

● PRODUCTION EXTRUSION AM

LEAM Technologies: Production-Grade Extrusion AM Through Local Thermal Control

Machines and process technology for stronger, faster, more repeatable polymer AM.

Who

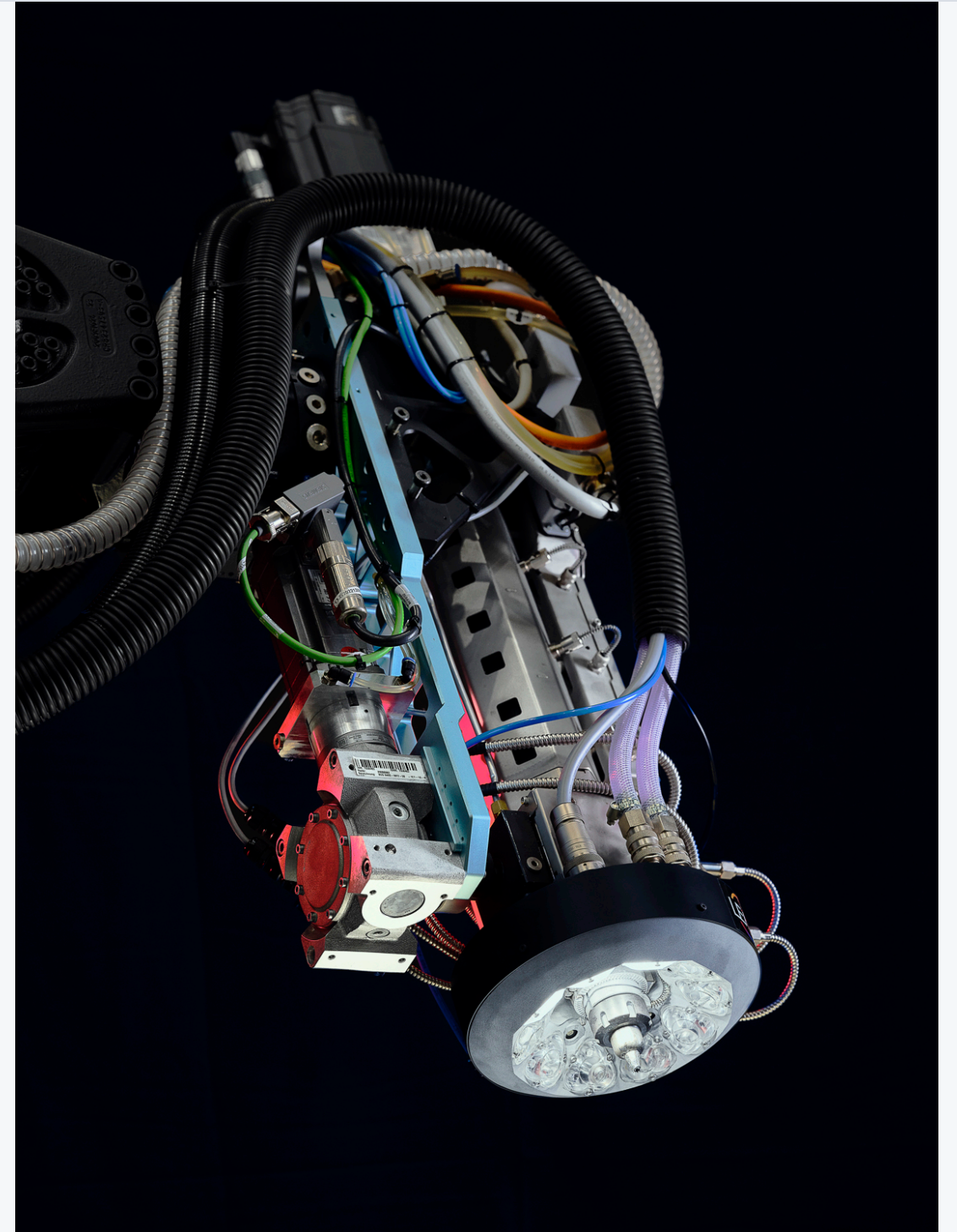
Industrial users, AM centers, integrators, machine builders.

What

Maritime, Oil & Gas, composite moulds, aerospace, rail, automotive.

Goal

Define a first part, target material, and qualification objective.



Installed robotic extrusion AM cell with DEMEX thermal-control hardware.

● MARKET PULL

Extrusion AM is ready where production needs flexible, fast, material-efficient manufacturing.

