



Laser Based on-line Measurement of Roll Profiles in Long Product Applications

Presented to the Institute of Roll Design – Spring
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Agenda

- This presentation will explain and answer the basic questions of the development of instrument and it's practical applications in the measurement of rolls (and other cylindrical configurations) in a Roll Shop environment.
 - Concept development
 - A quick review of the science
 - Development process
 - Review of the in-service results
 - Where we are going next...

Concept Development

- Strip Mills have been measuring profiles for years. AMBIT developed a laser based alternative to the contact / LVDT systems.
 - Ability to reduce maintenance costs, increase reliability, increase accuracy, ability to get real time profile assessment were the drivers
- There were no on-line systems available for long product / shape roll profiles either before or after rolling
 - Templates and CNC programs
- After much research, lasers were chosen as the means to address the challenges

Project Concept

- To develop a system that is user friendly and provides useful data to the roll shop.
- Ability to measure the profile utilizing CNC lathe programming
- Ability to generate a hard copy report
- Ability to generate overlays for predictive stock removal
- Capable of measuring concentricity / roundness

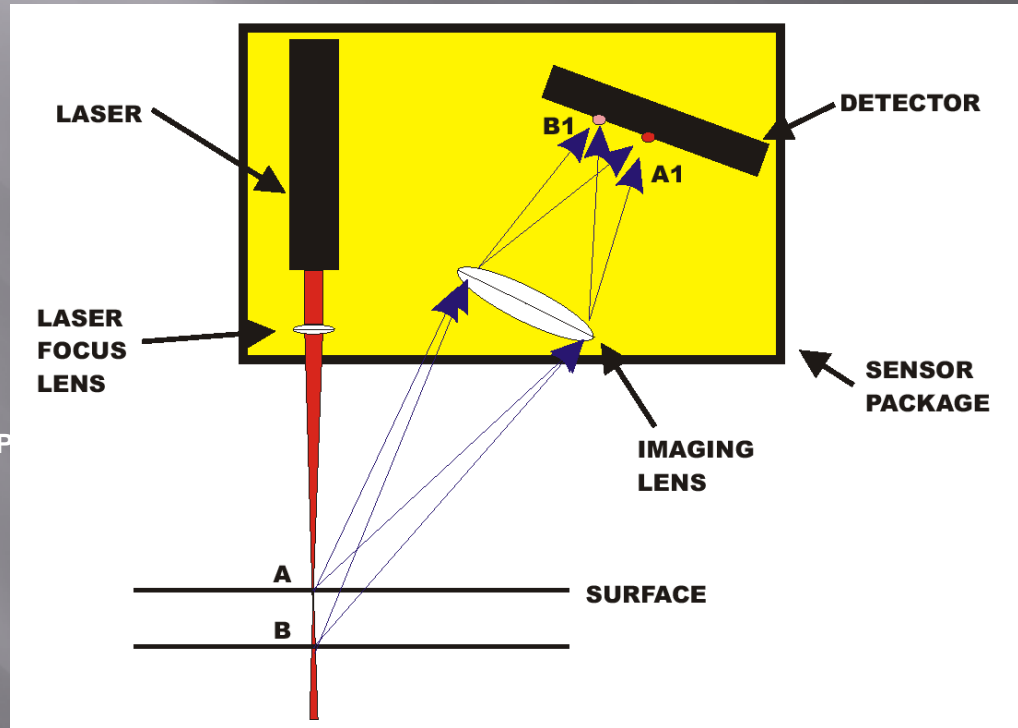
The Lasers

- The Ambit Laser-Mic units utilize Acuity AccuRange 700 Laser Distance Sensors
 - Lasers are selected on the basis of the depth of the pass of the rolls to be measured.
 - The lasers are capable of measuring variation to 0.1micron if needed
 - Lasers are rated to last 75 years!
 - Class II lasers - safety is not an issue!

