

## BACKGROUND

- Binder Jetting Additive Manufacturing (BJ-AM) is a method of 3D printing where a binder (glue) is selectively deposited to join powder materials, typically metals. This 3D printing method allows for complex geometries with good properties once sintered but requires de-powdering of loose powders after printing [1].

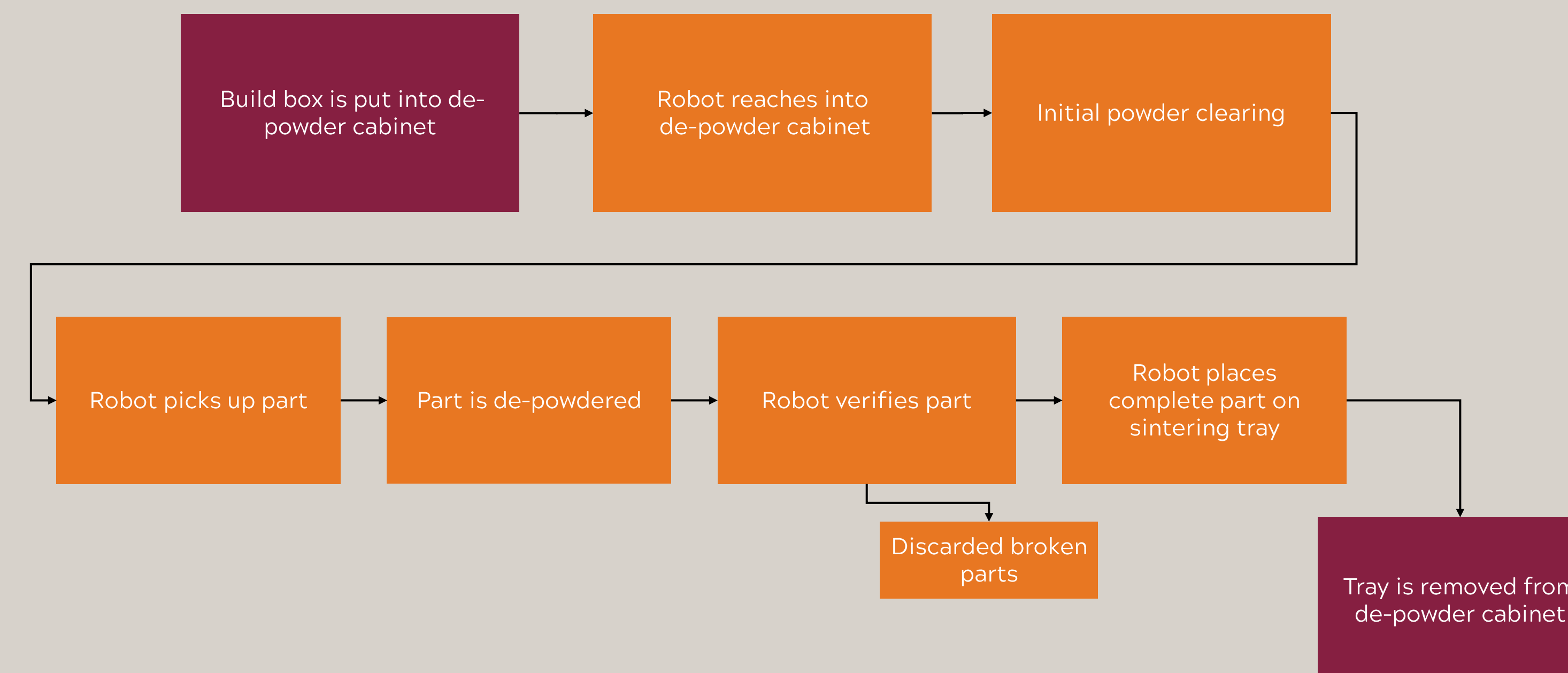


## INTRODUCTION

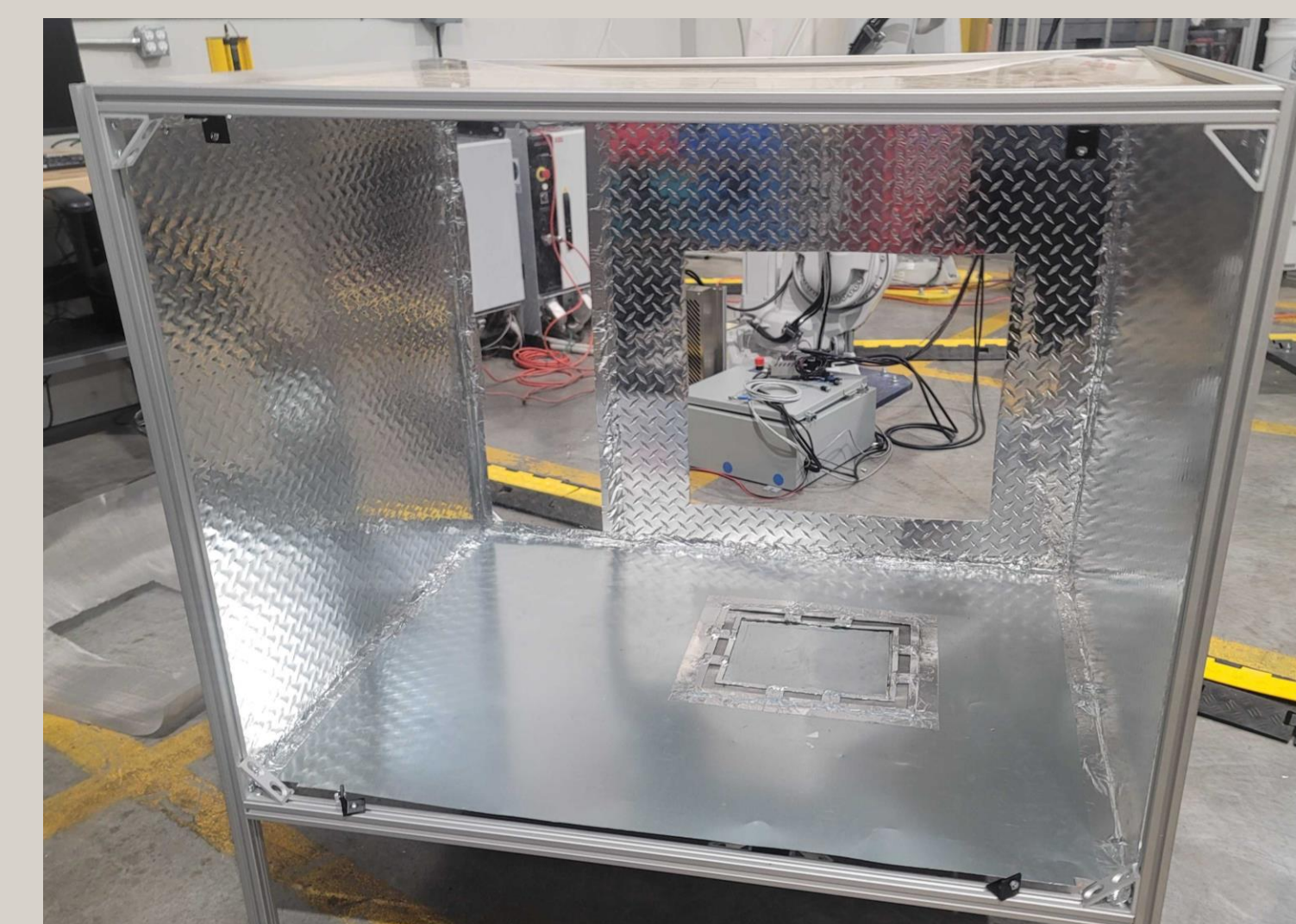
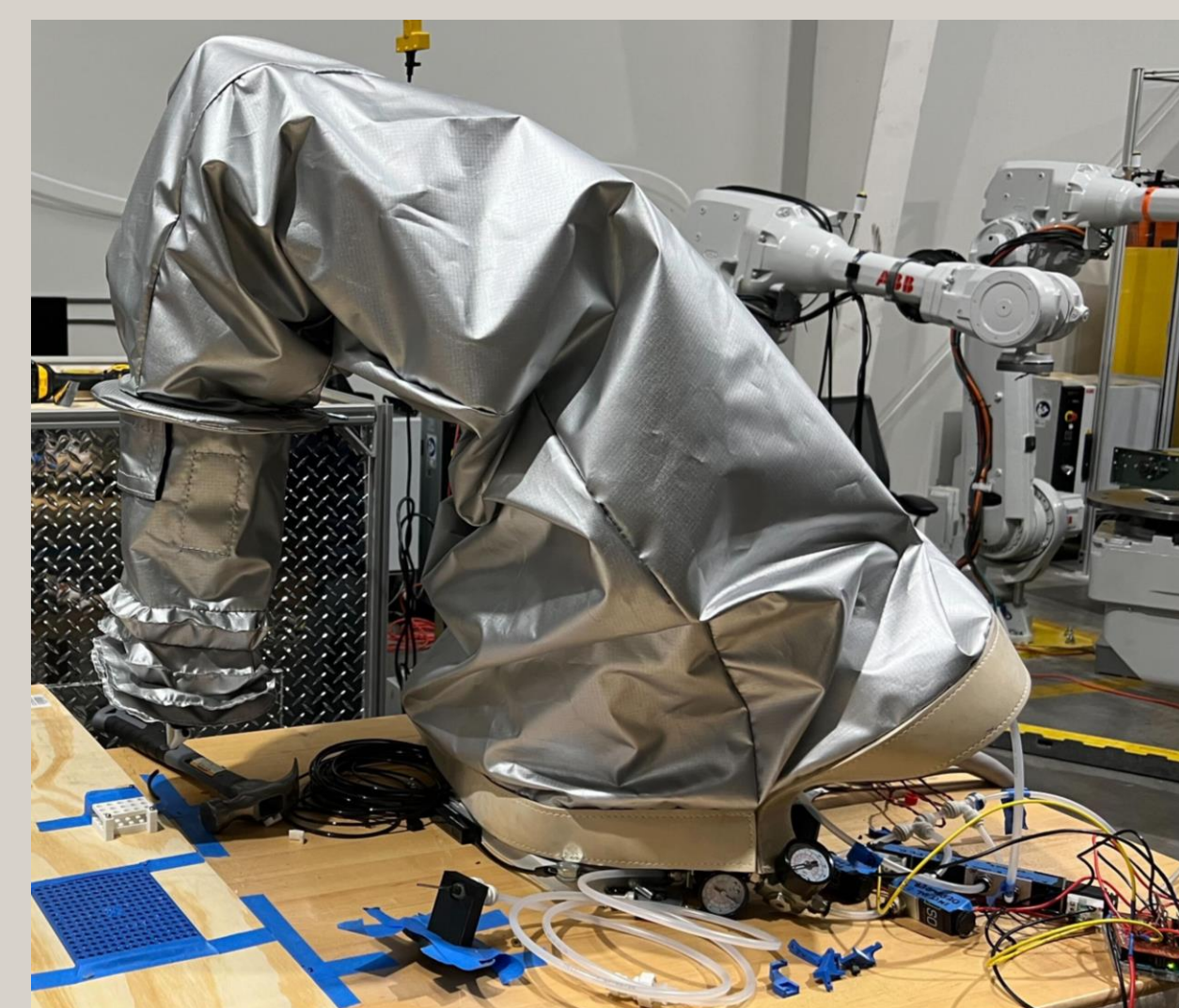
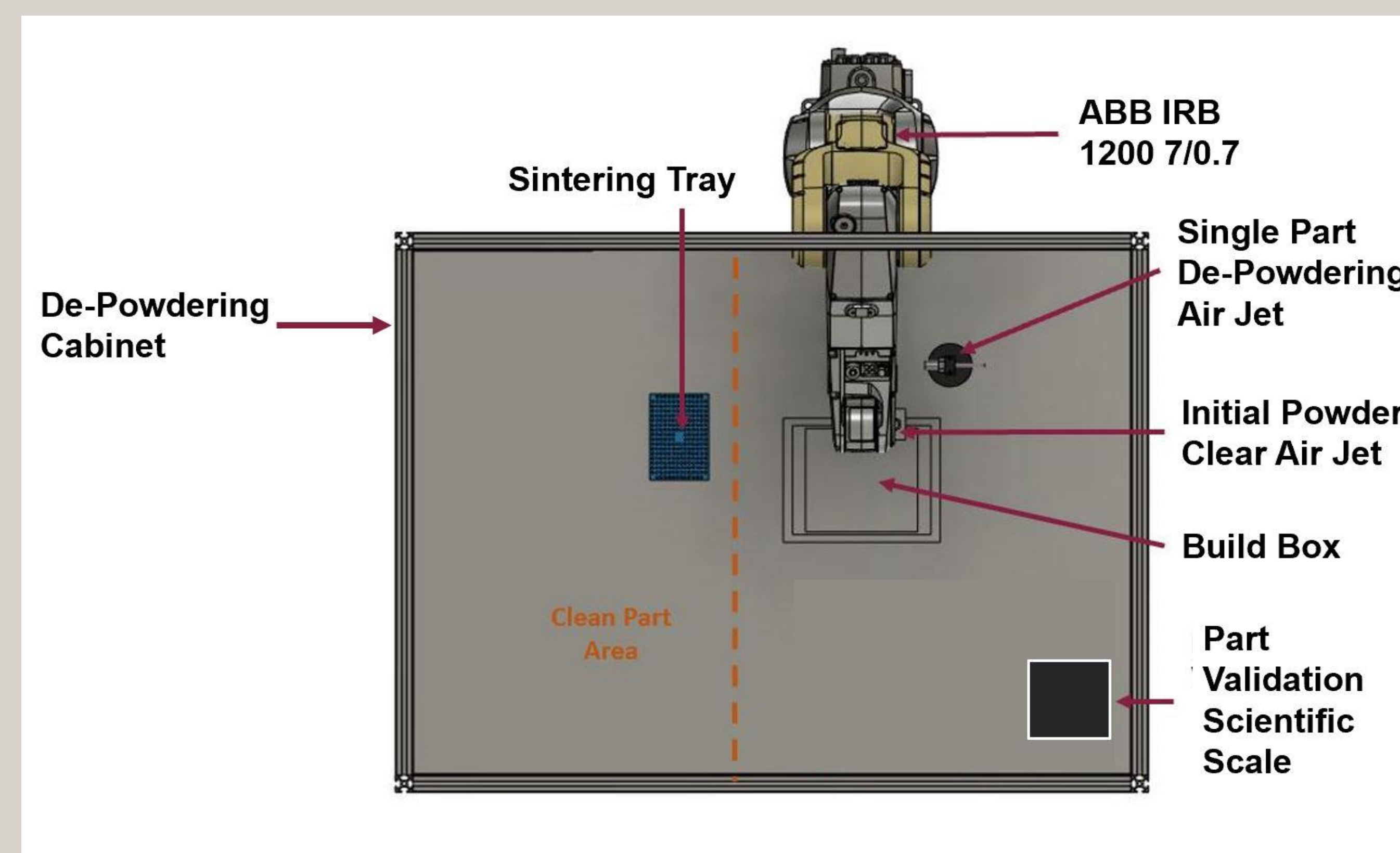
- Binder Jetting Additive Manufacturing (BJ-AM) is currently used by many manufacturers to produce large quantities of small, complex metal parts however, there exists limited modalities of autonomous BJ-AM de-powdering. For this reason, many binder jetting manufacturers use automated batch processes for sintering and printing but rely on manual de-powdering of as-printed (green) parts prior to post-processing steps. This manual de-powdering process is costly in time and manual labor hours. We wish to automate this de-powdering process to achieve lower labor costs and higher production throughput.



