Injection Molding and Open Platform 3D Printing Considerations

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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

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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

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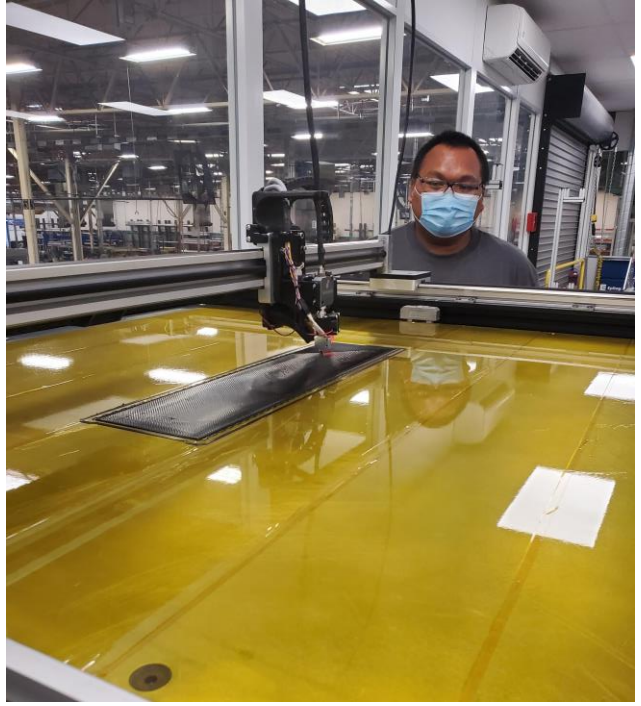

M. Holland: 3D Laboratory

- 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

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Our history:

2018

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

-Portfolio expansion

-Laboratory Construction

-Addition of engineering support position

2019

Expanded laboratory construction

Addition of photopolymers

Addition of engineering support

2020

Separated as an entity of M. Holland

3rd laboratory reconstruction

Addition of engineering support

Expanded into Powder bed fusion

2021

Addition of engineering support

Launch of 5 new suppliers

4th construction of laboratory

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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

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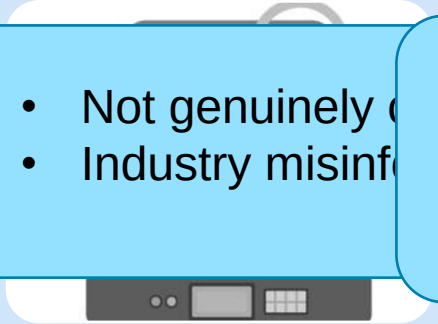
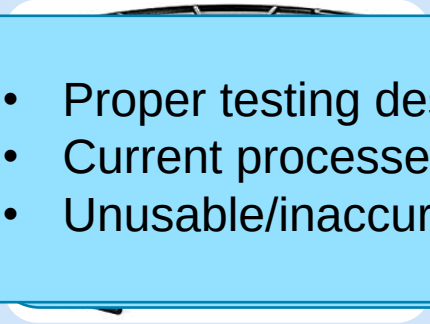
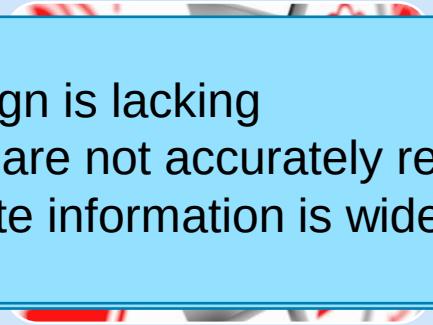
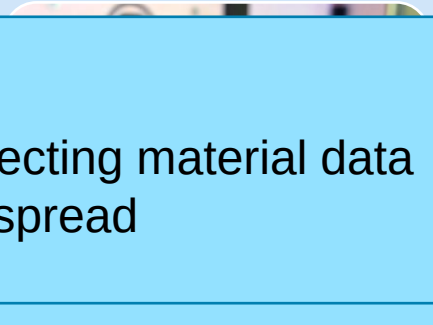
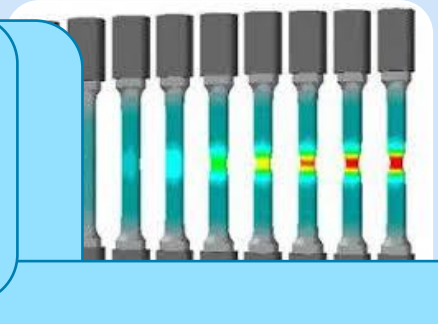
Adoption: Plastics Industry Challenges











