

TEAM 13 - NO-CONTACT GAP MEASUREMENT DEVICE

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ROLLING MACHINE²



Figure 1. Rolling Machine



Figure 2. Looking down on rollers



Figure 3. Safety Feature

Presenting:
Matt N.

NEED STATEMENT AND GOAL STATEMENT

Need

- The current use of feeler gauges to gap a pair of rollers is unreliable, time consuming, and potentially damaging.

Goal

- A non-invasive way of measuring the distance needs to be created.

Presenting:
Matt N.

CAMERA EXPERIMENTATION

- DSLR Camera (provided by Dr. Gupta) taken to the lab to test the visibility.
- Multiple pictures of the rollers were taken from various angles and distances.
- Several methods of lighting and zoom capabilities taken into consideration.
- Conclusion: Further experimentation is needed to determine the effectiveness of photography.



Figure 4. Backlighting was attempted to help with gap clarification.

Presenting:
Sam G.

CAMERA EXPERIMENTATION



Figure 5. Ruler used to scale photographs.



Figure 6. Attempted photography of roller gap.

Presenting:
Sam G.

LONG DISTANCE MICROSCOPES

- Allows the focus capability of a microscope with much more zooming capabilities.
- Focuses from 3 meters to 60 mm.
- Extremely expensive, looking for cheaper alternative.

Cost: ~\$4,000



Figure 7. Model KX InfiniMax Long Distance Microscope.

Presenting:
Sam G.

LASER TECHNOLOGY AVAILABLE

- gapCONTROL: Laser Line Triangulation
- Optical Online Micrometer
- Compact Laser Micrometer
- Gapman Portable Electronic Feeler Gage

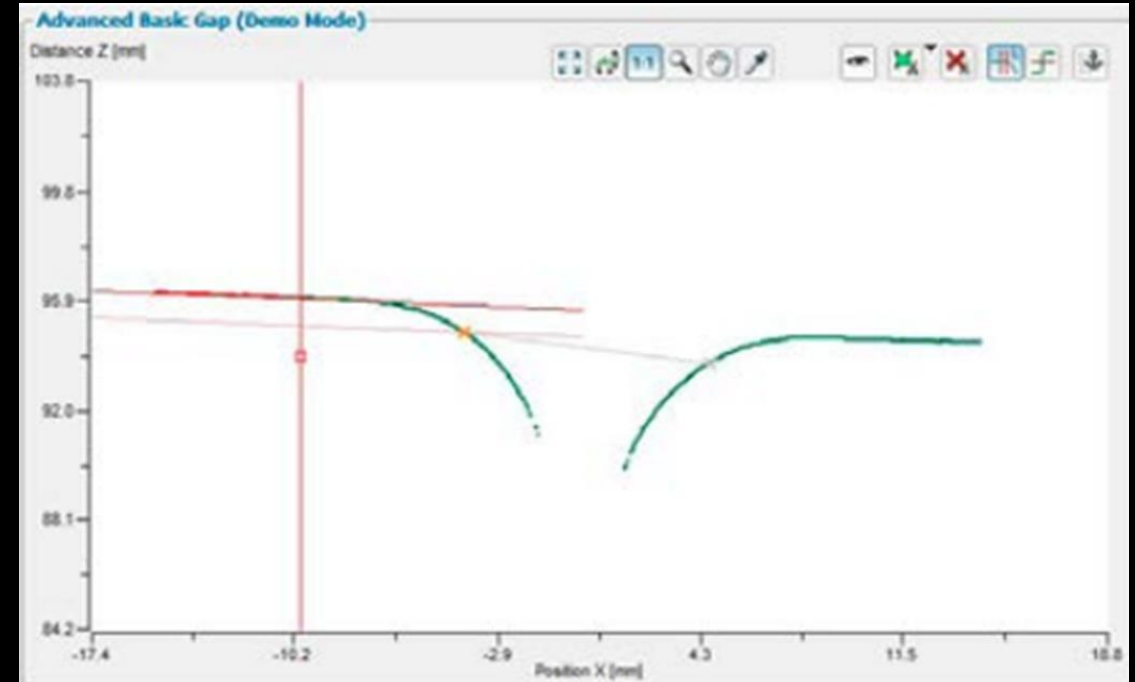


Figure 8. Plot of Laser Triangulation results.

Presenting:
Forrest P.

GAPCONTROL

- Uses laser line triangulation to plot the gap on an X-Z plot.
- Measures the differences in the vertical distance on a surface.
- The differences can be easily measured on the plot which is read on the software provided.

Cost: ~\$10,000



Figure 9. gapCONTROL Laser Triangulation hardware.

Presenting:
Forrest P.

OPTICAL ONLINE MICROMETER

- Another gap measurement system from Micro-Epsilon.
- Gap upper range is 28 mm with a resolution of 2 microns.
- Working distance of 2 meters.
- Pieces can be disassembled and used individually.



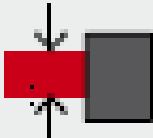
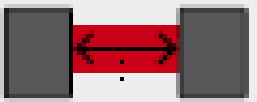

Figure 10. Optical Online Micrometer hardware.

Cost: ~\$5,000

Presenting:
Forrest P.

COMPACT LASER MICROMETER

Digital Resolution: $1\mu\text{m}$

	Measuring range 46mm
	Target-sensor gap up to 2m
	Linearity $<20\mu\text{m}$

Cost: ~\$5,000

Presenting:
Forrest P.

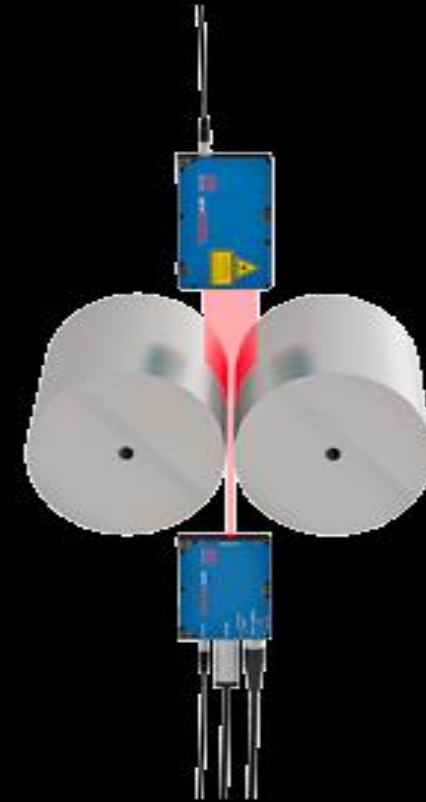


Figure 11. Compact Laser Micrometer hardware.

GAPMAN PORTABLE ELECTRONIC FEELER GAGE

- Taped down to one roller.
- In this way, you can make 1, 2, or 3 simultaneous gap measurements.
- Capacitance based “non-contact.”
- Minimum gaps of 100 microns.

Cost: ~\$4,000



Figure 12. Gapman Feeler Gage hardware.

Presenting:
Forrest P.

MOVING FORWARD

- Discussion and discernment with sponsor
- Experimentation and suggestions from advisors
- Further contact with product suppliers
- Considering outside of the box ideas (i.e. thermal, exterior)



Figure 13. Potential manufacturers to partner with.

Presenting:
Forrest P.

REFERENCES



Figure 14. General Capacitor's Logo.

- <http://www.infinity-usa.com/products/instruments/Model-KX-InfiniMax.aspx>
- http://www.micro-epsilon.com/optical-micrometer/micrometer/optoCONTROL_1202/index.html
- <http://www.capacitec.com/Products>