

Annual Additive Post-Printing Survey: Trends Report 2021

ANNUAL EDITION 2021

POSTPROCESS

INTRODUCTION

The third year of the Annual Additive Manufacturing Post-Printing Trends Report recorded a doubling in the number of participants, mirroring the exciting growth of the industry's interest in the post-printing segment. As many companies look to increase their use of additive manufacturing (AM) prompted by COVID-19 learnings, the awareness of the criticality of the post-print step to meet the needs of the growing market has been further heightened.

Our goal in surveying the market and assembling this data is to help make clear the path towards a successful future for AM by recognizing the downfalls and opportunities when it comes to post-printing. Whether new to AM or many years in, we hope that readers will find helpful takeaways that they can utilize for their own business planning.

This year's report provides new insights and angles but also confirms some of the most insightful learnings from last year's edition. The verification of these key points when looking at the data year over year with an expanded respondent pool is further confirmation of validity of the report.

Thanks to everyone who took the time to share their valuable insights and opinions to compile this one-of-a-kind transcript.



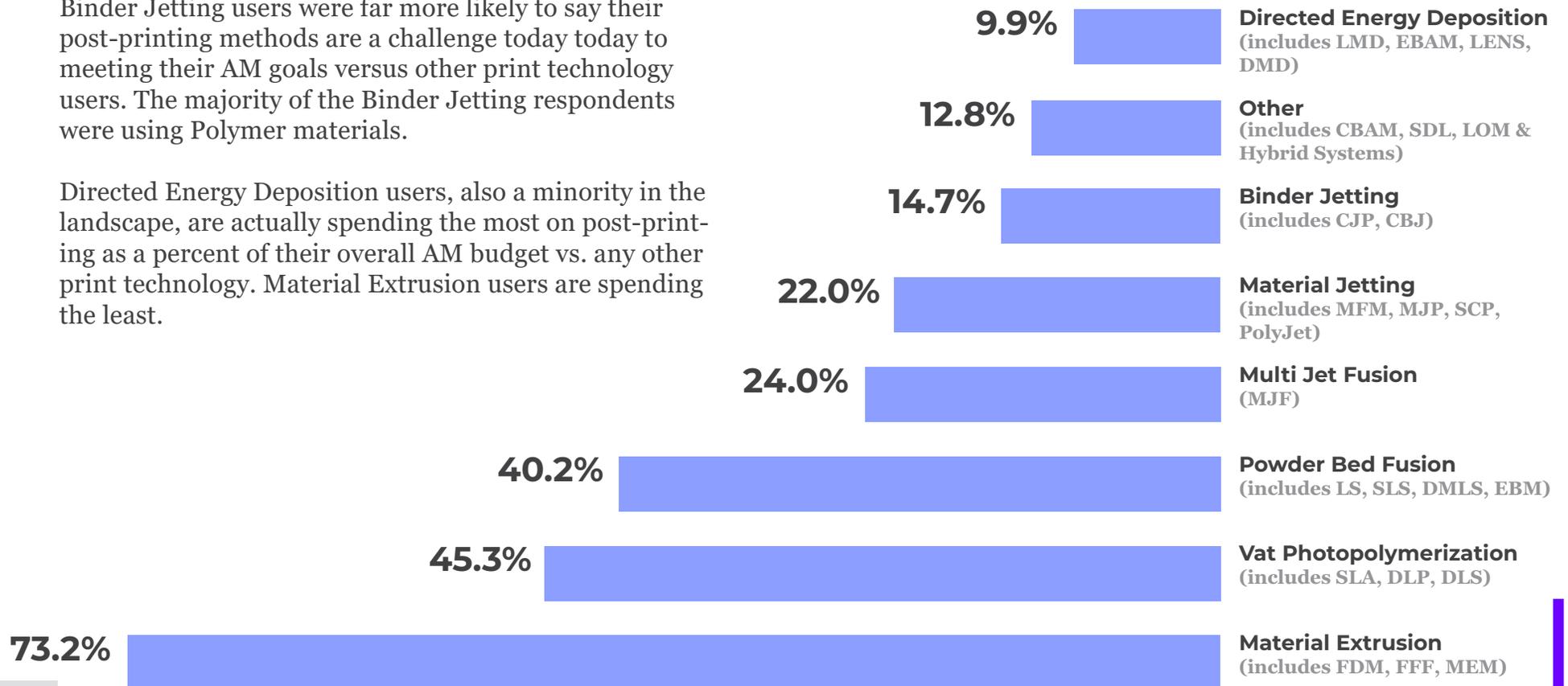
PRINT TECHNOLOGY TRENDS

Our respondents' print technologies usage trending is steady year over year, with Material Extrusion, Vat Photopolymerization, and Powder Bed Fusion in the 1, 2, and 3 positions, respectively again.

As a preview to additional survey questions discussed in forthcoming pages, trends specific to print technologies reveal:

While representing a smaller portion of the respondents, Binder Jetting users were far more likely to say their post-printing methods are a challenge today to meeting their AM goals versus other print technology users. The majority of the Binder Jetting respondents were using Polymer materials.