- Not genuinely
- Industry misinf

- 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

Misguided machinery purchases

Limited and high-cost material selections

- Lacking necess
- Cost-prohibitive selections
- Open platform developments inaccessible to closed source users

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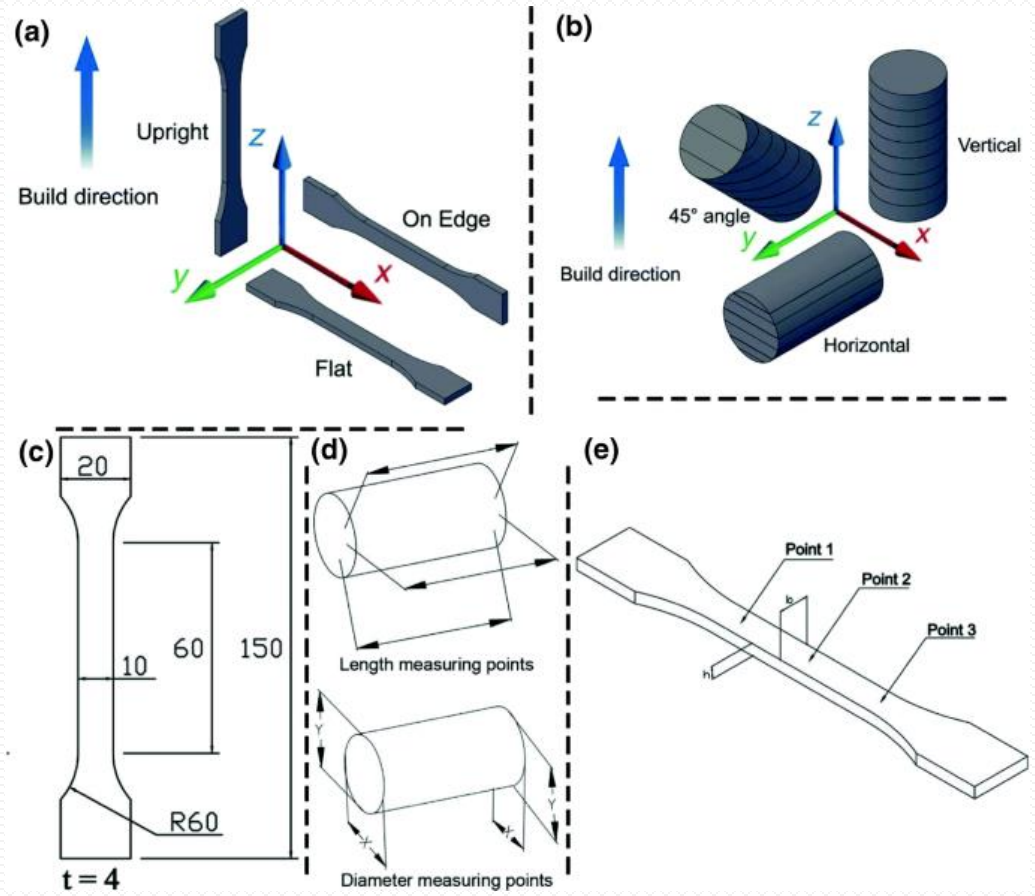
Machinery and Materials

- 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.

