

Scaling Up of 3D Printed Castings

ATI Project Manager:

Nick Laney

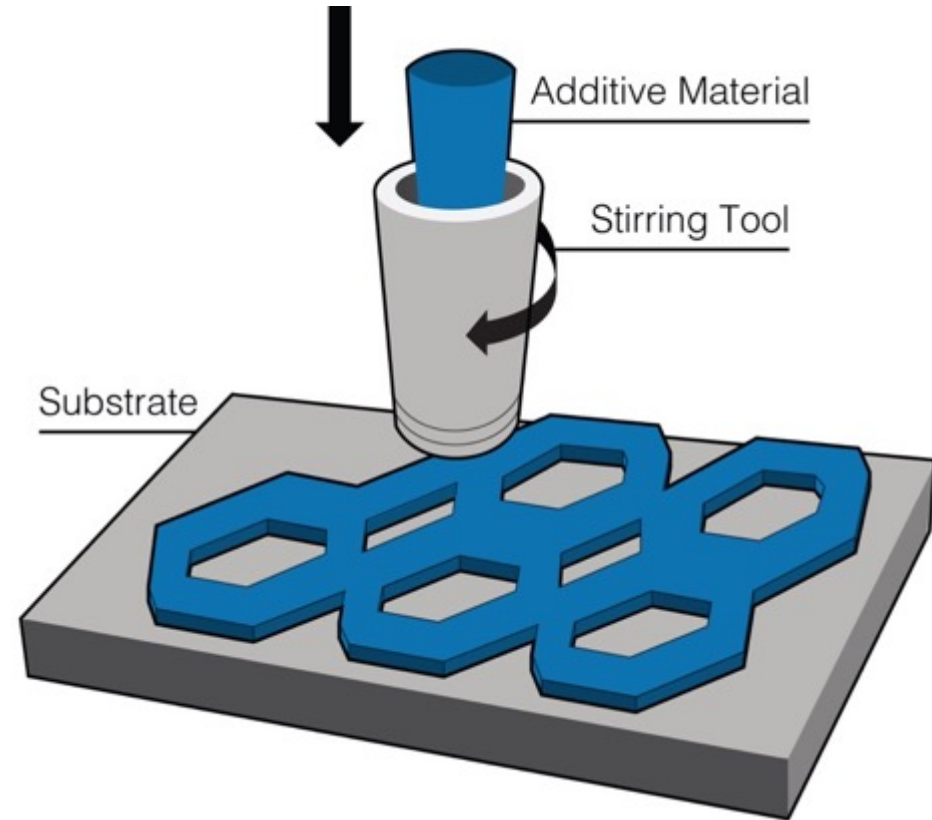
