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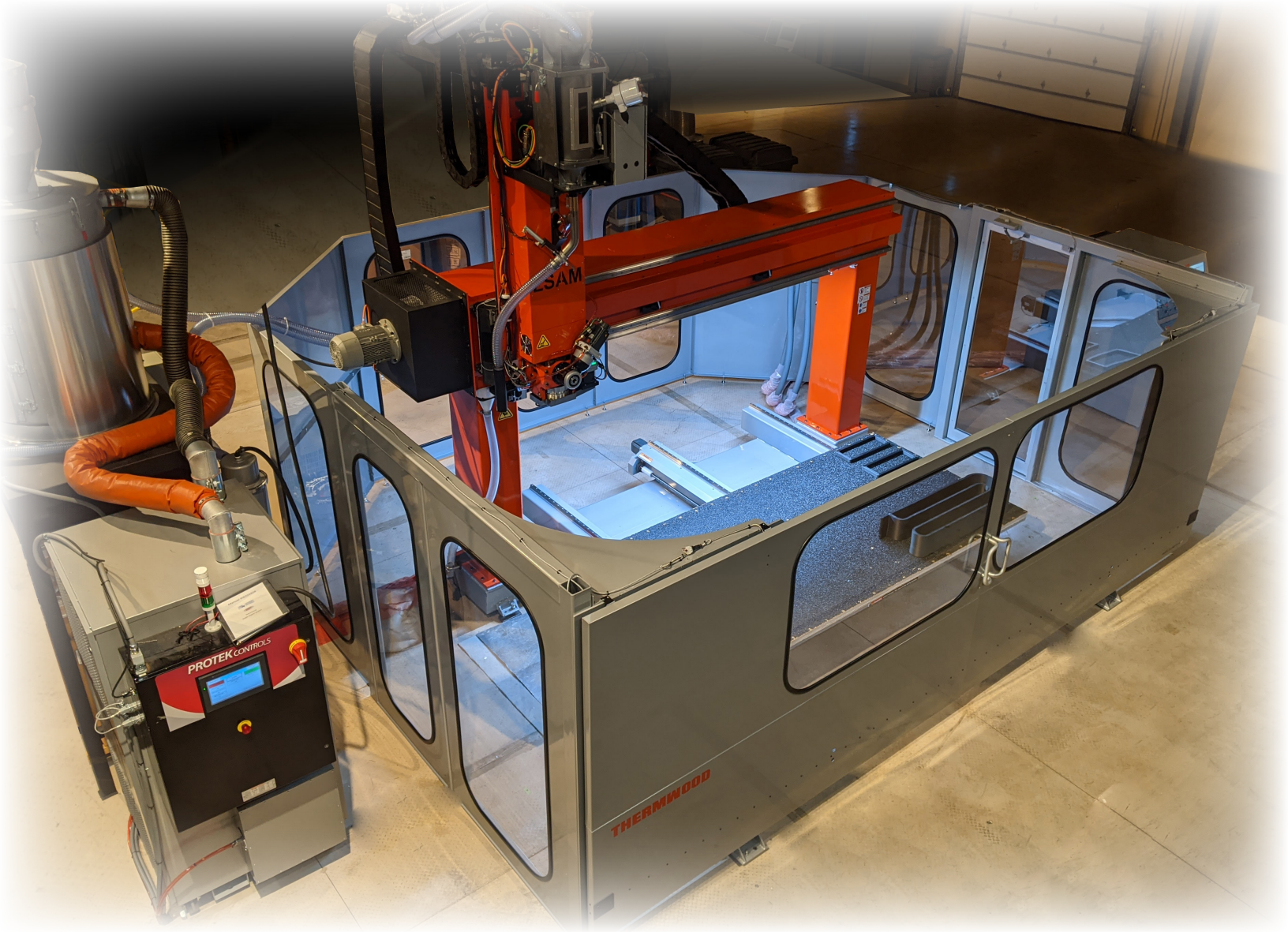
LSAM

