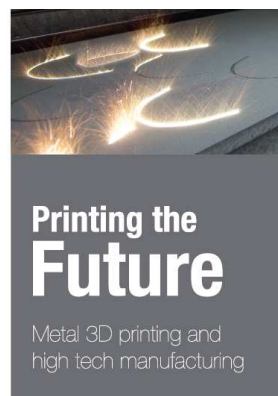


# R·A·M·

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## Powder metallurgy

- Fastest growing metal forming
- Allows greater freedom of design and materials
- Efficient manufacturing
- Creates product advantage
- Products now in market



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## 3D Manufacturing

- Design freedom brings new ideas
- New products
- Increased value
- Most things are possible including assemblies and internal structures
- Complexity is free (often reduces cost).

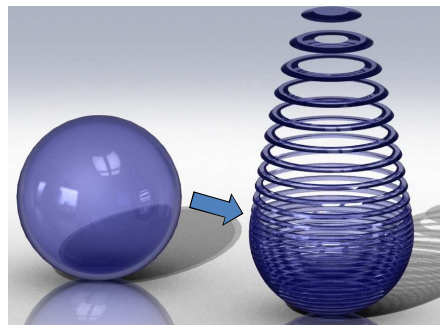


Foiling moth parts designed by Southern Spars



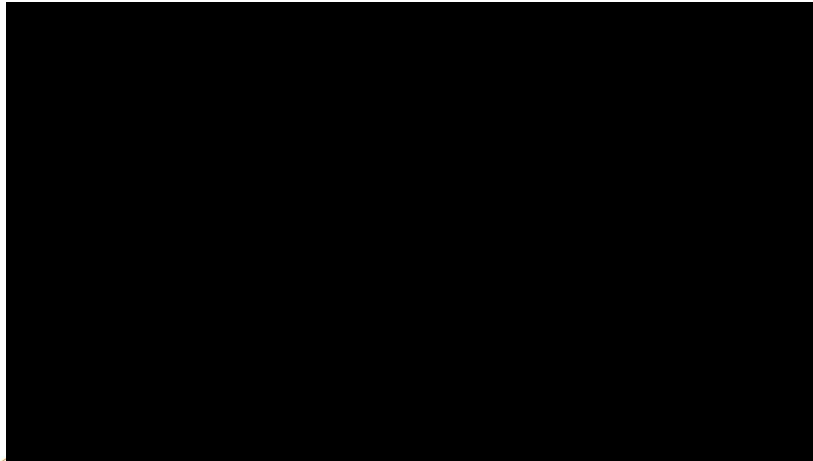
## The new Way

- Generate a 3D model
- Software slices the 3D model into thin slices
- Machine builds it layer by layer



## SLM System

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## Where now

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- Started with Plastics – most established
- Systems becoming quite cheap
- Like buying a standard printer – cartridges
- Metal/ceramics started – RAM can do Titanium alloys, stainless steels, Inconel and special materials
- Design is key – increasing in importance



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## Materials

- Look at materials as a functional component
- Comes from good materials knowledge
- Ability to apply it to design
- Eg. Ti64 is five times the price per kg than 316 stainless steel.
- But it is almost half the weight
- Yield around 3 times higher
- Result less mass required for a part
  - titanium may be cheaper if designed right



## Possibility

- No longer metal powder
  - Similar to the billet material
- Tolerance tends to be  $\pm 50\mu\text{m}$  but some variation
- Minimum wall thickness approx.  $180\mu\text{m}$
- Reducing level of complexity is economic
- Some finished parts cheaper than billet price



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**“I have seen the future,  
and it works...”** Lincoln Steffens

