Automated Buffing Machine

SPONSORED BY: AUTOCAM MEDICAL   **SPONSOR:** MITCHELL MAYBERRY   **FACULTY ADVISOR:** DR. CHRIS PUNG

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BACKGROUND:

AutoCam Medical is a contract manufacturer of precision-machined surgical drill bits, drivers, screws, plates, cutting tools, as well as surgical implants, instruments, and handpieces. One line which AutoCam is working to improve is its surgical drill bits. Currently, the end diameter of the drill bits are buffed manually using a buffing wheel.

PROJECT DESCRIPTION:

The purpose of this project was to design and build a machine that will automatically buff the end diameter of surgical drill bits.

THE PROCESS:

The UR5e robot picks up a drill bit from a pallet of parts and loads the drill bit into a collet which is connected to an air chuck. Once the bit is secured in the air chuck, the buffing wheel is brought up to the drill bit. The end, outside diameter, and chamfer is then buffed by the buffing wheel. Once the bit has been buffed, the robot takes the part out of the collect and places it into an outgoing pallet.
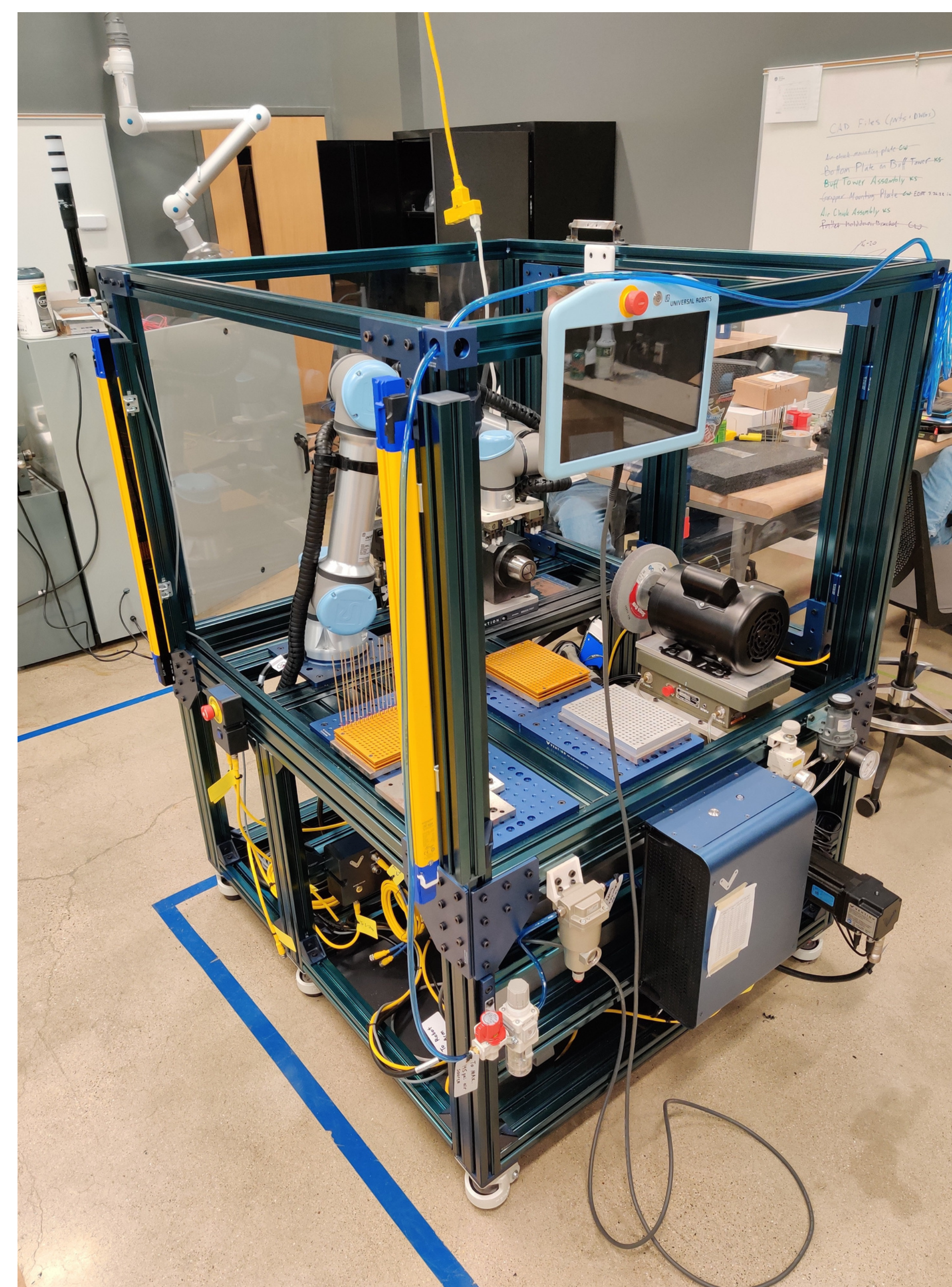