AR 700 Triangulation Laser Sensor



Triangulation Principles



SP

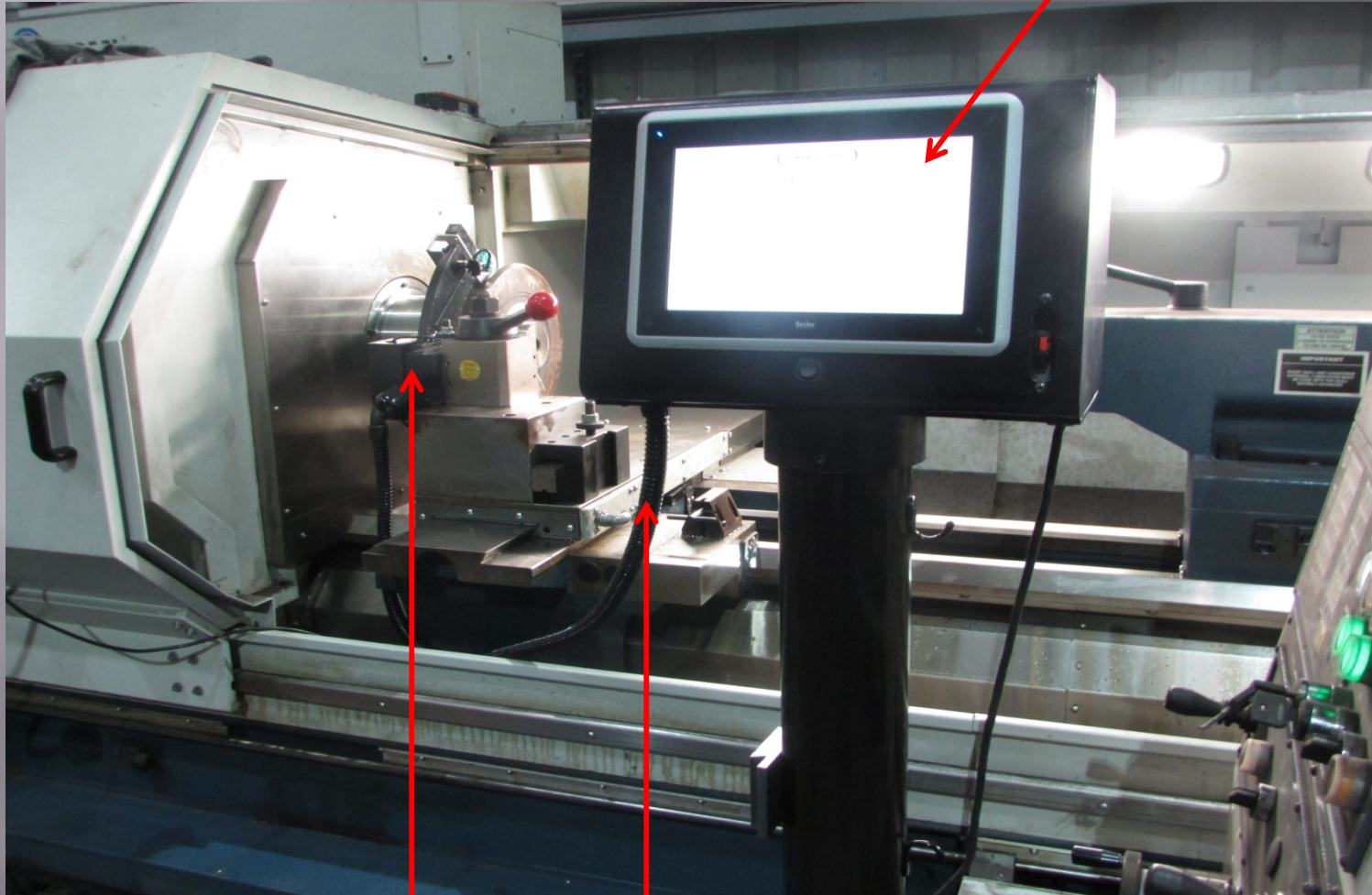
Ambit

Laser-Mic 520



Unit Basics

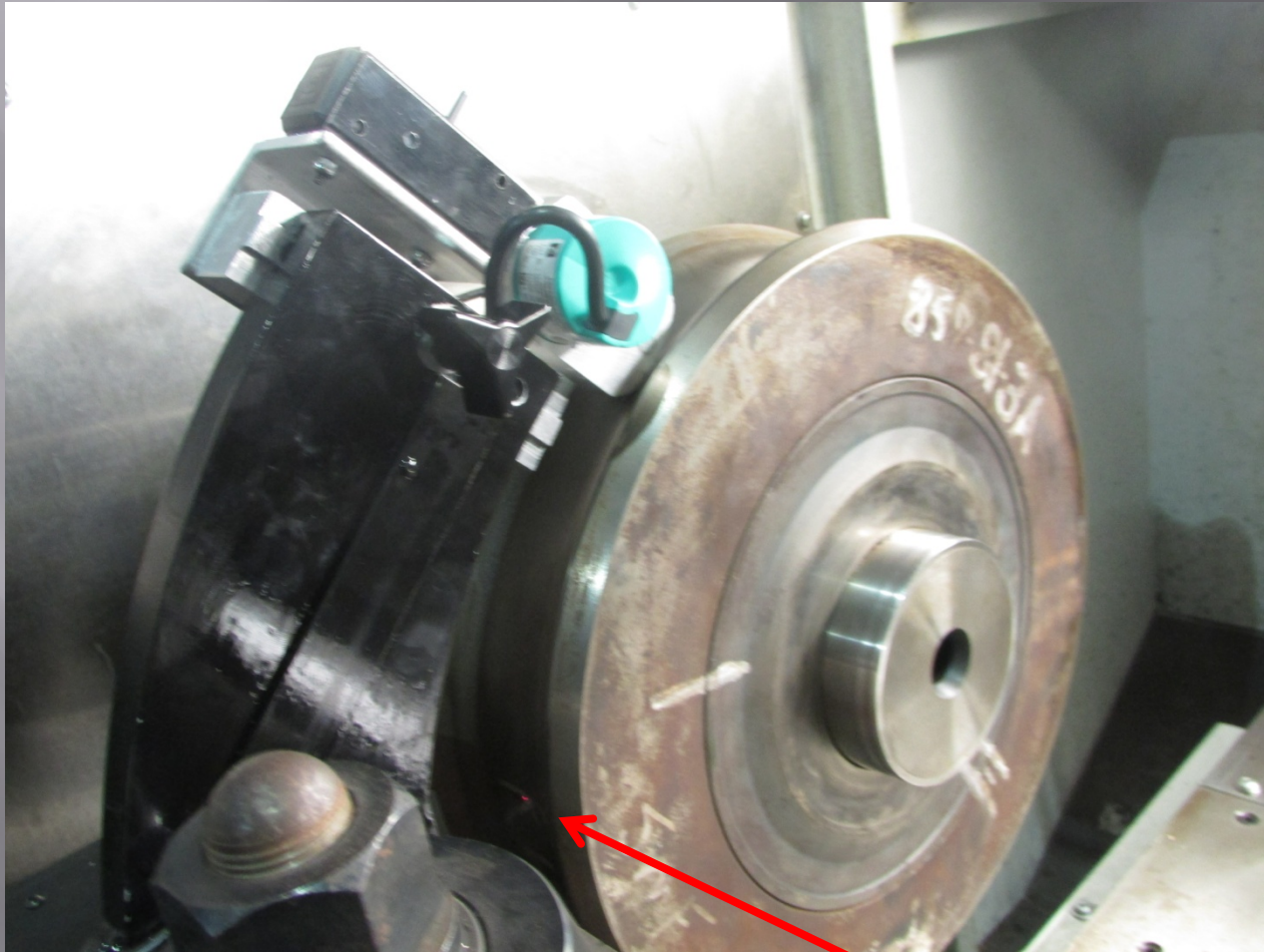