Directed Energy Deposition users, also a minority in the landscape, are actually spending the most on post-printing as a percent of their overall AM budget vs. any other print technology. Material Extrusion users are spending the least.

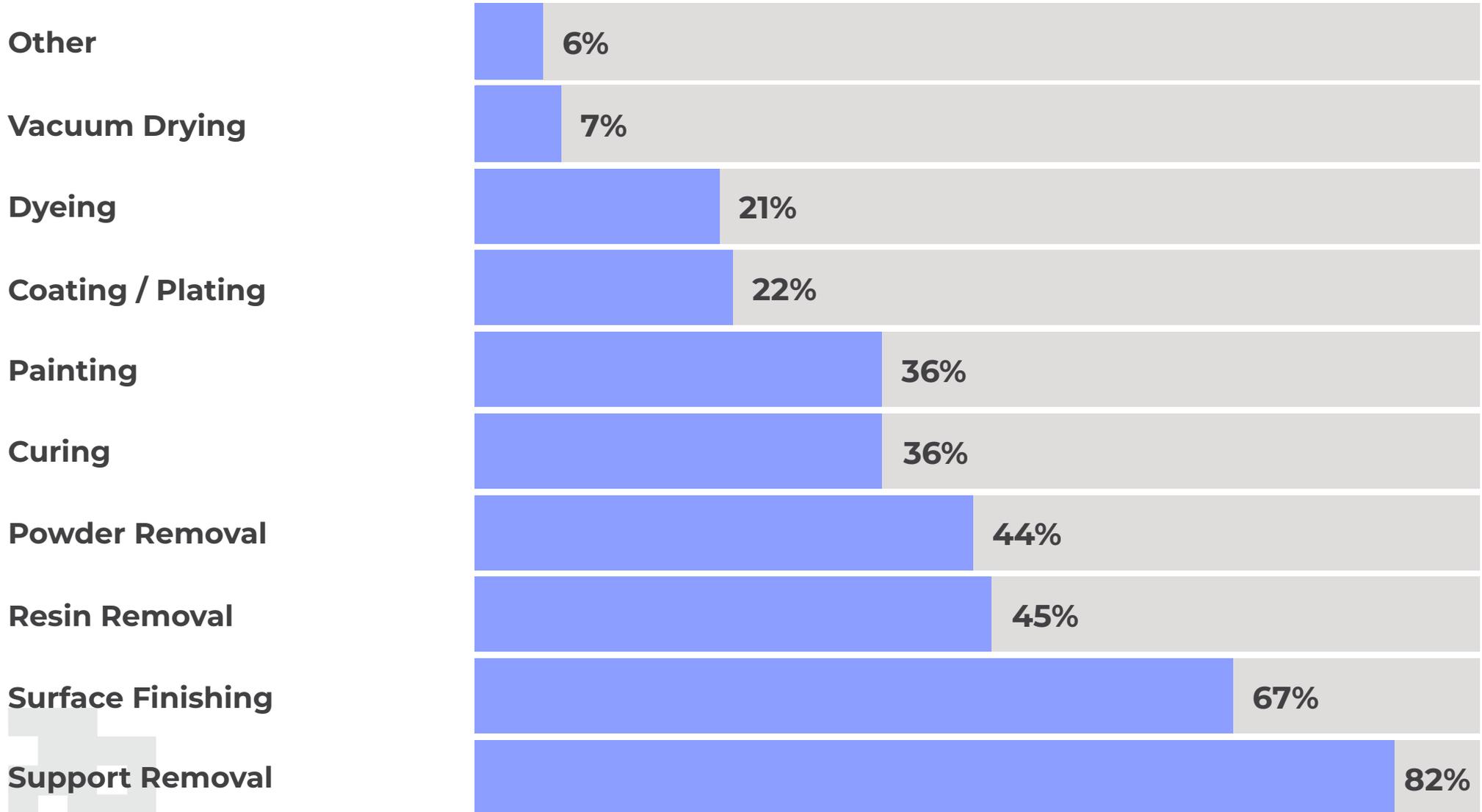


POST-PRINTING METHOD TRENDS

In line with the most utilized print technologies shown on the prior chart, removal processes for support, resin and powder are still reported by respondents as the most common operations. As a preview to additional survey questions discussed in forthcoming pages, trends specific to post-print methods reveal:

Users performing Powder Removal and Dyeing most indicate that their methods used today are an inhibitor to achieving their AM goals.

Of the top 5 methods being used, respondents who must perform Powder Removal processes are spending the most on post-printing as a percent of their overall AM budget.