1 Flexible production

Large tools, spares, low-volume parts, local manufacturing.

2 Shorter development cycles

Prototype-to-tool and prototype-to-pilot loops can compress.

3 Resilient supply chains

Print closer to demand with fewer dedicated molds.

4 Resource efficiency

Reduce billet waste and inventory with near-net-shape parts.

5 Lightweight and tooling use cases

Aerospace, automotive, rail, maritime, and composite molds.

● REMAINING BARRIERS

Adoption slows when the thermal process window is left to trial and error.

Bonding

Cold interfaces after long layer times

Large paths can cool before the next bead arrives, weakening interlayer formation.

Cooling

Thermal accumulation in short or thick regions

Local overheating can disturb geometry, surface quality, or part stability.

Data

Limited process evidence for qualification

Without thermal and machine logs, repeatability is hard to document.

Scale

Repeatability across parts, materials, and operators

Production requires process limits, not individual operator recipes.

CORE PRINCIPLE

Better bonding starts where the bead meets the previous layer.

Instead of relying only on chamber temperature or retained heat, LEAM applies localized thermal control at the deposition interface.

Hot bondable interface

Heat is directed to the material that must bond, when it must bond.

Stable bulk state

The broader part is managed for geometry and thermal stability.

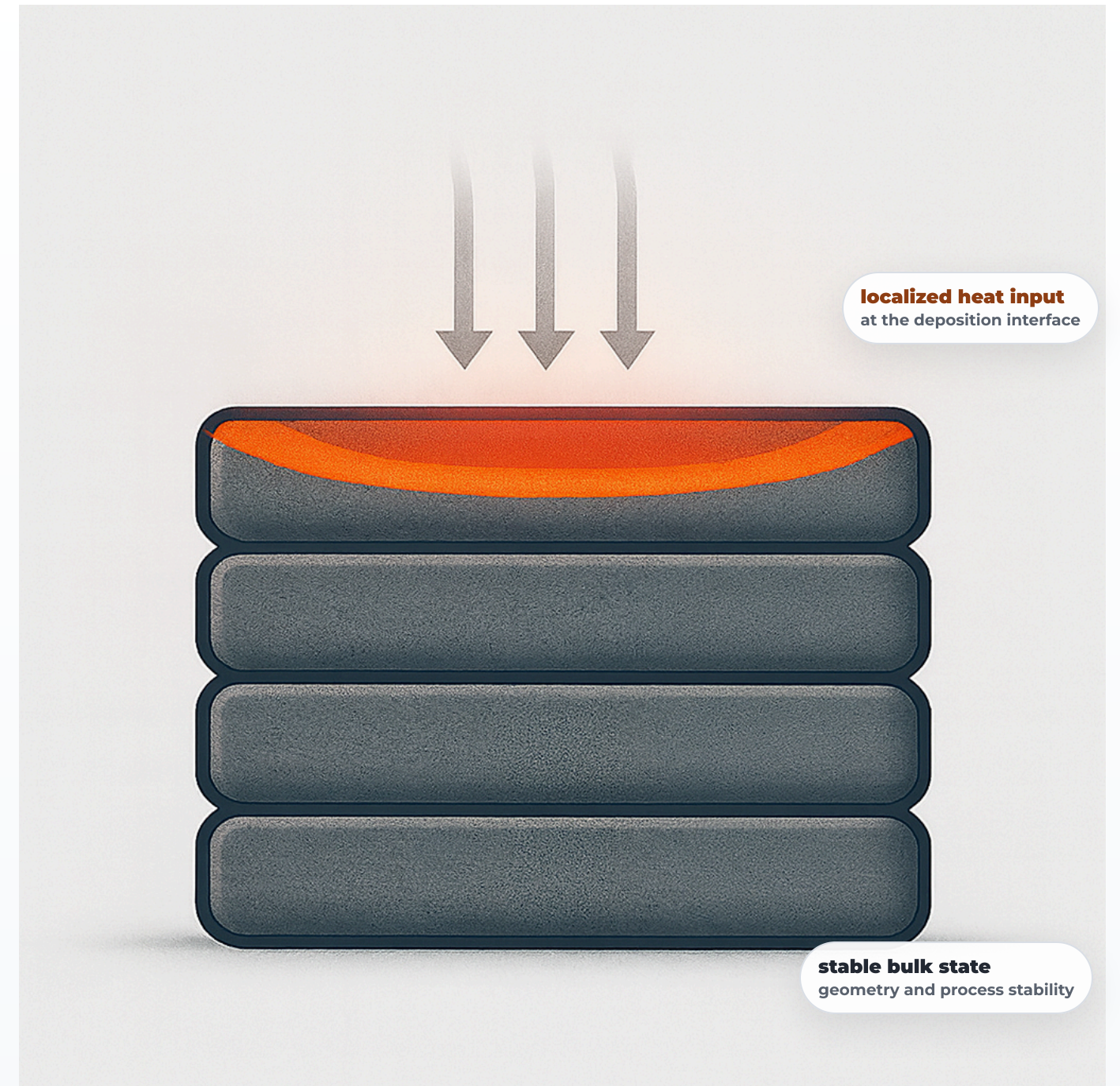
Sensor-informed control

Temperature sensing and machine feedback make the process observable.

Repeatable process window

Control logic replaces manual trial settings with a documented target state.

Key message: Better thermal control enables better bonding, more repeatable properties, and a more predictable production process.



MACHINE ARCHITECTURE

LEAM adds sensing, control, safety and data transparency to extrusion AM as a production layer.

Extrusion platform

Robot or gantry system, extruder, toolpath, machine feedback.

Retrofittable DEMEX Module

Localized light-based heating around the deposition interface.

Real Time Thermal Sensing

Contactless temperature measurement close to the process.

Closed-loop control

Heating, cooling, and speed coordinated to the target process window.

Process data

Logging for repeatability, documentation, and internal qualification work.

Safe integration

Non-laser visible LED heating with enclosure and shielding concept.

APPLICATION WEDGE

