Team 01: Bar Straightness Measurement System

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Problem Statement:
Current manual methods for measuring straightness, and roundness are inconsistent and unreliable, leading to undetected defects that cause equipment damage and downtime, with limited data available for quality improvement.

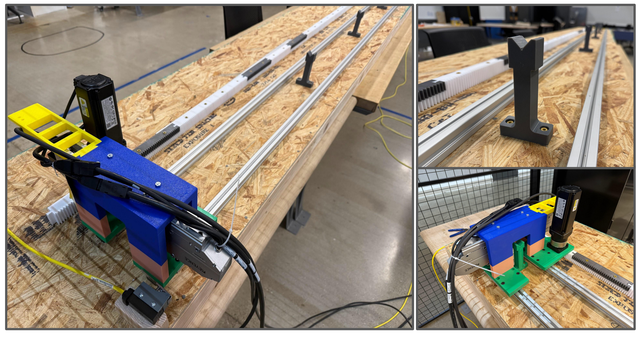
Objective:
Design and build a precision measurement system to evaluate the straightness, roundness, diameter, and length of stainless-steel rods. Diameters vary from 3.81 mm (0.1500 in) to 12.70 mm (0.500 in). Lengths include 1.83 m (6 ft), 2 m, 3.6576 m (12 ft), and 4 m rods. Additionally, with the capability to be modified for more lengths and diameters.

Straightness: Variation of a features distance to a nominal axis over a length.

Roundness: Variation of a closed shapes surface distance from a center point.

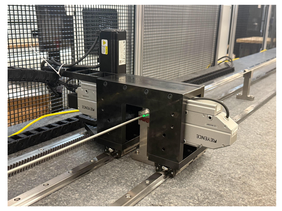
Diameter: Straight line distance across a circle passing through its centerpoint.

Prototype Build:

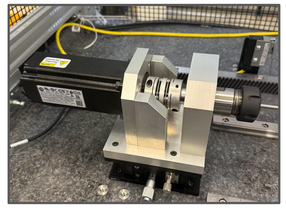


Granite Base:
Provides a flat, and thermally stable datum for the rest of the components.

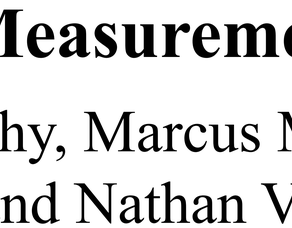
Gantry:
Driven by rack and pinion, it carries the micrometer used to measure the straightness, roundness, and diameter.

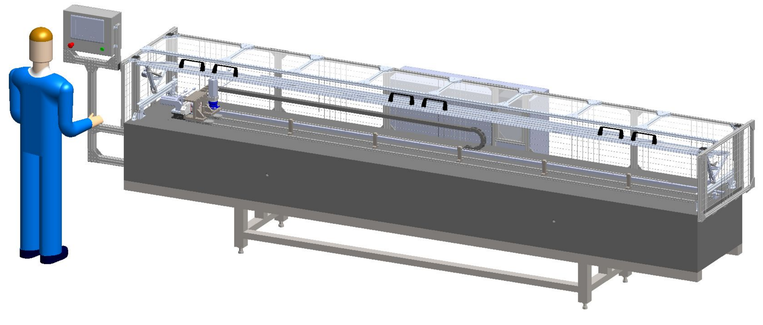


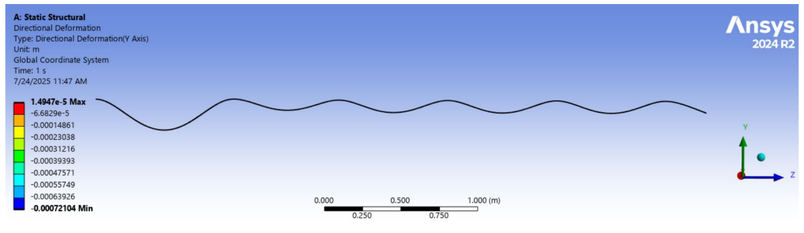
Collet:
Controlled by servo motor, a collet clamps onto bars to rotate at each measurement interval. Assembly is mounted atop a vertically adjusting stage to accommodate all diameters.



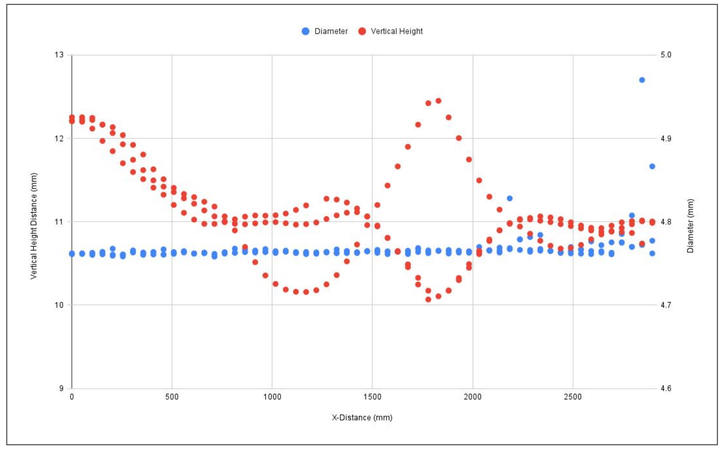
Rails and V-Blocks:
The rails and V-blocks are all aligned to a tight tolerance to minimize the relative variability along the length of travel.



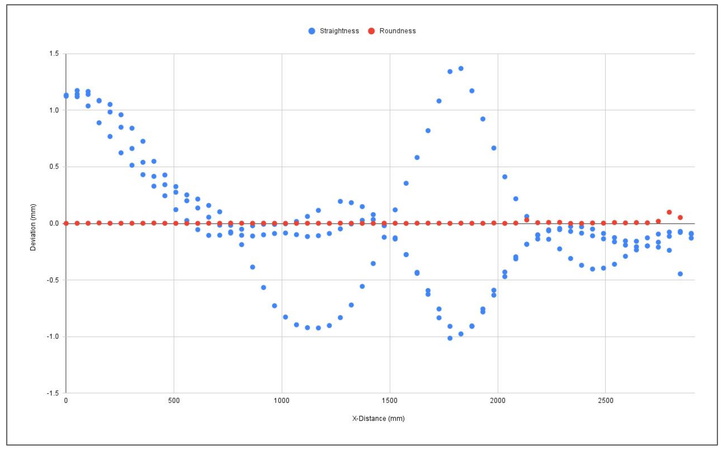




Collected Data:



Calculated Data:



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