



# Team 13: Automated Valve Seat Final Inspection Machine



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## The Team



## Introduction / Background

- NN Inc. makes 20,000+ valve seats weekly for DEF injectors..
- Each has a swirl channel and laser code tied to a part variant.
- Mixed or incorrect parts cause quality issues.
- This machine inspects and sorts parts by code and depth before packaging.

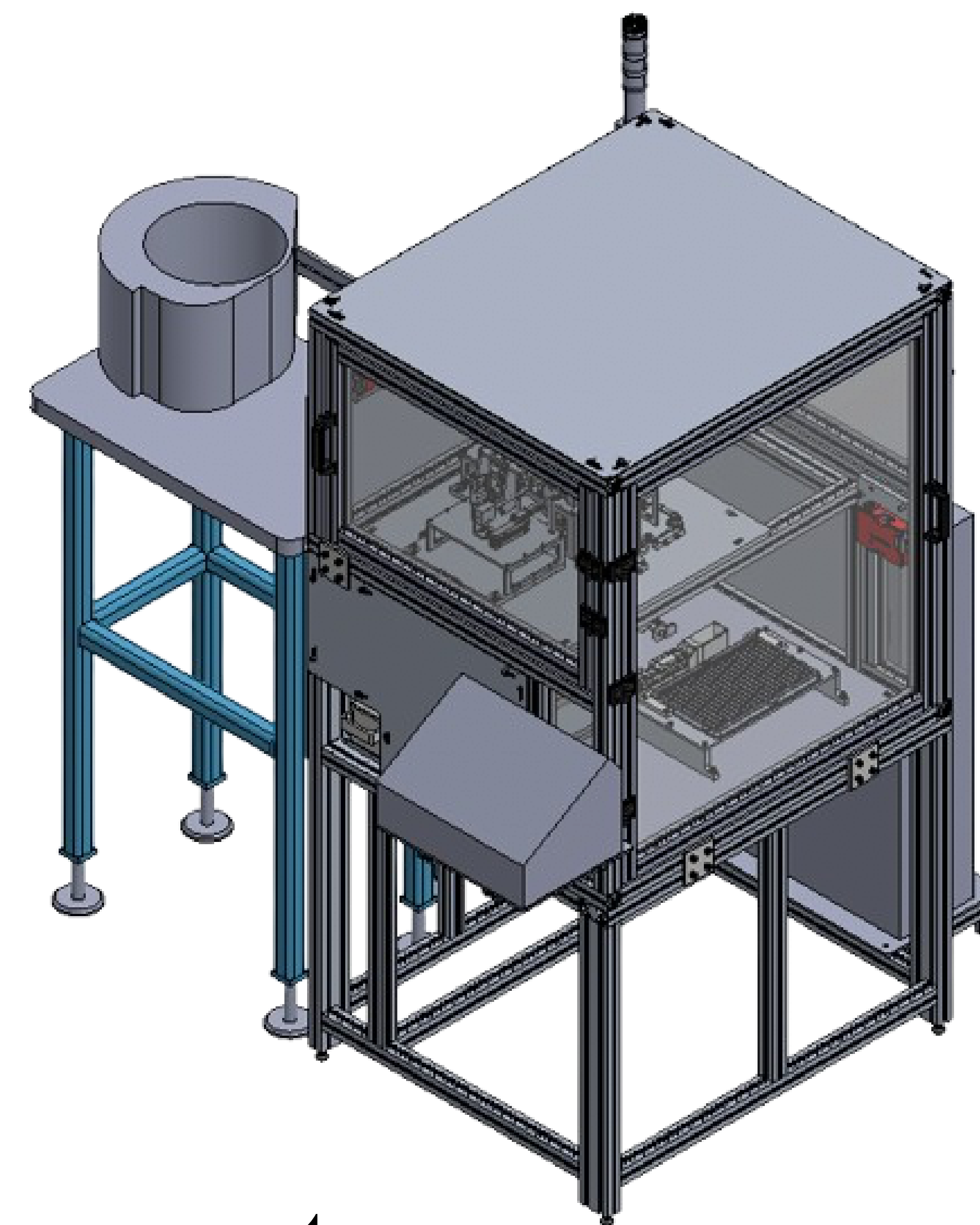
## Objectives

- Prevent mixed or incorrect valve seats from reaching customers
- Verify laser-marked code and swirl channel depth for each part
- Automate the final inspection and sorting process
- Maintain high speed, accuracy, and safety
- Stay within a \$25,000 budget

