SAIC-GM Accelerates Prototyping Production with In-House 3D Printing

A Need to Keep up with Fast-Paced Design Demands

SAIC-GM, a Sino-foreign joint venture between Shanghai Automotive Industry Corporation (SAIC) and General Motors (GM), is one of the signature premium passenger vehicle brands in China. Established in 1997, it has been involved in collaborative efforts with three world-renowned brands, selling under Buick, Chevrolet, and Cadillac. According to the China Association of Automobile Manufacturers (CAAM), in 2012, SAIC reached the top spot in the domestic market with an annual production of 3.5 million vehicles.

> “Stratasys FDM and the trial production of prototype vehicles complement each other and develop hand in hand.”

Zhou Yang
Prototyping Manager, SAIC-GM

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Case Study

However, living up to its global reputation is no easy task. In a country with the largest population as well as the largest automotive market, customers naturally look for the best in style, performance and price. As a result, all R&D and product design teams within the SAIC-GM manufacturing hubs were constantly working towards tight deadlines to come up with the latest automotive innovations. Unfortunately, the Prototyping Unit — that serves multiple departments from lighting to HVAC and engine and interior design — found it difficult to keep up with increasing demands from the assembly plant.

"The Prototyping Unit here is mainly responsible for producing models and function components for engineers to verify concepts and refine designs. During the prototyping phase, parts often need to be iterated up to 10 times before all departments agree on the design. This process can take as long as three to six months, thus leading to many delays affecting production schedules," said Zhou Yang, Prototyping Manager at SAIC-GM.

Ramping up Prototyping Efficiency

During the second half of 2018, SAIC-GM completed 14 total assembly checking (TAC) fixture projects with over 300 prints weighing more than 60,000 grams. SAIC-GM achieved this impressive task by switching to 3D printing using the Stratasys® Fortus 450mc™ 3D printer — which provided improved production efficiency, easy operation and allowed for the adjustment of models.

Compared to traditional wrought aluminum, FDM® reduced the printing cost by 79 percent, turnaround time by 83 percent and TAC weight by 21 percent. Additionally, SAIC-GM was able to facilitate operation and installation, enhance the ergonomic effect and decrease weight without compromising strength, with the help of an internal honeycomb design structure.

Another important application that SAIC-GM leveraged 3D printing for was the manufacturing of prototypes for vehicle parts — which are typically high-cost, have a long turnaround time and don't necessarily function well. However, rapid prototyping using FDM 3D printing helped solve these issues. Plus, Stratasys ABS-M30™

material effectively met requirements for the interior and exterior trim parts in most trial production stages, as well as their high standards for temperature, chemical exposure, accuracy and mechanical load.

3D printing catered to the unique needs of trial production — including short runs, frequent changes of status and short production cycles — while minimizing procurement costs and waiting periods. What's more, SAIC-GM could now customize parts to avoid inconsistency between new and old parts and manufacture them in small batches.

In contrast to the high cost and long lead time of the injection molding, FDM 3D printing allowed for simple model changes, easy output of complex profiles and a timely response to problems on the production line. Problems with engineering parts could also be identified in the earliest stage of the trial production of prototype vehicles, allowing SAIC-GM to resolve them in advance.

Expanding Beyond Prototyping to Tooling

Bringing 3D printing in-house not only led to prototyping efficiencies for SAIC-GM, but also aided the tooling team in reducing production time and costs of assembly tools. “Thanks to FDM 3D printing technology, we can now respond to the verification requirements during the production of prototype vehicles in real time,” says Zhou.

Inside its trial production workshop in Shanghai, SAIC-GM uses FDM to design and produce tools that workers on the shop floor use on a daily basis in addition to producing assembly parts for prototype vehicles. Aside from that, their 3D printers printed pieces that could be assembled on a vehicle directly, thereby guaranteeing in-time delivery.