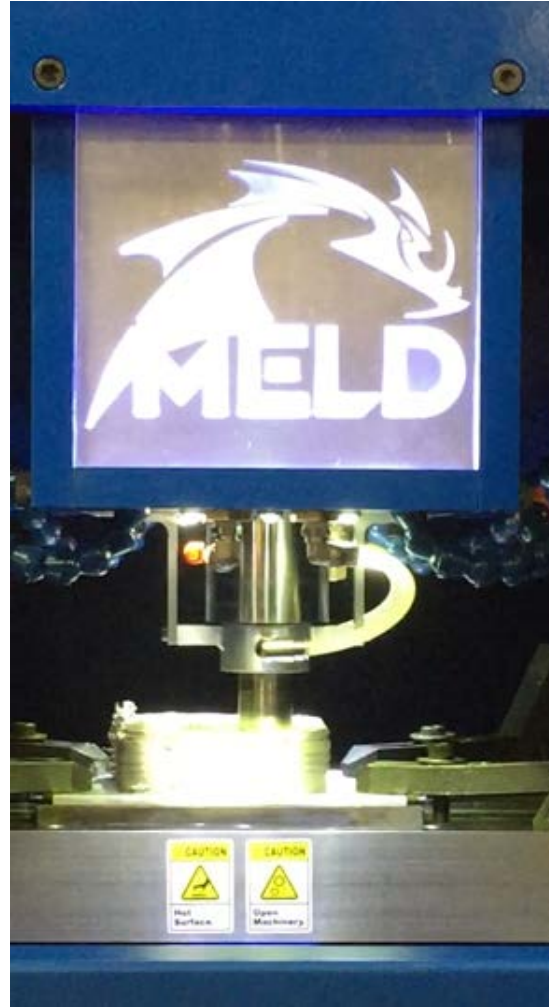
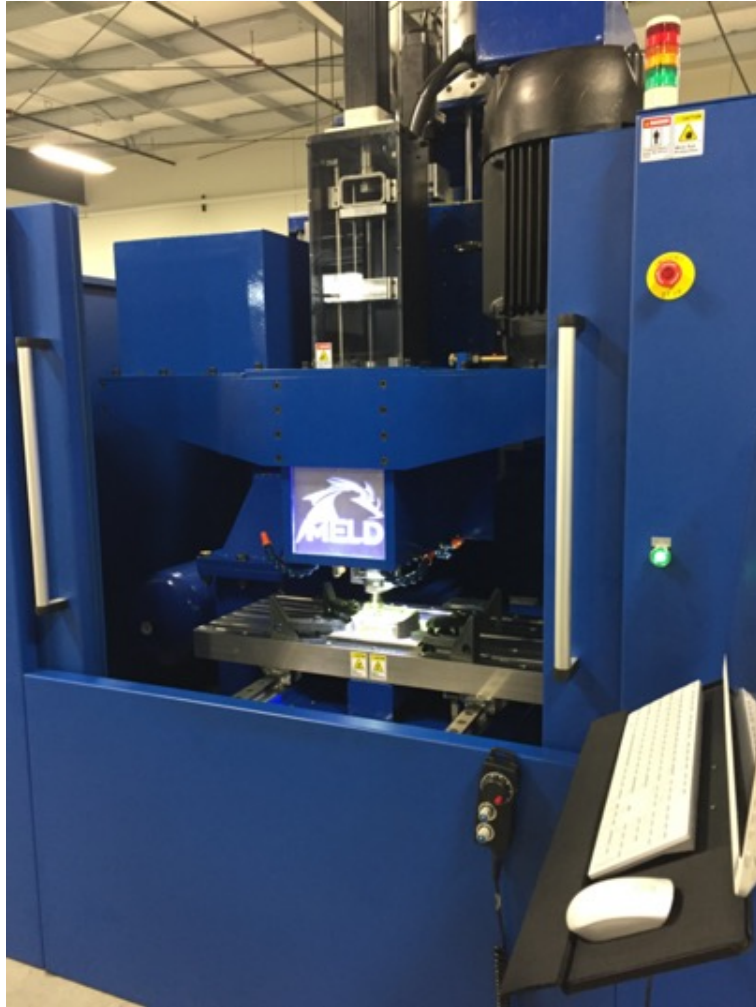
Program Technical Representative: Alicia Harmon (HII-Newport News)

