Roll Roundness and Motion Measurement with Motion Control

FMT Equipment Corporation has developed of a new roundness measurement method of large rolls rotating in their own bearings in a roll grinding machine. Between mechanical designs and mathematical procedures, run-out can be eliminated from a measurement. And even more importantly, periodic motion from the bearing clearance or other external sources can be measured and separated from the roundness measurement.

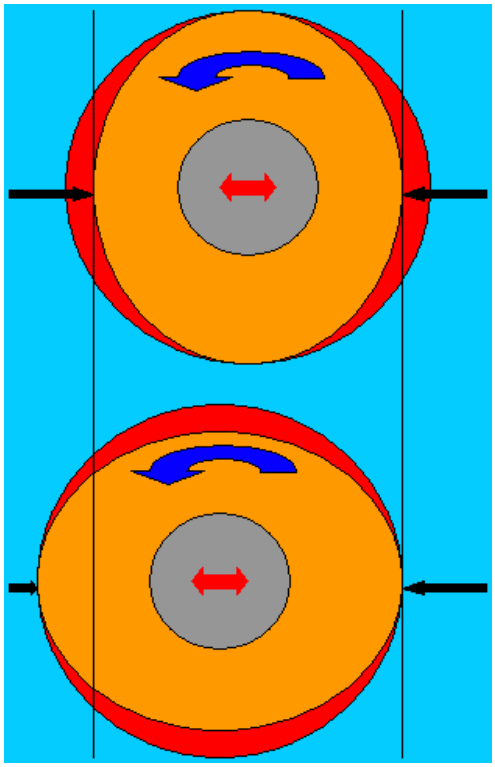
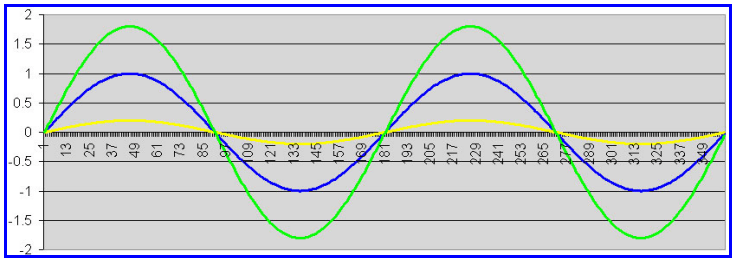


Figure 1: An example of roll motion. The part already ground out is shown in red.
The point of the roll surface on the grinding wheel side stays in the same location. Arrows represent measuring gauges. The grinding wheel side is at the right arrow.
As the roll rotates it moves horizontally matching the ground oval shape. The bottom picture shows the positions after the roll has rotated 90˚.
The point of the roll surface on the back (left) side moves horizontally double the oval shape.
See animation on our web site: www.fmt-equipment.com.

Figure 2. Situation at each side after 80% of roll motion has been ground to the roll surface as an oval shape.
Blue: Oval shape
Green: Measurement at back side
Yellow: Measurement at wheel side



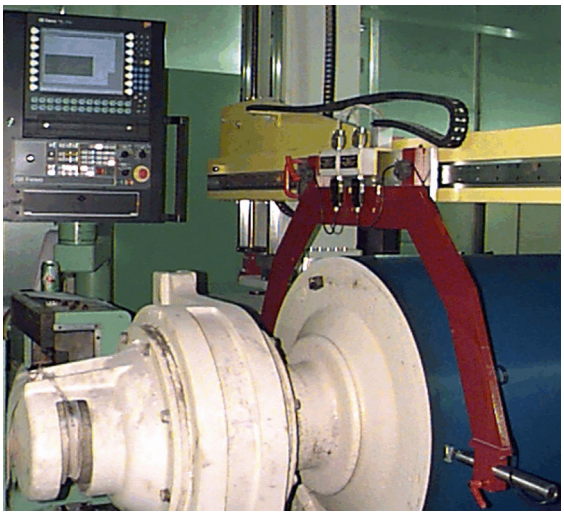


Figure 3. Machine mounted roll caliper interfaced with Abbott Machine/GE Fanuc CNC controls.

