WIRE CONCENTRICITY ANALYSIS

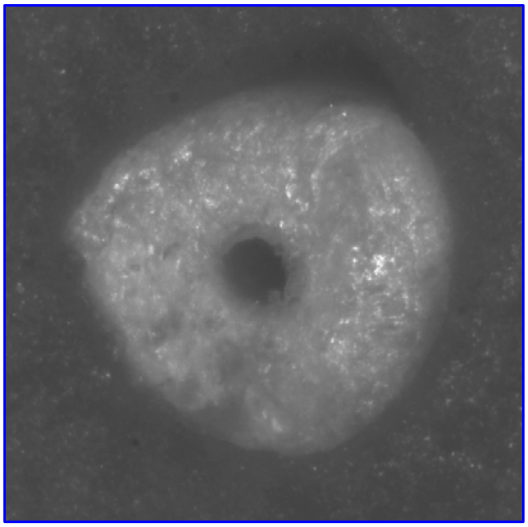

Figure 1: *Original image in reflected light (25x). Calibration factor = 3.27 mm/pixel.*

Sample Description

A section of foam insulator usually covering electric wire is submitted for analysis. The inside wire is removed for contrast purpose.

Purpose of Analysis

Demonstrate the ability of the Clemex Vision image analyzer to evaluate the concentricity of the inner diameter compared to the outer diameter of the foam.

Apparatus

Image Analysis System:	Clemex ImPak V3.0
Microscope:	Nikon Optiphot 2
Objective:	Nikon 2.5x (25x mag)
Motorized Stage:	Marzhauser
Stage Controller:	Clemex ST 100
Camera:	Kokak ES 1.0

No gray processing is needed prior to binarization[1]. The inner diameter is binarized in blue and the foam insulator in red. A radial grid is produced starting from the center point of the inner diameter. Using binary tools, different radial grids are isolated to produce measuring lines. The center points of both inner and outer diameter of wire are isolated and linked for offset evaluation.

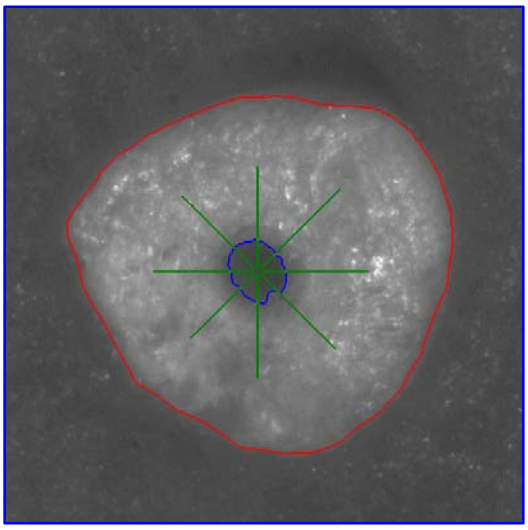

Figure 2: *Final detected concentricity lines overlaid against the original image. Outline of the wire detection is also shown.*

Results

Lines from radial grids are also available to measure the thickness distribution of the foam wall, the inner radius and the concentricity lines. Results are cumulated for automated statistics and graphics production. Final results are printed directly from Clemex Vision.

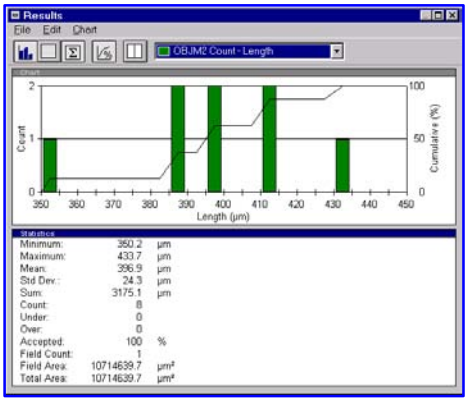

Figure 3: *Cumulative graphic giving the length of the concentricity lines.*

Conclusion

It is possible to measure the concentricity of the wire. Many other measurements can also be performed at the same time on inner diameter, foam wall and, the other radial grid detections.

[1] Images to follow the procedures are available in appendix A.

