

Background

Accu-Precision, a manufacturer of aerospace components, is challenged by a tab removal process that is slow and produces inconsistent results. Our team is developing a faster, safer, and more precise solution that maintains tight tolerances across various materials.


Mission

Design a tooling assembly capable of **safely, quickly, and efficiently** removing work holding tabs from parts with complex geometries, ensuring no gouging and leaving no more than 0.002 inches of remaining tab material.

Procedure

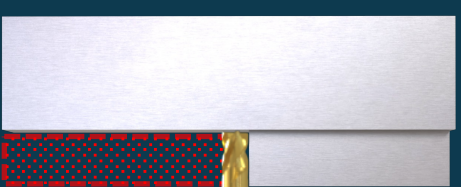
Tab Removal Steps

1



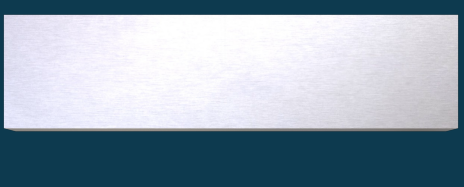
Lay part flat on table with tab facing downwards between parallel guide plates then adjust guides to match width of tab

2



Feed part along guide plates and steadily push through end mill and guard

3



Inspect completed part surface for proper finish

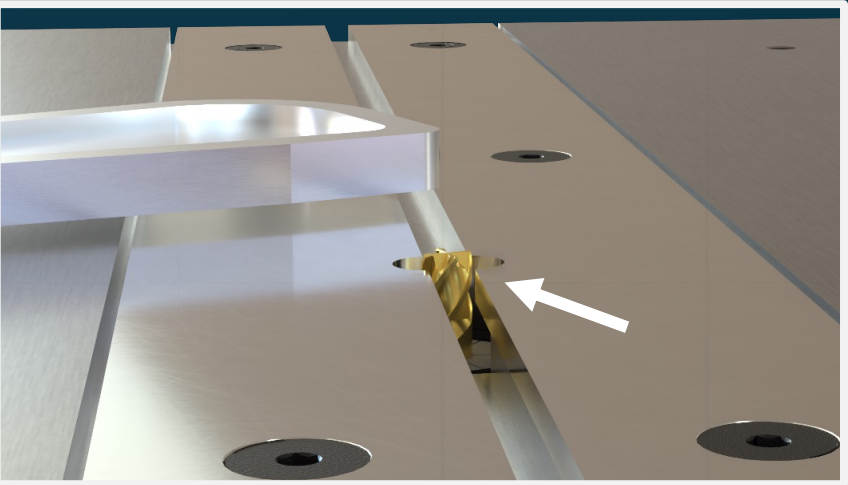
Requirements

✓	OSHA & ADA compliance
✓	Plastic, aluminum, steel, stainless
✓	Remove no material from part
✓	≤0.002" remaining tab material
✓	0.003"-0.020" tab width
✓	1/16"-3/4" tab height
✓	Up to 80" tab length
✗	Straight, curved, proprietary tabs
✓	0.25"-1.5" tab radii

