

From Prototype to Production

From Text to Spaceship: Advancements in Computational Product Design

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Design



Print



Monitor



Certify



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Bottom line upfront: Physics-informed, AI-driven generative design—combined with high-performance simulation and in-situ monitoring—can accelerate the pathway from design to qualified, certified products.

Design of an Additively Manufactured Recuperator With 800 °C Inlet Temperature for sCO₂ Power Cycle Application

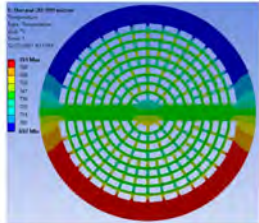
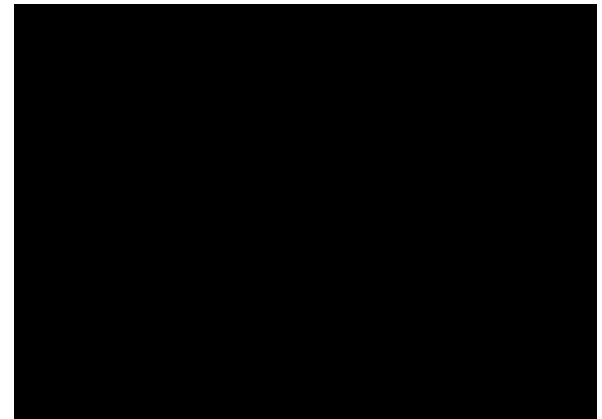
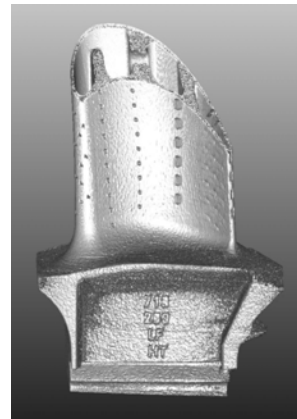


Fig. 16 Thermal profile generated for 2-D plane stress model

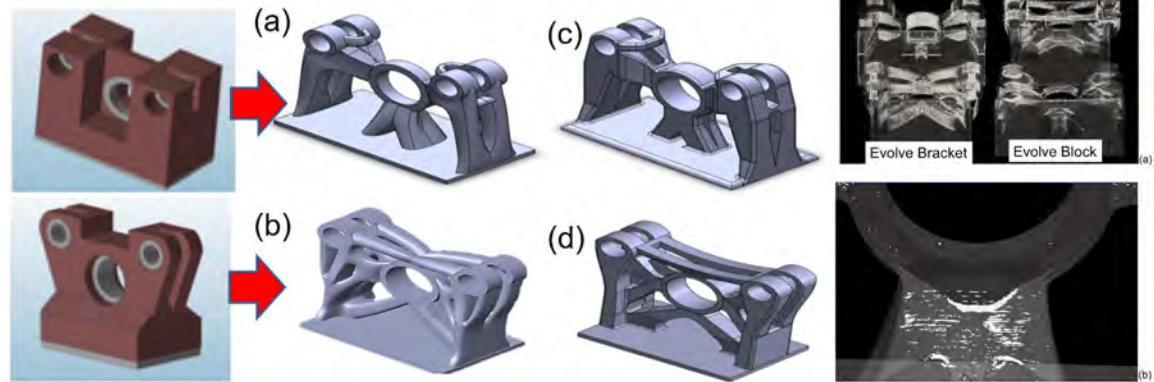


- How about Design? Let us see an example project relevant to Aerospace.

Topology optimization tools enable us to design like nature—achieving structural and functional performance through local material control.

Multi-solution nature of topology optimization and its application in design for additive manufacturing

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 Manufacturing Demonstration Facility, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA
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 Energy and Transportation Science Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA



Characterization of topology optimized Ti-6Al-4V components using electron beam powder bed fusion

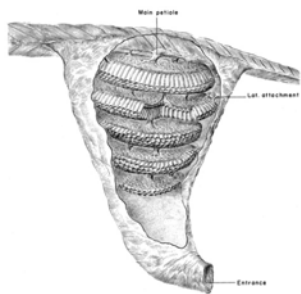


S. Yoder^{a,*}, S. Morgan^a, C. Kinzy^a, E. Barnes^a, M. Kirka^b, V. Paquit^b, P. Nandwana^b,
 A Plotkowski^b, R.R. Dehoff^b, S.S. Babu^{a,b}

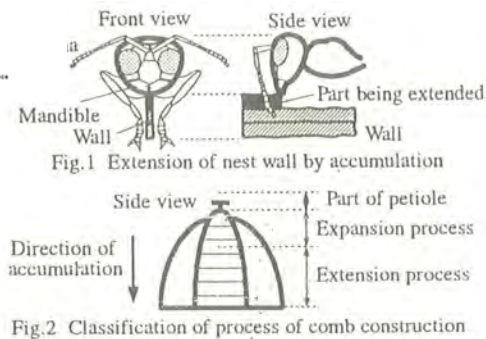
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- Each target application demands a unique design, which underscores the need for robust in-situ monitoring.

How can we learn from nature? Paper wasps exhibit multi-length-scale design and fabrication strategies that inspire biomimetic engineering.



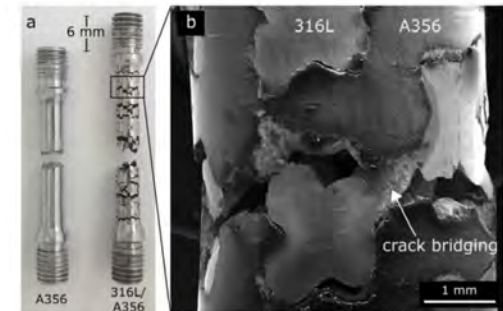
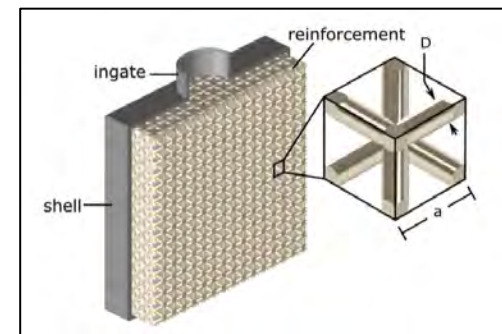
Jeanne (1975)
Honma and Fukui (1995)



Courtesy: Anita Monroe, UTK



Courtesy: Prof. W. Zhou, U. Arkansas



- We must deploy such design approaches broadly to foster community engagement and adoption.



DELIVER BENEFITS
FROM RESEARCH

DEVELOP STEM
TALENT FOR AMERICA

EXPAND THE GEOGRAPHY
OF INNOVATION

FOSTER A GLOBAL
S&E COMMUNITY

Questions, Comments, and Discussions