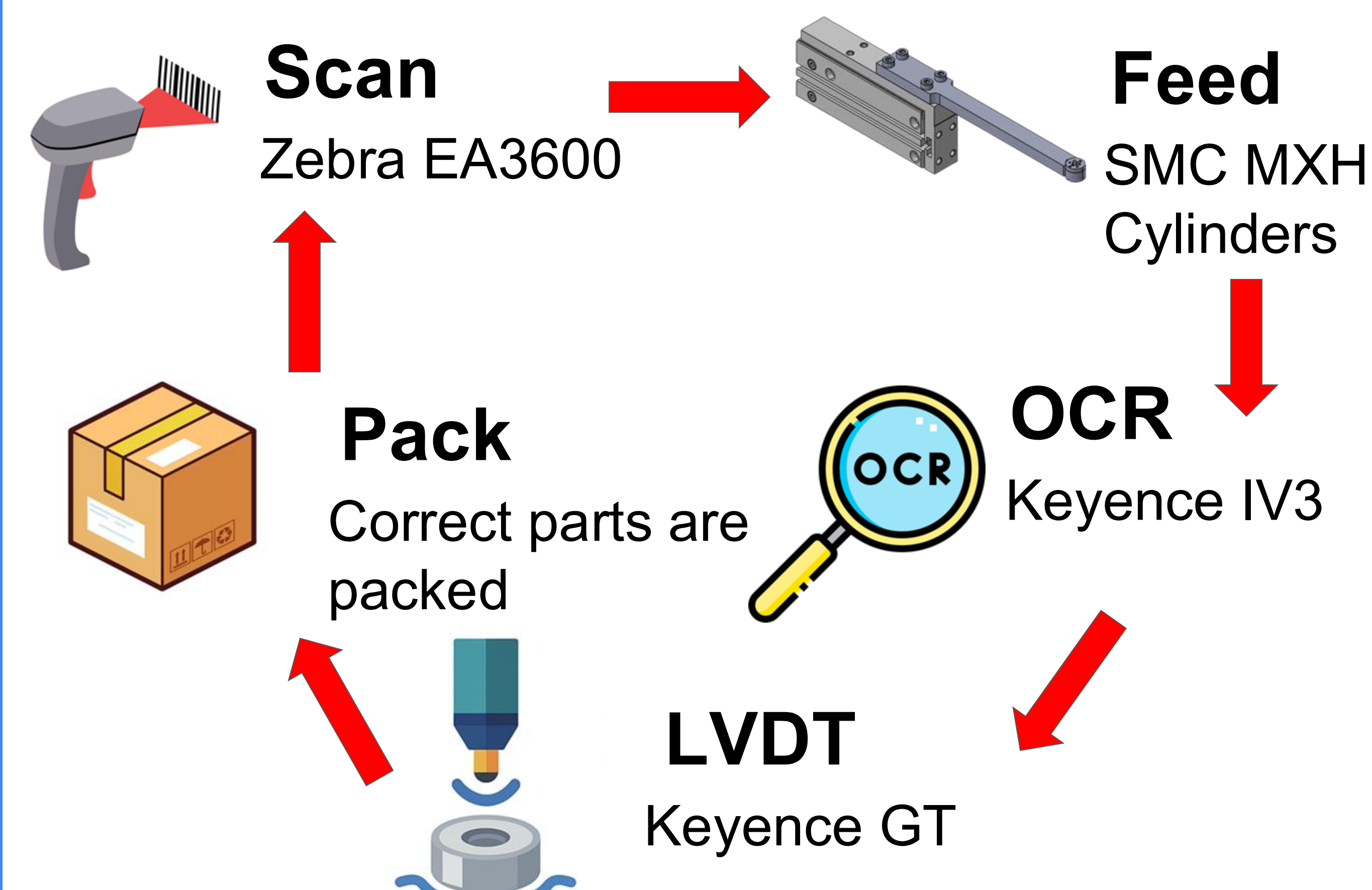
## System Flow & Key Components

### **Process:**

1. **Scan** barcode to select part variant
2. **Feed** part into machine (laser code face-up)
3. **OCR** station verifies laser-marked code
4. **LVDT** measures swirl channel depth from below
5. **Reject** parts via air blow-off if incorrect
6. **Pack** accepted parts in custom tray fixture