10/29/2020

NSRP SDMT Meeting



Deposit at a Higher Rate



https://www.youtube.com/watch?v=-u1NOkzeVpY&feature=emb_logo

Deposit at a Higher Rate

The project goals are to:

- To deposit material at a higher rate
- Demonstrate printing capability in aluminum to keep costs down
- Identify potential nozzle head materials that can be procured and tested for longevity in a future project.

The objective is to:

- Assess feasibility and potential for scaling up the technology to increase the scale of printed castings.

Original Project Task Schedule

Task	Q1 - 3/1	Q2 - 6/1	Q3 - 9/1	Q4 - 12/1
Project Setup and Kickoff Meeting	█			
Printed Part Selection	█			
Stirring Tool Modification		█		
Stirring Tool Manufacturing			█	
Stirring Tool Testing			█	█
Conduct Test Program			█	█
Review and Document Testing				█
Prepare Final Project Report				█
Quarterly Status Reports	█	█	█	█

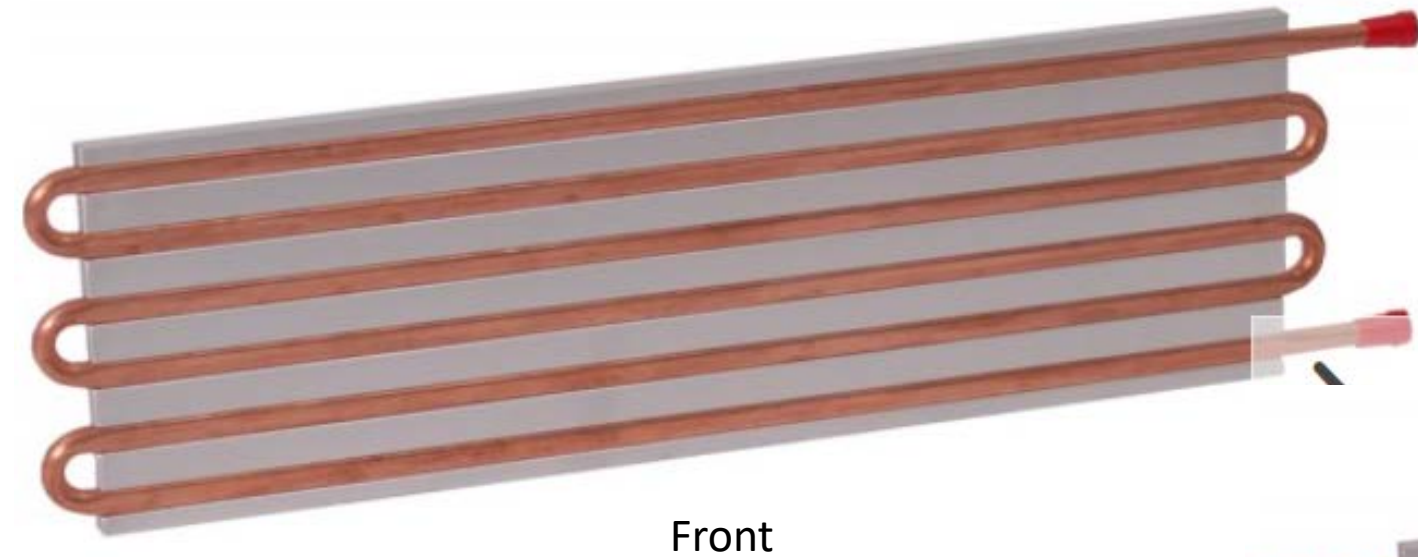
Current Project Task Schedule

Task		Q1 - 3/1	Q2 - 6/1	Q3 - 9/1	Q4 - 12/1
Project Setup and Kickoff Meeting	Complete ✓				
Printed Part Selection	Complete ✓				
Stirring Tool Modification	Complete ✓				
Stirring Tool Manufacturing	Complete ✓				
Stirring Tool Testing	Complete ✓				
Conduct Test Program	In progress. Parts scheduled for 11/30 completion				
Review and Document Testing	In progress. Scheduled for 11/30 completion				
Prepare Final Project Report	Not started. Scheduled for 11/30 completion				
Quarterly Status Reports					