Use local thermal control where large polymer AM needs reliable material performance and repeatable production.

Discovery question

Which first part has a clear material, geometry, thermal process window, and qualification target?

APPLICATION FIELD	PAIN POINT	LEAM VALUE
1 Maritime	Long paths create cold interfaces and local heat buildup.	Restores weldable interfaces; manages mixed heat history.
2 Oil & Gas	Billet and mold routes drive lead time, waste, and cost.	Enables material performance at the specification of compression-molded material.
3 Composite moulds	Large tools are slow to iterate and bond-quality sensitive.	Extends layer-time window; reduces thermally limited waiting.
4 Aerospace	High-temperature tooling and overprinting need controlled interfaces.	Stabilizes interface and bulk state for qualification work.
5 Rail	Low-volume spares need FST-capable, repeatable production.	Improves consistency for high-Tg and FST-capable materials.
6 Automotive	Production aids and low-volume parts face cycle-time pressure.	Balances interface quality, cooling strategy, and throughput.



Large printed boat hull context for production-oriented polymer AM.

● PRODUCTION INTEGRATION

LEAM creates a controllable and documentable manufacturing process.

The machine should behave like production equipment: controlled, logged, repeatable, and ready to integrate with existing workflows.

- 1 Controlled process**
Move from manual trial-and-error to defined thermal targets.
- 2 Logged thermal and machine data**
Capture evidence for internal documentation and repeatability studies.
- 3 Traceability foundation**
Support future qualification work without claiming automatic certification.
- 4 Safer operation concept**
Non-laser visible LED heating with shielding and enclosure concept.
- 5 Workflow integration**
Fit into existing AM centers, robotics cells, tooling lines, and process labs.



BUSINESS CASE

Start from a high-value first part, then prove the process window.

The right project is not a generic machine demo. It is a part, material, and qualification target where thermal control removes a real adoption barrier.

A pilot machine de-risks production adoption while creating the process data needed for a machine investment decision.

Industrial customer value

Lower adoption risk

Run a defined pilot before committing to a production cell.

Measurable process case

Compare bonding, stability, lead time, waste, and rework against the current route.

Integration roadmap

Define machine interface, safety concept, data record, and operator workflow.