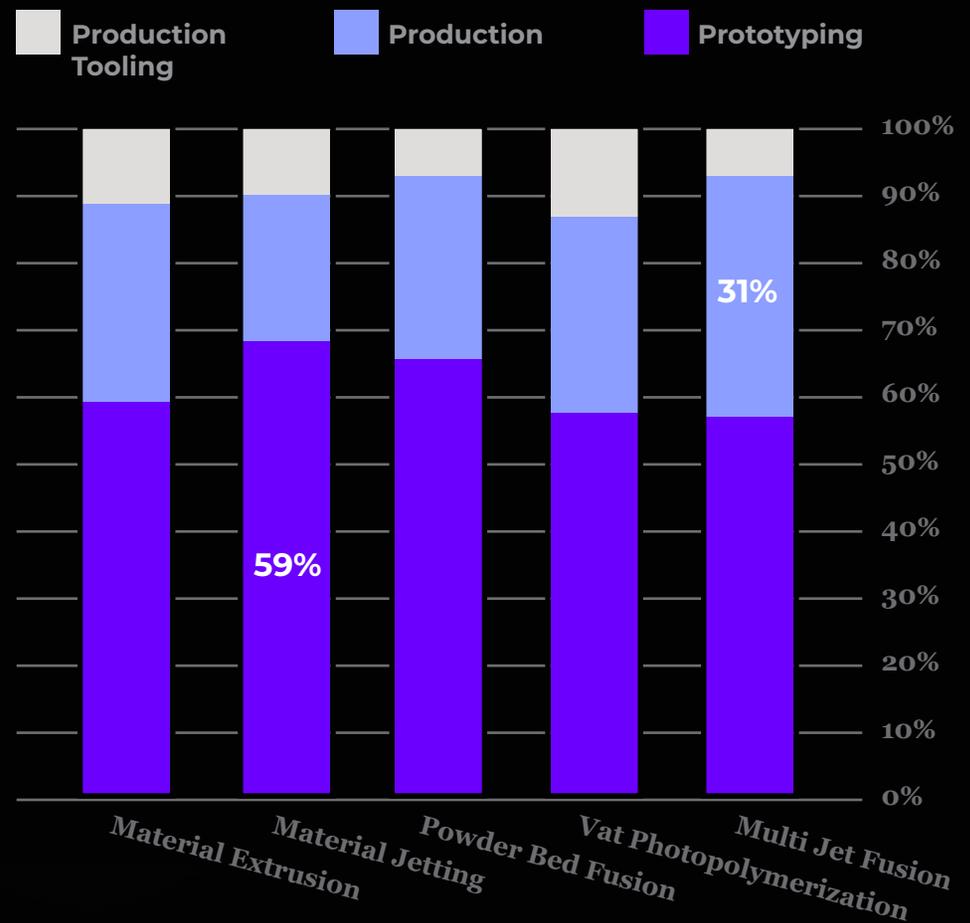


PRODUCTION VS. PROTOTYPING TRENDS

Focusing in on the top five print technologies, which make up more than 80% of total respondents:

Multi Jet Fusion (MJF) users report the highest percentage of their operations using additive for Production at 31%. However, post-printing methods are of a concern for the ability to continue to scale. Less than 18% of MJF users say their current post-printing methods are acceptable for today and the near future, which is the lowest of all five print technologies.

Material Jetting (MJ) users are leading the Prototyping usage category. MJ users are one of the top reporting Length of Time to Finish Parts as its #1 pain point. The ability for the market to continue to grow into Rapid Prototyping applications will require addressing this obstacle.