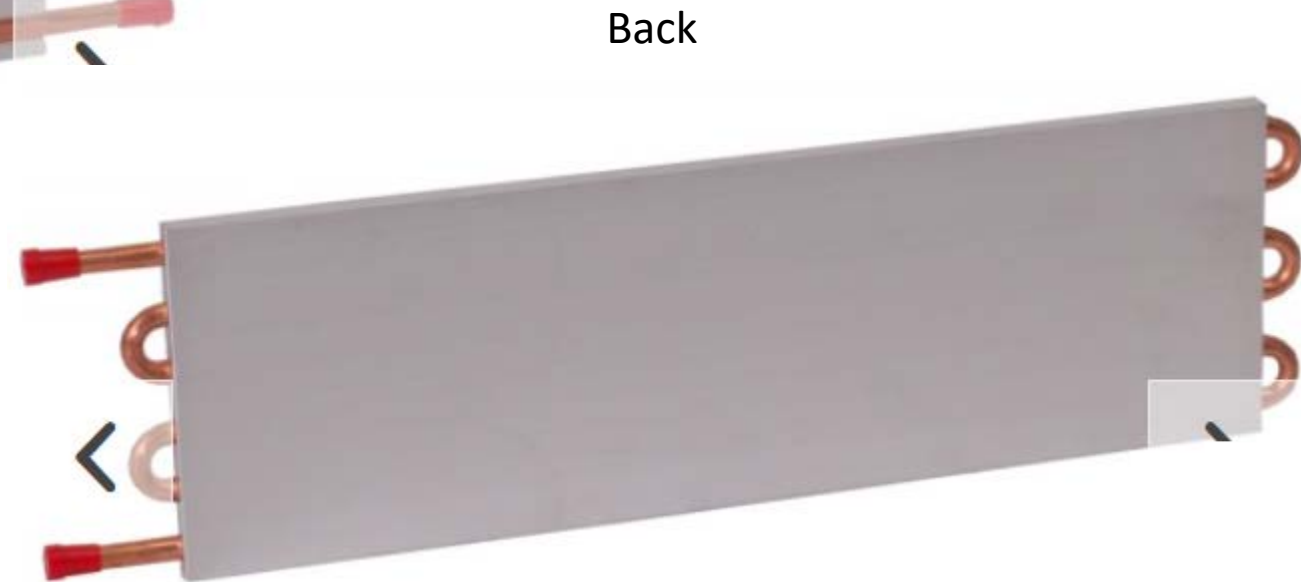
Deposit at a Higher Rate

- Project Setup and Kickoff Meeting
 - Determine SOW
 - Develop Schedule
 - Hold Kickoff Meeting
- Determine Part to be Printed
 - Conduct Survey or Submit Candidates to be printed (including dimensions)
- Stirring Tool Modification
 - Larger opening for increased deposition rate
- Stirring Tool Manufacturing
 - Fabricating nozzle head from 'tool steel'
- Stirring Tool Testing
 - Ensure fabricated stirring tool prints under normal operating conditions
- Conduct Test Program
 - Test for increased deposition rate
 - Possibly test metallurgical properties
 - Create final part
- Review and Document Testing
 - Review Deposition Rate
 - Document Nozzle Performance Results
- Prepare Final Project Report
 - Collectively combine all reporting MELD has conducted into final report format
- Quarterly Status Reports

