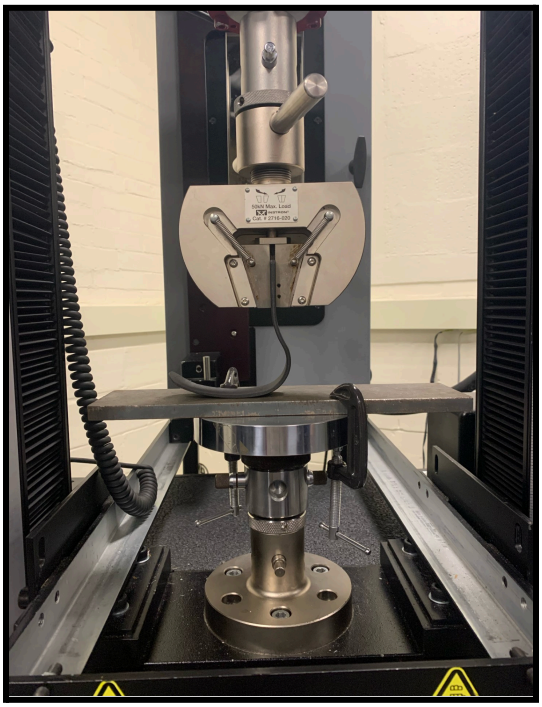
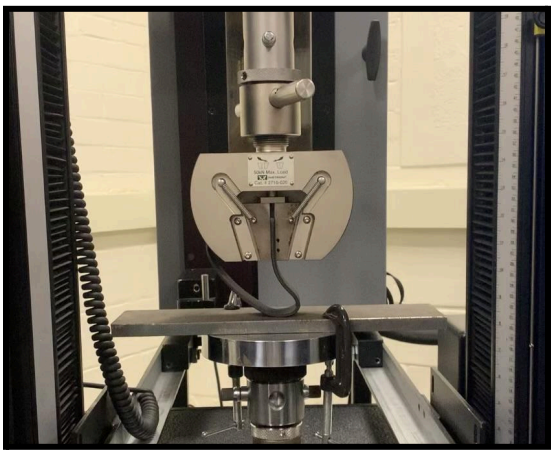
Picture of the PLA running blade in the Instron Compression tester

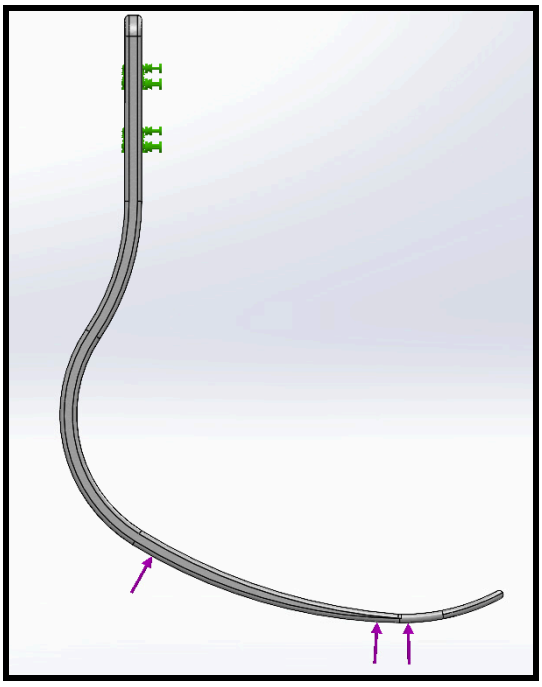
Picture of the Onyx running blade before force has been applied



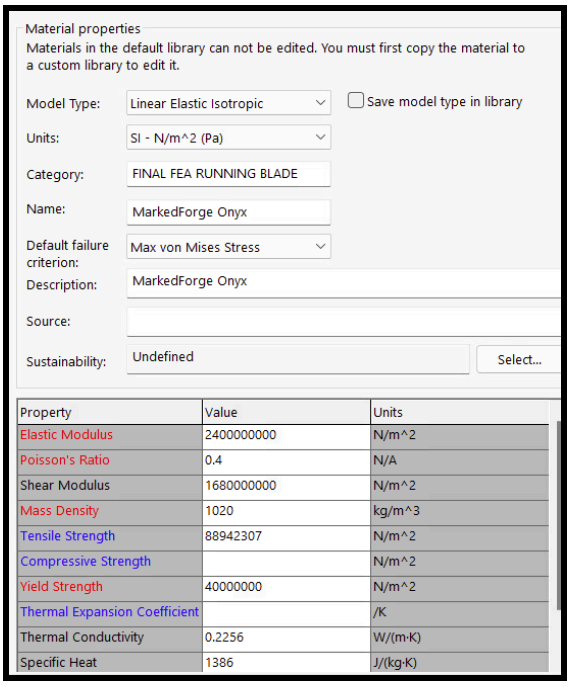
Picture of Onyx running blade after some Compressive load has been applied



