CARRYING ITS WEIGHT

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3D PRODUCTION SYSTEMS

FDM Technology Helps Reduce Tooling Costs By $60,000 Per Part

"Every time we avoid cutting a tool, we save 8 to 12 weeks."

– Randy Larson, Polaris

Real Challenge

Polaris snowmobiles have achieved an unparalleled record of performance, winning 60% of the stock class titles during the 2008 World Snowmobile Championships. Polaris has built this amazing record through painstaking attention to detail. The attitude of company engineers is "Every part must be perfect."

In the past, the pursuit of perfection could sometimes be expensive. Polaris engineers designed plastic parts and then built tooling to injection mold the prototypes. They installed the prototypes on snowmobiles and checked their fit and finish, eye appeal, and functionality. In nearly every case, they came up with ways that the prototypes could be improved. These improvements cost an average of $60,000 in tooling modifications for each part.

"In the last few years we've been doing things differently," says Fabrication Shop Supervisor, Randy Larson. "We looked for a machine that could produce prototypes strong and accurate enough for functional tests. Stratasys 3D Production Systems met our requirements. The PC-ABS material provides 70% of the strength of production ABS, so it's strong enough for nearly every prototype. Just as important, we've found the system provides accuracies of +/-0.001 inch per inch (0.0254 mm per mm) which is also sufficient for most every prototype."

As an optional accessory to RMK model snowmobile seats, Polaris makes a carrier rack that can hold a bag, shovel, and fuel can. The part measures 16 x 18 x 5 in. (41 x 46 x 13 mm). The most critical dimension is the width, which must be held to within +/- 0.010 in. (0.254 mm).

How Did FDM Compare to Traditional Processes for Polaris?

Process	Cost Estimate	Lead Time
I.M. Tooling	$60,000	70 days
FDM	$1,200	2 days
SAVINGS	**$58,800 (98%)**	**68 days (97%)**

Real Solution

Engineers designed the carrier rack in Pro/E and built it using a Stratasys 3D Production System, employing the FDM additive fabrication process. Then they evaluated the physical part and improved the design to an extent that would have required the usual revisions to the mold. FDM prototyping

Image 1: Polaris avoided cutting two injection molding tools by using Fused Deposition Modeling (FDM) for a snowmobile carrier rack.

Image 2: The carrier rack prototype was built in two pieces and assembled.

Image 3: The rack can carry a bag, fuel can, and shovel.

saved the cost of these mold revisions by letting the engineers perfect the design before cutting factory tooling.

Even before the injection mold was built, the marketing department wanted to show the new accessory at a "snow shoot" where the snowmobile industry demonstrates its latest models for the press. So they installed the FDM carrier rack prototype on a new 2008 snowmobile and shipped it to West Yellowstone. Test drivers put the machine through its paces, and the FDM prototype handled the conditions, just like a production part.

"Because FDM can produce accurate functional prototypes, we avoid about $60,000 in tooling cost per part by proving out the design before committing to tooling," says Larson. By contrast, the FDM prototypes for the carrier rack cost a total of only $1,200. "Every time we avoid cutting a tool, we save 8 to 12 weeks on tooling as well." For the carrier rack, two FDM prototype versions took 25 hours each, for a total of about 2 days. "Time savings like this, when multiplied by many components in an average project, results in improved time to market."

"As a result of this high value, there is so much demand for FDM parts within Polaris that we run the machine 625 hours out of the 720 hours in a month." This amounts to 86% of all the hours in a month – day and night. Machine reliability has been very impressive as well, says Larson. Of those monthly 625 hours expected of the machine, "we've calculated uptime at nearly 99%. And the little amount of time the machine is down includes our annual scheduled maintenance."

Image 3: The prototype carrier rack handled conditions just like a production part.

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