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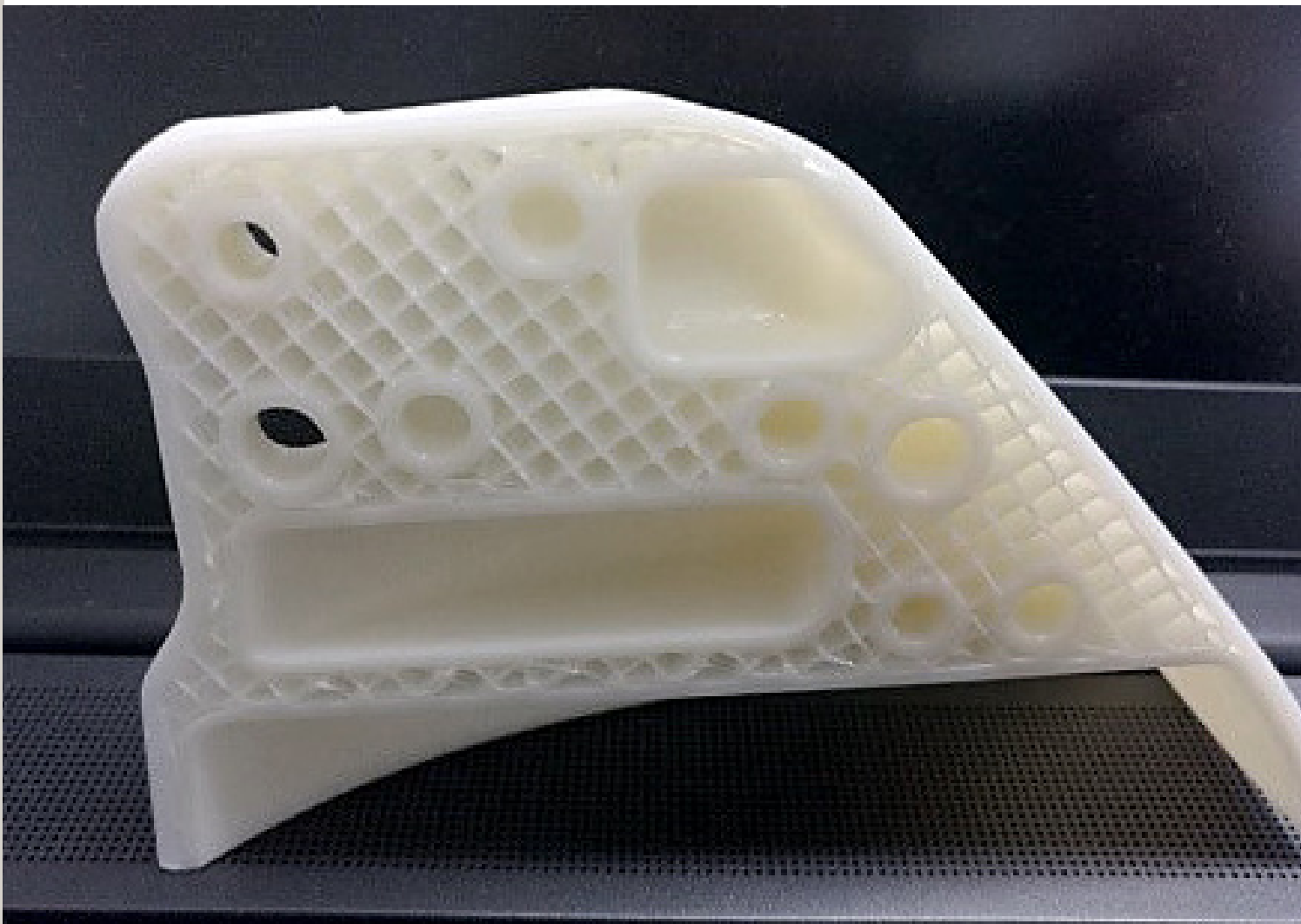

Plans for Future 3D Prototypes

Altogether, using 3D printers has helped SAIC-GM save RMB 840,000 (roughly 120,000 USD) in one year, as well as break into new territories. For the first time, the company was able to print parts for car exhibition and real vehicle assembly. “We now leverage 3D printing to complement CNC to meet the high standards for cost-effectiveness, high efficiency and accuracy in our prototyping and tooling departments,” says Zhou.

SAIC-GM plans to apply FDM in a larger scope and use it in all aspects of the trial production of prototype vehicles, such as dashboards and steering wheels. It believes that 3D printers have great potential to address the high standards for ergonomics, dimension accuracy, surface roughness, and transparent and colorful material.

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