This shows the Onyx running blade at the point where the test was stopped



This picture shows the loading condition that was placed on the running blade through Solidworks FEA



Material properties

Materials in the default library can not be edited. You must first copy the material to a custom library to edit it.

Model Type: Linear Elastic Isotropic — Save model type in library

Units: SI - N/m^2 (Pa)

Category: FINAL FEA RUNNING BLADE

Name: MarkedForge Onyx

Default failure criterion: Max von Mises Stress

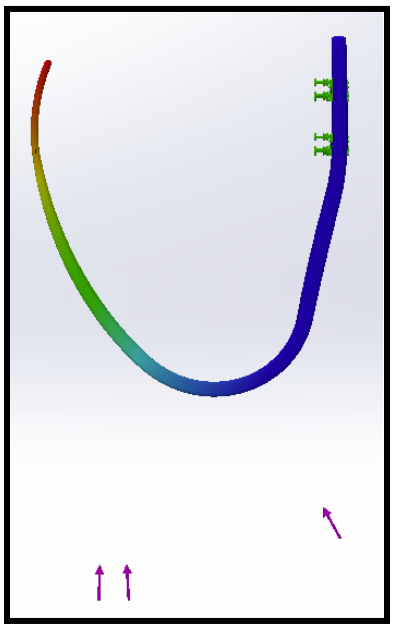
Description: MarkedForge Onyx

Source:

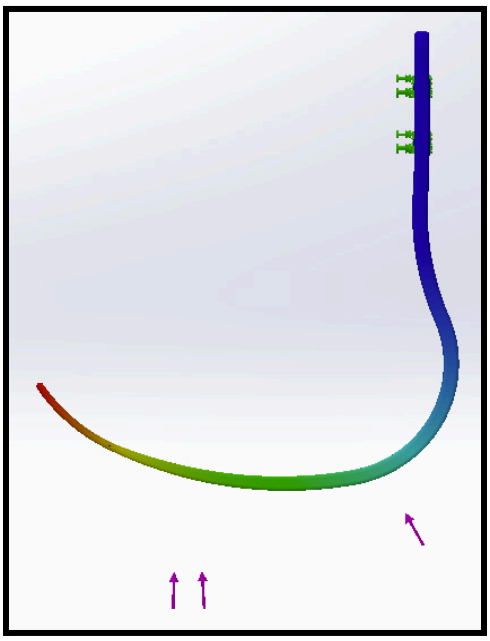
Sustainability: Undefined — Select...

Property	Value	Units
Elastic Modulus	2400000000	N/m^2
Poisson's Ratio	0.4	N/A
Shear Modulus	1680000000	N/m^2
Mass Density	1020	kg/m^3
Tensile Strength	88942307	N/m^2
Compressive Strength		N/m^2
Yield Strength	40000000	N/m^2
Thermal Expansion Coefficient		/K
Thermal Conductivity	0.2256	W/(m·K)
Specific Heat	1386	J/(kg·K)