Large Scale Additive Manufacturing

ADDITIVE PRINTER

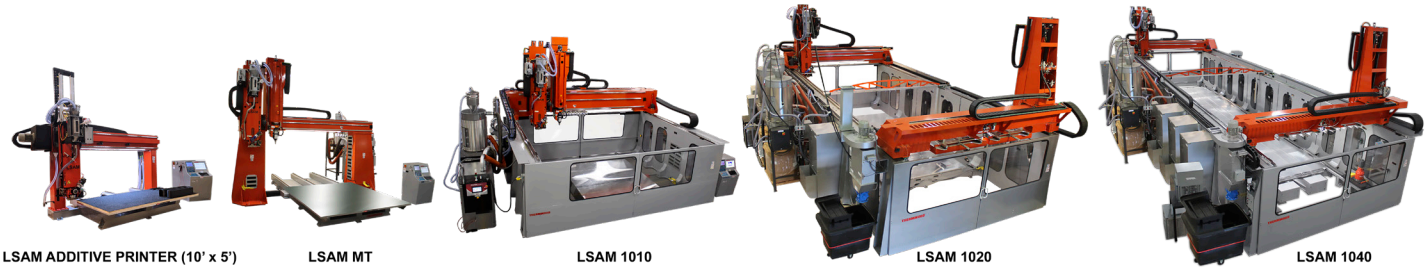


Thermwood Corporation, manufacturer of some of the largest composite thermoplastic additive manufacturing systems operating in industry today, has announced the availability of a new line of lower cost **"PRINT ONLY"** LSAM systems, called LSAM Additive Printers.

Thermwood's current LSAM line of large scale, dual gantry, "print and trim", near-net-shape additive manufacturing systems use an advanced print technology that produces high quality, fully fused products from a wide variety of reinforced composite thermoplastic polymers, including materials that process at high temperature like PSU, PESU, and PEI.

These systems are being used primarily to produce molds and tooling, most for aerospace and industrial production applications.

LSAM 105 Additive Printer


LSAM ADDITIVE PRINTER (10' x 5') LSAM MT LSAM 1010 LSAM 1020 LSAM 1040

40mm Print Head

The 40-60mm print heads used on our flagship machines weigh well over two tons and require a significant machine structure and powerful servo drives to achieve optimum performance.

The standard 40mm melt core has a maximum output of between 190 and 210 pounds (86.2kg and 95.3kg) per hour, depending on the polymer being printed.

In order to handle the 40mm Print Head, the gantry structure of its highly successful 5 axis CNC routers was re-engineered to use the incredibly strong "slot and tab" structural steel approach used on flagship LSAM machines. The same table, base structure and servo drives used on their five axis CNC routers could be used pretty much as is. With these changes the "LSAM Additive Printer" was born.

Although smaller than the flagship systems, which can print over 500 pounds per hour, the 40mm print head can still print up to 100 pounds per hour, which is still a higher maximum output than virtually all other systems available today. It is capable of producing large parts at temperatures up to 450° C, with overall size limited primarily by the table size and working envelope.

Vertical Layer Printing

All LSAM Additive Printers can print parts up to four feet tall. If you need taller parts, you may be able to print them by lying the part down and printing vertically. The only Additive Printer that supports Vertical Layer Printing is the 5 wide 10-foot-deep version. It can print parts up to 10 foot tall.

LSAM Control

The same powerful, feature rich LSAM control used on the large flagship LSAM systems, along with all its unique patented additive print features is standard on the new LSAM Additive Printers. A system for drying and conveying pelletized polymer material is also included as is a liquid chilling system to maintain temperature control on vital systems. This is especially important when processing high temperature materials.

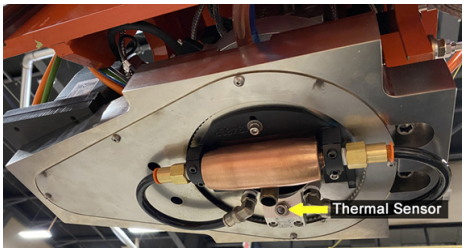
Optional Dual Hopper Dryer

The machine comes standard with a single hopper material dryer; however, an optional dual hopper dryer is also available for applications that change materials often.

Optional Enclosure

An optional enclosure that surrounds the machine is available. The machine with this full enclosure can also be built to meet European CE standards.

Thermal Sensor Layer Automation System



Thermwood's new Thermal Sensor Layer Automation System is also available on the LSAM Additive Printers. This is an exciting new system that automates the print process to easily and automatically obtain the highest quality layer to layer fusion.

With this system, a servo controlled thermal sensor, which travels with and rotates around the print nozzle, measures the temperature of the bead an instant before a new bead is added. This data is sent to the control which automatically adjusts print speed to print at the precise temperature that results in the best bead fusion for that particular polymer. Thermwood's LSAM print technology already produces the best quality, strongest large-scale additive parts and this system not only makes it better but also easier.

Fume Collection Module

The specially designed, highly rigid tab and slot, structural steel gantry also incorporates a fume extraction system that pulls print fumes through specially designed activated charcoal filters to remove them and "sweeten" the air. The collector is equipped with (4) carbon cartridges for high efficiency collection of air borne smoke generated from the printing process and produces approximately 5,500 CFM filtered airflow.