Control Screen



Measuring Unit

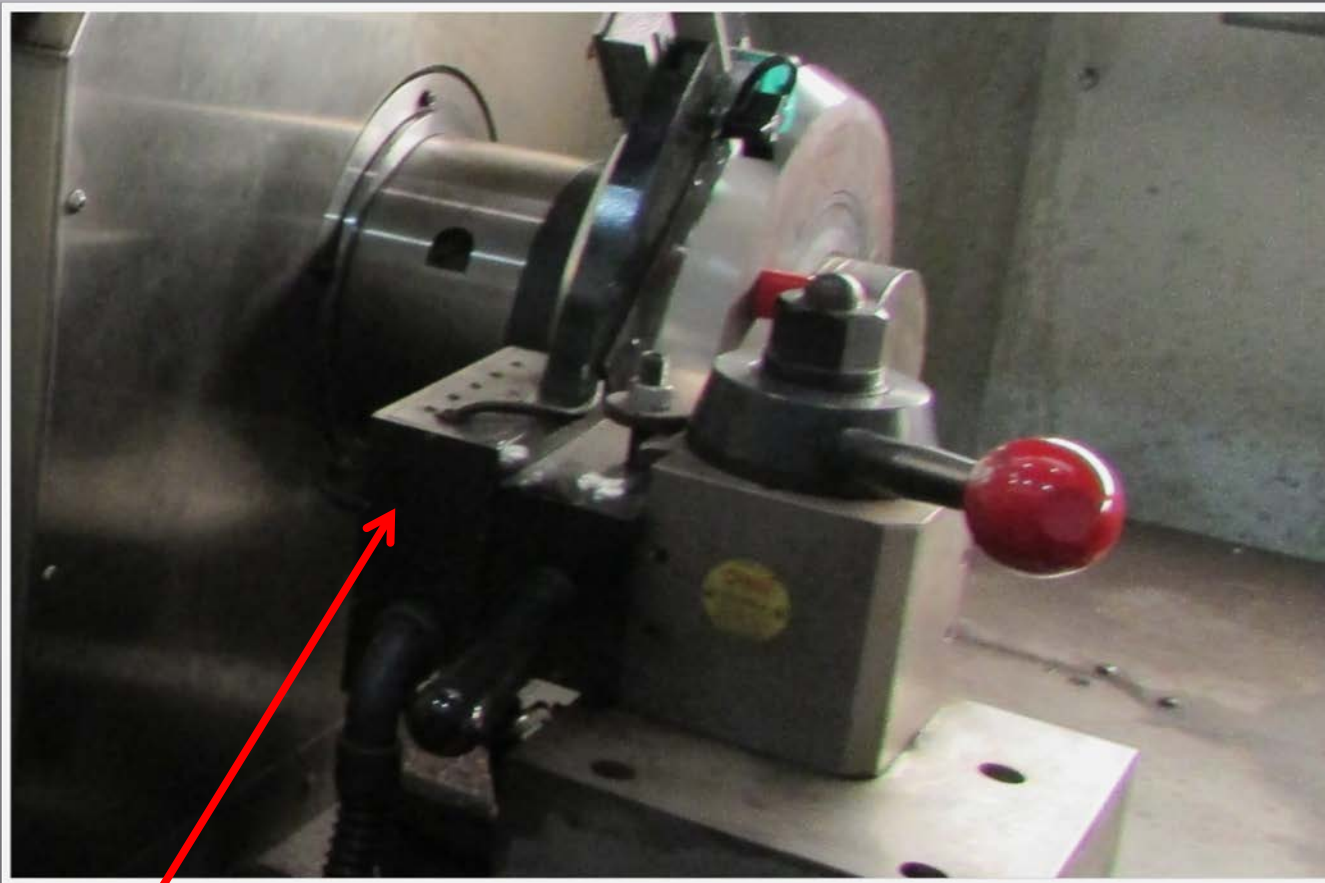
Umbilical

Laser Position



Laser dot on roll

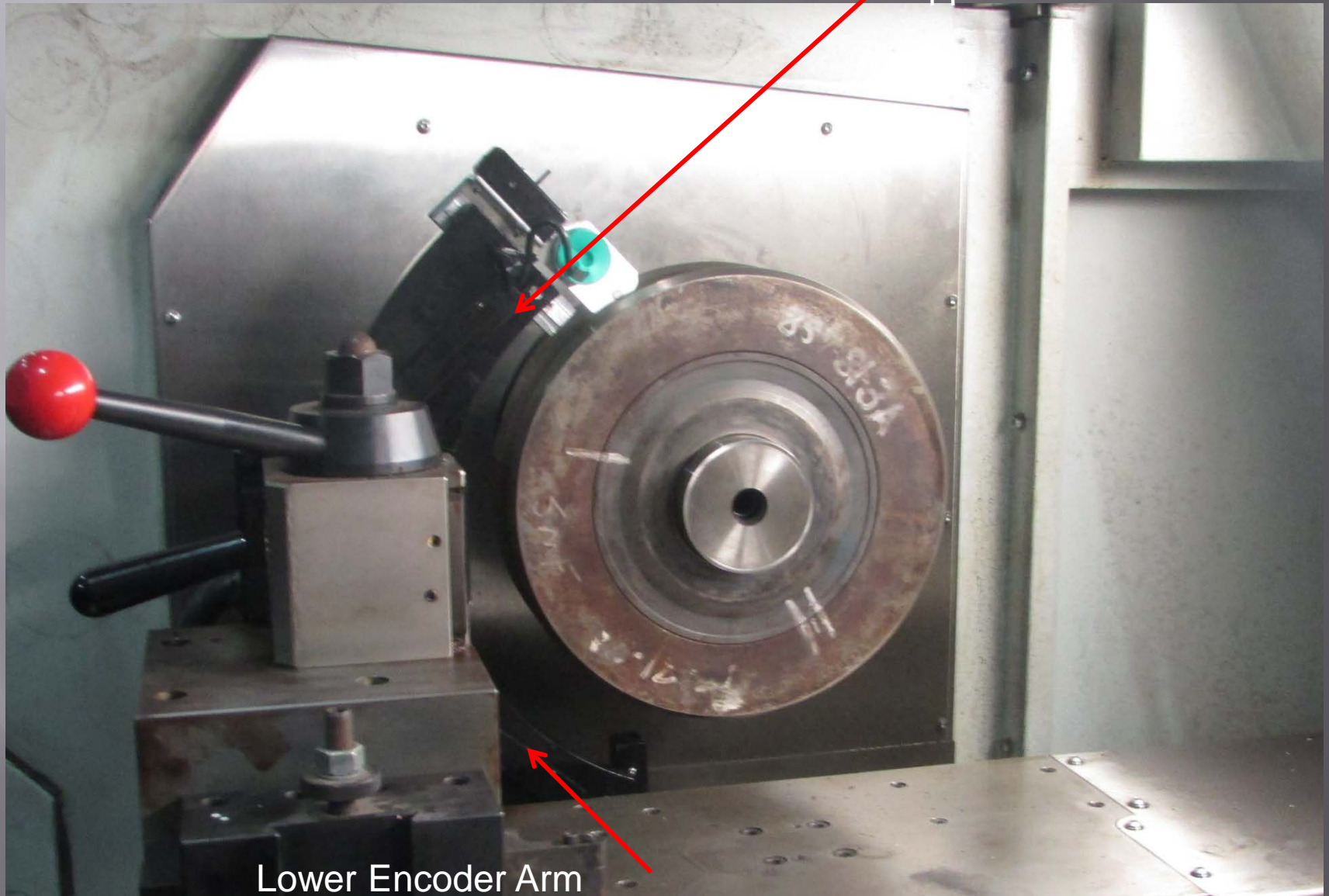
Laser Position



Laser Housing