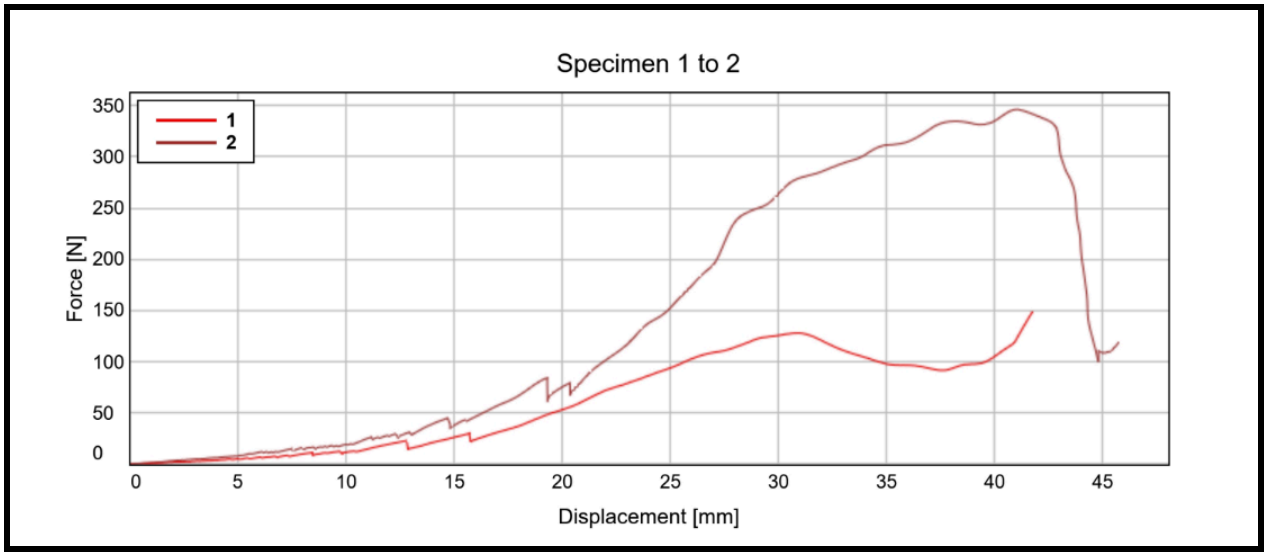
This picture shows the Onyx material that we made through the material properties provided by Markforged



This picture shows the vertical displacement of running blade when subjected to a force of 100 N

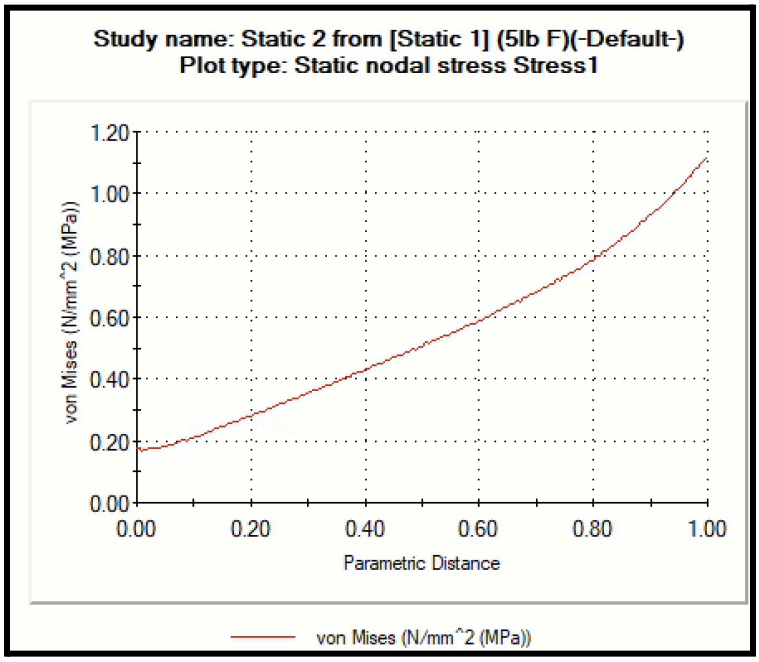


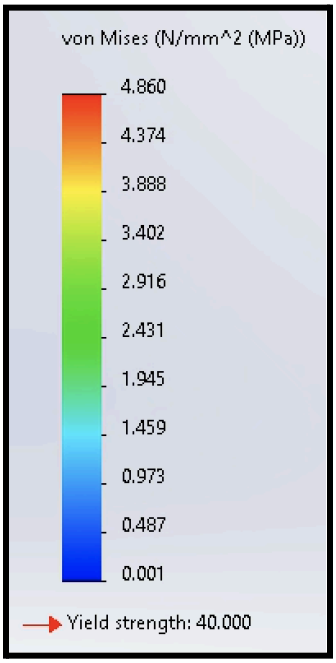
This picture shows the vertical displacement of the running blade when subjected to a force of 25 N