Print 3D Slicing Software

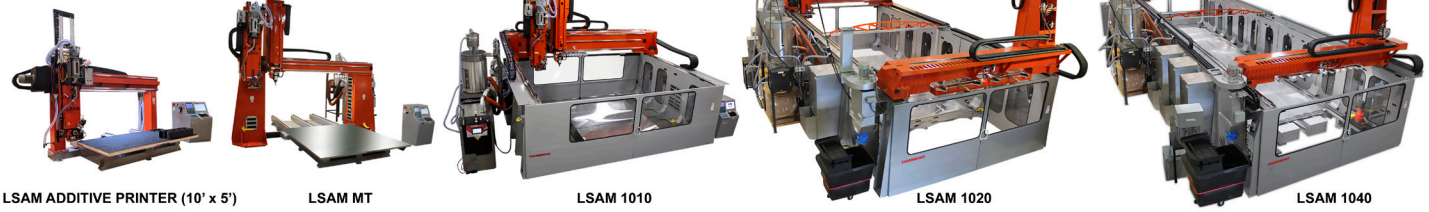
Thermwood offers an additive manufacturing software utility for its LSAM machines called LSAM Print^{3D} which operates within Mastercam, featuring multiple printing options and techniques which are essential for "near-net-shape" additive printing of large components.

To create a print program using LSAM Print^{3D}, an initial 3D computer model is generated using a CAD system. The 3D computer model, in an industry standard solid, surface or mesh file format, is loaded into Mastercam software and Thermwood's LSAM Print^{3D} utility is used to create a print model and generate the CNC machine code needed to actually print the part.

LSAM

Large Scale Additive Manufacturing

This new LSAM Additive Printer is intended to introduce LSAM additive technology to a whole new level of application and customer. With the addition of the LSAM Additive Printers, Thermwood now offers the largest selection of large-scale additive manufacturing systems for thermoplastic composite materials in the industry with models available for just about every application and budget.



LSAM ADDITIVE PRINTER (10' x 5') LSAM MT LSAM 1010 LSAM 1020 LSAM 1040

	LSAM 55 AP	LSAM 510 AP	LSAM 105 AP	LSAM MT	LSAM 1010	LSAM1020	LSAM1040	LSAM 1520	LSAM 1540
Configuration	Moving Table Single Fixed Gantry	Moving Table Single Fixed Gantry	Moving Table Single Fixed Gantry	Moving Table Single Fixed Gantry	High Wall Fixed Table Single Gantry	High Wall Fixed Table Dual Gantry	High Wall Fixed Table Dual Gantry	High Wall Fixed Table Dual Gantry	High Wall Fixed Table Dual Gantry
Table (Wide x Deep)	5 'x 5' Moving	5'x 10' Moving	10'x 5' Moving	10'x 10' Moving	10'x 10' Fixed	10'x 20' Fixed	10'x 40' Fixed	15'x 20' Fixed	15'x 40' Fixed
Max Print Height	4'	4'	4'	5'	5'	5'	5'	5'	5'
Vertical Layer Print	N/A	Optional	N/A	Optional	N/A	Optional	Optional	Optional	Optional
Operation	Print Only	Print Only	Print Only	Sequential Print & Trim	Sequential Print & Trim	Simultaneous Print & Trim	Simultaneous Print & Trim	Simultaneous Print & Trim	Simultaneous Print & Trim
Available Print Only	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Available Print Heads	40mm	40mm	40mm	40mm	40mm	40mm Standard 60mm Optional	40mm Standard 60mm Optional	40mm Standard 60mm Optional	40mm Standard 60mm Optional
Max Print Rate (lbs/hr) Polymer Dependent	≈ 100	≈ 100	≈ 100	≈ 200	≈ 200	≈ 200 (40mm) ≈ 500 (60mm)	≈ 200 (40mm) ≈ 500 (60mm)	≈ 200 (40mm) ≈ 500 (60mm)	≈ 200 (40mm) ≈ 500 (60mm)
Max Part Weight (lbs)	1,000lb	Standard Print 1,000lb Vertical Print 2,000lb	Standard 1,000lb 2,000lb (w/Opt 2nd Drive)	5,000lb	Stanard- No Practical Limit	Standard- No Practical Limit Verticle Print- 50,000lb	Standard- No Practical Limit Vertical Print- 50,000lb	Standard- No Practical Limit Vertical Print- 50,000lb	Standard- No Practical Limit Vertical Print- 50,000lb
Max Print Temperature	450 °C	450 °C	450 °C	450 °C	450°C	450°C	450 °C	450°C	450 °C
Single Hopper Dryer	Standard	Standard	Standard	Standard	Standard	Optional	Optional	Optional	Optional
Dual Hopper Dryer	Optional	Optional	Optional	Optional	Optional	Standard	Standard	Standard	Standard
Thermal Sensor Automation	Optional	Optional	Optional	Standard	Standard	Standard	Standard	Standard	Standard

≈ Approximately

THERMWOOD

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