NINJATEK CASE STUDY LIBRARY

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3D PRINTED STAR WHEEL CORRECTS BELT SEATING ISSUE

ARMADILLO | FUNCTIONAL PROTOTYPING

Dave Winters, a process engineer at Fenner Drives, needed to correctly seat a power transmission belt on an idle gear for trimming.

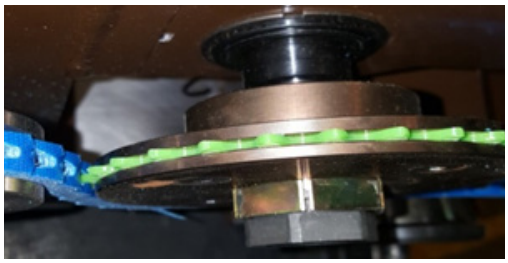
The current steel wheel had teeth that were 1/16” too long. This prevented the belt from falling flush against the gear. Without this proper seating, the trimming wheel would not accurately trim the belts.

The team used Armadillo™ semi-rigid 3D filament to create a model with reduced teeth height to achieve the function desired.

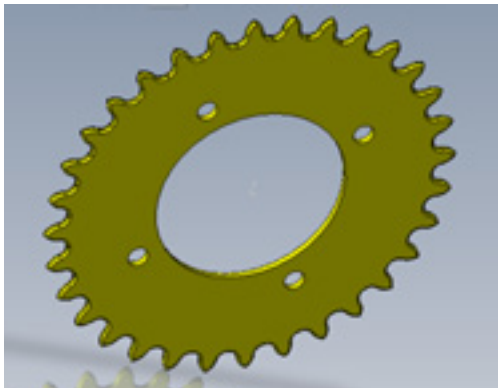
The traditional solution for this design would have taken over $500 of machining time. By 3D printing the gear total cost was less than $50, including engineer design time and materials.

The printed solution saved the company $450 in machine time and up to 3 weeks of turnaround time.

“By 3D printing the star wheel before investing in tooling, we kept the machines running and saved the cost of an incorrect tool.” – Dave Winters



The blue power transmission belt needed to be flush against the gear in order to correctly trim the edges to the correct specifications



INFILL: 100%
LAYER THICKNESS: .1MM

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3D PRINTED COLUMNS IMPROVE BIKE SEAT SUSPENSION

NINJAFLEX | CUSTOM SOLUTION

Sharon Farr's bike seat on her older Raleigh Tess women's mountain bike was uncomfortable during her frequent rough trail rides. Her light body weight did not provide enough impact to trigger the seat's design for additional cushioning.

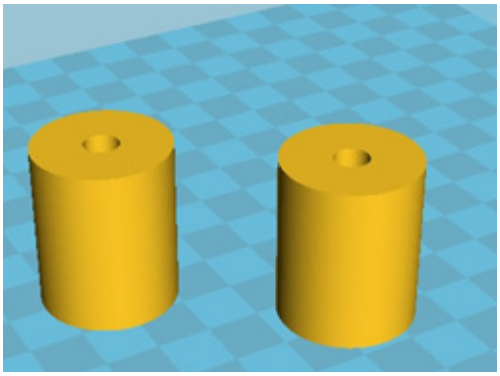
Sharon's husband, Christer, **created 2 custom columns to provide more suspension for the bike seat.** He designed the columns using CAD, and then imported them into Cura slicing software where he was able to customize the correct combination of layers and inner fill.

Christer used an Airwolf 3D HDR, dual head printer, to print the columns. The best design used 4 outer and inner layers at 50% fill. Fewer outer layers and greater fill could have been utilized for more cushion.

The printed solution provided the exact cushioning needed on the bike seat. To purchase the 2 suspension columns **would have been $7.50 each, while printing them only cost $3.00 apiece.**

"I was able to create a custom ride that can be changed quickly to accommodate rough off road riding or asphalt trail riding." – Christer Smith

The original Thudbuster LT seat post uses 2 urethane cylinders stacked on top of each other inside of a hinged parallelogram to provide suspension through the round tube.



INFILL: 50%
4 Inner & Outer Layers

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3D PRINTED SUCTION INDUCING SCREEN PREVENTS MATERIAL FROM ESCAPING

NINJAFLEX | PLUGS & SCREENS

The Fenner Drives extrusion plant was experiencing issues with resin escaping from their extrusion line. This in turn caused reduced suction consequently limiting the system's ability to transfer resin through the line.

