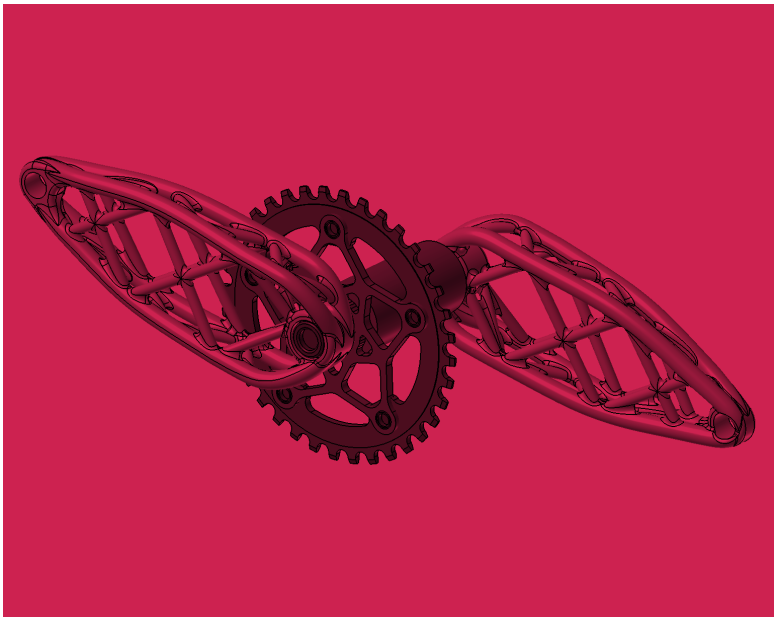
EVOTECH
Computer-Aided Engineering Ltd

Case Study



Project Scope: To develop a structural- and print-optimised high-performance road bike chainset concept which can be customised to individual rider ergonomics and power profile.

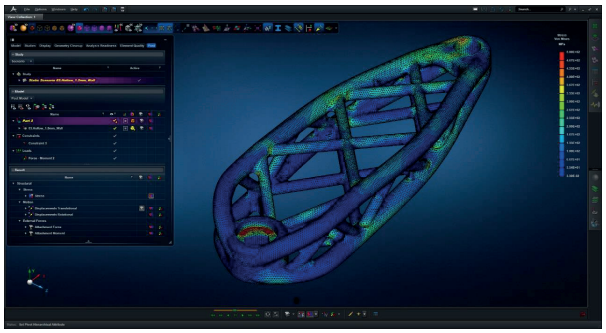
Toolsets: MSC Apex Fossa & Nastran (design optimisation), MSC Simufact AM (AM build analysis).

Outcome: Fully customisable 'concept to print' strategy with significant performance benefits over legacy designs (300% stronger, 340% stiffer and 100% increase in stiffness to weight ratio).

Mirada Pro

Evotech Computer-Aided Engineering Ltd is an Engineering Consultancy based in the UK, specialising in product development through advanced Finite Element Analysis (FEA). With a background predominately in the Aerospace industry, we are expert in multi-scale model development, analysis and structural optimisation, and hold NAFEMS PSE Certification at Advanced level (including Non-Linear Analysis, Composites, Optimisation and FE Model Verification).

Evotech CAE Ltd are highly-experienced in Design Optimisation for both polymer and metallic product development through Additive Manufacture. This case study, in conjunction with MSC Software, highlights some of the development work to explore the concept of a high-performance road bike chainset, using a hollow printed Titanium structure, which can be 'mass customised' based on specific rider ergonomics and power profiles.



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MSC Apex

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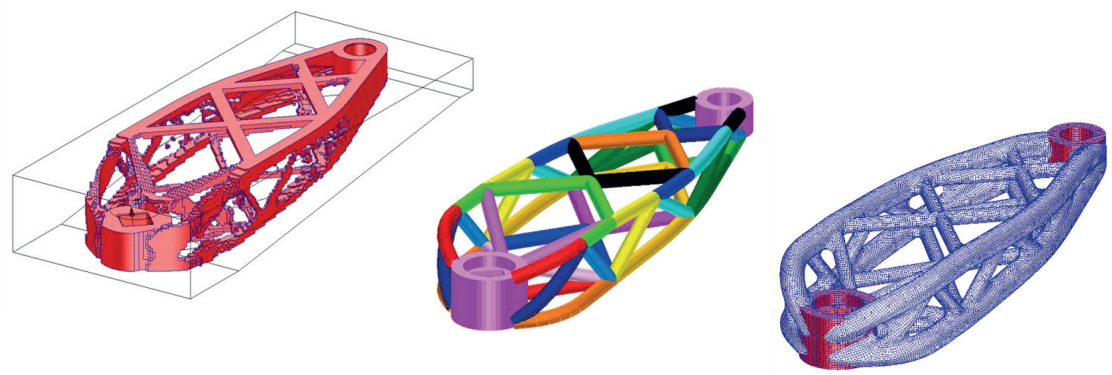
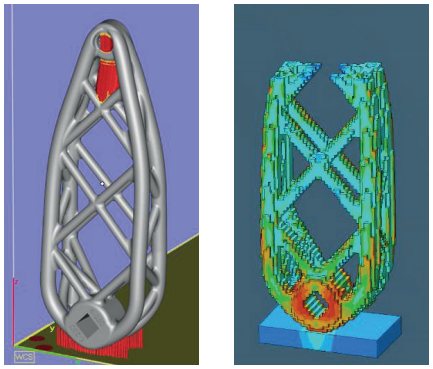
MSC REGISTERED CONSULTANT

PSE CERTIFIED

Topology through 1D – and 2D – Sizing Optimisation



Manufacturing Simulation



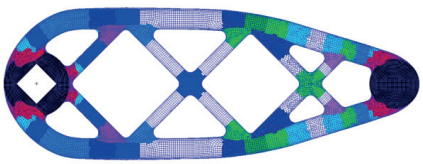
Key Analysis Steps

- Development of parametric optimisation strategy, based on robust topology and sizing algorithms, whilst minimising support structure and respecting build orientation and manufacturing guidelines.
- Manufacturing simulation of build and support removal to ensure distortion and residual stress levels below acceptable levels.
- Fatigue/durability optimisation, focussed on targeted life for individual rider power profiles (i.e. less powerful riders can benefit from a lighter crank).

> "Evotech CAE has rapidly accelerated the design and optimisation phase of our product development process as well as helping to prove its robustness. The combination of unrivalled commitment to getting the job done, with a will to being at the forefront of innovation means we are very much looking forward to working with Evotech CAE in the future. Mirada Pro, 2016"

Fatigue Life Optimisation

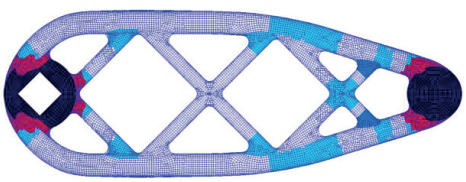
Baseline



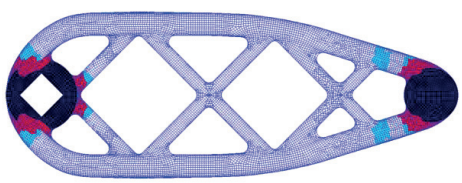
(shown for reducing power/load levels – mass reduces significantly with power)

Model 1: Power Reduction 17% Mass Reduction 8%

Model 2 :Power Reduction 38% Mass Reduction 14%



Model 3: Power Reduction 50% Mass Reduction 16%



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