CASE STUDY 4: AMERICAN WOODMARK CORP- ADDITIVE MANUFACTURING INTEGRATION

American Woodmark Corporation (AWC) specializes in a variety of mass production wood cabinetry and furnishings worldwide and maintains 9 manufacturing facilities. Over the past 4 years, AWC's revenue sales have grown significantly, and posted over one billion in sales in 2017. And although markets and accent style trends will always change, AWC is at heart a manufacturer and thereby highly focused on optimization of their manufacturing process and always on the lookout for new ideas.

One idea specifically involved a unique stage of their manufacturing process involving cabinet doors, at the AWC plant located in Monticello, KY. The process involved the application of a specific adhesive to several components for assembly. The adhesive process consisted of the manual use of an adhesive bottle being squeezed, a bead of adhesive applied, and then brushed by hand for coverage. As the process was rudimentary in nature, and continually had varying results requiring addition post processing work and cleanup, it was seen as an ideal opportunity for improvement.

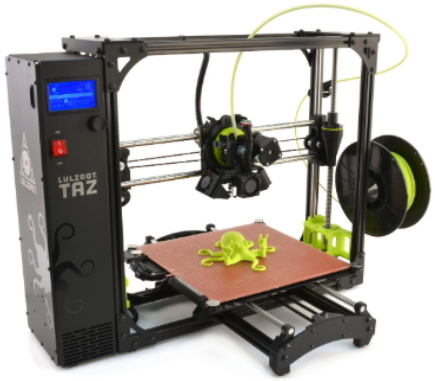
Therefore, a preliminary concept was introduced utilizing a design for a unique adapter plus a mechanical process that would remove the need for the manual squeezing. Potentially reducing excess adhesive being applied, reduce application time, reduce post processing work and cleanup, and reduce worker fatigue.

Although the mechanical process was fairly straight forward, the required new adapter design had to be internally complex to perform correctly. However, what was soon determined was that the adapter design simply could not be produced using conventional manufacturing methods, such as CNC or even plastic injection molding due to that internal complexity. Alternatives that could actually be produced using conventional manufacturing were considered, however, such alternatives were not close enough to the needed design to be effective, including internal design issues and physical external profile shapes. Additionally, the conventional alternatives came with a price tag of $500 to $1000 per adapter set. Therefore, the project remained at a standstill due to the costs and limitations of conventional manufacturing.

AM PROCESS & SOLUTION

After some time, the idea of using low cost, desktop additive manufacturing (AM) equipment to potentially produce the adapter was introduced. Since AM technology, also known as 3D printing, is ideal for internally complex designs, the adapter design was a perfect candidate for consideration. Therefore, AWC began purchasing and utilizing low cost AM equipment as well as experimenting with the variety of materials that such equipment can employ.

FINAL COSTS



Although several AM units were purchased, the final one used for adapter production was a Lulzbot Taz 6, with an investment expense of approximately $2,500. The 3D printed versions of the adapter, which are digitally inventoried within AWC's system, and printed on demand, can be produced in under 6 hours, and for less than $5, with no labor or post processing required. Additionally, with a digital inventory of the adapter and the "print on demand" format, no physical part storage is necessary.

Comparatively, assuming some form of a conventional manufacturing produced adapter been possible, AWC estimates that the expense would have been over $120,000 to reach the same operational state. With an additional $500 per replacement adapter as needed, which would also involve shipping costs and be subject to lead times.

CONCLUSION

The new process involving the low cost AM produced adapter and the mechanical process, referred to as "The Glue Cat," has reduced the cycle time of this specific adhesive process down from 13 seconds to 2 seconds in time studies. Also, quality control issues of sanding and repair occurrences have been reduced by 95%.

Overall, AWC estimates that because of this system, made possible by low cost AM equipment and integration, AWC Monticello is saving at least $160,000 per year. A very impressive accomplishment, considering that the total one-time AM equipment investment was less $5000.

Because of the Monticello plant's extraordinary success, 4 of the 9 AWC plants now have some form of low cost AM equipment available. As positive data such as this is shared, and the return on investments are realized, that ratio is likely to grow quite quickly.

AWC potential conventional costs - $120,000 (initial) + $500 per part
AM comparative equipment costs - $3500 (initial) + $5 per part
AWC annual savings and process improvement - $160,000 per year

For more information visit: https://www.facebook.com/cadd.lab
Or SCC's 3D printing program webpage:
https://somerset.kctcs.edu/education-training/program-finder/digital-printing-technology-3d-printing.aspx

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