EB Part Candidate - Flat Copper Tube Cold Plate



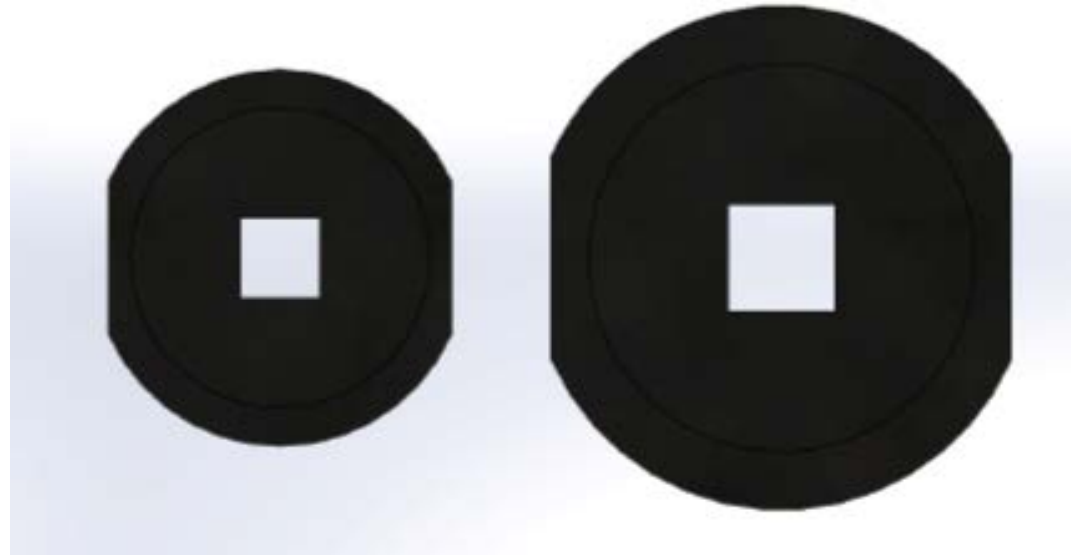
Front



Back

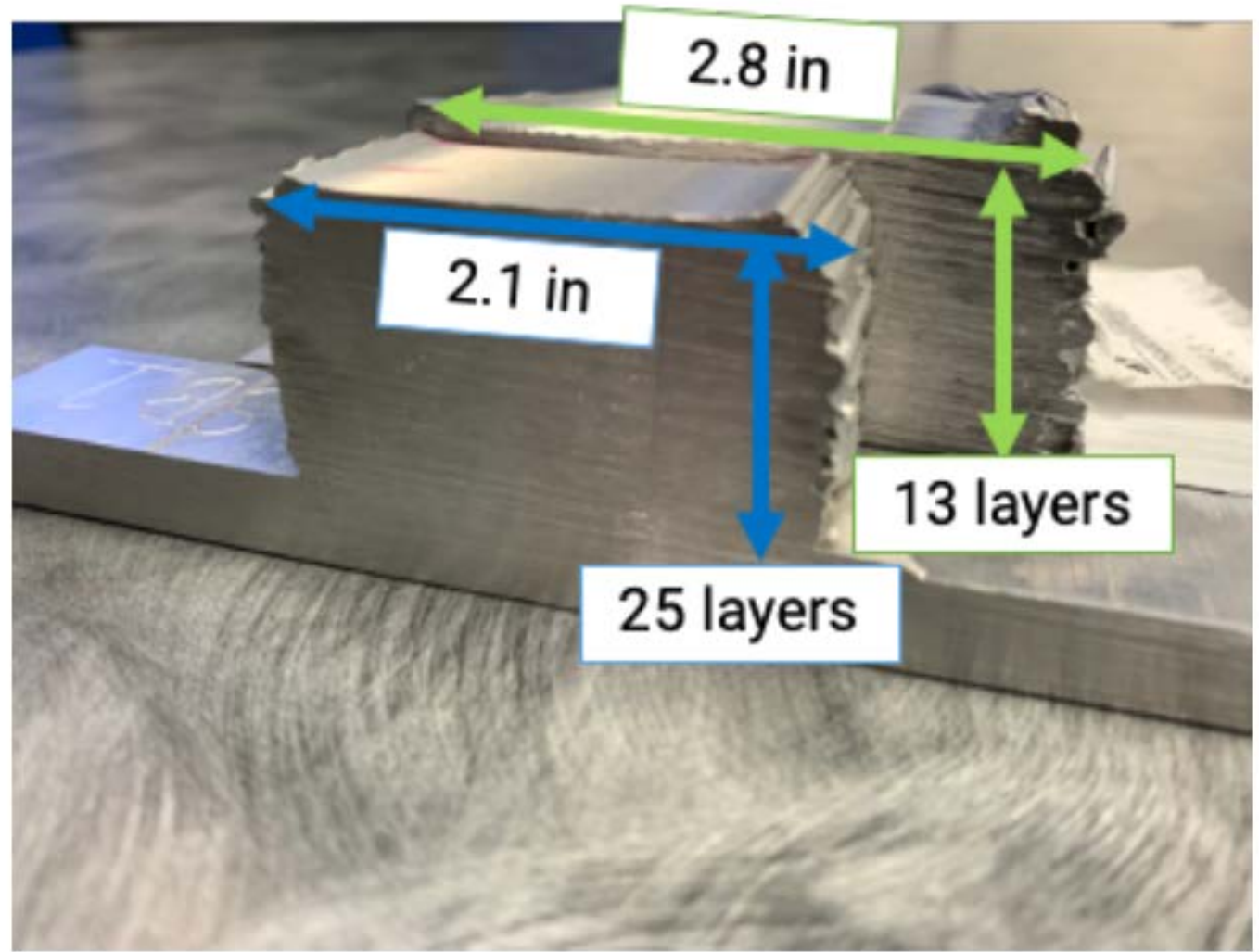
Increasing Deposition Rate

- Larger Tool/Nozzle
 - More usable material per tool mass
- Larger Feedstock
 - More depositable material available per tool/nozzle