System Breakdown

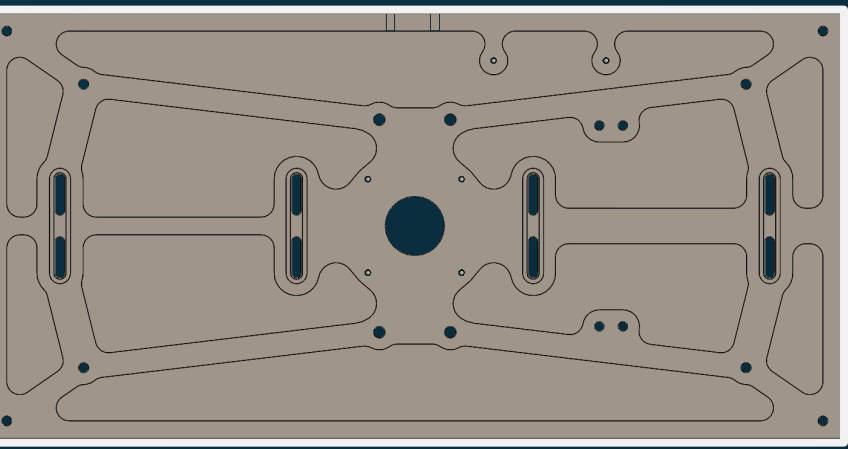
Patent Pending

End Mill



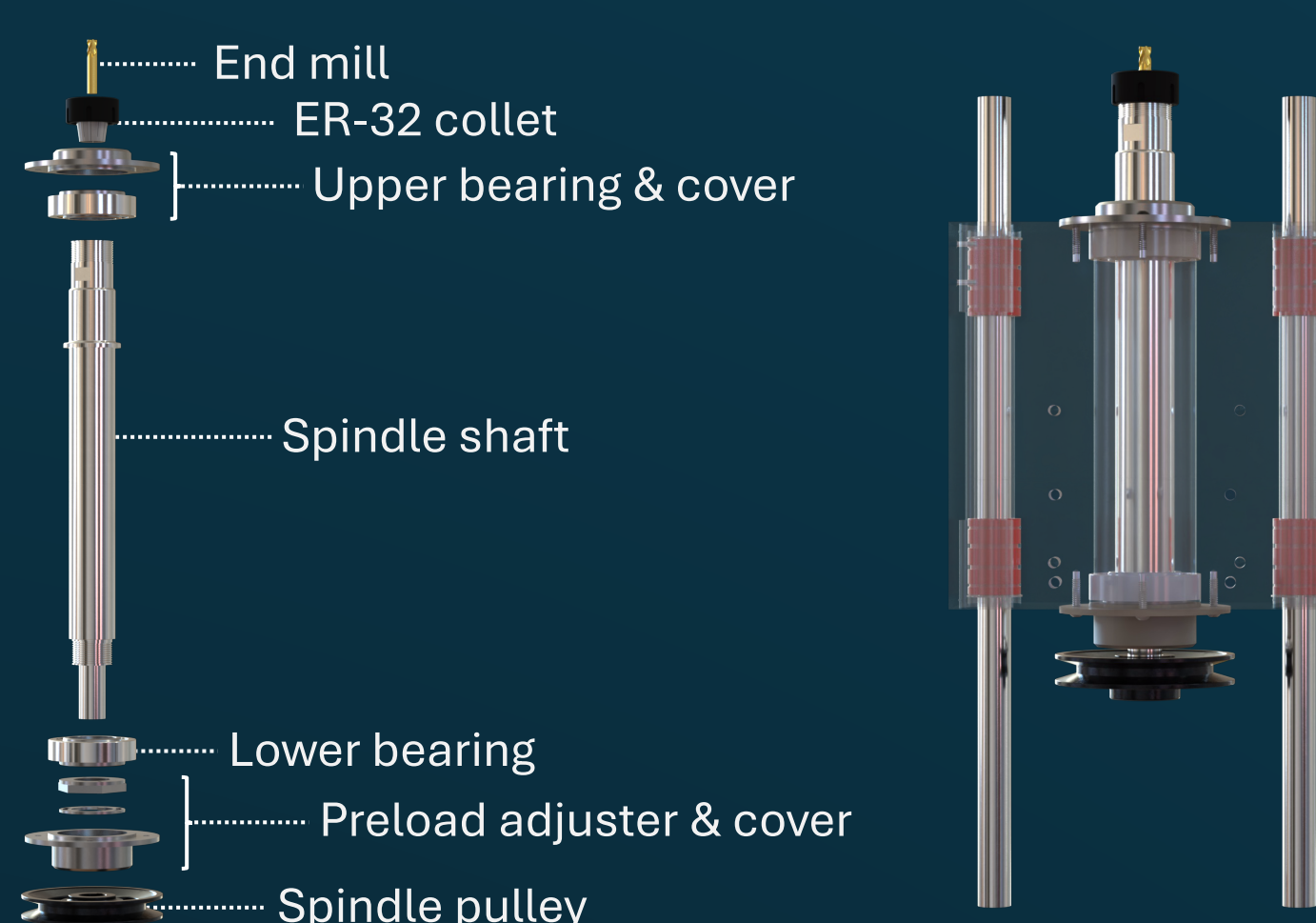
3/8" carbide roughing end mill mounted in an ER32 collet, cuts tabs at 3450RPM, positioned at the top of the spindle, this tool handles all material removal