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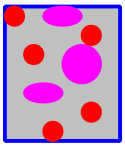
IMAGE ANALYSIS REPORT

Appendix A
Images



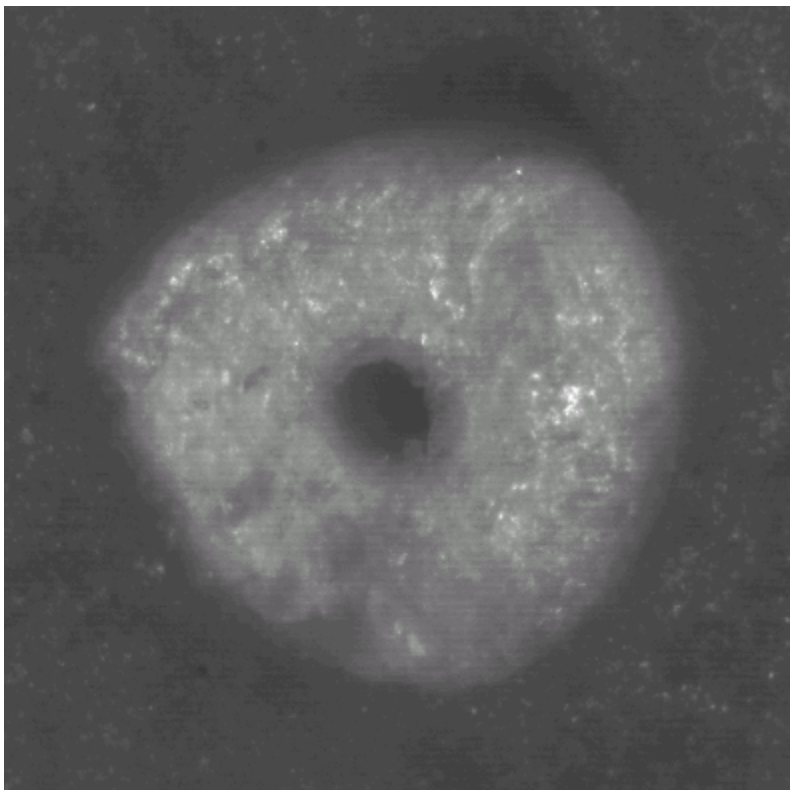


Fig1: Original image at 25x.

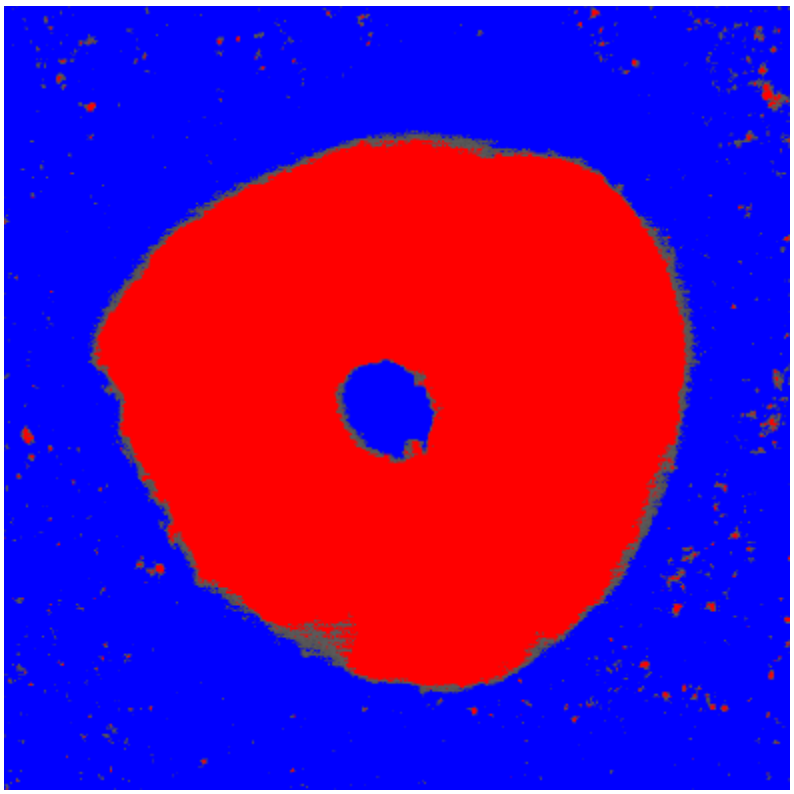


Fig2: Gray Threshold applied on the original image.