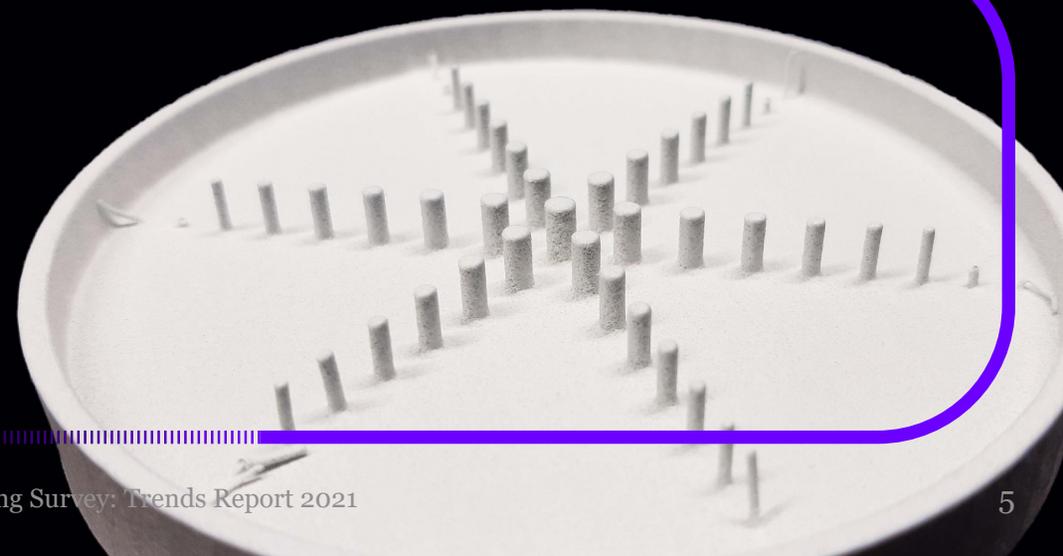
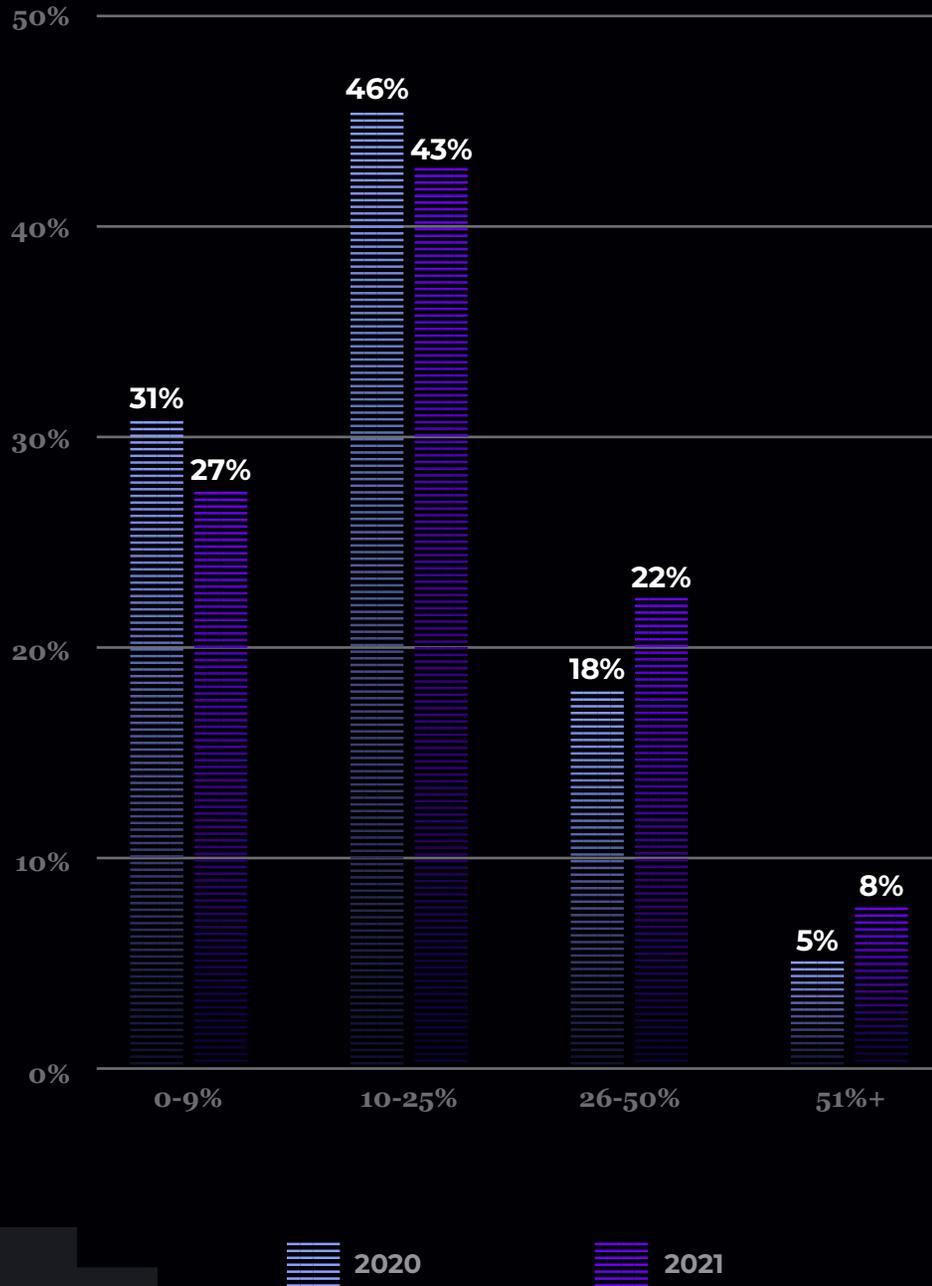


POST-PRINTING EXPENDITURES

Post-Printing as a portion of additive manufacturing operational expenditure has trended up year over year. Respondents who said they spend greater than 26% of their overall budget increased from 23% of all respondents in 2020 to 30% in 2021.

The percentage of respondents who do not know how much they spend on post-printing stayed consistent with last year at near 20%.

Also consistent with last year, respondents in the Automotive market reported post-print expenditures highest of the top 5 markets, with nearly 50% saying they are spending 26% or more of their budget on post-printing.