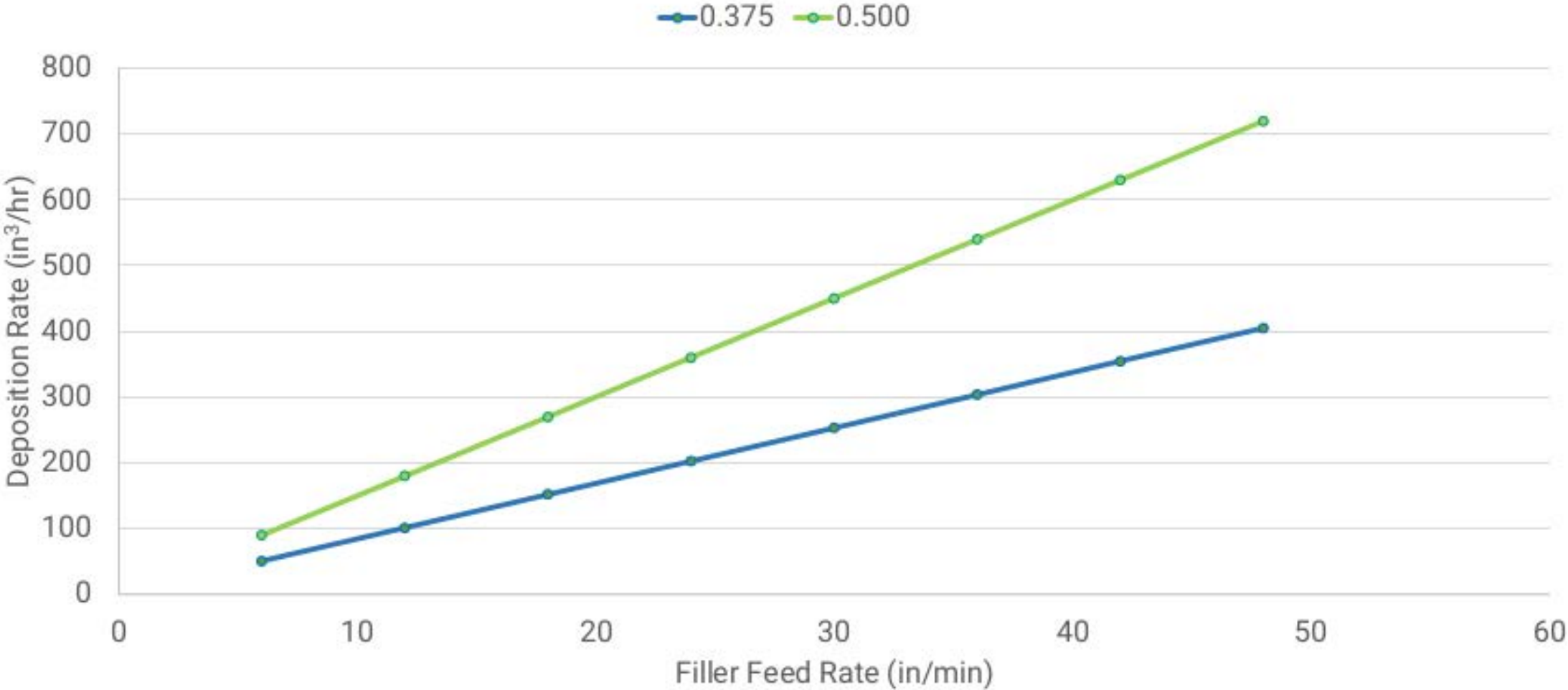


Printing Results

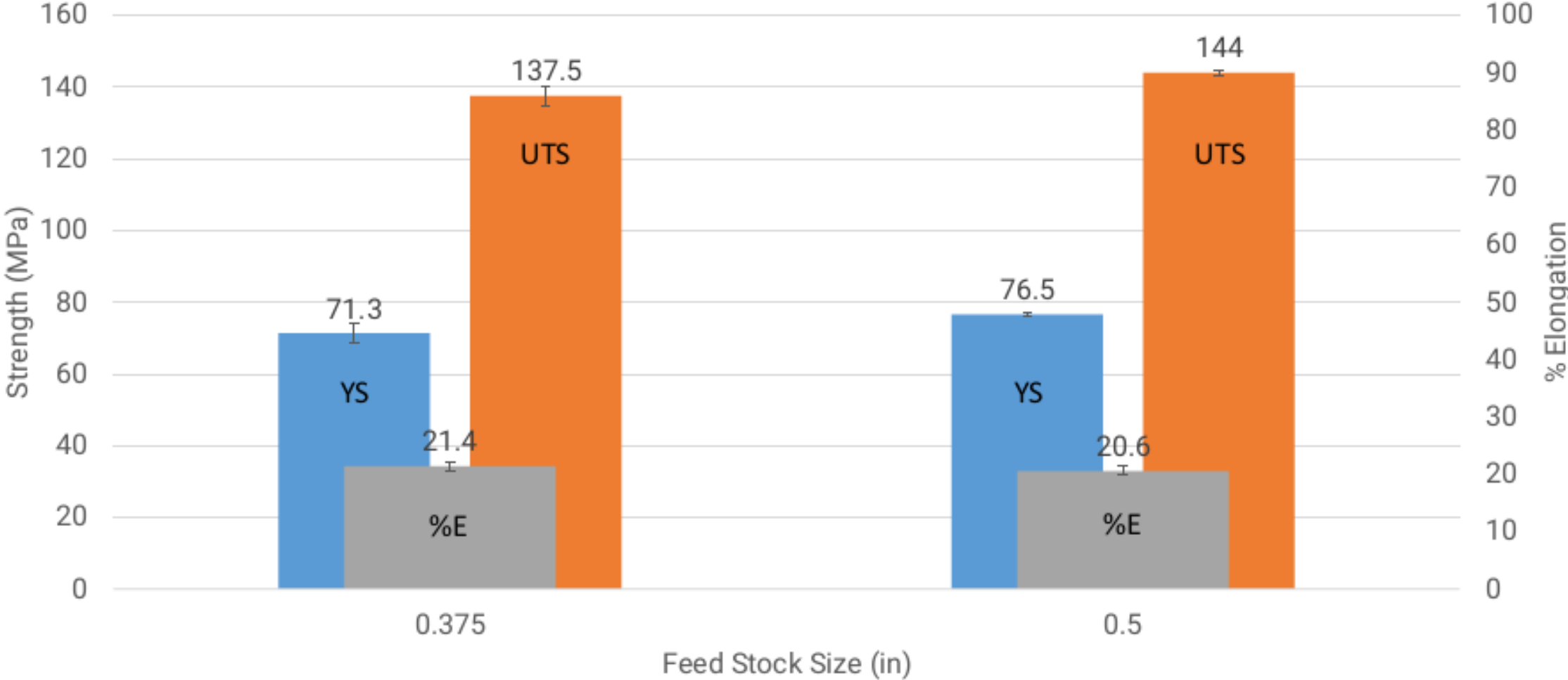
- Layers
 - Halved the number of layers per build
- Deposition Track
 - 33% wider deposition track
- Deposition Rate
 - Increased from 50.6 to $180 \frac{\text{in}^3}{\text{hr}}$



Deposition Rate Comparison



Quality Testing: Mechanical Properties



Reported properties taken in z axis (short transverse)

Printing Results

- Demonstration part has been selected
- Al1100 material has been ordered and arrived in October
- Parts will be printed and delivered NLT November 30th
- Material testing to occur between November and December

Questions?