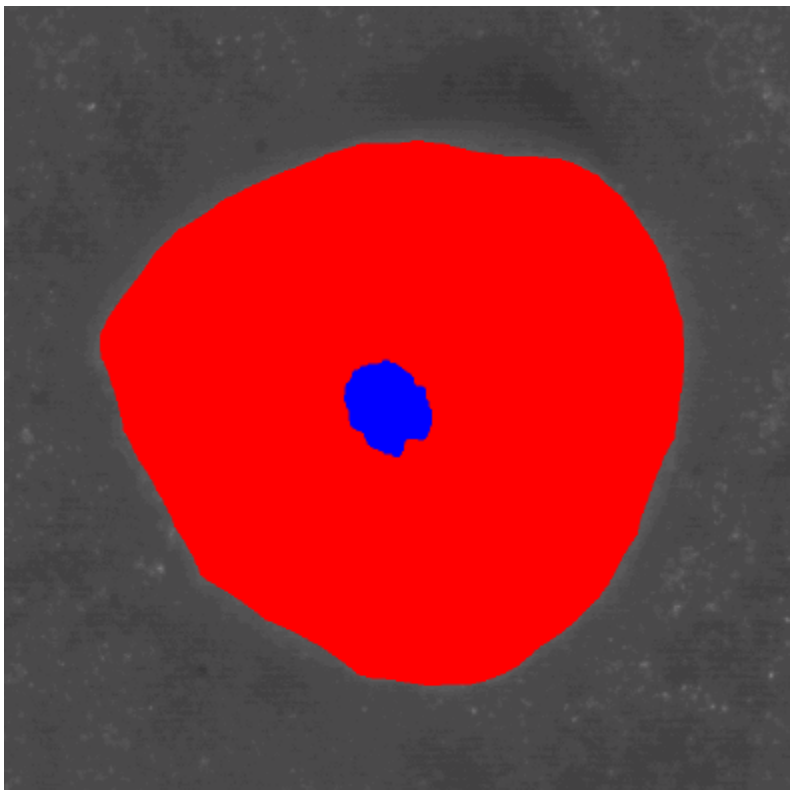


Fig3: Red and blue bitplane after some binary transformation to remove artifacts.

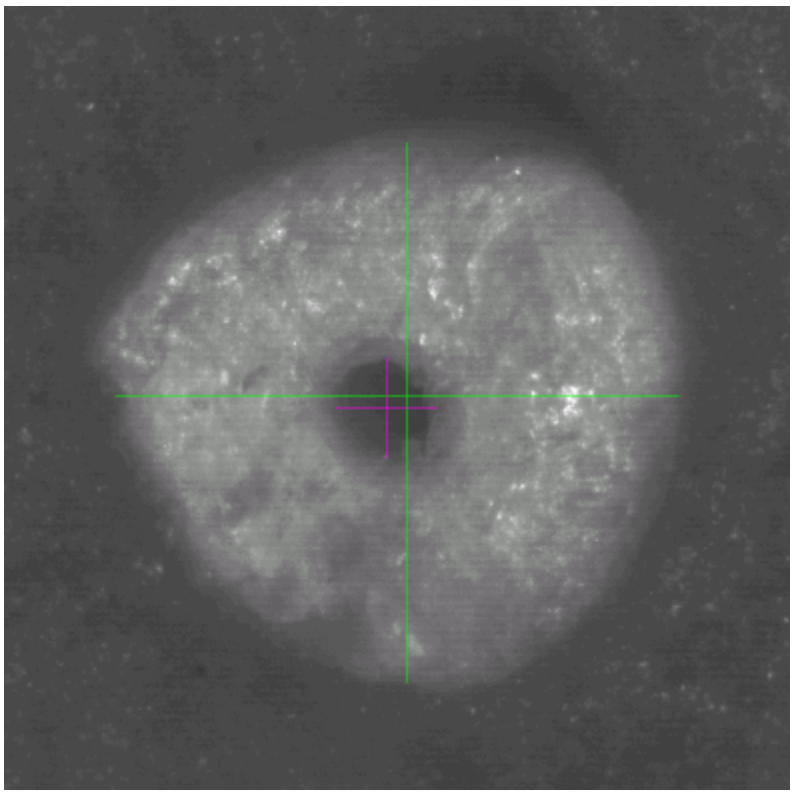


Fig4: Radial grids are used to calculate the distance between the two centers.

