

## **Will the Future of American Manufacturing Be Printed?**

By Ben Masters, age 15 / nytimes.com

Ever since Charles Hull invented the technology behind 3-D printing in the 1980s, the world of manufacturing has been one step behind its potential. This innovative technology can revolutionize American manufacturing into a customized process by enabling rapid prototyping, eliminating the extensive carbon footprint of manufacturing and decreasing the cost of custom consumer products. The solution to the wasteful and ecologically unsound practices of mass production in America is 3-D printing.

From my experiences in using 3-D printers in high school engineering classes, I have discovered how this revolutionary technology has the potential to change the world of manufacturing. 3-D printing uses raw materials to build objects layer by layer and reduces the amount of material used in manufacturing compared to traditional methods. According to the U.S. Department of Energy, subtractive manufacturing, the process of removing material from a block to create a product, can waste up to thirty pounds of material to create a one-pound product in some circumstances. However, 3-D printing uses 98 percent of the raw material used to make the final product in some methods. This technology has reduced the steps in the procedure of manufacturing and in turn reduces product costs.

3-D printing has enabled many in need to economically print customized prosthetic limbs. One in 2,000 children is born with an irregularity in an arm or hand. Unfortunately, until now children have rarely been given the opportunity to have a prosthetic arm because it costs about \$40,000 to build one out of titanium. But with 3-D printing technology a family can economically print a prosthetic arm using about \$20 of plastic filament. Although the pieces are not nearly as strong as titanium, they can be easily replaced or repaired when broken

or outgrown. A prosthetic hand can be printed in about 20 hours and takes a few hours to construct using files from a free website, Thingiverse. This technology has made it possible for custom pieces to be manufactured at a reasonable price.

Although 3-D printing reduces the amount of raw materials used, it does use more electricity. The process of 3-D printing requires electricity to heat the extruder, the nozzle that melts the plastic filament, and ultimately build the object. Engineers are currently working to enable the use of 3-D printing while using less energy to reduce the carbon footprint of manufacturing.

The progressive technology behind 3-D printing is becoming more time efficient and economical. Siemens, the largest engineering company in Europe, envisions 3-D printing will become 50 percent cheaper and 400 percent faster in the next five years. The environmentally harmful methods of American manufacturing can be solved by the inventive technology of 3-D printing.

### **Works Cited**

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