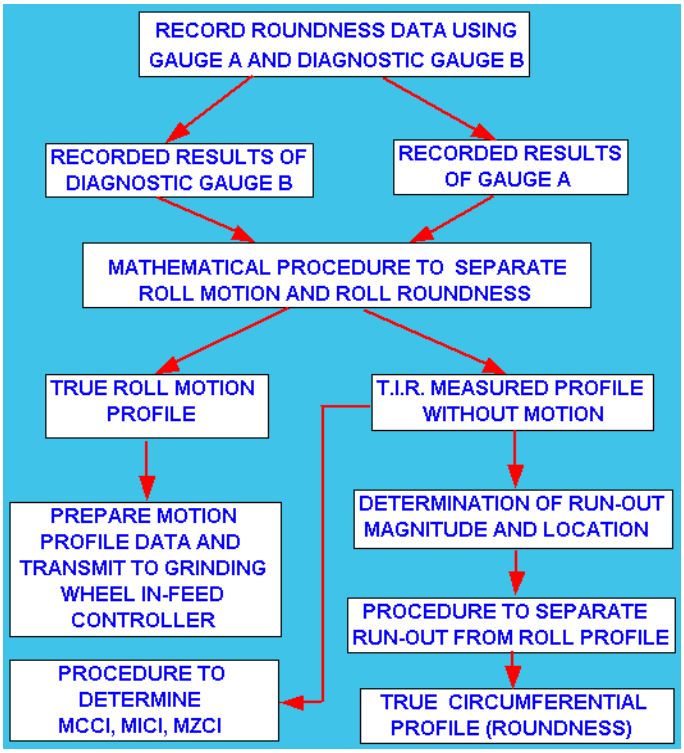


Figure 4. Data recording and calculating procedure to determine the roundness of rolls.

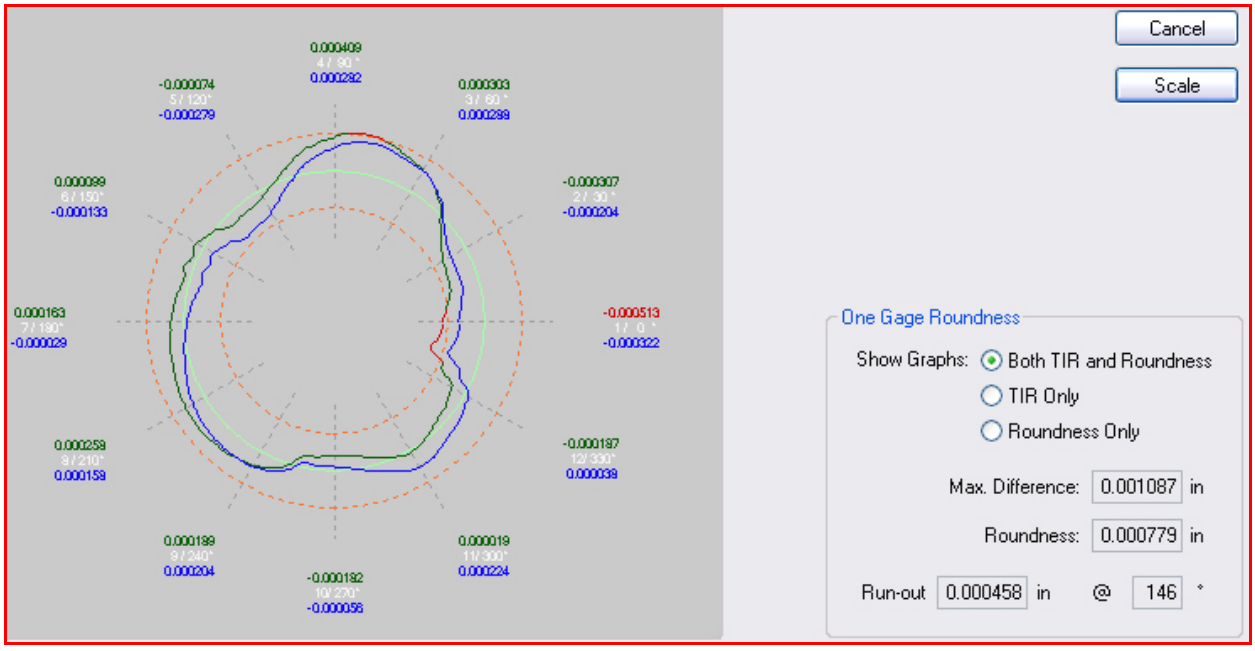


Figure 5. Screenshot: Green measurement graph: Total Indicator Reading (run-out and out-of-roundness)
Blue measurement graph: Roundness.

Figure 5 shows the results after removing run-out from a T.I.R. (Total Indicator Reading) measurement recorded with a single gauge. The result is the true out-of-roundness of a roll at the measuring location.

Circular Roll Measurement Principle

A single probe is required to measure run-out and roundness of a cylinder if the center of rotation is fixed. The run-out and roundness can be separated mathematically.

If a disturbance is periodic and matches the roll rotational frequency, then this disturbance is ground into the roll surface.

If the measuring probe is located on the wheel side, it does not record this disturbance. Therefore, two probes are required to measure Runout and Roundness of a roll with periodic motion.

A mathematical procedure is applied to separate roll motion from the T.I.R. measurement. Data from periodic roll motion can be used by roll grinder controls to compensate for the motion. The controls have to be programmable. The motion control system can be added to the RollTrack® crowner system directly or an export file can be provided to the CNC controls of a roll grinder.

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