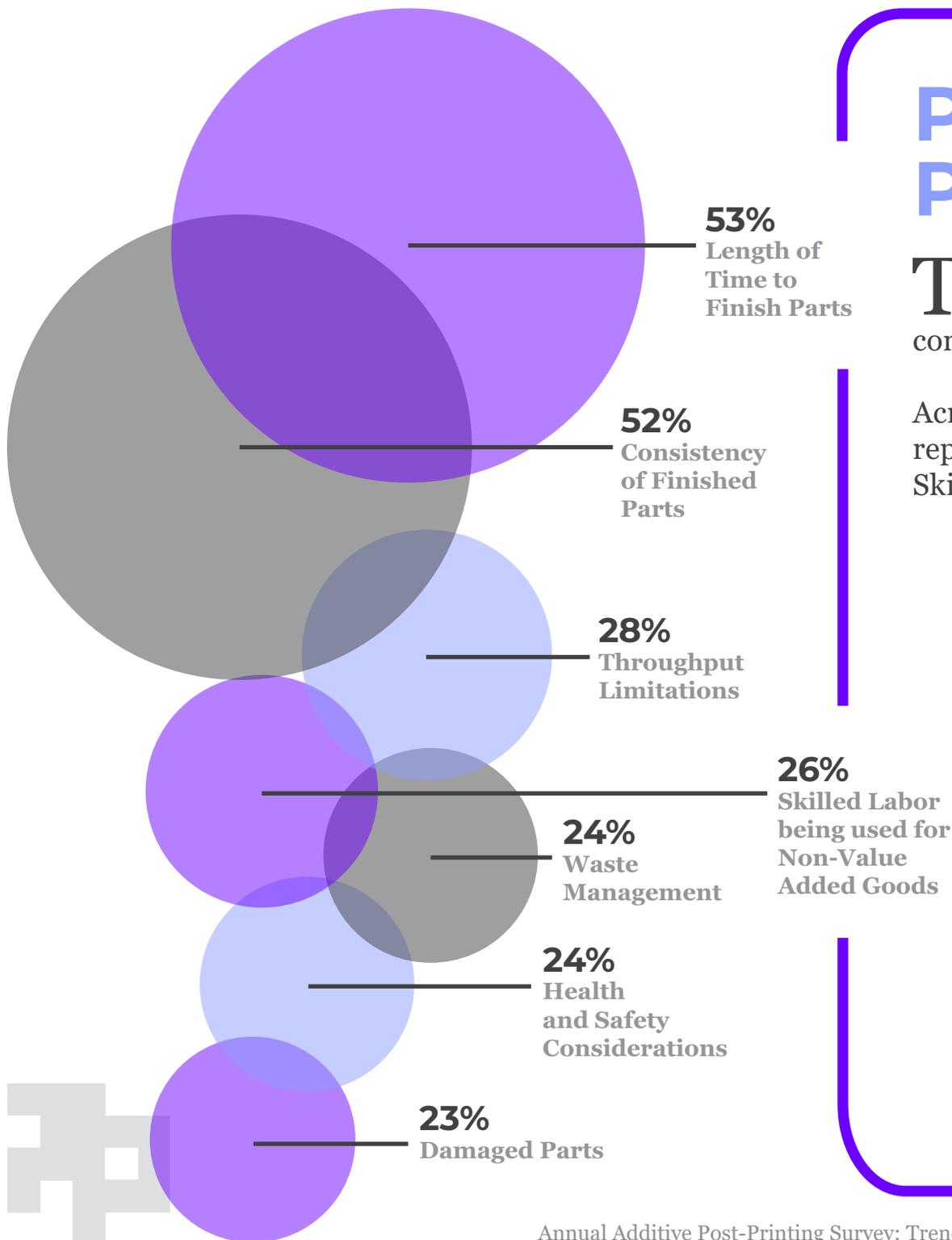
POST-PRINTING PAIN POINTS

The top 3 post-print pain points reported by additive manufacturing users were consistent year over year.

Across all remaining categories, percentages reported increased, most significantly for the Skilled Labor choice.

As reported previously, not only do users performing Power Removal most indicate that their methods today are an inhibitor and their spending the most on post-printing as a percent of their overall budget, they also represent the highest percentage of pain points reported in the top 3 categories.

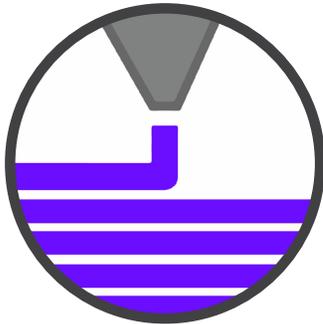
Users in Resin Removal reported the most concern for the two HSE choices (Waste Management and Healthy & Safety Consideration).



KEY TAKEAWAYS: TOP 3 PRINT TECHNOLOGIES

Let's explore highlights for respondents who said one of these technologies was their top printing method used...

Material Extrusion



With no change versus last year, this group's top 3 pain points continue to be:

- Consistency
- Length of Time to Finish Parts
- Damaged Parts

Material Extrusion users are reporting the most pain points overall, with every category selected by users.

VAT Photopolymerization



Resin-based print users' top pain points changed dramatically year over year, from:

2020

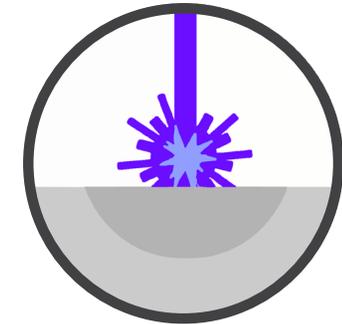
- Labor
- Damaged Parts
- Throughput Limitations

2021

- Health, Safety, Environmental
- Length of Time to Finish Parts
- Consistency

Could this be due to the impact of COVID regarding supply chain constraints and heightened safety awareness with regards to utilization of IPA for resin removal?

