T-Crow is a practical and convenient way to capture images of living creatures and wildlife from inside a vehicle. © Formlabs

Series Production thanks to a Combination of SLA and SLS

360° Vision in the Dark

Manufacturing a camera tripod can be very time-consuming and cost-intensive. Added to which, both market and demand keep changing rapidly. To ensure that a tripod remains attractive and universally useful, an ability to make quick adjustments is hugely important – this is the perfect scenario for 3D printing.

Handheld night-vision and thermal-imaging devices are standard equipment for hunters, boaters and the security industry. Problem is that the devices do not work through glass windows. So, when out and about at night in their cars, drivers have to hold their devices out the windows or keep stepping out of their vehicles. Using a 3D printer, the company XSpecter has developed a solution for mounting the devices to the vehicle exterior – a stabilizing and controllable tripod that is mounted to the car roof or window by means of suction or magnetic feet. Boasting integrated 360-degrees rotation and an additional tilt range of 55 degrees, the T-Crow, as it is known, makes it possible to detect creatures and obstacles from inside a vehicle.

From idea to prototyping to finished tripod – XSpecter uses 3D printing to develop the product from start to finish. First, the various parts are designed using CAD software, adjusted slightly and then flexibly modified. The STL or OBJ file is then imported by print preparation software that enables the 3D printer to process the information. The prototypes are printed directly on location in a matter of hours or even minutes. The team employs a combination of two different printing

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Except for the electronics components, the tripods are produced wholly by additive methods. © Formlabs

3D Printing Technologies

Selective Laser Sintering (SLS)

Selective laser sintering is the most widely employed 3D printing technology for industrial applications. It is ideal for complex structures, including interior features, undercuts, thin walls and negative features. SLS parts combine excellent mechanical properties with a stability similar to that of injection molded parts. The combination of low part cost, high productivity and established materials makes SLS printing a popular choice with engineers for use in functional prototyping, as well as a cost-effective alternative to injection molding (of limited runs).

Stereolithography (SLA)

Stereolithography was the world's first 3D printing technology and was invented in the early 1970s. It remains one of the most popular technologies for today's professionals. SLA parts offer the highest resolution and accuracy, clearest detail, and smoothest surface finish of any 3D printing technology, but its key advantage is its versatility. SLA is a good option for highly detailed prototypes that require tight tolerances and smooth surfaces, such as molds, patterns and functional parts. Stereolithography is widely used in a variety of industries, including engineering and product design, manufacturing, dentistry, jewelry, model making, and education.

Source: ***formlabs.com***

technologies: selective laser sintering (SLS) and stereolithography (SLA) (**see Box**). The necessary materials and equipment are both supplied by the company Formlabs.

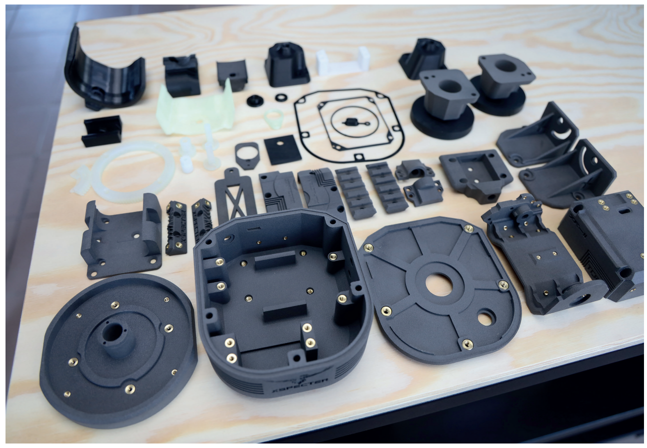
Journey to a Ready-to-Ship Tripod

The housing of the tripod is produced with an SLS printer (type: Fuse 1). The laser sintering takes place in a bed of nylon powder (type: Nylon 12 Powder). This makes for a lightweight housing that is resistant to many environmental influences. In addition, it readily lends itself to downstream cutting of threaded bushings needed for later assembly. The nylon powder is located inside the build chamber, where a laser melts individual powder particles layer by layer and joins them into a three-dimensional structure. The surrounding powder acts as a support, rendering additional supporting structures unnecessary. After printing, the powder has to be removed in a post-processing station to prevent it from being inhaled. No other finishing operations are necessary.