Side View

Upper Encoder Arm



Lower Encoder Arm

Operating Screen Basics



On/Off Switch

Removable 32Gb Storage

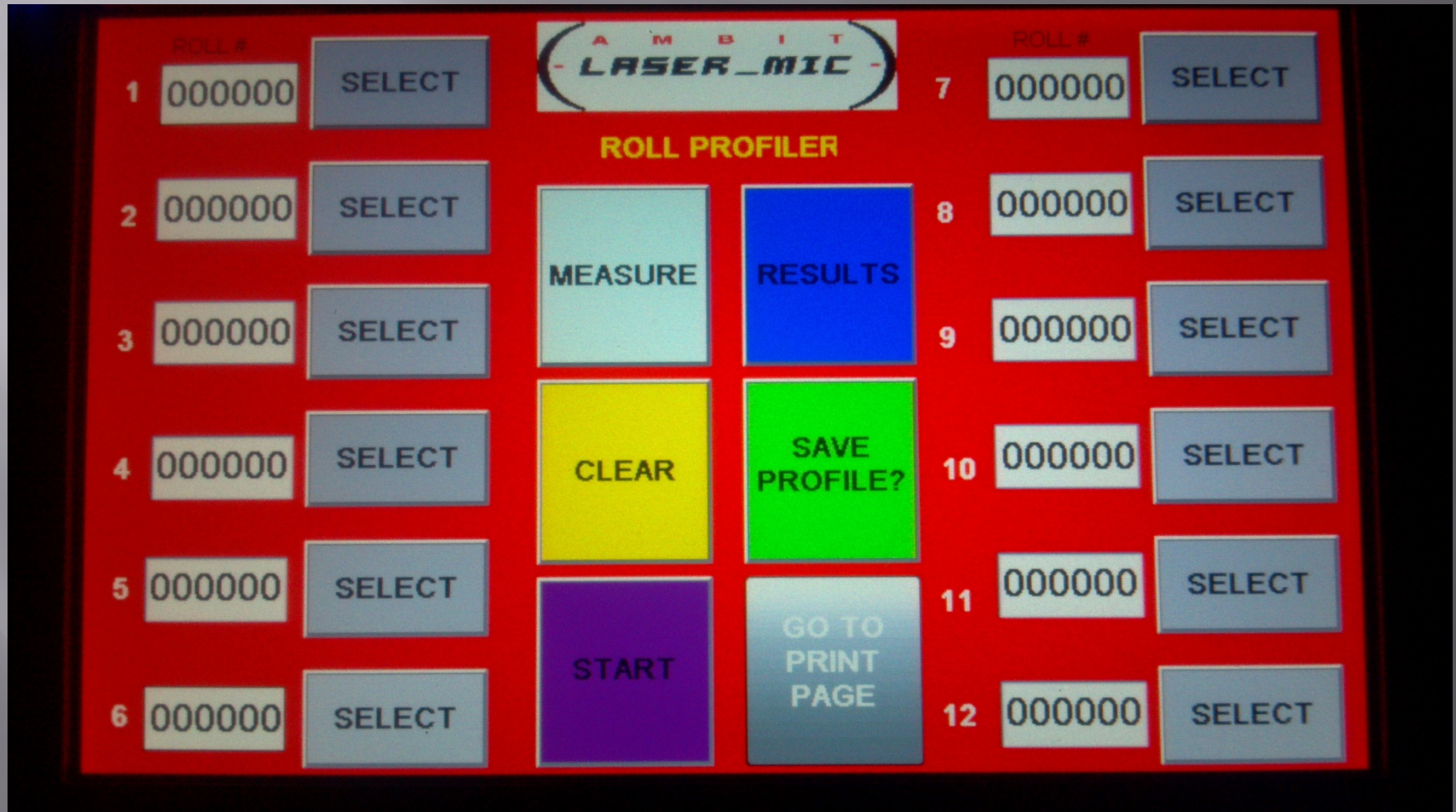
Durability

- The Ambit Laser-Mic units are constructed with powder coated T6 6061 aluminum and stainless steel parts.
- The lasers are Class II and are rated for 75 years
- The only moving parts are protected by the unique construction

