From Prototype to Production: A Decision Framework for Industrial Additive Manufacturing

How engineering teams reduce development cycles by **60–75%**, eliminate **€15,000** tooling per variant, and scale production **from 1 to 10,000 parts**.

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✓ 12 pages of technical content
✓ Real case study (OMNIA Technologies Group)
✓ ROI calculator included
✓ HP MJF and Carbon DLS material specifications

60–75%
Time-to-market reduction

€8–15k
Tooling saved per variant

1–10,000
Economical batch size

For:

- *Engineering Managers*
- *R&D Directors*
- *Technical Operations Leaders*

THE PRODUCTION BOTTLENECK

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Traditional Manufacturing Challenges in Machinery Development

TIME
- 4–8 weeks tooling
- 12–16 weeks total cycle

COST
- €8–15k tooling
- MOQ 500–1,000

DESIGN
- Assembly constraints
- Limited geometry

If:
- ***Development cycle > 12 weeks***
- ***≥ 3 design iterations per year***
- ***Tooling cost > €10,000 per variant***

Then traditional manufacturing is structurally inefficient.

WHY ADDITIVE MANUFACTURING IS NOW PRODUCTION-READY

WHAT HAS CHANGED

1995–2010 → Prototyping
2010–2018 → Functional validation
2018–Today → End-use production

Carbon®

Core Advantages

1. ZERO TOOLING COSTS

- No molds required
- File update replaces retooling

2. ON-DEMAND PRODUCTION

- Batch size 1–10,000
- Zero inventory risk

3. GEOMETRIC FREEDOM

- Lattice optimization for weight reduction
- Organic geometries impossible with traditional methods

4. COMPRESSED LEAD TIMES

- From CAD to finished part: 1-3 weeks
- Integrated post-processing and QC

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MATERIAL SPECIFICATIONS

Production-grade materials for demanding applications

HP MULTI JET FUSION

NYLON PA12

- TENSILE STRENGTH: 48 MPA
- ELONGATION AT BREAK: 20%
- TEMPERATURE RANGE: 95°C TO 350°C
- CHEMICAL RESISTANCE: OILS, GREASES, HYDROCARBONS

Application: Functional prototypes | End-use parts | Medium-duty components

TPU THERMOPLASTIC POLYURETHANE

- SHORE HARDNESS: 88A
- HIGH FLEXIBILITY & IMPACT RESISTANCE
- ABRASION RESISTANT
- TEMPERATURE RANGE: -31°C TO 192°C

Application: Flexible parts | Gaskets | Impact-absorbing components

CARBON DLS™ (i.e. Carbon resins)

RPU 70 (RIGID POLYURETHANE)

- TENSILE MODULUS: 1700 MPA
- HDT: 60°C
- HIGH STIFFNESS & DIMENSIONAL STABILITY
- CHEMICAL RESISTANT

Application: Industrial fixtures | High-temp applications | Structural components

EPX 82 (EPOXY RESIN)

- TENSILE MODULUS: 2800 MPA
- HDT: 130°C
- SUPERIOR MECHANICAL PROPERTIES
- EXCELLENT THERMAL STABILITY

Application: Aerospace components | Automotive under-hood | High-performance parts

EPU 46 (ELASTOMERIC POLYURETHANE)

- SHORE HARDNESS: FROM 56A TO 78A
- HIGH REBOUND RESILIENCE
- EXCELLENT ABRASION RESISTANCE
- SOFT-TOUCH SURFACE FINISH

Application: Cycling saddles | Rowing pads | Footwear | Ergonomic grips

Real Data from Industrial Applications

QUANTIFIED PERFORMANCE METRICS

Verified performance metrics from completed projects

TIME-TO-MARKET REDUCTION

- Prototype development: 6 days vs 4-6 weeks traditional
- 100-part production run: 10 days vs 8-12 weeks traditional
- Design iteration cycle: 48 hours vs 3-4 weeks
- Result: 60-75% development time reduction

ENGINEERING PERFORMANCE

- Weight reduction: 40-60% through topology optimization
- Part consolidation: 5-15 components → single part
- Thermal efficiency improvement: +50-80% with conformal channels
- Material waste reduction: 95% vs subtractive methods

COST IMPACT

- Tooling elimination: €8,000-€15,000 saved per variant
- Inventory reduction: 70-85% lower stock value
- Obsolescence elimination: 15-20% annual carrying cost removed
- Typical ROI: 4-8 months

PRODUCTION FLEXIBILITY

- Economic batch size: 1-10,000 parts
- Variant cost: €0 additional per design change
- Customization at scale: unlimited part variations

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CASE STUDY: COMAS – OMNIA Technologies

Automation Machinery Manufacturer Achieves 60% Lead Time Reduction

Omnia Technologies
Enabling Evolution

83% LEAD TIME REDUCTION

COMPANY PROFILE COMAS (OMNIA Technologies Group) – Global leader in filling and capping machines for pharmaceutical, cosmetics, and diagnostics industries.