## PROCESS DESIGN



## SYSTEM DESIGN

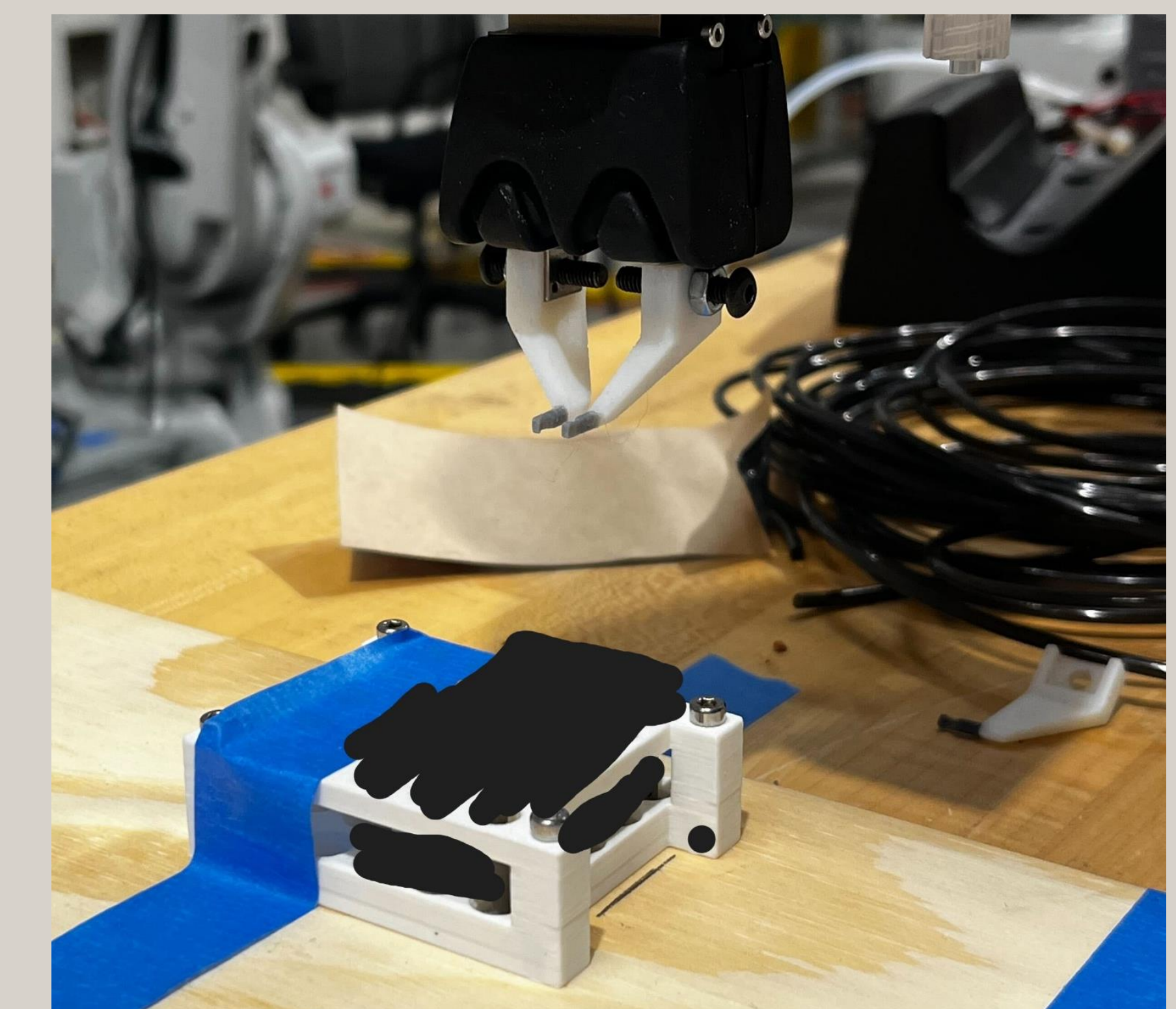


## TESTING

- Pick and Place: Plastic parts standing in a 3D printed tray mimicking a layer of parts with only 30% excess powder remaining were picked up by ABB IRB 1200 Robotic Arm equipped with a pneumatic gripper and placed in a 3D printed sintering tray.

## RESULTS

- Pick and Place: Using a gripper tailored for small parts and resin-printed gripper fingers, PnP efficacy reached 100% success over 75 trials for non-powdered parts



Note: Due to customer's IP, we cannot show the parts' geometries

## OBJECTIVES

- Full Autonomy: No human assistance required from build volume insertion to sintering tray removal.
- Complete Part De-Powdering: All excess powder removed from processed parts.
- Improve Part Throughput: System can autonomously de-powder an equivalent or greater quantity of parts per batch than traditional manual de-powdering.

## REFERENCES

[1] ISO/ASTM 52900:2021 (EN), additive manufacturing — general principles ..." [Online]. Available: <https://www.iso.org/obp/ui/#iso:std:74514:en>. [Accessed: 01-Apr-2023].

[2] "Digital Metal@ 3D printers – fast and effective," *Digital Metal*. [Online]. Available: <https://digitalmetal.tech/printer-line/dm-p2500/>. [Accessed: 31-Mar-2023].