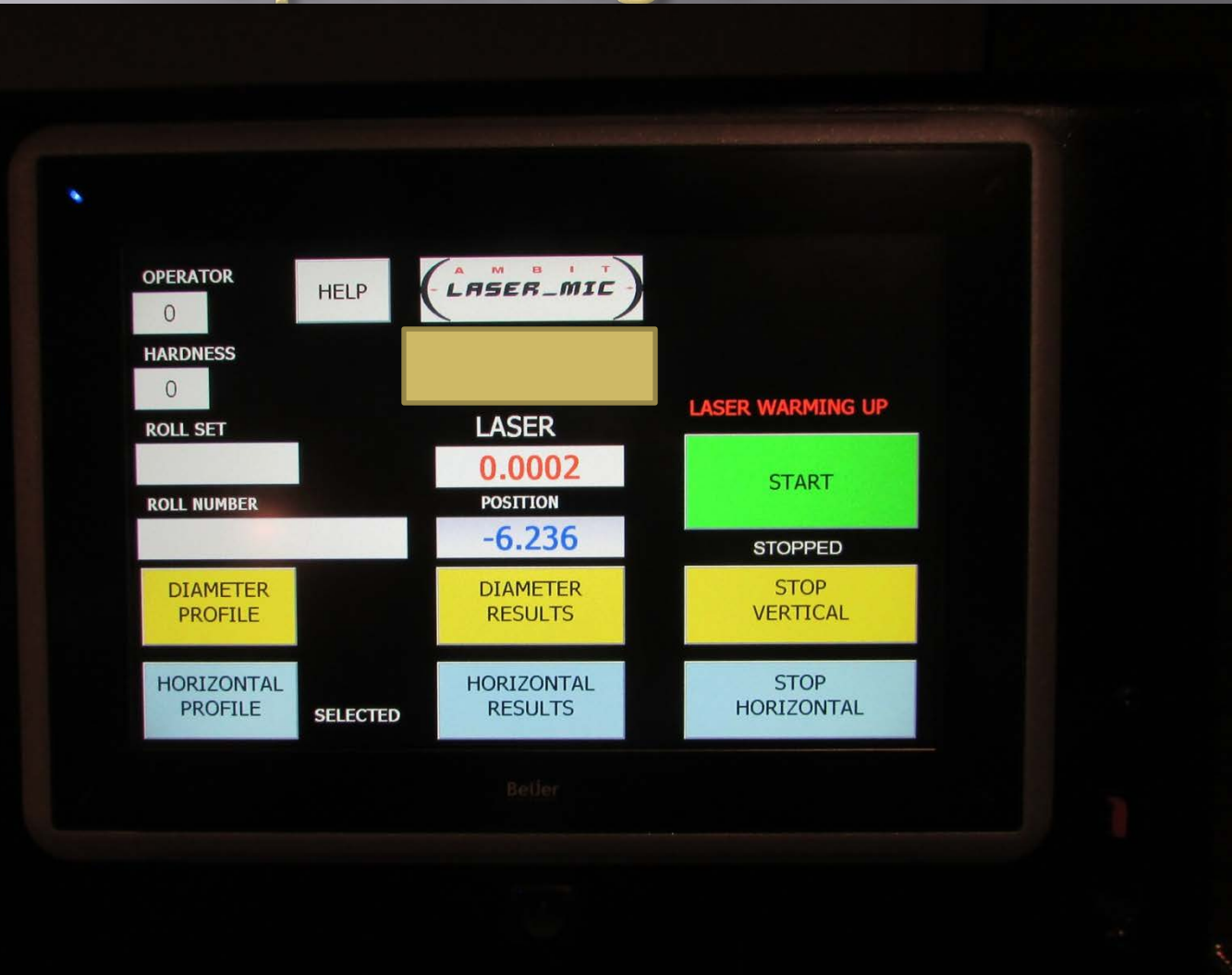
Ease of Use

- The Laser-Mic unit can profile a roll in seconds after the operator has entered the roll information
- The laser sensors provide a “No Contact” method of measurement
- Just slide it on your quick change tool post. Touch screen operated, the intuitive operating system can be learned in a single hour of instruction
- The profile is able to be viewed on the touch screen to verify that the profile is acceptable before removing the unit from the quick change tool post.

