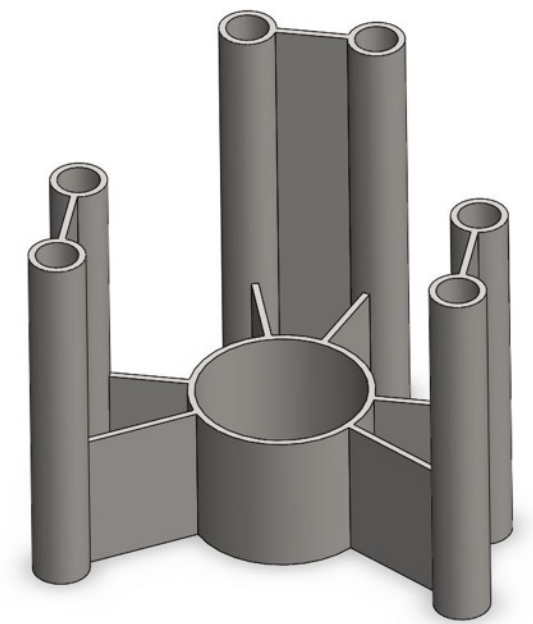
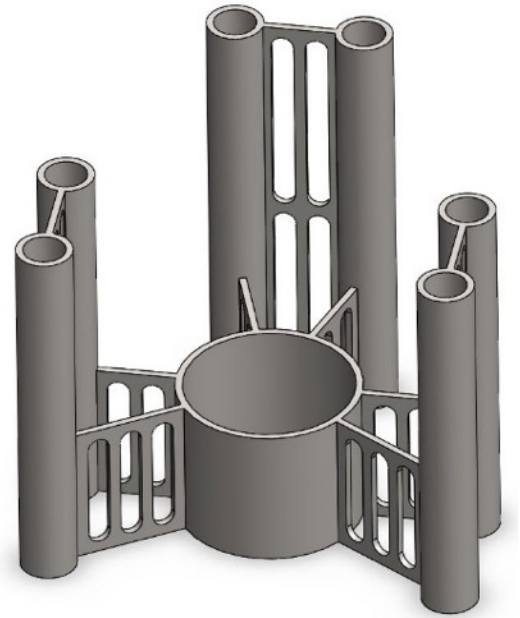
# Additive Design





Same Mission..... FIT FORM FUNCTION

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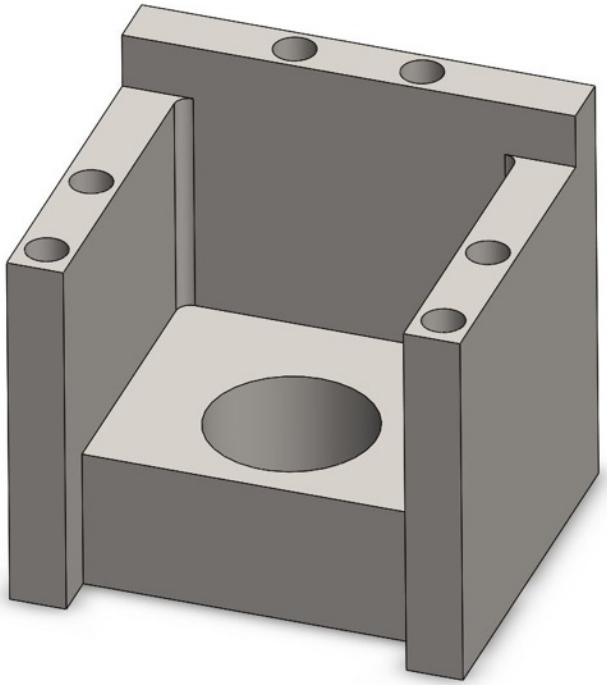
## Casting or Machining Design