Worksurface



36"x18"x1.25" A36 steel plate includes weight reduction pockets, cutting weight from 300lbs to 170lbs while maintaining structural integrity

Spindle Housing



End mill
ER-32 collet
Upper bearing & cover
Spindle shaft
Lower bearing
Preload adjuster & cover
Spindle pulley

Spindle supported with tapered roller bearings for high-speed cutting applications and minimal tool runout

End Mill Guard

Spring-loaded safety guard covers spinning end mill, swings aside when part is fed through

Emergency Stop

Brings spindle to a stop in under 2 seconds for operator safety

Industrial Motor

1 horsepower motor drives spindle via belt up to 3450RPM at 3.0A

Variable Frequency Drive

Drives motor with 220V, 3-phase power from wall outlet, spindle speed adjusted with dial

Sturdy Construction

Comparable to industrial manufacturing equipment

Precision Lift System

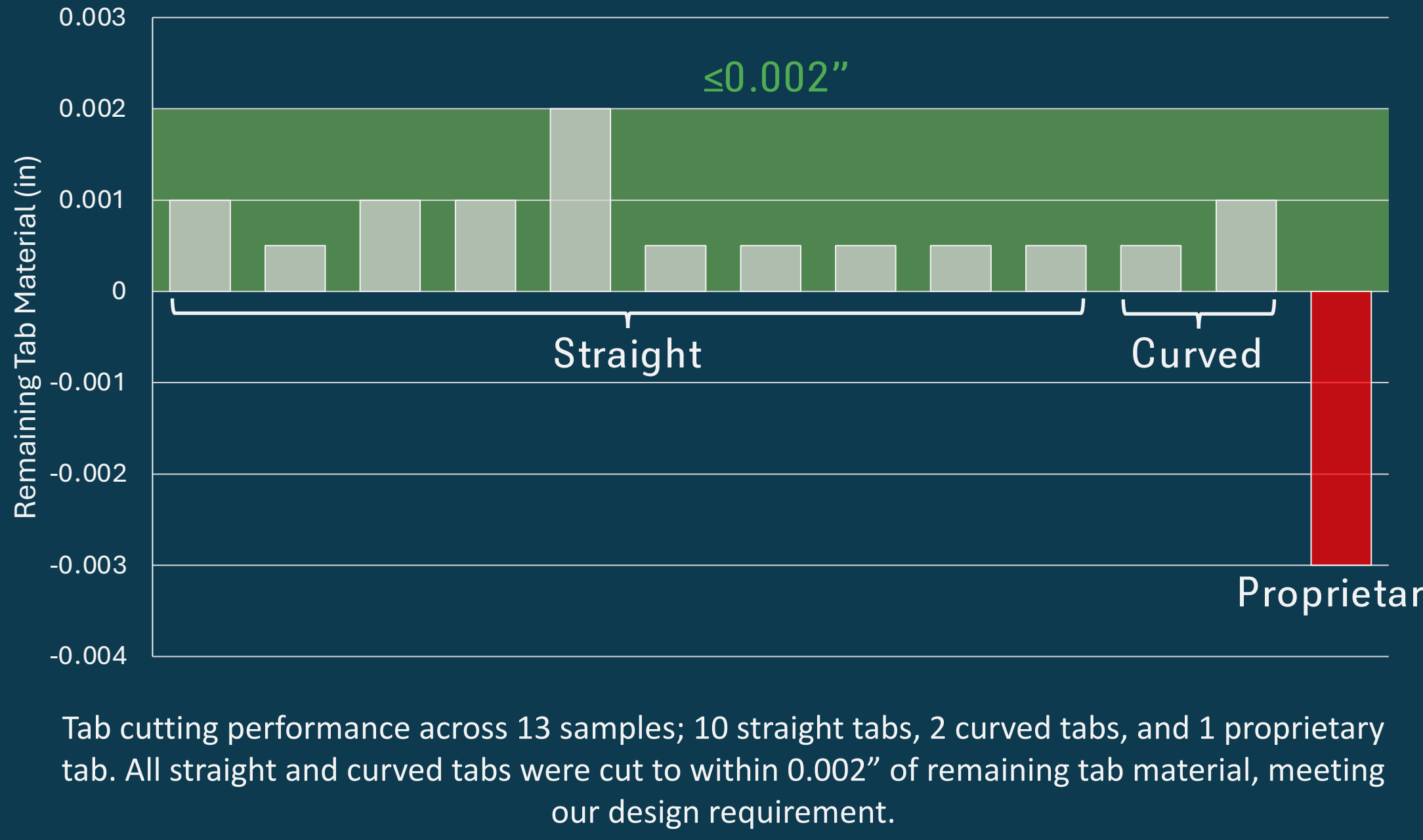
Crank driven ball screw delivers 0.005" of vertical travel per turn for ultra fine adjustment

