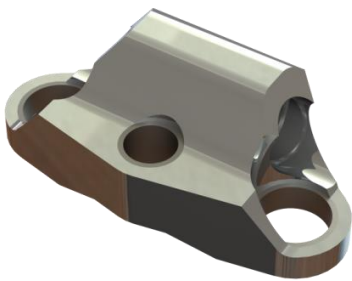


Downhill Bike Crown with BCIT

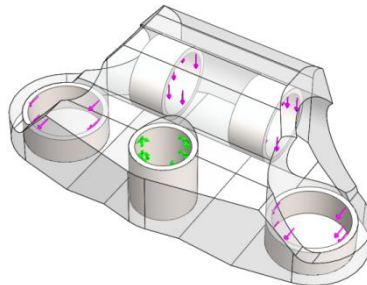
Students of the British Columbia Institute of Technology in Canada (BCIT) have undertaken a study to design an integrated crown and stem for a downhill mountain bike. The aims of this study were:

- To eliminate the 4 bolts holding the stem on the crown of the current design.
- To investigate a lighter geometry for the crown with stiffer & stronger performance using titanium as the material.
- To utilise Topology Optimisation within SOLIDWORKS to understand the minimum mass, maximum stiffness design layout.

Identifying the Optimal Design using TruForm SW – Directly within SOLIDWORKS BCIT created a package space which defined the volume within which the crown design could fit. Loads were then applied to the structure using SW Simulation. Finally the package space was optimised using the Topology Optimisation add-in, TruForm SW, to identify the material layout that would most efficiently support the applied loading, thereby ensuring a light-weight design.



Package Space Creation
in SOLIDWORKS



Loading in SW
Simulation



Topology Optimisation
using TruForm SW

Developing the Design - The students then took the optimisation results and made two different design interpretations. The first design was a typical interpretation for CNC machined Aluminium, whilst the second was developed to take advantage of Additive Manufacturing in titanium. As you can see from the images below, the two interpreted designs are very different. However there are key similarities between the designs, in the locations of the main structural load paths, which show that they have been topology optimised using the SOLIDWORKS add-in TruForm SW.



CNC Aluminium
Design



3D printed Titanium
Design

Overall both designs provided a 20% mass saving compared to the original part while also improving the stiffness and strength.