Powder Bed Fusion



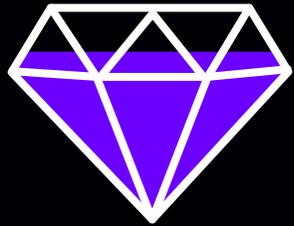
With this group's top 3 pain points as:

- Consistency
- Length of Time to Finish Parts
- Skilled Labor Being Used

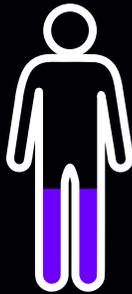
This group indicated Consistency as a pain point at the highest percentage of any pain point for any print technology.

POST-PRINTING INVESTMENTS

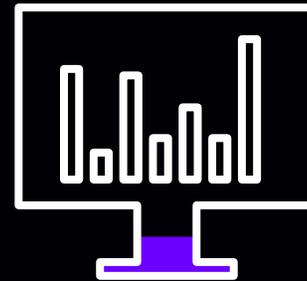
The top 3 areas where AM users would like to invest in to improve their post-printing operations were consistent year over year. The choices centered on investment for the purposes of reduction of or redirection of labor increased the most over last year, as echoed by the data collected on pain points reported previously. This sentiment is likely correlated to the tight labor market experienced in 2021.



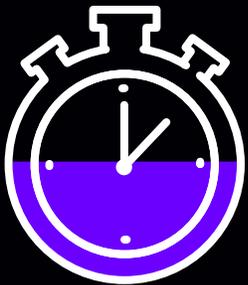
76%
Improving
End Part
Quality



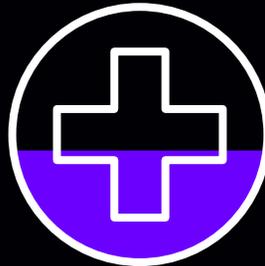
38%
Reducing
Dependency
on Labor



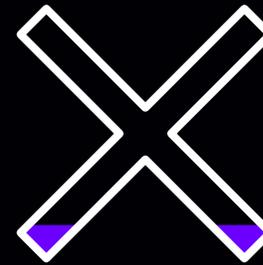
12%
Ensuring a
Connected
/ Software
Enabled
Factory



45%
Reducing
Cycle Time



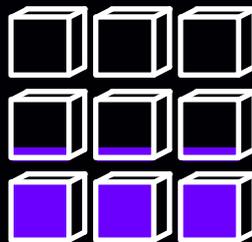
36%
Increasing
Health, Safety
& Sustainability
Operations



8%
Have No Plans
to Invest in
Post-Printing
Operations



38%
Redirecting
Labor to Higher
Value Activities



34%
Increasing
Throughput

REFLECTING ON KEY THEMES IN 2021

HEALTH, SAFETY & SUSTAINABILITY

60% of respondents said they are looking to improve the health, safety, and sustainability of their post-printing operations, consistent with the response from 2020.

VAT Photopolymerization users lead the pack again with respondents who use VAT as their primary print technology being the most concerned with HSE, followed by DED and PBF users.

Material Extrusion users have the most concerns about dealing with Waste Management.



COVID'S IMPACT

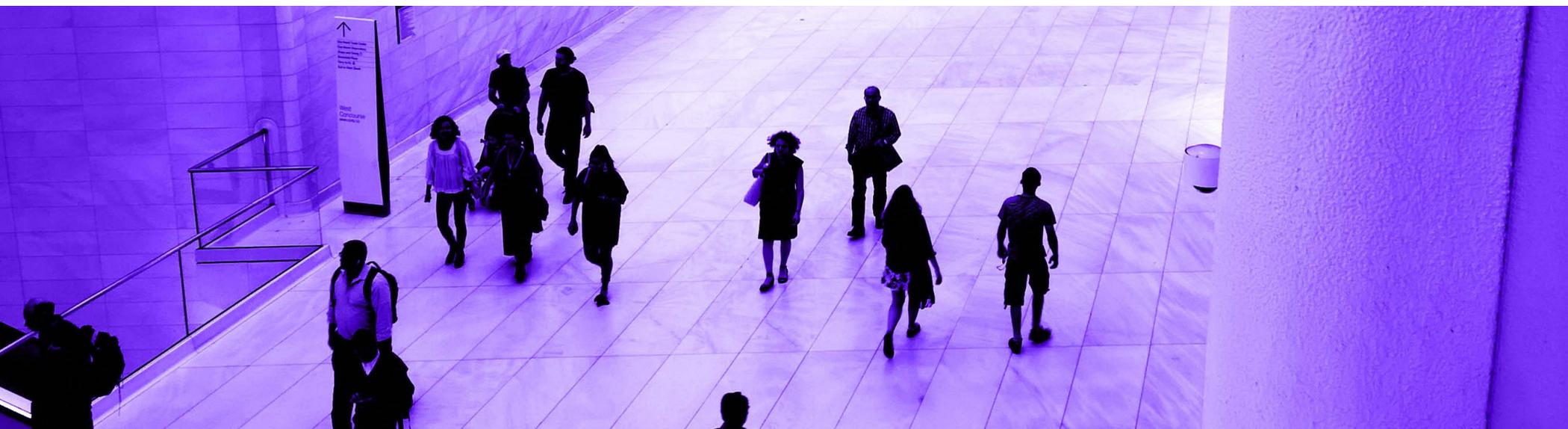
Overall, 32% of respondents indicate they will increase their use of AM after COVID. The majority of these respondents' primary region of operations was Europe.

