Injection Molding and Open Platform 3D Printing Considerations

Haleyanne Freedman
Global Engineering Market Manager - 3D Printing/Additive Manufacturing
M. Holland Company
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About Haleyanne

- Experienced with over **65 different 3D Printers and technologies**
- Expert with **application conversion from injection molding to additive**
- Works with hundreds of companies of all sizes through all stages in adopting 3D Printing
- Mechanical engineering background with specialization in Additive Manufacturing polymers and metals: MIT
- Designs and provides **design and operational training/education** for hundreds of engineering teams in plastics industry
- North America Chair for Women in 3D Printing and Vice Chair for Women in Manufacturing
- Serves on several additive advisory councils
M. Holland Overview

- Largest resin distribution company in North America
- Family-owned for 70 years
- Volume of over 1.8 billion pounds
- Serving over 5,000 clients
- Distribution to over 50 countries
- Partnered with over 30 Strategic Suppliers
M. Holland and **3D Printing**

- **Consultative services and training**
- **Expert guidance on method, machinery and material selection**
- **Portfolio of 250+ materials for all processes; FFF, SLS and SLA/DLP**
- **5,000+ Plastic Injection Molding Customers with applications for 3D**
- **Industrial part design and prototyping services**
M. Holland: 3D Laboratory

- 65+ 3D Printers
- Wide selection of technologies: FDM, FFF, SLA, DLP, SLS, MJF, CLIP, DLM
- New printing platforms tested monthly
- 8+ new-to-market or beta materials tested monthly
- Custom material compounding and development
- Extended data sheet production
- Custom 3D Printer builds
- Material and parameter development
M. Holland 3D History
Our history:

2018
- Master distribution agreement signed with Owens Corning creating the 3D Printing department for M. Holland

2019
- Portfolio expansion
- Laboratory Construction
- Addition of engineering support position
- Expanded laboratory construction

2020
- Separated as an entity of M. Holland
- 3rd laboratory reconstruction
- Addition of engineering support

2021
- Addition of engineering support
- Launch of 5 new suppliers
- 4th construction of laboratory
- Expanded into Powder bed fusion
Value Proposition

- Unparalleled access to molders and plastics processors
- Access to hundreds of materials, suppliers and technical support
- 65 Account Managers, 20 Engineers internationally accessible
- Over 40 warehousing locations
Adoption: Plastics Industry Challenges

- Misguided machinery purchases
- Limited and high-cost material selections
- Proper testing design is lacking
- Current processes are not accurately reflecting material data
- Unusable/inaccurate information is wide-spread
- Material suppliers often take little responsibility for validation and certification
- Lacking necessary certifications
- Cost-prohibitive selections
- Open platform developments inaccessible to closed source users
- Not genuinely comparable to injection molding properties
- Over investment
- Closed platform limiting participation
- Inaccurate technical data provided by the industry
- Lack of education around capabilities and availability
- Industry misinformation harms wide-spread adoption
- Proper testing design is lacking
- Current processes are not accurately reflecting material data
- Unusable/inaccurate information is wide-spread
Machinery and **Materials**

- Material development and industry advancement is happening on open platform printers
- **Closed platforms** do not enable wide-spread legitimate adoption in the plastics industry
- **Material costs** are high
- **Material availability and selection** are still too limited
- **Machine manufacturers** can NOT be responsible for the development and pricing of material
Technical Data Shortcomings

- Lack of testing standards has enabled inaccurate data distribution
- **Orientation** overlooked and not adequately understood
- Testing protocols are not designed to adequately assess anisotropy
- Existing testing processes are not designed for additive analysis

Averaging of tensile data creates misconceptions and misinterpretation.
## Supplier TDS

### MH Extended Data

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<th>Mechanical Properties</th>
<th>Metric</th>
<th>Imperial</th>
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<tbody>
<tr>
<td>Tensile Modulus</td>
<td>7400 MPa</td>
<td>1074 ksi</td>
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<tr>
<td>Tensile Strength (Yield)</td>
<td>102 MPa</td>
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<td>Tensile Strength (Break)</td>
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</tr>
<tr>
<td>Elongation (Break)</td>
<td>2.1 %</td>
<td>2.1 %</td>
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<table>
<thead>
<tr>
<th>Orientation</th>
<th>Mechanical Properties</th>
<th>Metric</th>
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<tr>
<td>Printed Flat - 0 °</td>
<td>Tensile @ Max</td>
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<tr>
<td></td>
<td>Tensile @ Yield</td>
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<td>Tensile @ Yield</td>
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<td>Elongation @ Max (%)</td>
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3D Printing: Cycle of Nonsense

- Misrepresented and unreliable technical data
- Unrealistic expectations of 3D printing technology
- Lack of certifications and adequate application validation
- Development and material validation responsibility falling on end user
- Inability to adequately adopt 3D Printing technology
- Industry desperation for wide-spread adoption

3D Printing: Cycle of Nonsense
Aligning Industry Expectations

- OEM 3D strategies do NOT dictate the plastics industry’s adoption of technology
- Additive companies don’t collaborate effectively enough to assist adoption
- Overpriced and overhyped material **DO NOT WORK**
- ROI on closed platform technology is not competitive
- Limiting materials limits applications significantly
- Molders NEED to diversify their offerings in order to stay relevant
Industry Responsibility

- Misinformation harms adoption
- Adequate testing standards are required
- Educate for realistic expectations
- Closed platform can’t compete; Open up materials platforms
Questions?

Hfreedman@mholland.com
Mholland3D.com