### **Key Components:**

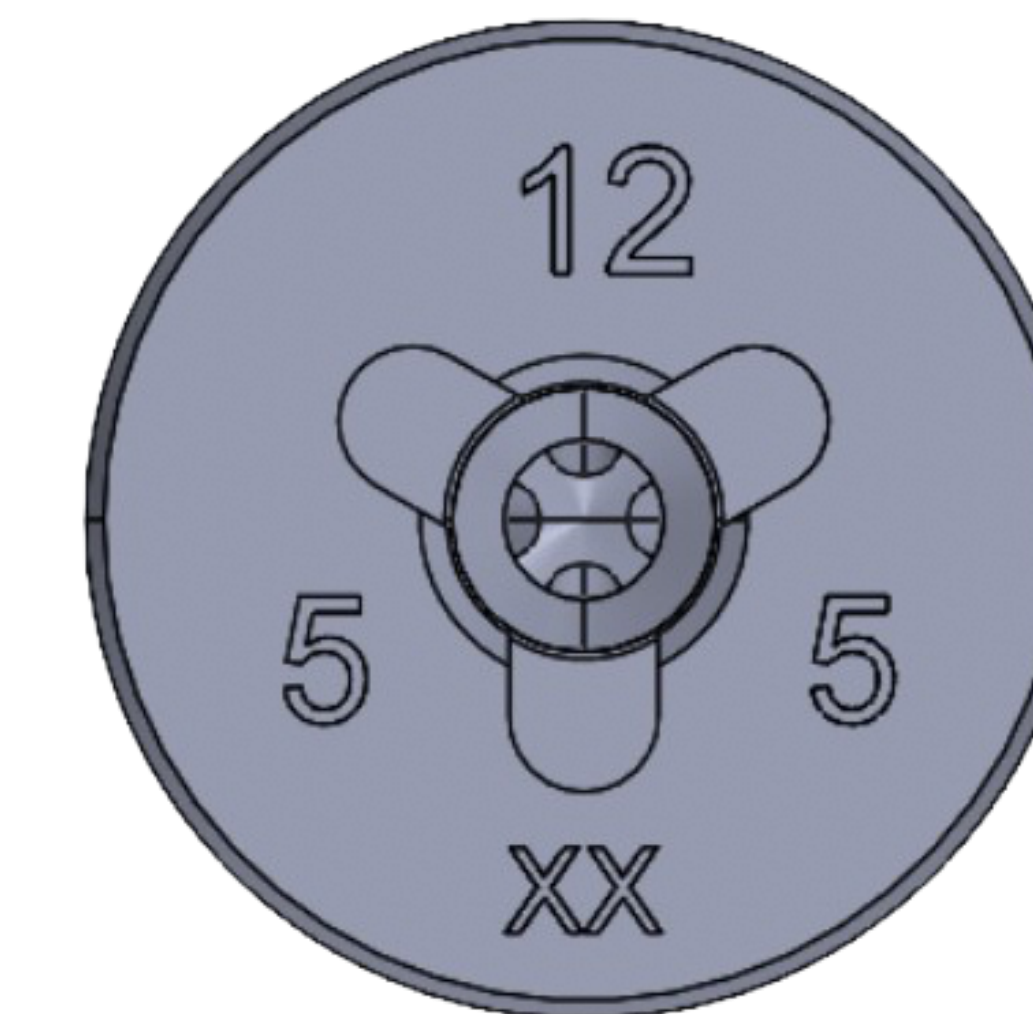


## Performance

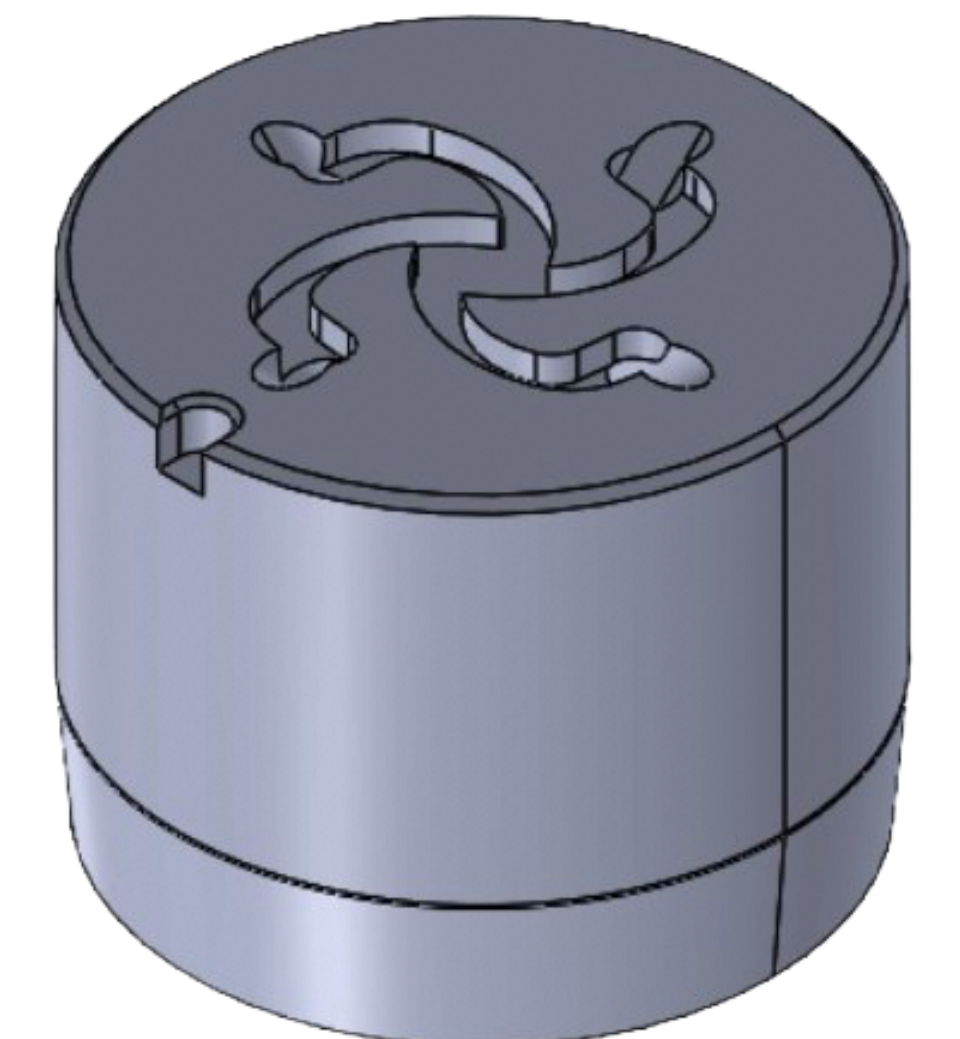
### Expectation vs. Measured

- Budget: \$25,000; Final Cost: \$23,465.47
- Cycle time: 9.5s; Measured time: 3.5s
- Conveyor track height: 3'-5'; Measured: 4'11"
- Fit within 60x60x72 in.; Measured 60x32.5x72 in.

### Laser-Marked Code



### Swirl Channel



## Future Use

- This machine will be implemented at NN Inc. to improve final inspection and packaging
- Built with a modular design for future part variants
- Flip station ready for inspecting additional features on upcoming designs
- Engineered for long-term use in a high-volume production environment

## Acknowledgements

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