Of the top 6 industries that our respondents hail from, users in the Job Shop/Contract Manufacturing category indicated significantly more than any other group that COVID will increase their use of AM.

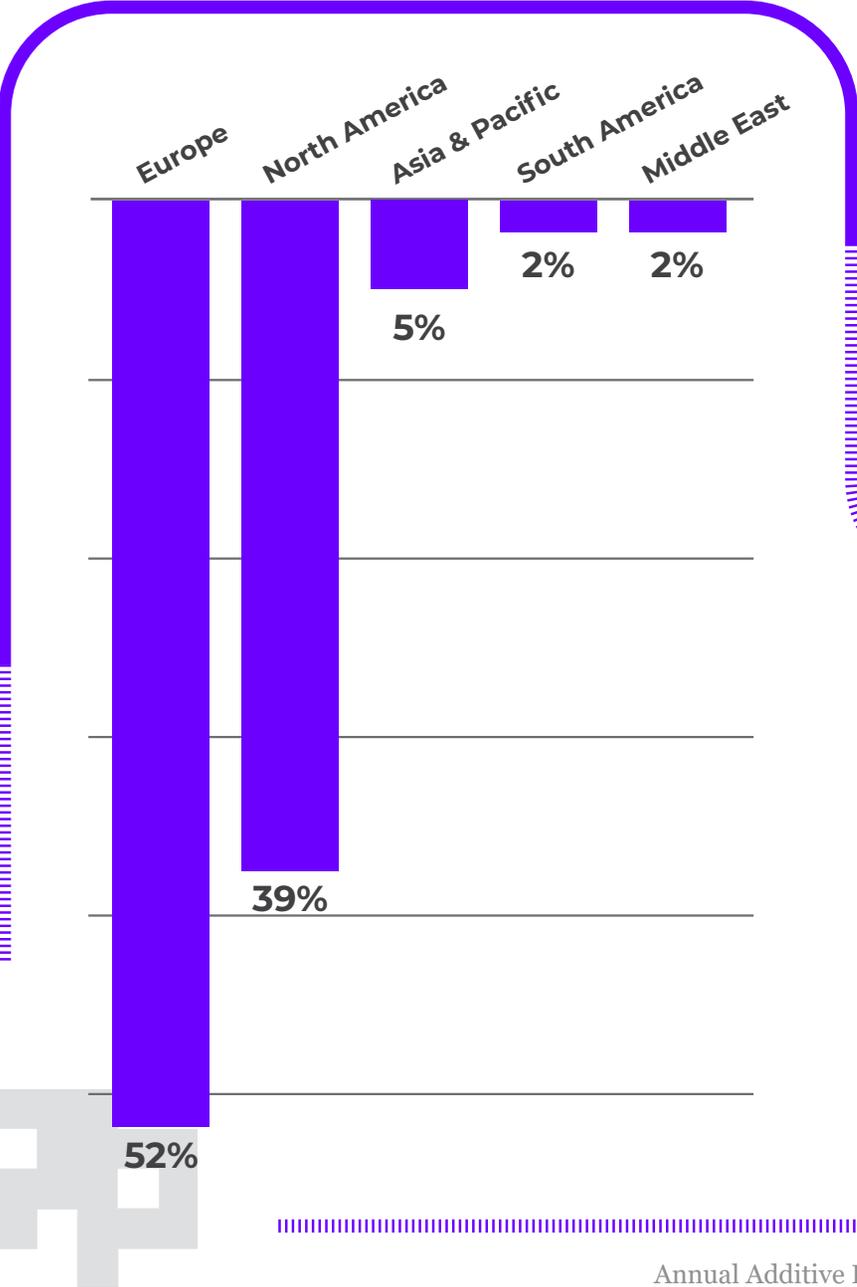
Users of Vat Photopolymerization and Powder Bed Fusion technologies were most likely to increase their use of AM after COVID. Material Jetting users reported the least percentage of increasing their AM usage.