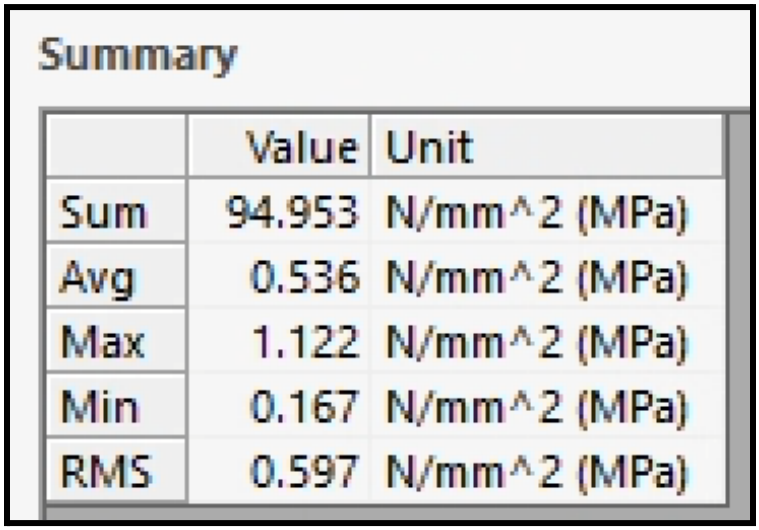


This picture shows the data collected by our tests on the Instron Machine. Specimen 1 is the running blade made out of PLA, and specimen 2 is the running blade made out of Onyx.

Markforged Onyx FEA & Simulation Data (25 lbf load):



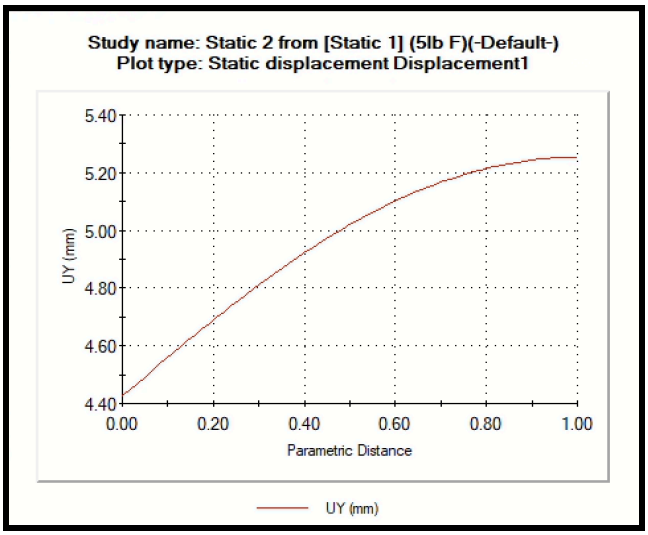


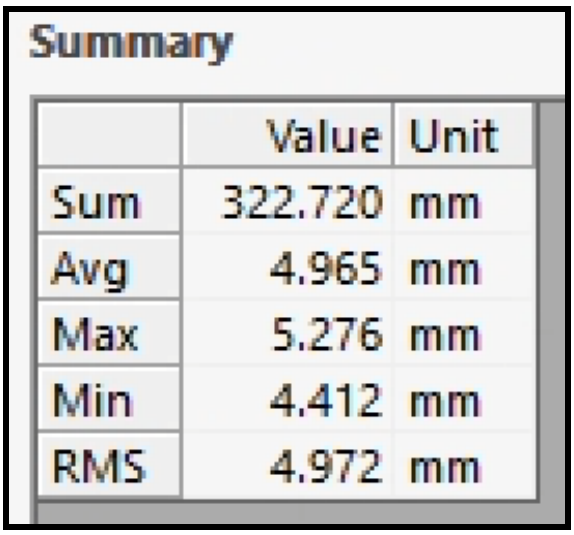


Summary

	Value	Unit
Sum	94.953	N/mm^2 (MPa)
Avg	0.536	N/mm^2 (MPa)
Max	1.122	N/mm^2 (MPa)
Min	0.167	N/mm^2 (MPa)
RMS	0.597	N/mm^2 (MPa)

Doing some probing along the bottom edge in SolidWorks FEA, we can see that the highest stress is 1.122 MPa. This occurs within the area where the blade contacts the ground. From the stress plot, we can see that the yield strength is expected to be 40 MPa. The stress at the bottom of the blade is not even close to this number, so we expect the running blade to work well in practice.





Summary

	Value	Unit
Sum	322.720	mm
Avg	4.965	mm
Max	5.276	mm
Min	4.412	mm
RMS	4.972	mm

Doing some probing at the bottom end of the blade, the maximum displacement is 5.276 mm. Our blade was modeled at 90 mm tall. The displacement as a percentage of the total height is (5.276/90) x 100% = 5.86%, which is not large.