CRITICAL SPECIFICATIONS:

- Remove overspray but no more than 0.0002" of material
- 500 parts per run
- Maximum 40 second cycle time
- 95% of parts must meet buffing criteria

MAIN DESIGN FEATURES:

BUFFING WHEEL TOWER:

The buffing wheel tower consists of a rotary table, two pressure tables, and the buffing motor, all secured onto a linear actuator. The rotary table allows for the buffing wheel to be rotated to buff the 45 degree chamfer. The pressure tables allow for a consistant buffing pressure, even as the buffing wheel wears down over time.
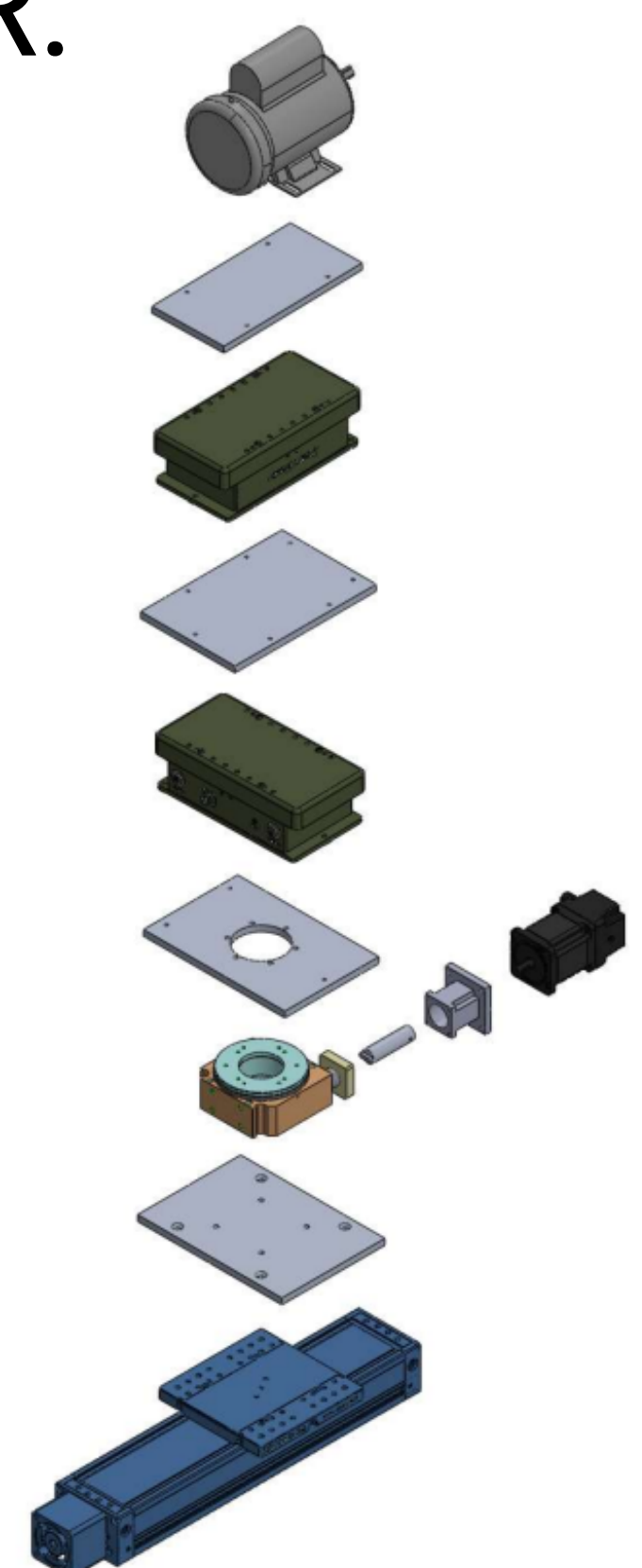
END OF ARM TOOLING:

The EOAT consists of a robot arm mounting plate, two pnumatic grippers, and custom gripper fingers. This must effectively transport the drill bits from the pallets to the air chuck and vice versa. By having two grippers mounted to the robot arm, the robot can grab the next bit while the current bit is being buffed, reducing the cycle time.