## Additive Design

Same Mission.... FIT ✓ FORM ? FUNCTION ✓

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Design Considerations

Laser Sintering/Powder bed technology

http://www.additivemet.com/learn/information/

AMM Technology Assessment Survey

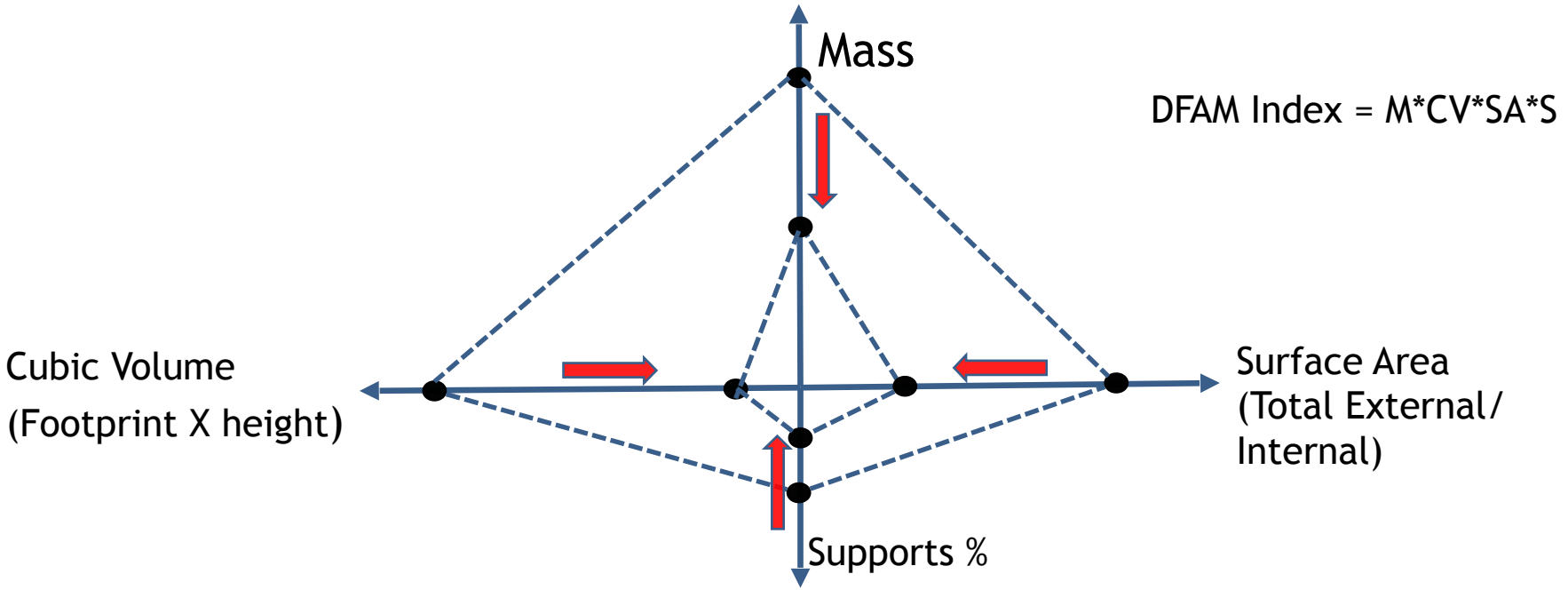
Design For Additive Manufacturing (DFAM) Procedures/Rules

Reference samples to define AMT process conditions

Material specifications and application guide

# Additive Metal Technology Cost Drivers

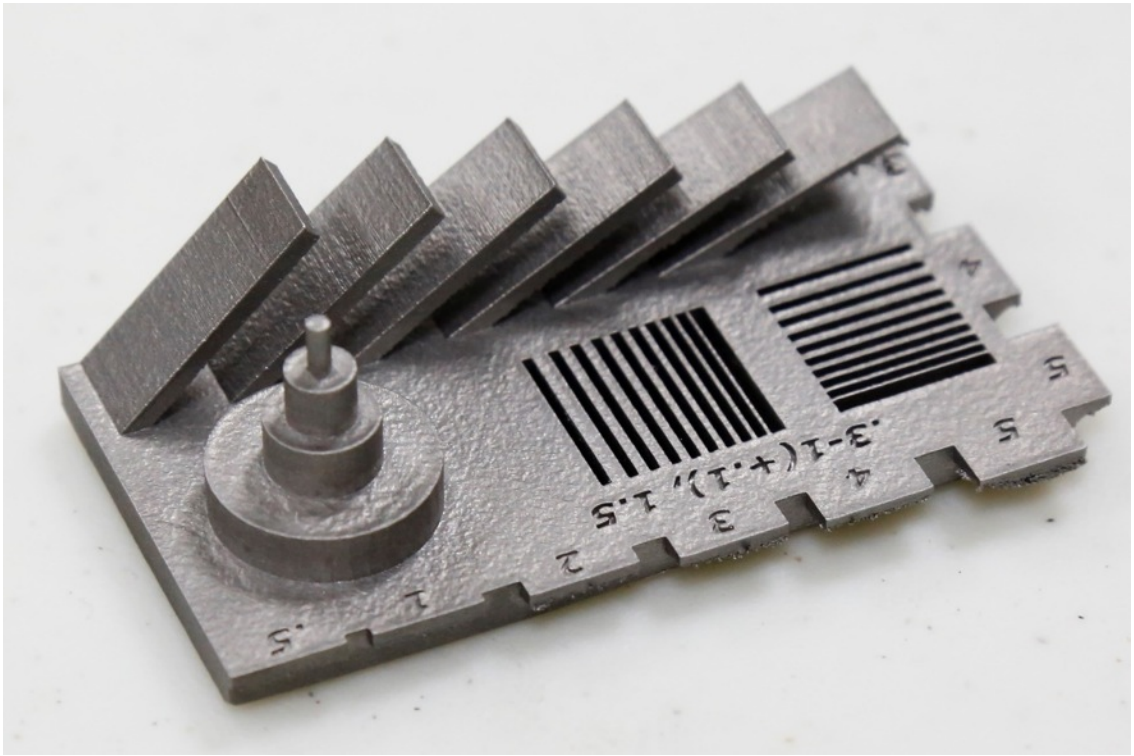
- Part Mass - Drives cost of processing and powder
- Part Total Surface Area - Drives edge finishing on each slice
- Part Cubic Volume - Drives space consumed on machine plate
- Unsupported sections of the part - attracts the cost of supports
- Design challenge is to optimize these factors with the “MISSION” of the part.



# AMM Process Constraints and limits Samples

We provide clients Procedures and a set of “Reference Samples” to define AMT process conditions

http://www.additivemet.com/app/download/762614944/Design+for+Additive+Manufacturing+-+Rev+1.PDF



- Unsupported Angles
- Wall thickness
- Hole size/orientation
- Overhangs
- Supports
- Positional tolerance
- Edge tolerance
- Stock add factors
- Surface finish
- Critical A/B/C surfaces
- Thread quality
- etc.

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# Collaboration Roadmap

- Gain understanding of AMT and design opportunities and rules
- Select a candidate project/s
- Perform a joint mission review
- Design optional part design solutions
- Costing and selection
- Proto build
- Project roll-out
- Contact us at info@additivemet.com