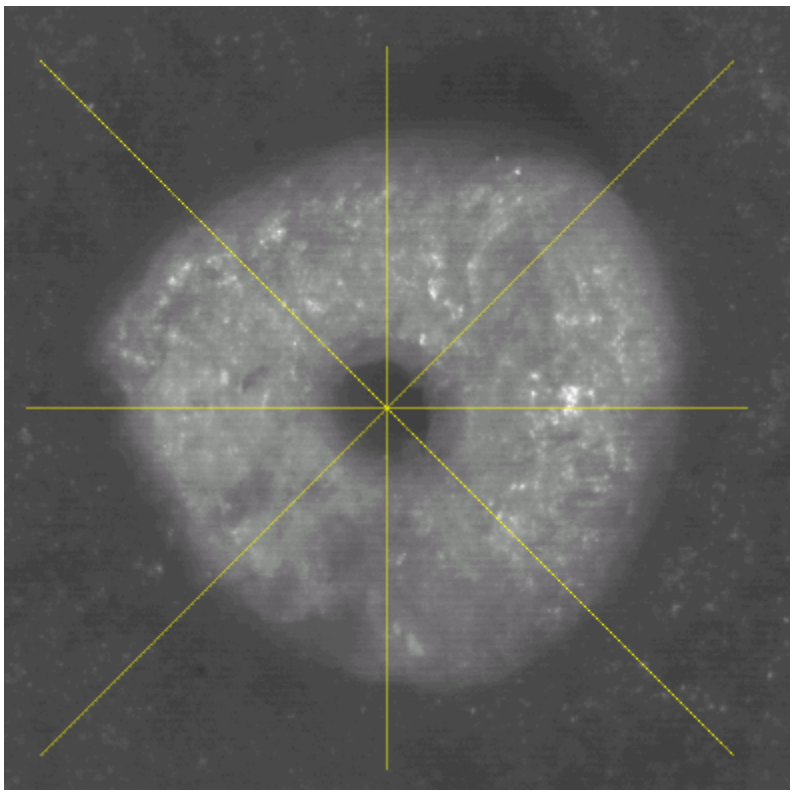


Fig5: Radial grid starting from the inner diameter center.

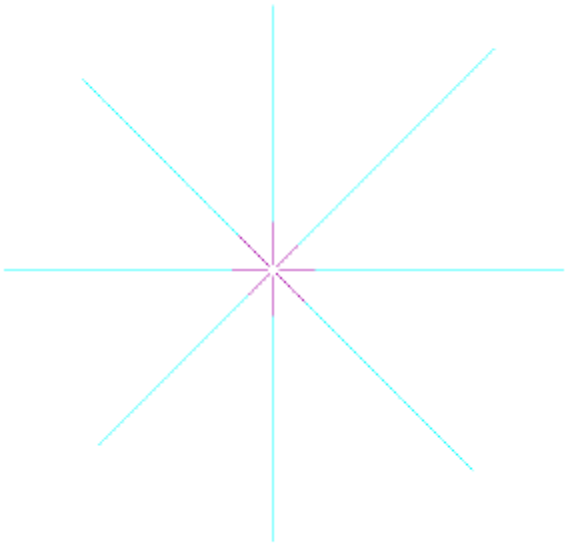


Fig6: Radial grid covering the inner diameter and the foam area.

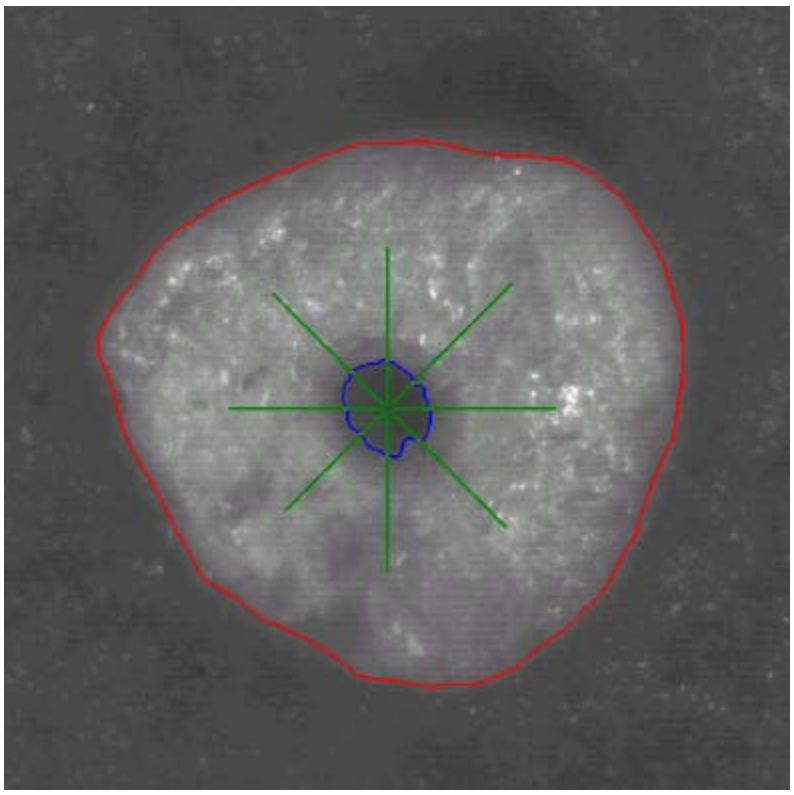


Fig7: Radial lines that represent the concentricity and wire outline.

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