

CUSTOMER SPOTLIGHT

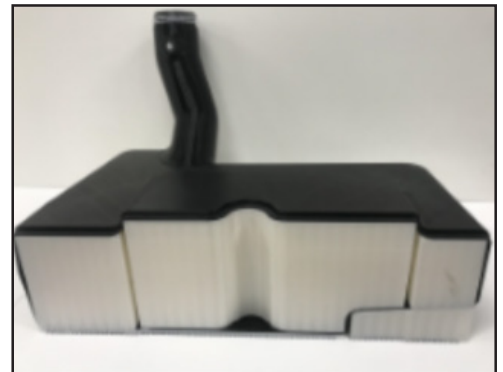


SCALE-UP STORY: GROWING PAINS OF ADDITIVE POST-PRINTING

Becoming a leader in an industry requires constant innovation to suit customer needs while staying ahead of the curve. Serving as a leading household name for more than a century necessitates all of that and more. Founded out of Minneapolis, MN in 1914, The Toro Company now serves 125 countries across the globe, and is one of the most recognized brands in maintenance solutions for the outdoor environment (e.g., turf maintenance, snow management, landscape, rental and specialty construction equipment).

Acknowledging the dynamic edge that additive manufacturing could give them, Toro implemented their first small Fused Deposition Modeling (FDM) printer back in 2012. Though they initially only employed the print technology for smaller prototype components, they soon invested in a total of six FDM printers to better serve their customers and develop a more diverse range of build sizes and parts for product groups. Before long, Toro realized how cost-effective it was to print larger parts piece-by-piece, then later fuse them together. This opportunity opened up an entirely new playing field for Toro's additive potential. However, as print volume rapidly increased, it became clear that this growth would be stunted by FDM support removal bottlenecks and subsequent throughput limitations. This Toro facility supplies prototype components for over 300 designers, so even with these printers running 24/7, there always seemed to room for even greater throughput.

At their most crippling, these post-printing bottlenecks would manifest in support removal times that were twice the length of build times. That equivocates to a part with a three-day build time taking six days to clean. Not to mention, the cleaning/support removal process itself is quite hands-on, so it was unfortunately common for technicians at Toro to get behind on part production when they had to dedicate so much time to rinsing, soaking, and picking support off of their parts. In addition to being time-consuming, the laborious post-printing process had a costliness associated with it as well, accounting for 25% of a part's total cost. Though Toro had evolved to be able to develop entire product bodies with additive, they were inhibited by the time and cost of their post-printing process.



Example 3D Printed FDM Part with Extensive Support Material

ENABLING SCALABILITY: A SOFTWARE-AUTOMATED SOLUTION

Finally, fed up with their workflow's inability to match throughput to demand, Toro decided that it was time for a change in their post-printing process. In 2019, Toro brought new precision and efficiency to its additive workflow with the PostProcess™ BASE™ support removal solution. Utilizing a three-pronged approach to support removal with software, hardware, and chemistry, the BASE ensures improved levels of consistency from part to part and fewer warped or damaged parts, which is a big money saver.

While support removal previously expended loads of time and energy, now only about two hours a week are dedicated to simply loading, unloading, and rinsing parts from the BASE. The software capabilities of the BASE enable users to store temperature and pressure settings as "recipes", so their post-printing process is as simple as "press play and walk away." Rob McArdell, Product Development Supervisor of Engineering

Technical Services at Toro, spoke to these efficiencies, saying, “With the software control over temperature, pressure, agitation, and duration that the BASE provides, our technicians barely have to think about support removal anymore.”

In respect to return on their investment, the BASE has brought Toro closer than ever to achieving their ultimate “build time = lead time” goal. “It’s integrated very well into our value stream. We went from spending two times the build time to clean parts to spending only 4% of the build time on average. That’s a tremendous improvement. Now, it’s very rare that something takes us more than a couple of hours to clean and remove all of the support from,” stated McArdell. Plus, between an average 89% decrease in post-print process times and over a 90% decrease in operator labor, the workflow efficiencies that the BASE has opened up haven’t just saved Toro resources, it’s allowed them to redefine their product offerings, as well.



**PostProcess™ BASE™
Support Removal Solution**

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Thanks to the breakthrough productivity levels that the BASE achieved, Toro has been able to rapidly manufacture high-quality pieces in a shorter amount of time than ever before. With these innovations, Toro has brought the past back to life, while continuing to trailblaze the future of lawn care. The extra time that the BASE allotted to the team meant that they could begin restoring old vintage equipment for the company’s museum. Simultaneously, the level of part quality enabled by the BASE opened up new promotional opportunities for Toro.

With a timeline of only twelve days until the world’s largest golf show, it would’ve previously been impossible to get a high-quality product from design to market under those restraints. However, thanks to the rapid support removal efficiencies of the BASE, Toro pulled it off with a day to spare. They were able to debut their new autonomous fairway mower at the world’s largest golf show, giving it invaluable exposure in their most significant industry. Regarding these achievements, McArdell said, “Without that rapid support removal, we would’ve never had time to do this.... the BASE, being a robust machine tool as well as something that’s integrated with some very intelligent, user-friendly software, really helped to make this possible.”

About The Toro Company

The Toro Company (NYSE: TTC) is a leading worldwide provider of innovative solutions for the outdoor environment including turf and landscape maintenance, snow and ice management, underground utility construction, rental and specialty construction, and irrigation and outdoor lighting solutions. With sales of \$2.6 billion in fiscal 2018, The Toro Company’s global presence extends to more than 125 countries through a family of brands that includes Toro, Ditch Witch, Exmark, BOSS Snowplow, American Augers, Subsite Electronics, HammerHead, Trencor, Unique Lighting Systems, Irritrol, Hayter, Pope, Lawn-Boy, MTI Equipment and Radius HDD. Through constant innovation and caring relationships built on trust and integrity, The Toro Company and its family of brands have built a legacy of excellence by helping customers care for golf courses, sports fields, construction sites, public green spaces, commercial and residential properties, and agricultural operations.



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