Safety Features

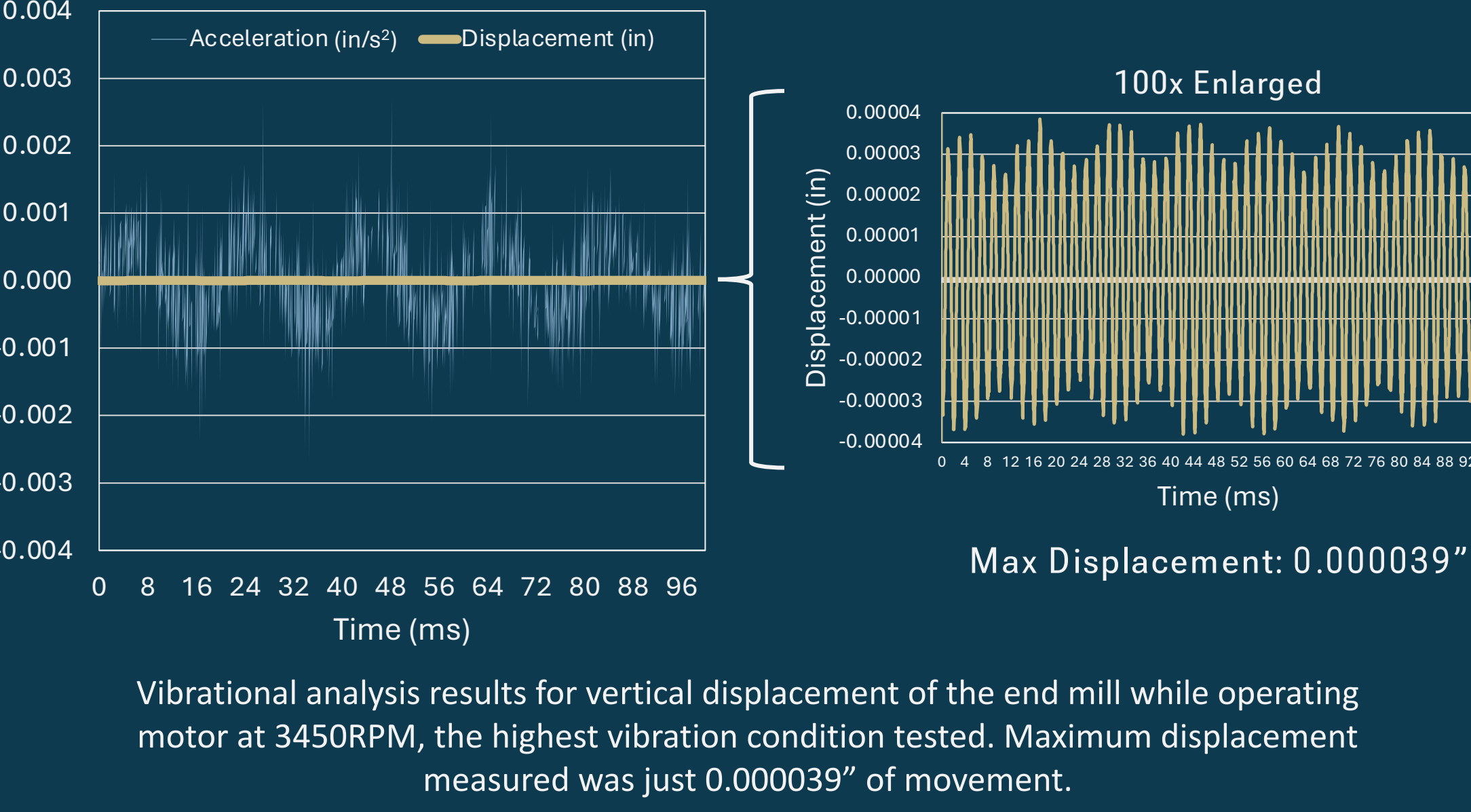
Operator safety is a **top priority**, especially since our machine will be used by workers on the shop floor. An **industrial emergency stop** halts the spindle in under two seconds, allowing for rapid response in case of an incident. A **spring-loaded end mill guard** protects the operator from the fast-spinning cutter, automatically swinging back into place when not actively cutting. The **motor belt is fully enclosed by a guard** that adheres to OSHA standards, shielding the user from the high-speed belt. **Adjustable tab guides** stabilize the part during operation to prevent kick back, and the machine's **sturdy construction** ensures long-term durability for safe, reliable use.