CHALLENGE

- High-precision components required for regulated industries
- Frequent design iterations during product development
- Small to medium production volumes (50-500 parts)
- Tight tolerances and material certifications mandatory

SOLUTION IMPLEMENTED

- CAD file and fisibility analysis
- HP Multi Jet Fusion technology with nylon PA12 material
- Design for additive manufacturing optimization
- Custom prototypes, adjusts after first test, production

Components Produced

Anti-rotation devices – prevent bottle spinning during capping

Dosing bellows – precise fluid transfer in pharmaceutical machinery

Ophthalmic tube parts – complex geometries for eye-drop systems

Nasal spray components – uniform dosing accuracy

Diagnostic holders – optimized for strength and dimensional stability

Measured Results

42 → 7 days | Lead time reduction

€8,400 Saved per iteration

3 in 1 month | Design cycles

100% | Traceability compliance

Engineering Support to De-Risk Implementation

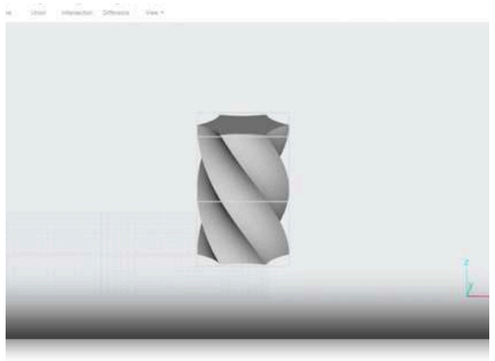
DfAM strategies to maximize performance and cost efficiency

1. Topology Optimization ↑

- Material removal in low-stress areas
- Weight reduction: 40-60% while maintaining strength
- Example: Aerospace bracket – 2.4 kg → 1.1 kg (-54%)

2. Part Consolidation ↑

- Eliminate assembly operations
- Reduce failure points
- Example: 12-part valve assembly → single component
- Time saving: -90% assembly labor



3. Lattice Structures ↑

- Engineered cellular geometries
- Strength-to-weight optimization
- Vibration dampening
- Material cost reduction

4. Mass Customization ↑

- Patient-specific medical components
- Custom tooling and fixtures
- Serialized part production
- Cost: identical across all variants

Prototek Design Support Services

- Pre-production file optimization
- FEA simulation and validation
- Material selection guidance
- DfAM (Design for Additive Manufacturing) consultation

Prototek Production Process: from CAD file to certified production parts

How to Implement Additive Manufacturing in Your Process

Proven 4-phase integration framework

WEEK 1 **IDENTIFICATION & FEASIBILITY ANALYSIS**

✓ CAD file reception, technical evaluation, and geometry verification
✓Technology and material recommendation (HP MJF, Carbon DLS) with DfAM optimization
✓Cost and lead time estimation

Output: Optimized CAD file + production proposal

WEEK 2-4 **PROTOTYPE VALIDATION**

✓ First prototype production, dimensional and visual quality control, and delivery for customer testing
✓Mechanical properties verification and design iteration as needed
✓ Final prototype approval

Output: Validated prototype ready for production scale-upl

ONGOING **SCALABLE PRODUCTION**

✓ Production planning and flexible scheduling for on-demand runs
✓ Small to large batch production (1–1,000+ parts) with consistent quality
✓ Integrated post-processing workflow

FINAL STAGE **POST-PROCESSING & QUALITY CONTROL**

✓ Part cleaning, support removal, and surface finishing (dyeing, vapor smoothing, painting)
✓ Mechanical testing, internal quality verification, and batch certification
✓Packaging, traceability documentation, and shipping to customer.

Production capacity

Production Flexibility

From 1 piece to 10,000+ parts/month
Same quality, same materials, scalable capacity

Quality assurance

ISO 9001& ISO 27001 Certified Process

Full material traceability with batch reports
Dimensional tolerances verified per specification

Expected Outcomes & ROI

Quantified business impact based on real cases

YEAR 1 FINANCIAL IMPACT

(Based on 15-20 component integration in your production)

Tooling Cost Elimination €120,000 - €200,000	**Inventory Reduction** €80,000 - €150,000
Obsolescence Elimination €15,000 - €30,000	**Revenue Acceleration** 2-month gaint

TOTAL YEAR 1 SAVINGS → €250,000 - €450,000

Typical ROI: 4-8 months | Most companies break even on first project

KEY OPERATIONAL IMPROVEMENTS

Development cycle **-60%**	Design iterations **3X5 more**
Design change response **few days**	Prototype to production **6-10 days**
Supply chain complexity **-40%**	Material waste reduction **95&**

CALCULATE YOUR ROI

Start Your Additive Manufacturing Journey

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Three pathways to evaluate and implement

①

FREE COMPONENT ASSESSMENT
48-72 hour turnaround

- Send CAD files
- Get cost comparison
- Technical feasibility
- DfAM recommendations

[Request Assessment ↓]

②

PILOT PROJECT
2-3 weeks

- 5-10 functional parts
- Mechanical testing
- Performance validation
- Production readiness

[Start Pilot Project ↓

③

STRATEGIC PLANNING SESSION
Complimentary for qualified companies

- 90-min consultation
- Roadmap review
- ROI projection
- Implementation timeline

[Schedule Session ↓]

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"Additive manufacturing allowed us to compress development cycles from months to days, while maintaining the precision and certification standards required in pharmaceutical and cosmetic machinery. The partnership with Prototek gave us production-ready parts with full traceability."

– D. Fulceri, Engineering Manager, COMAS (OMNIA Technologies)

Key Takeaways

✓ Reduce time-to-market by **60-75%**	✓ Produce **1 to 10,000** parts economically
✓ Eliminate **€8,000-€15,000** tooling costs per variant	✓ Achieve geometric complexity impossible with traditional methods
✓ Free capital tied up in inventory (**70-85%** reduction)	✓ Start with pilot project, scale based on results

Request Component Analysis:

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