Research and technology-center value

Transfer platform

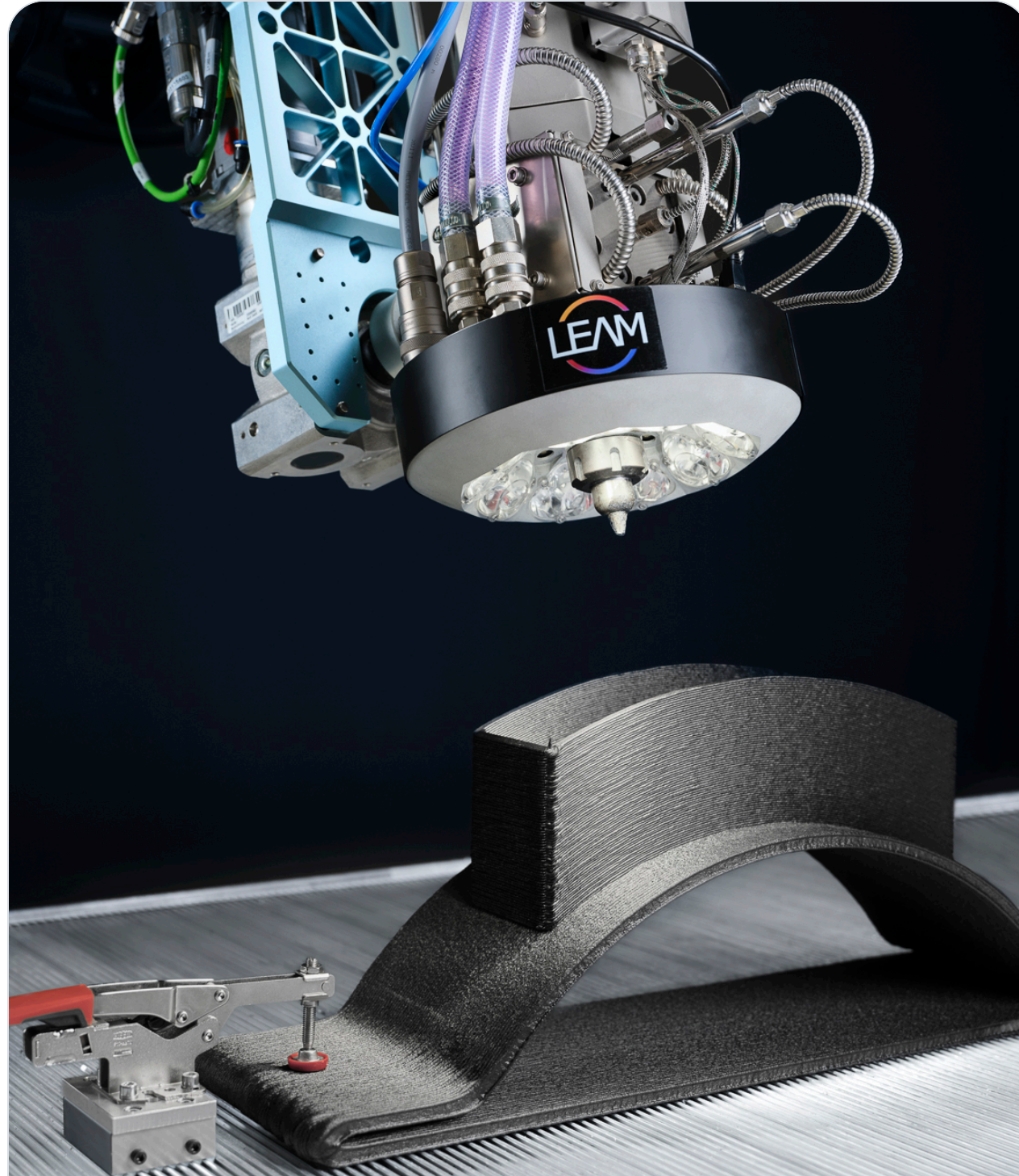
Use a real machine cell to connect material studies to industrial users.

Qualification workflows

Build repeatable datasets around part, material, toolpath, and process window.

Application pipeline

Maritime, Oil & Gas, composite moulds, aerospace, rail, and automotive.



DEMEX mounted above a multi-axis overprint demonstrator part.

● CALL TO ACTION

Let's discuss your applications and the first pilot part.

1

Identify the application

Maritime, Oil & Gas, composite moulds, aerospace, rail, automotive.

2

Define the first part

Geometry, material, toolpath, process constraint.

3

Set the qualification goal

Bonding, stability, data record, internal acceptance criteria.

4

Deploy a pilot machine

Controlled print cell, operator workflow, data capture.

5

Evaluate production scale

Machine integration path, production-cell scope.

Connect

AM centers, industrial customers, integrators, and machine builders with production constraints.

Discuss

Define where a LEAM-controlled extrusion AM cell can create a measurable result.

Evaluate

Evaluate functionality, safety, data logging, material fit, and part workflow.

Define

One part, one material, one thermal bottleneck, one qualification objective.