Train Bearing Inspection Automation

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BACKGROUND

- Wabtec inspects locomotive bearings to verify that the components meet remanufacturing specifications
- Manual inspection currently takes an operator 10-15 minutes
- Automates, accelerates, and improves precision of the inspection process for used locomotive bearings
- Assess each bearing for roundness and inspect for surface defects
- Clearly marks defective bearings upon exit for the operator's attention

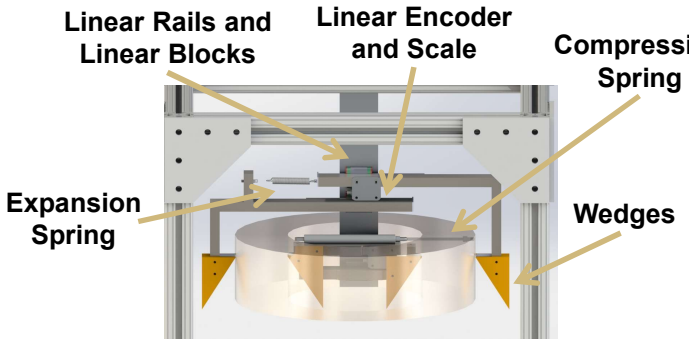
REQUIREMENTS

- Measures out-of-roundness at 6 individual points with 0.0004 inches accuracy
- Inner and outer diameters of each bearing measured within 1 micron precision
- Machine provides Go/No-Go decision based on out-of-roundness and surface defects
- Handle 5 bearings simultaneously, supporting up to 365 lbs combined weight
- Ensure each bearing inspection is completed within a five-minute cycle time

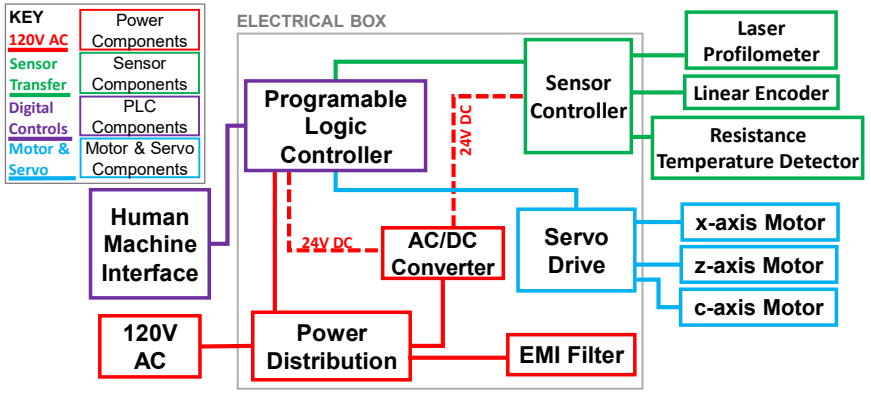
RESULTS AND NEXT STEPS

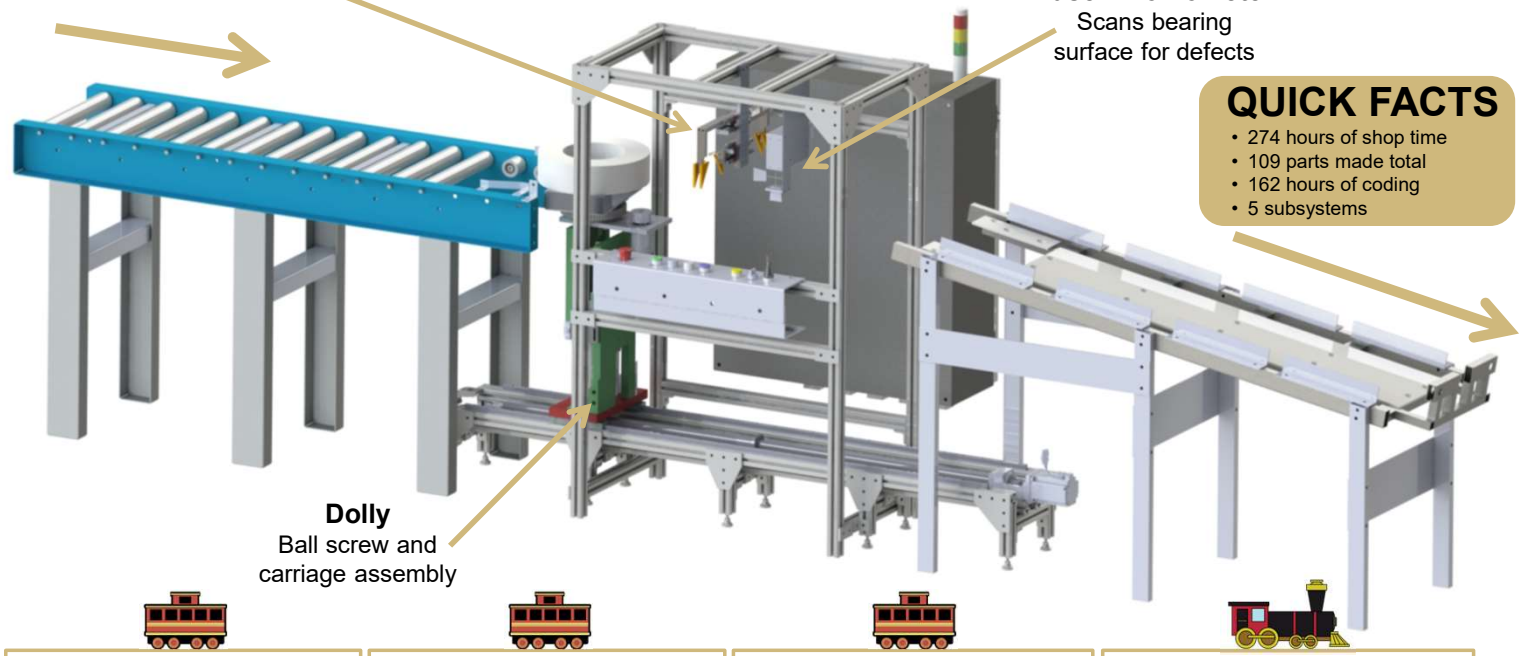
- Bearing thermal time constant of 4,853.9 seconds (1.34 hours)
- Unloading Ramp angle of 12º
- Full machine functionality test
- Persistent bearing inspection to confirm repeatability and reproducibility (R&R) of the machine
- Adjust machine to accommodate multiple bearing sizes
- Add a subassembly for cleaning and polishing each bearing before inspection

DESIGN



ELECTRICAL SYSTEMS





QUICK FACTS

- 274 hours of shop time
- 109 parts made total
- 162 hours of coding
- 5 subsystems

Loading Conveyor

- Five bearings are loaded simultaneously
- The machine is activated by the operator
- One bearing will be lifted and maneuvered in three axes: x, z, and c for rotation

Dolly

- The dolly lifts through the frame, guided by triangular wedges, to enter the inner and outer diameter measurement calipers
- The dolly rotates the bearing along the c-axis, allowing the laser profilometer to construct a profile of the bearing surfaces

Measurement

- Six diameter measurements are taken for both the inner diameter and outer diameter
- The Laser Profilometer integrated to the frame to scan for surface defects
- Holds the mounted electrical box and control panel

Unloading Ramp

- A passive indicator marks it as "No-Go" or diverts the indicator to signal "Go" along path to the ramp
- The Dolly raises the bearing up to the unloading ramp where each bearing is gently lowered
- The Unloading Ramp stores 5 bearings until unloaded by the operator

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