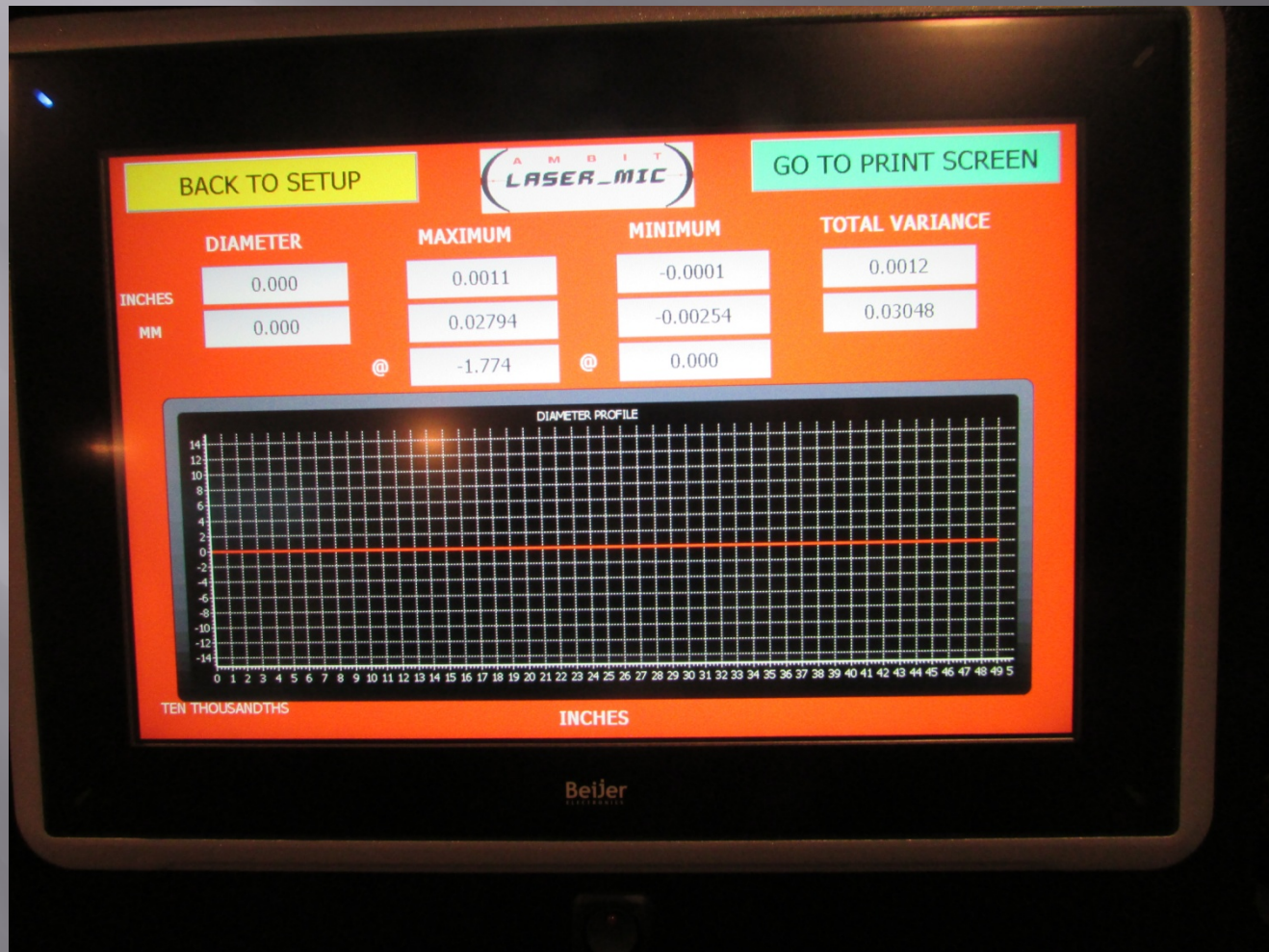
PROFILER Screen



Operating Screen



Results Screen



Roll Shape Printout

ROLL SET

44 rm 2a

ROLL NUMBER

OPERATOR

0

HARDNESS

0



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PRINT

SAVE

REPORT

BACK

TOTAL
VARIANCE

0.1463

INCH

3.717

MM

MINIMUM

MAXIMUM

INCH

-0.0874

0.0589

MM

-2.221

1.496

@

@

LENGTH

INCH

-0.890

-0.107

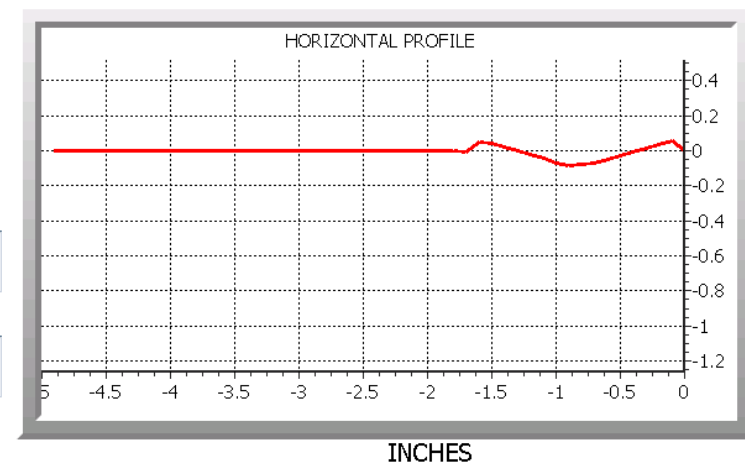
-1.746

MM

-22.61

-2.71

-44.348



Concentricity Printout

ROLL SET

44 rm 2a

ROLL NUMBER



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PRINT

SAVE

OPERATOR

0

HARDNESS

0

MAXIMUM

MINIMUM

REPORT

BACK

0.0004

-0.0009

TOTAL
VARIANCE

DIAMETER

0.010

-0.023

0.0013

INCHES

13.846

@

@

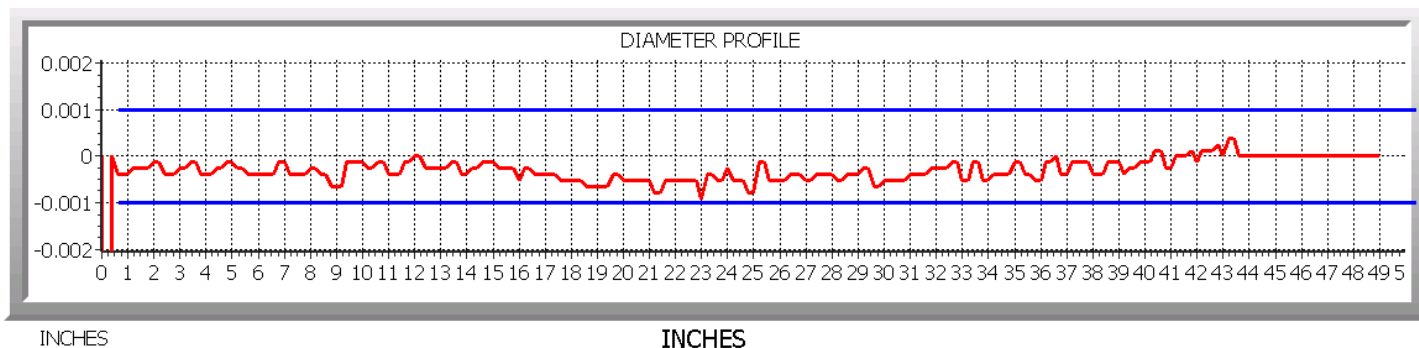
MM

351.69

43.180

22.920

0.033



Overlays

Profile 1

Profile 2

Profile 3

Profile 4

Profile 5

Profile 6

Profile 7

Profile 8

Profile 9

Profile 10

Profile 11

Profile 12

DISPLAY

CLEAR



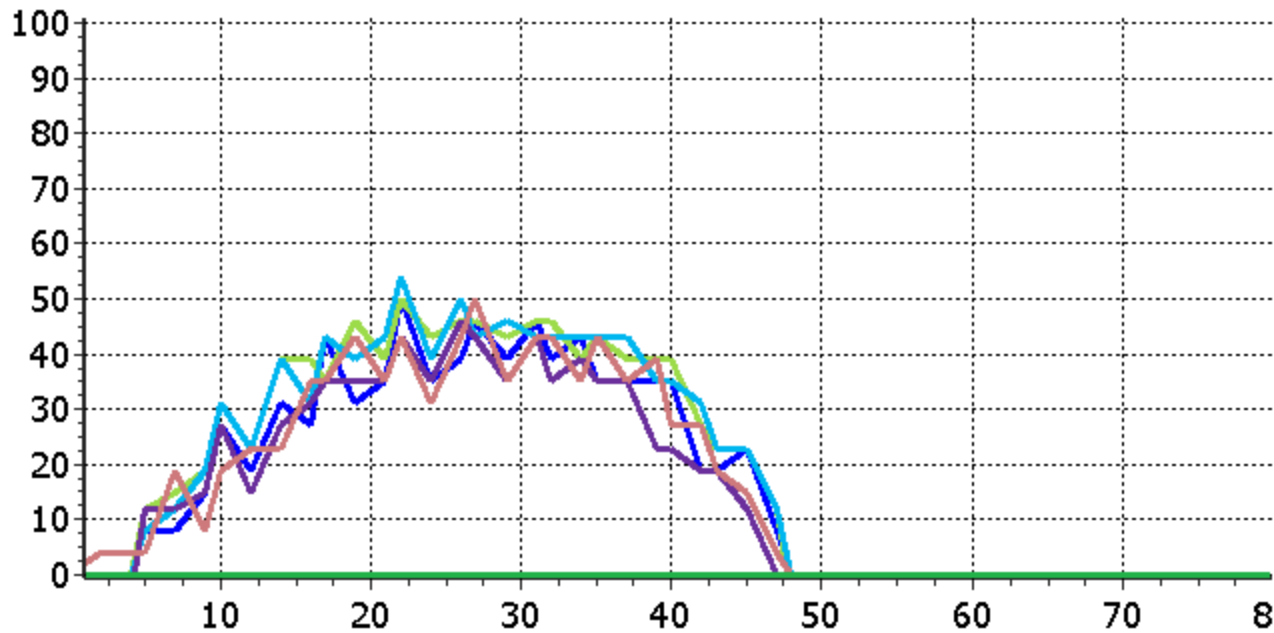
BACK

SAVE

PRINT

Ten Thousandths

ROLL PROFILE



Field Study Table

Total Variance Results	.0014	.0013	.0012	Average .0012925
Number of Concentric Scans	8	21	11	Total Scans 40
Average Variation Ambit	.000051	Statistical Probability of +/- .0001 Reliability	99.7%	Number of Results in the +/- .0001 Range= 40

Advantages of Ambit Laser-Mic

- Accuracy and Reliability
- Durability
- Ease of use
- Cost savings
- Little to no maintenance
- No contact measurement
- Unlimited storage via removable flash drive
- Customizable reports including graphs and overlays
- Excel reports that can be easily assimilated into larger data analysis files.

Coming Next

Portable Inline product profiling:

Line laser based 360 degree product profiling to be placed at any point in production, hot or cold. This device will give the user the ability to profile product at any given point in the production process. There are various levels of accuracy that can be achieved and as always with Ambit the device will be created according to the needs of the user.

In stand product profiling: 360 degree product profiling in between stands. Real time feedback of product profile while moving through the mill stand. Created to the needs of the user this product can also be integrated into the mill stand controls if requested.