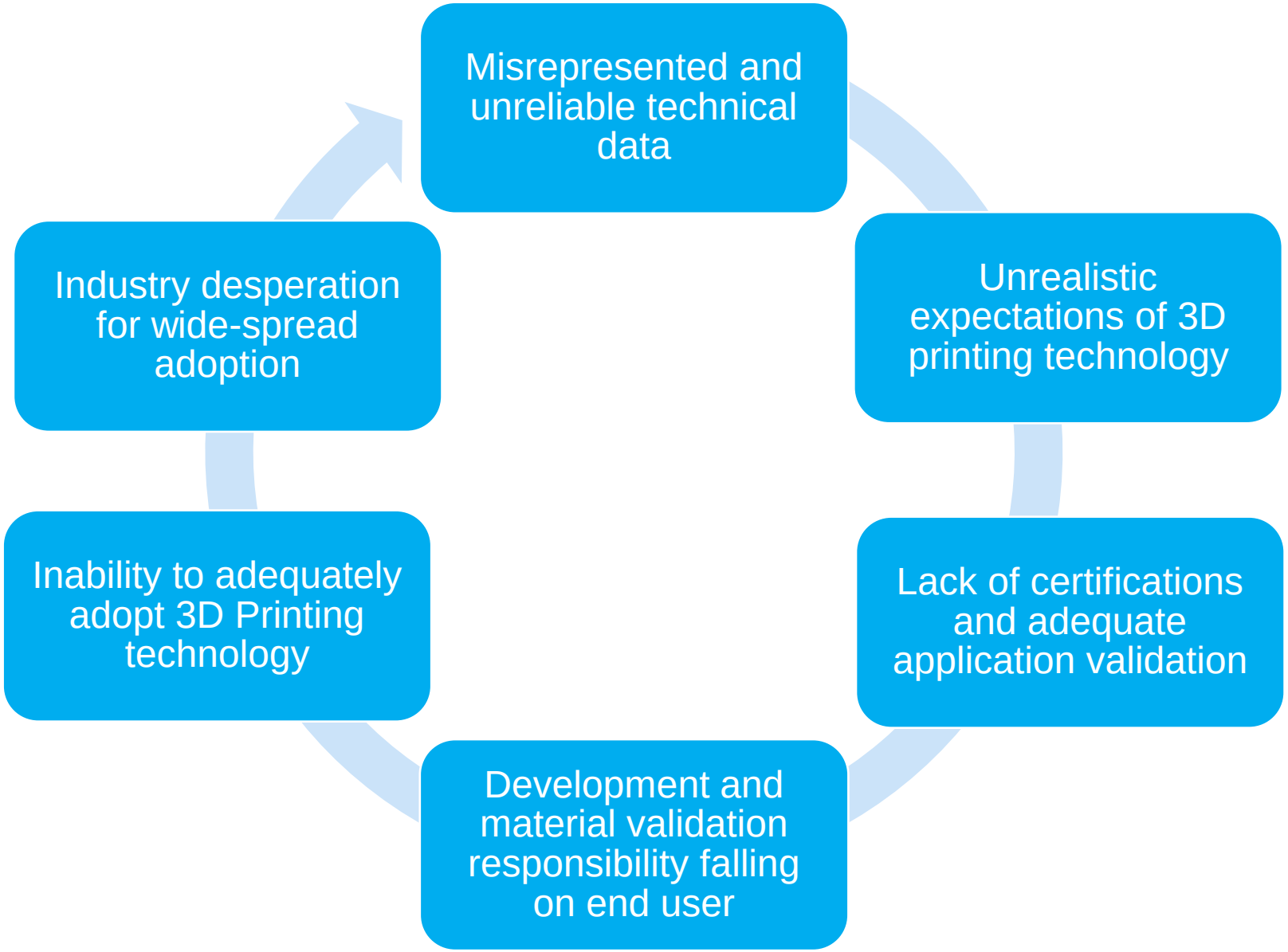
Supplier TDS

Mechanical Properties	Metric	Imperial
Tensile Modulus	7 400 MPa	1,074 ksi
Tensile Strength (Yield)	102 MPa	14,800 psi
Tensile Strength (Break)	102 MPa	14,800 psi
Elongation (Break)	2.1 %	2.1 %

MH Extended Data

Orientation	Mechanical Properties	Metric	Imperial
Printed Flat - 0 °	Tensile @ Max	100 MPa	14502 psi
	Tensile @ Yield	100 MPa	14502 psi
	Tensile Modulus	6205 MPa	900 kpi
	Elongation @ Max (%)	2.6%	2.6%
Printed 30 °	Tensile @ Max	19.8 MPa	2876 psi
	Tensile @ Yield	18.7 MPa	2713 psi
	Tensile Modulus	972 MPa	141 psi
	Elongation @ Max (%)	8.5%	8.5%
Printed 60 °	Tensile @ Max	335 MPa	4858 psi
	Tensile @ Yield	31.7 MPa	4600 psi
	Tensile Modulus	3282 MPa	476 ksi
	Elongation @ Max (%)	4%	4%
Printed Vertical - 90 °	Tensile @ Max	23.8 MPa	3456 psi
	Tensile @ Yield	21.7 MPa	3143 psi
	Tensile Modulus	2220 MPa	322 ksi
	Elongation @ Max (%)	2.8%	2.8%

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

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Industry Responsibility

Misinformation harms adoption

Adequate testing standards are required

Educate for realistic expectations

Closed platform can’t compete; Open up materials platforms

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Questions?

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