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Jay Leno and Team Put 3D Systems Digital Manufacturing Thread to the Test

Jay Leno, comedian and celebrity host of NBC's The Tonight Show from 1992-2014, is almost as well known for his beloved classic car and motorcycle collection. Housed in Burbank, CA, the Big Dog Garage collection includes more than 200 cars and 100 motorcycles, all kept in pristine and fully drivable condition by Jay's small team of top notch mechanics and engineers.

Since leaving the Tonight Show, Jay has been able to focus full-time on his car collection, making a point of driving five vehicles every day to keep them in road condition. Even with this level of attention paid to keep the vehicles in tip-top shape, parts inevitably break. Finding replacement parts for classic and hand-built cars, some of them more than 100 years old, is virtually impossible, and manufacturing new ones using traditional methods can get very costly, very quickly.

Fortunately, Jay and his team do not need to rely solely on traditional methods, but instead, employ cutting-edge technology to solve this problem. By implementing 3D scanning and 3D printing into their renovation workflow, they can create end-use parts and casting patterns for the vehicles. Not only is the technology providing massive benefits for vintage cars, it is also proving invaluable for one-of-a-kind and custom vehicles that do not have mass-produced parts stock available.

One such car, the EcoJet, is a concept vehicle that was hand-built by Jay's team. The EcoJet features a 650 horsepower Honeywell gas turbine engine that runs on biodiesel fuel. It is basically a car wrapped around a jet engine, which means that it cannot be started inside the garage because of the jet wash it creates.

"Because the EcoJet has to be pushed out of the garage and out of



This 650 horse-power, jet-powered, hand-built vehicle relies on 3D scanning and 3D printing technologies to be able to stay in tip-top condition.

trailers at shows, it is easy for people to inadvertently lean on and break the vents that are installed just behind each door on the car," explains Jim Hall, Chief Engineer at the Big Dog Garage.

Under normal circumstances these breakages would not be a problem – just take the original CAD data and 3D print a new version, right? However through a series of mishaps on the garage's servers after the car was built, the CAD data for the EcoJet had been lost. After regularly repairing the parts by hand, Jim finally opted to bring his 3D scanning tools and software into play.

With the 3D Systems software and hardware solutions, you can efficiently and accurately scan, design and produce high quality 3D data as well as physical parts, tools and products. The technologies include 3D scanners, engineering and production software, 3D printers and 3D inspection tools. They are also tuned to work with other vendors such as 3D scanner OEMs, like Faro, as well as support traditional manufacturing processes such as machining, injection molding and more.

Using a Faro scanning arm and 3D Systems Geomagic Design X software, Jim is able to quickly and accurately scan the shapes of the broken parts in 3D, and almost instantly recreate the parts using the solid modeling toolsets in Geomagic Design X.



The finished 3D printed parts are strong enough to be used as direct end-use parts, with the Selective Laser Sintering (SLS) nylon materials offering greater strength-to-weight ratios than traditional materials and yet able to be given a perfect finish.





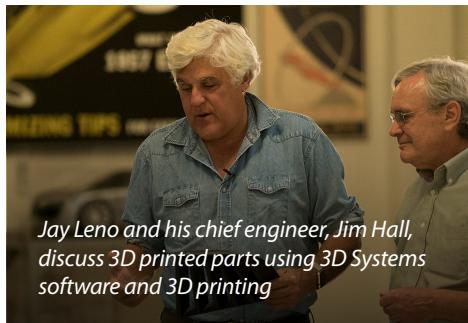
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SLS prints are created in nylon powder with a very wide choice of materials for extreme temperature resistance, flexibility, high tensile strength, and lighter weights.



Jay Leno and the EcoJet hand-built jet-powered vehicle.



Jay Leno and his chief engineer, Jim Hall, discuss 3D printed parts using 3D Systems software and 3D printing



Jim Hall (left) and 3D Systems' Sean Parker scanning the EcoJet into Geomagic Design X reverse engineering software using the Faro 3D scanner.

"Scanning using the Faro arm is close to perfect," commented Jim. "The blue light scanning is incredibly accurate and can even work on shiny parts – something that has not been easy for 3D scanners in the past."

Once the 3D model is checked for accuracy compared to the original scan data in the software, Geomagic Design X automatically transfers the data to 3D CAD – in this case, Autodesk Inventor – using the LiveTransfer function.

"Geomagic Design X is just that – magic!" observed Jim. "This software makes sense out of the 3D scan data, it's super fast and it creates 3D models and then transports them into your CAD software as native files. In a matter of 30 minutes we have gone from no CAD data to having feature-based, editable 3D CAD data of the parts."

The next step in the workflow is to 3D print the parts, which is easily done from the new CAD data. Since the old parts had broken very easily, Jim and his team consulted with 3D Systems On-Demand Parts Manufacturing Services, Quickparts, on what 3D printed materials would be better suited to avoid damage to the vents. Through this service, customers have access to all of 3D Systems' print technologies and a range of materials, along with the application expertise of the 3D Systems team.

"3D Systems Selective Laser Sintering (SLS) printing delivers very high strength and very light parts using the Duraform HST Nylon material," said Ziad Abou from 3D Systems Quickparts. "We don't want to increase weight on the car so we had to be careful to make the right choice."

Duraform HST is a nylon 3D printing material that works specifically in 3D Systems' SLS (Selective Laser Sintering) printers. As a fiber-filled nylon with anisotropic mechanical properties, it is ideal for functional prototypes and end-use parts that require high stiffness and elevated thermal resistance and has a surface that is very easy to finish. SLS printers deliver very high quality, durable parts that are used in automotive, aerospace and other high-level engineering industries.

Although Jay's garage is outfitted with 3D printers, it does not have the high-end SLS printers required for this job. Instead, Jim and his team sent the data to 3D Systems, who both 3D printed and gave the parts a very high quality finish. The parts were then sent to the garage and immediately fitted to the EcoJet.

"This is amazing, how we just take 3D scans and come back with end-use parts that fit perfectly," said Jay Leno. "We could never have done this without 3D Systems."

The new parts from 3D Systems Quickparts fit the EcoJet perfectly, and the increased strength of the SLS-printed parts means that it will be harder to break them going forward.

Said Jay, "With 3D printing the automotive industry has changed more in the last ten years than it did throughout the entire last century. We are pleased to be positioned at the forefront of this technology with 3D Systems."