APPENDIX: MEET OUR RESPONDENTS



DEMOGRAPHICS: COMPANIES



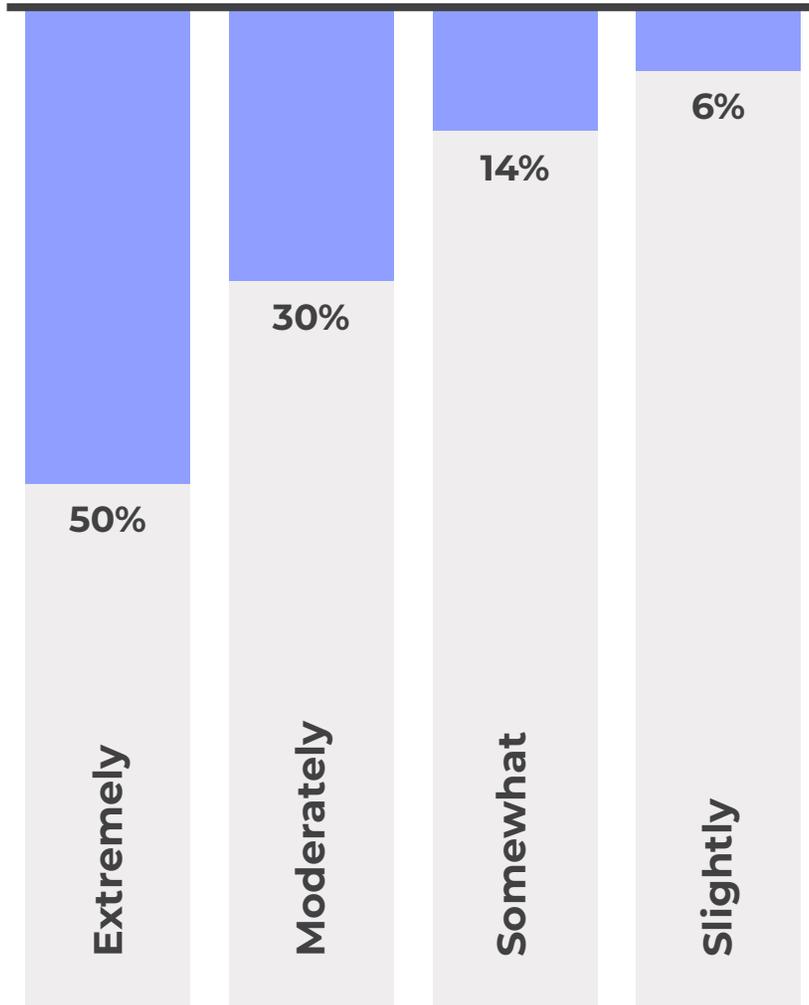
Top 5 Industries of our Respondents:



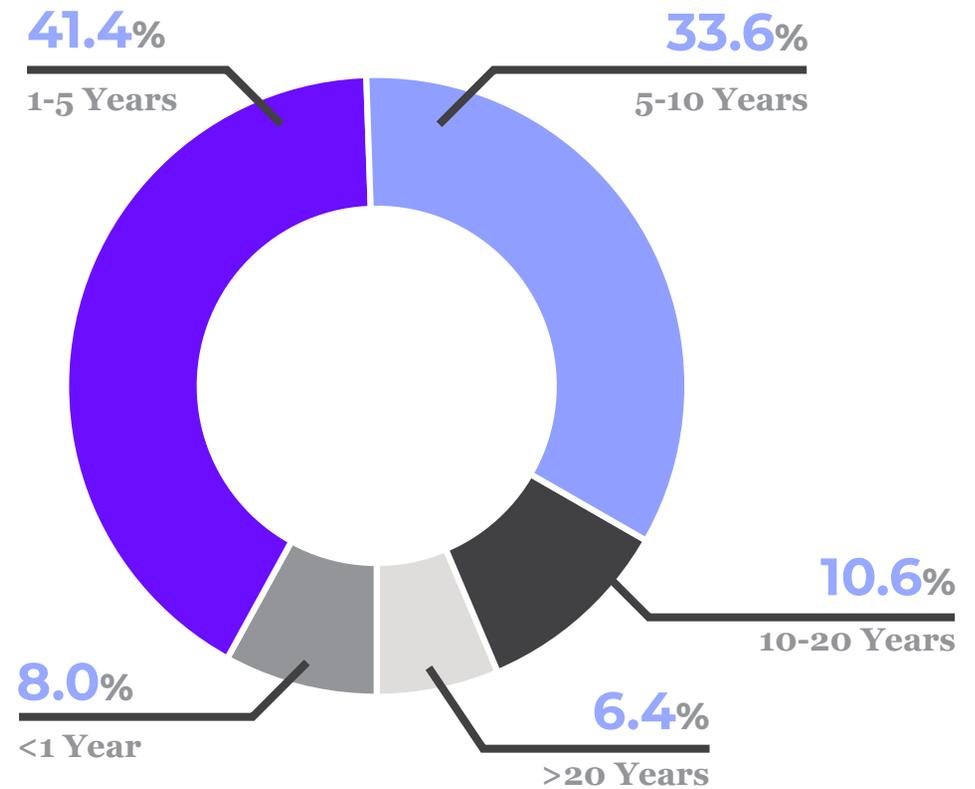
17.2%	Investigating for Use
5.8%	Using for Less Than a Year
12.5%	Using for 1-2 Years
26.5%	Using for 3-5 Years
17.8%	Using for 6-10 Years
20.2%	Using for More Than 10 Years

DEMOGRAPHICS: INDIVIDUALS

How familiar are you with your company's additive manufacturing post-printing methods?



Approximately how many years have you been working with Additive Manufacturing?





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