Polymers

Additive Manufacturing Opportunities in 2018–23

3dpbm   x   SMARTECHMARKETS PUBLISHING
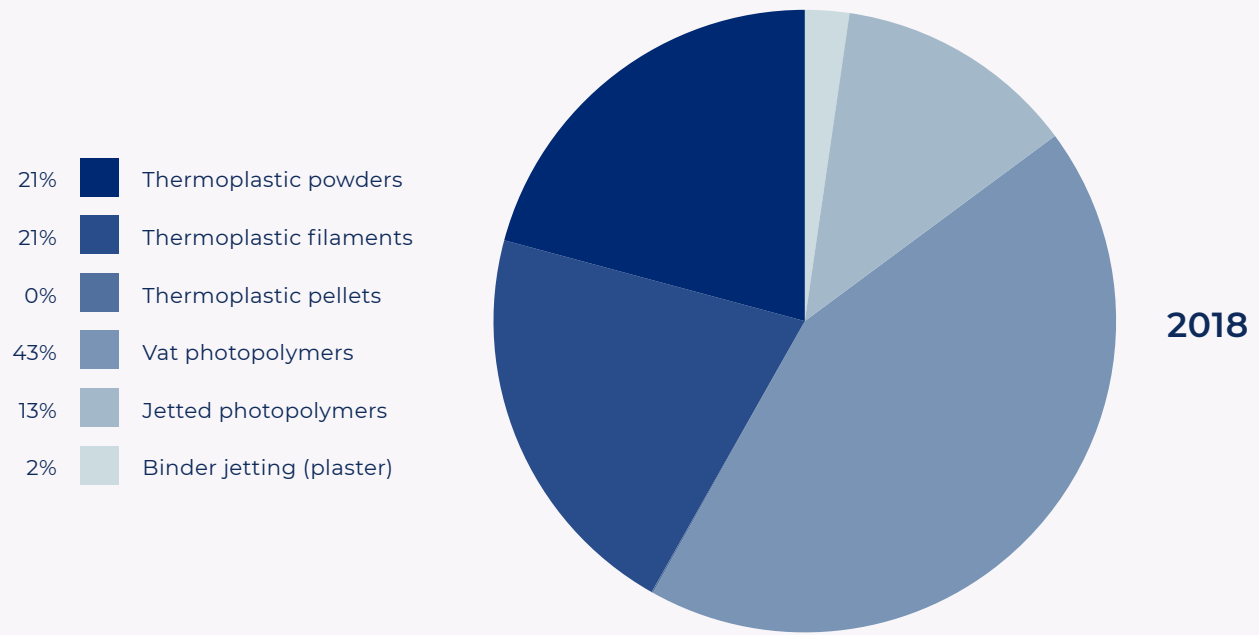
Stretching the Polymer AM Market

We foresee a continuously and rapidly expanding market opportunity for the supply of plastic, polymer (and thermoplastic composite) print materials. When accounting for low-cost printers utilized in professional environments, this market has grown from an estimated $670 million worldwide in 2014, to nearly $1.1 billion by the end of 2017. We are now forecasting that the overall market for polymer materials in AM will grow to just over $4.2 billion by 2023, driven primarily by vat photopolymers and thermoplastic powders for PBF technologies.