XSpecter uses a large-format SLA 3D printer (type: Form 3L) for the axles and gears. Various synthetic resins can serve as the printing materials here. These are contained in cartridges that can be swapped readily. To facilitate incorporation of oversize adjustments for the two-axis control system, a flexible resin (type: Durable Resin) is used that is both tough and lubricious. In SLA printing, the liquid resin flows into a tank where it is subsequently cured by means of UV rays. Printing starts with the build platform moving down until it reaches the synthetic resin. The laser then selectively cures the resin layer by layer. In this process, the bottom layer is repeatedly immersed in the liquid resin to ensure seamless printing.

Once the various parts have been printed and finished – all done in-house – they are assembled using the threaded inserts. The end result is a wholly 3D-printed camera tripod, except for the electronics components, that is ready to ship within three days.

No more tedious manual actuation: the camera systematically and accurately detects every movement within the user's location radius. © Formlabs



All the individual parts of the T-Crow prior to assembly. © Formlabs

Design Flexibility

Because the 3D printers are easy to use and production is done in-house, XSpecter can make changes flexibly and quickly, even on the fly, without having to invest in expensive tooling or being tied to excessively long wait times from suppliers. For example, if a design flaw is found or there is corresponding customer feedback, a new iteration can be implemented overnight.

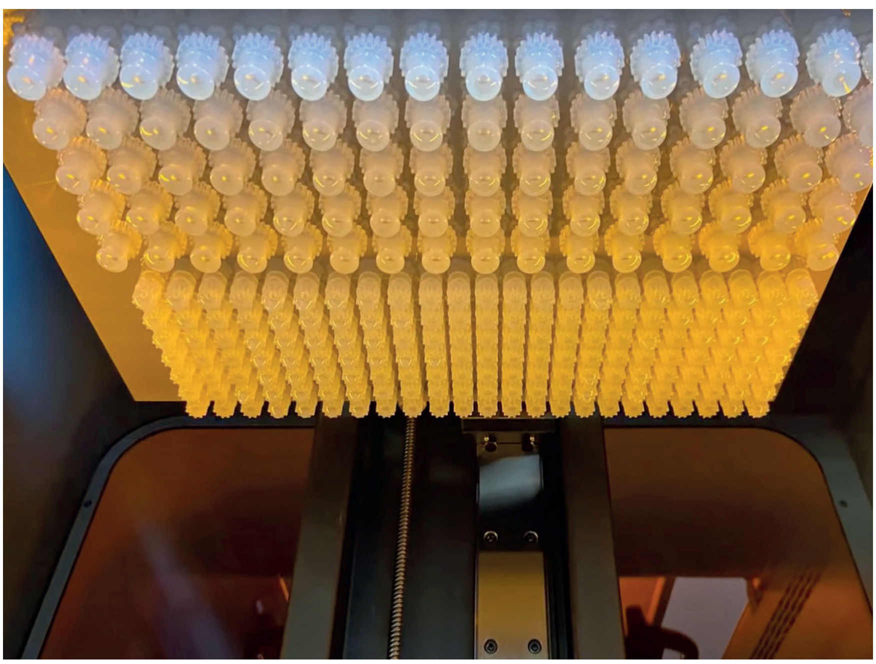
Delivery problems with the in-built on/off switches forced the team to switch to an alternative. This meant that the cut-out for the electromechanical component had to be enlarged by about 2 mm. Thanks to 3D printing, the team was able to accomplish this overnight. If an injection mold, commissioned at a cost of around EUR 120,000, had been involved, changes like this to the original mold would have required more time – and money.

Conclusion & Outlook

3D printing is playing a transformative role in the series production of XSpecter camera tripods. It is facilitating the development and realization of new products, such as new cameras. More than that, the team can respond quickly to, for example, adapt the tripod's adapter to fit any new devices that may appear. The simple workflow associated with a 3D printer can significantly shorten the production time for objects. Production is cost-effective and takes place on location. And it can be customized such that either a single printer or an entire production line of 3D printers provides a smooth supply chain.

The implementation of 3D printing into manufacturing processes also greatly assists with incorporating customer feedback. For, even if the tripods are already in series production, they can be continuously modified and developed.

The T-Crow tripod is an all-rounder product, but it is not the company's only product. Projects coming down the line include the development of Sea-Crow, a maritime variant of the camera tripod. It also integrates searchlights and functions as a night-time navigation aid on the water. ■



Gear wheels for the T-Crow made of Durable Resin on the build platform of the Form 3L. © Formlabs

Info

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