



**With additive manufacturing, almost anyone, located almost anywhere, can enter the product development and manufacturing business, says Terry Wohlers, Principal Consultant and President, Wohlers Associates, Inc.**

#### Current Trends in 3D Printing Technology

We have seen that the producers of machines for Additive Manufacturing (AM) are making improvements to the software, mechanical systems and energy sources for speeding up the build process. Customers of these systems are streamlining the 'front-end' and 'back-end' processes to make the start-to-finish process more efficient. For example, cleaning & finishing the parts can require timely and expensive manual labour; therefore, companies are automating as much of it as possible.

We document 19 trends in *Wohlers Report 2012*, a market study that we have been producing for 17 years now. One of the trends is that the technology is now being viewed as a serious method of manufacturing. Another is that much-needed industry standards are being developed by the ASTM International Committee F42 on Additive Manufacturing Technologies. Third is the dramatic advancement in metals. In the last 10 years, metal technology has developed from almost nothing to producing thousands of production parts annually.

#### Latest Technologies in AM

One of the latest technologies is Ultrasonic AM (UAM) from Fabrisonic. The machines from the company produce fully-dense parts in a range of metals using ultrasonic welding (high-frequency sound), which produces little heat. Another up-coming technology is the growing number of RepRap-inspired 3D printers that sell for as

low as under \$500 for a kit to more than \$2,000 for an assembled system. 'RepRap' is an open-source development that started at the University of Bath, England. The original material extrusion technology was invented, developed and commercialised by Stratasys in the early 1990s.

#### Challenges Faced in Adopting AM

Most AM systems were designed for prototyping, but not for manufacturing. Therefore, problems occur with consistency from system to system and among different parts made by the systems, so repeatability is of chief consideration. Moreover, some systems are not reliable. Material cost is also high and an obstacle to adoption, especially for manufacturing applications. AM materials cost about 50–100 times more than the equivalent materials for conventional manufacturing processes.

Companies prefer systems that are reliable and are expecting advances in systems & materials technology. We have seen advances with some companies and systems, while with others it has been disappointingly slow. Without strong R&D and commercialisation, the industry will not progress at the pace expected by the user community.

#### Emerging Opportunities for the Industry

We see many emerging opportunities. With AM, almost anyone, located almost anywhere, can enter the product development and manufacturing business. As patents expire, less

expensive systems will become available that will bring prices of materials downward.

#### Adoption Rate & Growth Prospects in India

AM is an excellent tool for design validation and product refinement. Therefore, it serves as a good companion to CAD software, which is used extensively in India. Also, AM is being used increasingly for jewellery design & production and for the prototyping of automobile parts.

The adoption of large, expensive AM systems has been slow in India. However, smaller, less expensive systems have been selling very well. As systems become faster & easier to use and as the price/performance ratio improves, sales are expected to become strong in India in the coming years.

#### Future Prospects

According to *Wohlers Report 2012*, the Compounded Annual Growth Rate (CAGR) of AM was 29.4% in 2011. The market for all products and services in 2011 was \$1.7 billion. We expect the market to grow to \$2.1 billion this year. The AM industry is expected to record strong double-digit growth over the next several years. By 2015, Wohlers Associates believes that the sale of AM products and services will reach \$3.7 billion worldwide, and by 2019, surpass the \$6.5 billion mark.

The future prospects for AM are exciting. We believe that it will eventually develop to become the most important, most strategic and most used manufacturing technology ever. ◀