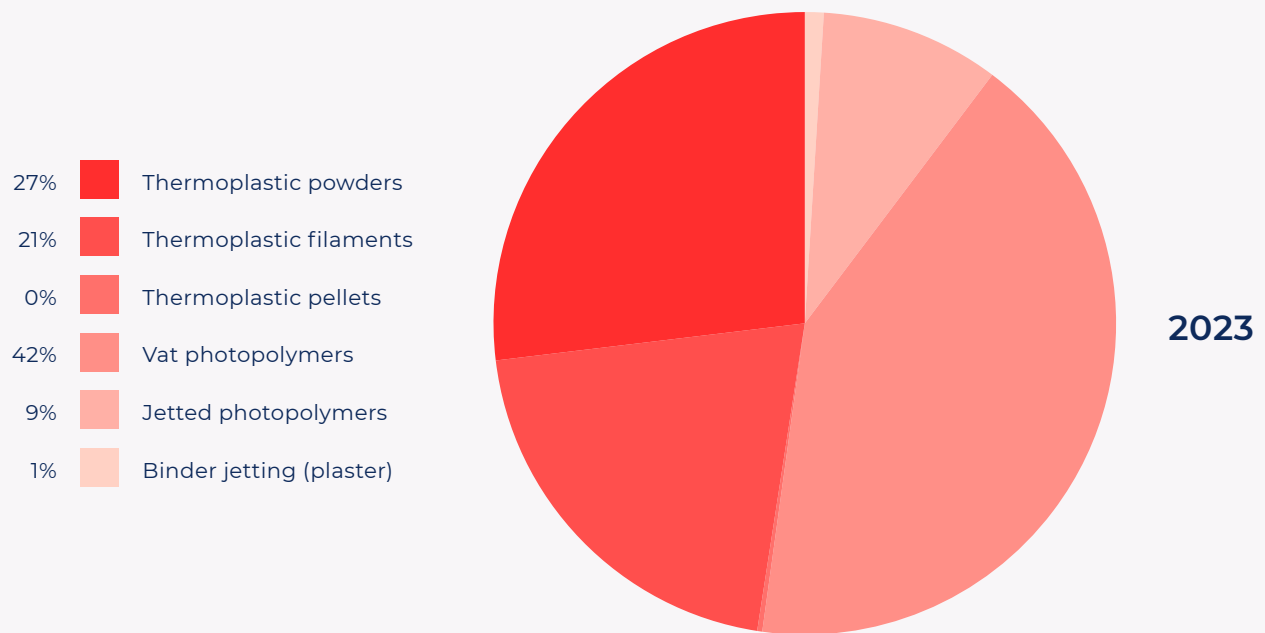Photopolymer materials are expected to continue to be the highest revenue generating segment for polymer 3D printing throughout the forecast period. This sentiment has grown since the previous edition of this study which anticipated thermoplastic powder materials to be the top grossing segment through 2026.

However, with the inclusion of low cost photopolymerization technology used in professional environments, and the significantly increased competitiveness in the powder segment driving down costs of powders (along with lower than previously anticipated demand for PAEK family powders in the current market), we now believe that photopolymers will remain the highest grossing material segment, followed closely by powders.

Polymer AM Market Share by Segment

21%	Thermoplastic powders
21%	Thermoplastic filaments
0%	Thermoplastic pellets
43%	Vat photopolymers
13%	Jetted photopolymers
2%	Binder jetting (plaster)

2018

Source: Smartech Publishing

27%	Thermoplastic powders
21%	Thermoplastic filaments
0%	Thermoplastic pellets
42%	Vat photopolymers
9%	Jetted photopolymers
1%	Binder jetting (plaster)

2023

Source: Smartech Publishing

Polymer AM Opportunities in 2018

"Photopolymer materials are expected to continue to be the highest revenue generating segment for polymer 3D printing"

Powders will, however, remain by far the highest volume of shipments worldwide. Forecasts from the previous iteration of this study greatly overestimated the current use of PAEK powder materials in direct production from powder bed fusion systems, and updated expectations now represent a more realistic demand scenario for this very high end, high cost materials.

The total outlook for powder based PAEK materials has also been affected by growth in printing of these materials in the material extrusion segment in filament form at lower costs.

From a materials standpoint, nylon materials, as well as ABS and various ABS blends, are the dominant polymers today across the industry when looking across technology segments. Photopolymer based systems utilize thermosets and seek to simulate

thermoplastic performance with acrylates and epoxy-based formulations. An examination of the most popular printing materials shows an interesting juxtaposition against traditional molding materials—mainly that the most widely used polymers printed today are not widely utilized in injection molding (take PA12, for example).

Meanwhile, the latest efforts in print technology evolution continue to, mostly, take aim at competing with injection molding technology in some aspect. Though the exception to this distinction is quite obviously ABS, which is widely injected molded and one of the most common materials for material extrusion 3D printing systems, material extrusion printing using ABS is, for the most part, unable to compete with injection molded ABS in most dynamics including isotropic strength, surface finish, cost per part at volume, etc.