Testing & Analysis

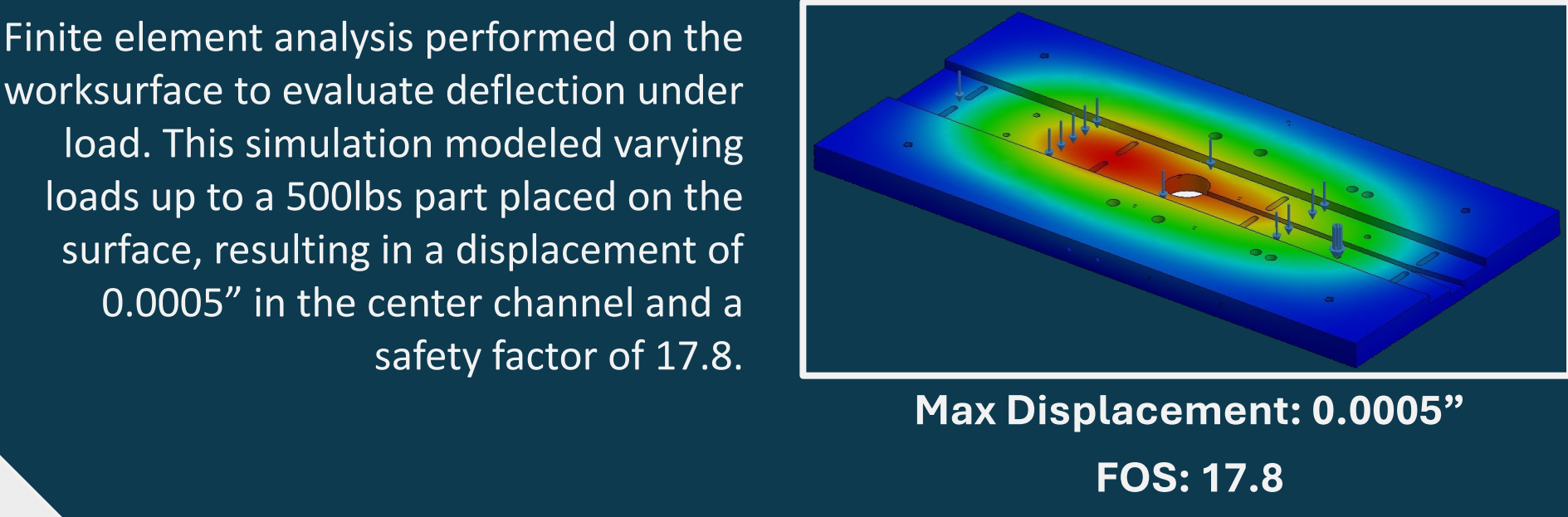
Remaining Tab Material After Cut



System Vibration Testing



Worksurface Load Analysis



Impact

- Improved operator safety
- Lower part rejection rate
- Reduced lead time
- Increased revenue

Future Work

- Standardize hardware
- Streamline manufacturing processes
- Further trials & field testing
- Chip collection