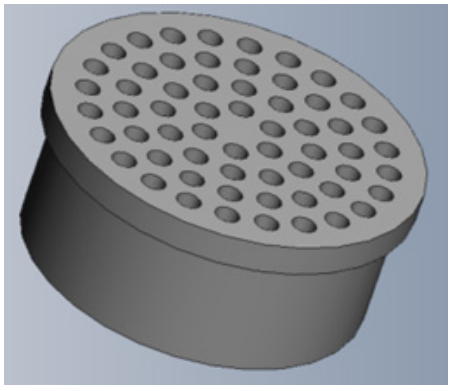
This was occurring across all 9 of their material vacuum transfer systems. They needed to come up with a solution that would prevent the material from plugging the oxygen control flapper. **A traditional metal solution would not work, due to the chance of metal escaping into the system.**

Using NinjaFlex filament, they designed a 3D printed press fit, self-retaining screen to be inserted upstream before the controller. The screen included holes that were small enough to stop the material from reaching the flapper and allowed the required air flow to pull the flapper shut.

The 3D printed solution was quick and inexpensive compared to designing and manufacturing the part externally. The total cost was $400 for 9 prints. Designing this also prevented future maintenance time required to unclog and clean the oxygen control flapper. **This saved the manufacturer $10,500 / year in maintenance costs!**

"Without this quick solution, we would have lost days of production time."

View of flapper inside of the controller where resin would escape the system.



INFILL: 100%
RETRACTION: none
PRINT TEMP: 235°C
PRINT TIME: 1 hour

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3D PRINTED GOPRO CAMERA CASE PROTECTS DRONE DURING CRASH

CHEETAH | CASES

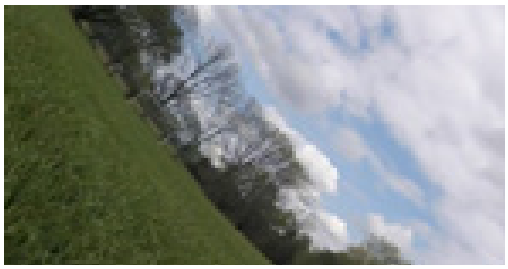
Chuck Durham's Flynoceros Orion drone frequently takes flights as high as 150 feet and as fast as 70 miles per hour. To capture the view from the sky, a GoPro camera mounted on top of the drone.

The drone frequently experienced rough landings or crashes which had broken several cameras. Previously, Chuck printed a case made of ABS material, but it offered little to no protection when he flew his drone.

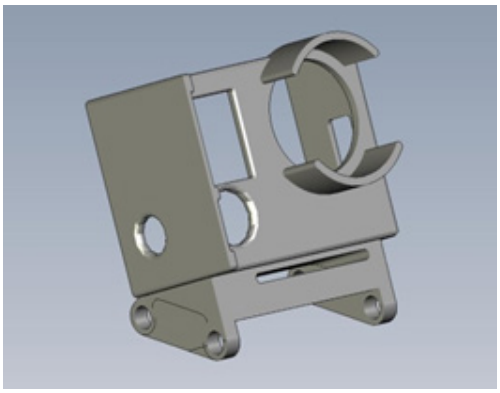
With his FlashForge Dreamer printer, **Chuck printed a case designed to mount directly onto the drone using Cheetah flexible filament.** Cheetah's marketing leading impact strength is recorded to be 84% greater than ABS!

At 100% infill, the case had enough substance and flexibility to withstand and absorb impact. **Now Chuck is able to fly his drone without worries, saving him hundreds of dollars in replacement costs!**

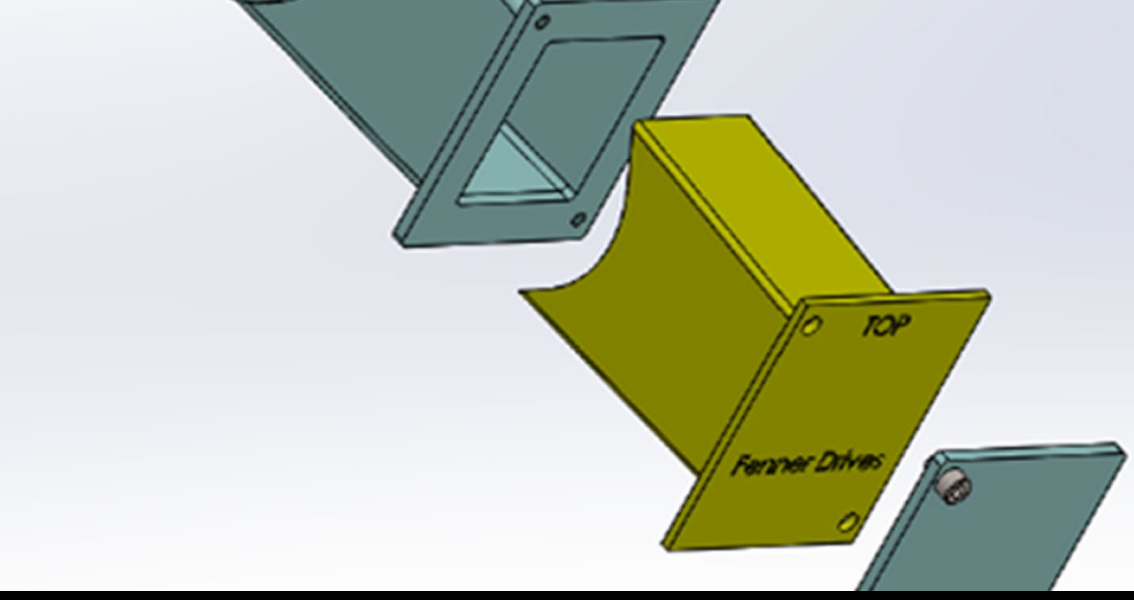
"Cheetah filament created a quick, durable mount for protecting my equipment" –Chuck Durham