This, in part, has helped spur the development and use of several new classes of polymers that are now becoming more widely printed and supplied. Material extrusion is the one printing process with a wide processing capability in terms of true thermoplastics, but the classic system architecture certainly favors particular materials in terms of easy, trouble-free processing with basic equipment.

Key polymer AM technologies

In the market for material extrusion-based polymer 3D printing, efforts to industrialize the classic extrusion printing concept are taking shape primarily in two areas –increasing the isotropic properties and Z-axis strength of parts and improving the potential for high throughput manufacturing potential.

Companies like Stratasys, BASF, BigRep, Essentium, and dozens more are working to redesign and improve filament extruders, develop thermoplastic composite materials, create multi-ax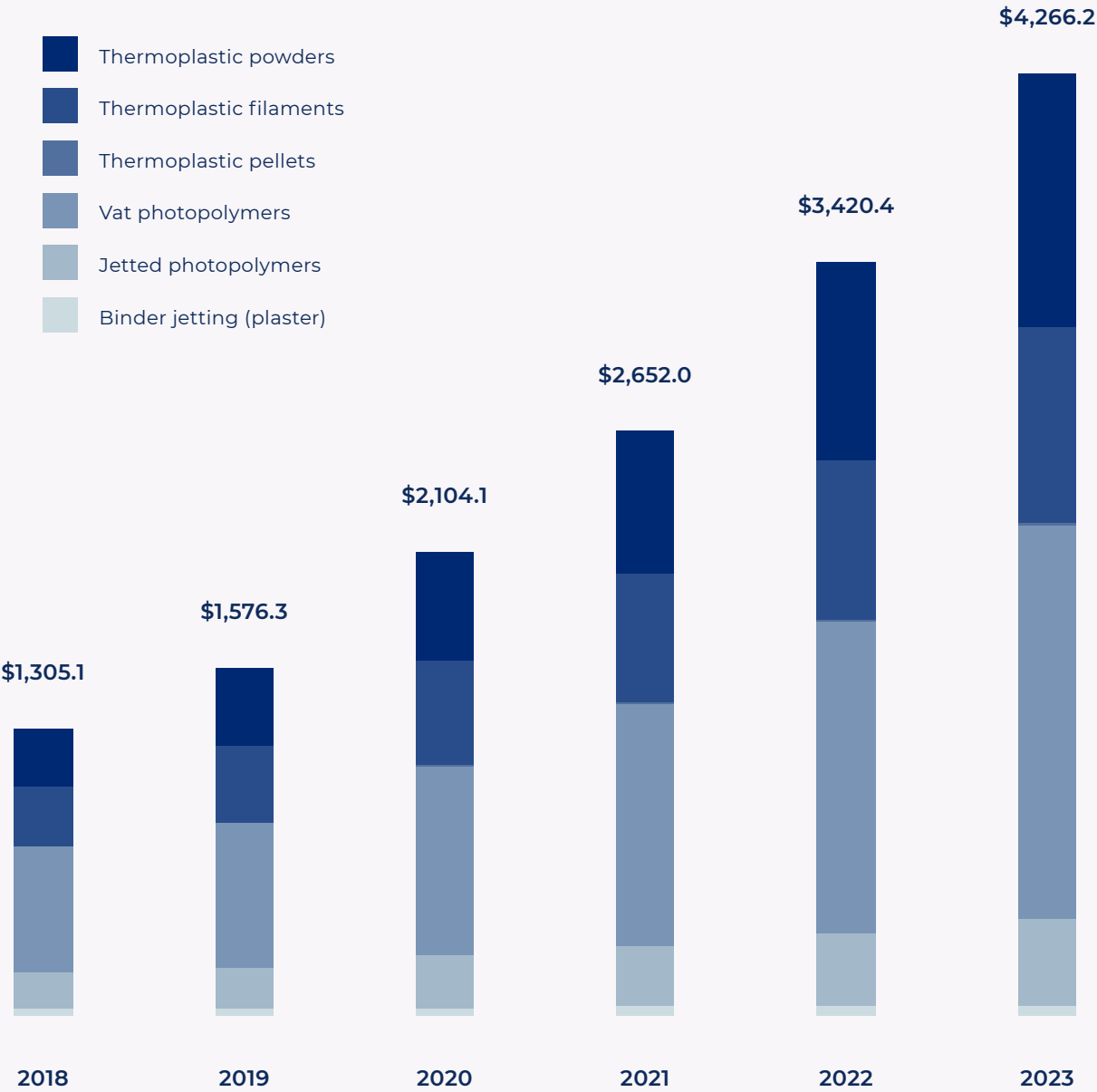is extrusion systems, and focus on high volume, swarm manufacturing using printer farms. SmarTech Publishing estimates that material extrusion 3D printing generated over 41 percent of all hardware revenues for polymer 3D printing in professional environments in 2017.

