The Value of FDM Jigs & Fixtures

Who, What, Where, When & Why
Who Is Stratasys?

We are passionate believers in the value and power of 3D printing, and in the change it can bring to the world. And we’re here to lead it.
PolyJet & FDM Technologies

PolyJet™

- Fine feature details
- Material versatility
- Multi-material product realism

Support Material  Model Material  Instant UV Curing

FDM®

- Industrial thermoplastics
- Accuracy
- Durability
Today’s Event

Host
Kim Killoran, Marketing Project Manager, Stratasys

Presenter
Rob Winker, Corporate FDM Applications Manager, Stratasys
Primary Applications for Additive Manufacturing

Additive Manufacturing

- Concept Models
- Functional Prototypes
- Manufacturing Tools
- End-Use Parts

Established / Traditional (Design)

Direct Digital Manufacturing (Manufacturing)
FDM Jigs & Fixtures

Applicable to most system owners
Increases justification of FDM
  • Component of >80% US sales
  • Large savings vs. traditional
Enhances system ROI & utilization
Provides real value to multiple departments
Play 60 second FDM Jig and Fixture commercial.
Agenda

Application Overview
Where Used
Traditional Process
FDM Role
FDM Process
FDM Best Fits
Benefits
Customer Success Story
How It’s Used
**Jig:** Type of custom made tool used to control the location and/or motion of another tool.

**Fixture:** Type of custom made tool used to hold the work in a fixed location.

Manufacturing industry relies on jigs & fixtures to:

- Maximize production quality
- Increase production efficiency

Used to:

- Position, hold, protect and organize

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*Pull-force Jig*
Jigs & Fixtures: Where Used

Manufacturing / Assembly
- Assembly aids
- Alignment fixtures
- Holding fixtures
- Nesting fixtures

Inspection
- CMM part fixtures
- Check gauges

Engineering / Testing
- Engineering test fixtures

Transportation / Inventory
- Part holders/carriers
- End of arm tools
- Assembly line pallets
- Tool holders/organizers (5S)
- Protection (High value component nests)

Medical
- Drill and Saw guides
Jigs & Fixtures: Where Used (Candidate Profile)

Manufacturers needing:
  • Positioning, placement
  • Holding, organization

Manufacturers starting/opening:
  • Projects, facilities, production lines

More needed, but:
  • Too much effort, time or expense
  • Bottlenecks/delays in fixture making
  • Short life or infrequent use
  • Nice to have but low priority

Open to change/alternatives
  • Creative, innovative, clever
Jigs & Fixtures: Where Used (Companies Benefitting)

- **ACIST** (MEDICAL SYSTEMS)
- **AKAISHI** (APPAREL (footwear))
- **BMW** (AUTOMOTIVE)
- **Honeywell** (ELECTRICAL EQUIPMENT/SYSTEMS)
- **Joe Gibbs Racing** (MOTORSPORTS)
- **Lockheed Martin** (AEROSPACE)
- **ORECK** (CONSUMER GOODS (vacuums))
- **Stratasys** (TEST/MEASUREMENT EQUIPMENT)
- **SYNTHES** (MEDICAL DEVICE)
- **Tennant** (COMMERCIAL/SERVICE EQUIPMENT)
- **Thogus** (CUSTOM MOLDER)
- **TriMark** (HARDWARE (latch/hinge))
- **Xerox** (OFFICE EQUIPMENT)
Jigs & Fixtures: Traditional Process

CNC machine / manual fabrication
- Wood
- Plastic
- Metal

Outsourcing*
- 5 – 20 days
- $100 - $2,500

In-house*
- 3-10 days
- $50 - $1,000
- Operator typically required

*125mm^3 (5in^3)
Jigs & Fixtures: FDM Process (Role)

Direct production on FDM system

- Direct from STL - tool manufacturing

In-house*:

*(Typical from concept to implementation)*

- < $100s
- 0.5 – 1.0 day
- Designs stay in-house

*125mm^3
Jigs & Fixtures:
FDM Best Fits (When…)

Quantity:
• 1-100+

Size (XYZ):
• ≤ 300 mm (12 in.)

Manufacturing requirements:
• Thermoplastic strength is acceptable
• Accuracy tolerance ≥ +/- 0.13mm (0.005 in.)
• Temperatures up to 200 °C (390 °F)

Frequent replacement or alteration
Complex shapes/geometries
Jigs & Fixtures: Benefits

Time & cost savings
- 40 - 90% lead time reduction
- 70 - 95% cost reduction

Streamlined, efficient process
- Eliminate detailed drawings
- Minimize PO & payment requirements
- Task, not a project

Digital inventory
- Reduction in storage space
- Quick replacement or revision
- Simple duplication
Jigs & Fixtures: Benefits

Design for function

• Part consolidation
• Integrated features
  – Fasteners, sensors, RFID tags
  – Pockets, channels, holes
  – Text – part #s, guides, instructions
• Ergonomics
  – Technician comfort
    ▪ Organic shapes
    ▪ Light weight (sparse interiors)
  – Lower cycle times
  – Easy access and storage
Customer Success Story

Oreck Manufacturing
Success Story: Oreck Vacuum

20-30 Injection molded parts / product
  - All require first article inspection
  - Adjustable fixtures not valid for complex parts

Utilize FDM to produce prototypes
  - Validate design & communicate with suppliers
  - Utilize in CMM program set up

Leverage FDM to produce CMM fixtures
  - Designed & built immediately
  - No penalty for complex shapes

Realized benefits include
  - Allows early programming of CMM
  - Significant comparative savings

<table>
<thead>
<tr>
<th>Method (In-house)</th>
<th>Time</th>
<th>Cost</th>
<th>Total Inspection Time</th>
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</thead>
<tbody>
<tr>
<td>Aluminum CNC</td>
<td>7 hours</td>
<td>$250</td>
<td>30 Days</td>
</tr>
<tr>
<td>FDM</td>
<td>3.5 hours</td>
<td>$55</td>
<td>1 Day</td>
</tr>
<tr>
<td>Savings</td>
<td>3.5 hours (50%)</td>
<td>$195 (78%)</td>
<td>29 Days (97%) (2900% Improvement)</td>
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</tbody>
</table>
Customer story video
Jigs & Fixtures: How It’s Used

Examples:

**Assembly / Manufacturing**
- Assembly aids
- Alignment fixtures
- Holding fixtures
- Nesting fixtures
- Workbook holders
- Custom equipment guards

**Testing / Inspection**
- Mechanical test fixtures
- Electrical test fixtures
- Lifecycle test fixtures
- CMM part fixtures
- Check gauges
- Go/no-go gauges

**Transportation / Inventory**
- Part holders/carriers
- Kitting Fixtures
- End of arm tools
- Assembly line pallets
- Production inventory org.
- Part protectors
- Factory efficiency
- Tool holders/organizers (5S)

**Medical**
- Drill and cutting guides

**Engineering**
- Test Fixtures
Final video:

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Jigs & Fixtures: Summary

Application

• Production of FDM jigs and fixtures

FDM’s role

• Alternative to machining and fabrication

Where used

• Wherever there is a need to maintain quality and production efficiency (nearly all industries)
More Information & Resources

www.stratasys.com/webinar-jigsandfixtures

• Download webinar slides
• View webinar on-demand
• Download application documents
• Contact your local reseller to request a benchmark
• Submit technical questions
Thank You!