Even when crashing, the GoPro camera was not damaged as it had been before using the new 3D-printed case. (From video taken by camera)



INFILL: 100%
LAYER THICKNESS: 2 walls ?
PRINT SPEED: 60mm/sec.



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3D PRINTED ANGLED PLUG SOLVES PERFORMANCE ISSUES

NINJAFLEX | PLUGS & SCREENS

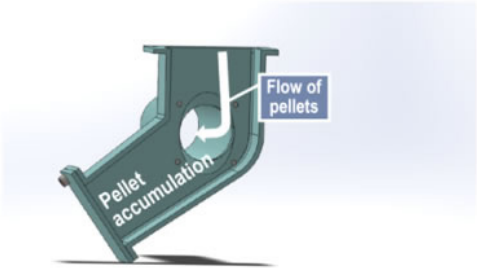
Fenner Drives discovered that pellets were accumulating and not reaching their destination within their extrusion system. They also found an air leak, which was producing unwanted moisture. These errors were impacting the performance of the extruded polyurethane material.

To gain access to the misplaced pellets, a technician had to manually remove a plate at the base of the component.

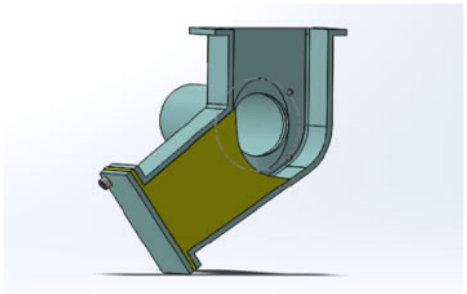
The solution to prevent this issue was to **create a plug that filled up the empty space preventing excess pellets from gathering.** This plug would also serve as a gasket to prevent airflow and moisture.

The plug had to be removable. The sides of the plug needed to each slope at a 2.5° angle to wedge inside the clogging area and maintain a snug fit. Because of this a metal solution would not have been possible.

With the flexibility and toughness of NinjaFlex, **the engineering team was able to print the plug within a matter of hours, allowing the team less downtime and easy maintenance.**



Cross-section of the area where extrusion pellets accumulate and were unable to transfer to the extruder.



INFILL: 25%

"..now the team enjoys less downtime and easy maintenance."

3D PRINTED CLUTCH LEVER BOOT REPLACEMENT FOR 1963 VOLVO WAGON

NINJAFLEX | CASES

Neil Glasson (PhD, Mechanical Engineering) is a Senior Research Engineer for a New Zealand government agency. In his free time Neil is also a 3D printing and classic car enthusiast.

Neil had to replace the rubber boot around the clutch lever of his 1963 Volvo Amazon wagon. **Purchasing the replacement part required an overseas purchase and at least a one-week lead time.**

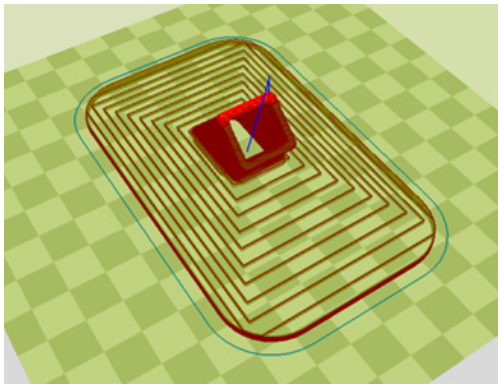
Placing the dimensions into Solidworks, he was able to design and print a new part on the first pass with his Prusa Mendle i2 printer.

One of the important fit challenges was creating a tight seal around the lever shaft. He also needed to consider still having room to stretch the boot over the wider top of the lever. With the help of liquid soap, **the flexibility of NinjaFlex filament allowed the part to stretch into place and fit snugly around the lever.**

Since the part was replaced, Neil has added several thousand kilometers to his odometer, and the part has held up beautifully.

"I've put a few thousand km on the car since and it is all good." -Neil Glasson

The original rubber flexible boot that fit around the clutch lever became hard and cracked over time.



INFILL: 60%
LAYER THICKNESS: 3 perimeters