In vat photopolymerization technology, the possibilities and scope of layer-free photopolymerization – such as those introduced by Carbon (CLIP/DLS), EnvisionTEC (cDLM) and Carima - continue to expand to push the technology into new realms of direct end use part manufacturing using new more reactive resins resulting in strong, long-life plastic parts of modest sizes.

Meanwhile, concurrent efforts to automate the pre-and-post processes associated with these technologies present attractive serial manufacturing capabilities for the near future. SmarTech Publishing estimates that within ten years, nearly 50 percent of vat photopolymerization machines sold will feature a layer-free printing architecture.

Powder bed fusion technology for polymers continues to benefit greatly from efforts in metals additive manufacturing using similar processes, and polymer powder bed fusion

Polymer AM Market 2018-23 ($US M)

Legend:
- Thermoplastic powders
- Thermoplastic filaments
- Thermoplastic pellets
- Vat photopolymers
- Jetted photopolymers
- Binder jetting (plaster)

Year	Value
2018	$1,305.1
2019	$1,576.3
2020	$2,104.1
2021	$2,652.0
2022	$3,420.4
2023	$4,266.2

Source: Smartech Publishing

Polymer AM Opportunities in 2018

systems are now reaping benefits of industrialization through parallelized machine design to increase productivity, high temperature processing for material expansion, and automated materials handling and post processing. SmarTech Publishing expects that shipments of powdered thermoplastic materials to support powder bed fusion markets will ultimately grow to nearly double that of the next closest polymer printing technology by 2027.

Key polymer AM applications

Customers in consumer goods and the automotive industry purchased the greatest number of printers in 2017, with consumer goods falling from the top industry for unit sales in 2014 overtaken by auto. The energy sector has significantly increased its purchasing of polymer 3D printing technology since 2014, purchasing triple the number of units by 2017.

For material consumption, however, providers of 3D printing services remain the largest market due to high utilization rates to support profitable operations. In addition, service providers also result in the largest printer hardware

revenues thanks primarily to their interest in production-oriented systems which include features to support high utilization, productivity, and lowest costs per part at scale.

The dental industry is amongst the most prominent end user industries in terms of material revenues from polymer 3D printing thanks to its widespread use of photopolymer materials used in both vat and jetting processes, where material prices remain very high due to the specialized nature of their development and relatively high volume use in applications for dental models, aligners, and wax casting patterns for crowns, bridges, and denture frameworks.

Full Report

See Report

This new report on additive manufacturing with polymers and plastics is the fourth in an ongoing annual series, which tracks the market progress by key polymer printing technology segment, based on the growing industry support of multidisciplinary polymer printing strategies.

This report features deep dive analysis and market data in each technical segment, complimented by a comprehensive market-wide analysis to provide stakeholders the most well-rounded resource for polymer AM strategy and critical market data.

SmarTech has developed and implemented new reporting capabilities for market data on additive manufacturing with polymers and plastics resulting in an astounding 128 fully featured market data exhibits across this report. The report reviews historic data and provides projected hardware and material revenue opportunities and market demand metrics ranging from machine installations, to unit sales, to material shipments, to pricing trends, and revenue generation – all by the industry's most expansive breakouts of print technologies, material categories and polymer material groups, industries, and geographies

SmarTech Publishing

A leading provider of industry analysis and market forecasts for the additive manufacturing industry. SmarTech Publishing's coverage provides insight to complement internal product planning and technology roadmapping, and provide low-cost knowledge enhancement for companies working in the AM industry.

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