

RAM

Reactive Additive Manufacturing

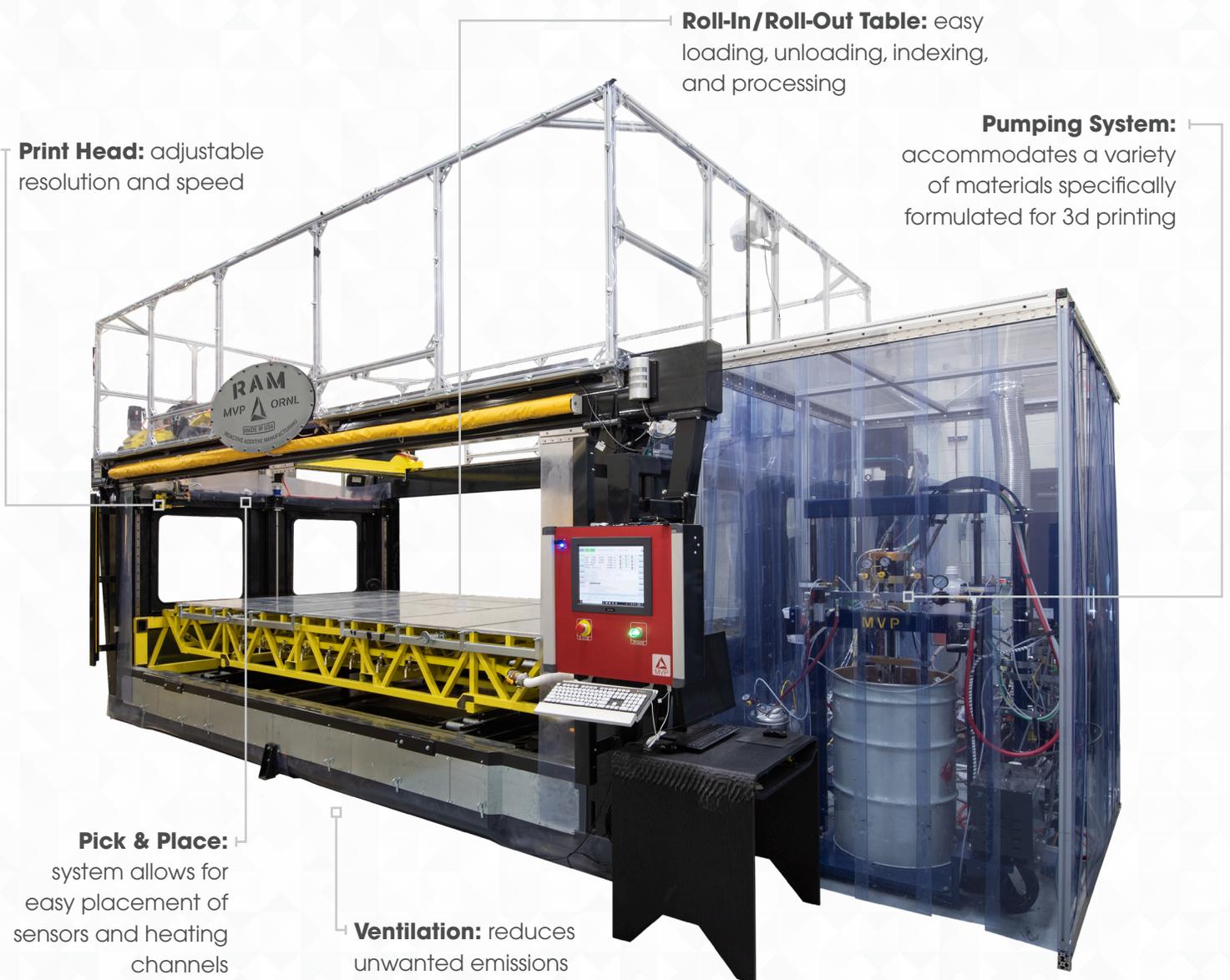
Large-Scale Thermoset Additive Manufacturing





What It Is:

RAM (Reactive Additive Manufacturing) is the world's first and only large-scale thermoset additive manufacturing machine enabling 3D printing of thermoset materials for prototype and production parts. RAM allows for the widest range of applications including low-cost fixtures, tools, and autoclave molds for variety of industries such as Marine, Tub and Shower, Automotive, and Aerospace. With a current print area of 16' x 8' x 3.5', the machine has the ability to produce large-scale parts, in various resolutions, with its unique thermoset material chemistries and pumping system. The patent pending removable table decreases cycle time and streamlines post processing with its indexing ability.



The Thermoset Difference:

Thermosets contain polymers which chemically react in the curing process to form a powerful bond. Thermoplastics require heat to soften pellets to become more fluid, therefore need cooling time to cure. The thermoset advantage lies in the cross-linking of polymers between printed layers resulting in stronger, more thermo-tolerant products. Compared to thermoplastic reinforced fiber materials, thermoset materials significantly **increase z-layer strength**, even without the use of reinforced fibers, **decreasing thermal expansion** and **optimizing isotropic expansion**. Thermoset materials also allow for increased tool path freedom as printing can occur between previously deposited soft materials resulting in significantly shorter layer times. Energy consumption in thermoplastic additive manufacturing has been shown to be equivalent to injection molding, whereas reactive additive manufacturing requires even less energy as there is no heated chamber or heated table.



Strong

- ▶ Cross-linking of polymers results in increased z-layer strength
- ▶ Chemical bonds in thermoset materials are inherently strong

Heat-Tolerant

- ▶ Reduced thermal expansion and optimized isotropic expansion without the use of reinforced fibers
- ▶ Ability to produce molds to withstand aerospace grade autoclave conditions

Process Efficient

- ▶ Higher quality surface finish reduces reduction in post processing steps
- ▶ Removable table enables decreased cycle time
- ▶ Ability to print between previously deposited soft materials results in increased tool path freedom

Affordable

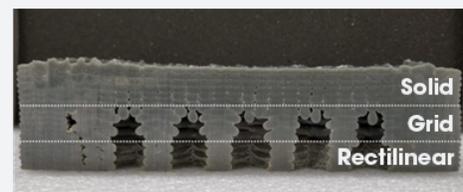
- ▶ Does not require high cost reinforced fibers for added strength

Scalable

- ▶ Thermoset materials allow for unrestricted print size

Energy Efficient

- ▶ Does not require heated table or chamber resulting in increased energy efficiency
- ▶ No post processing heat source needed for many material formulas



Cross section of infill design illustrates the sparse-to-solid layer transition with porous-free surface layers. This design decreases the amount of material used, which reduces the final cost and weight of the print.

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Specifications

Build envelope:	16' x 8' x 3.5' (scalable sizes available)
Print speed:	up to 50 in/sec
Deposition rate:	≤ 60 lbs/hr
Materials:	commodity and precision materials available
Print head:	multi-axis
Control:	proprietary software with touchscreen
Safety:	light curtain



About MVP:

Magnum Venus Products (MVP) is the premier equipment manufacturer providing solutions for composites, adhesives and sealants, winders, impregnators, reciprocators, protective coatings, and reactive additive manufacturing. MVP serves manufacturers in a variety of industries with its unparalleled customer service providing consultative solutions to improve manufacturing efficiencies.



Contact us today!

To discuss product information or request a print demonstration, call 727-385-8035 or visit MVPind.com.