Decarburization

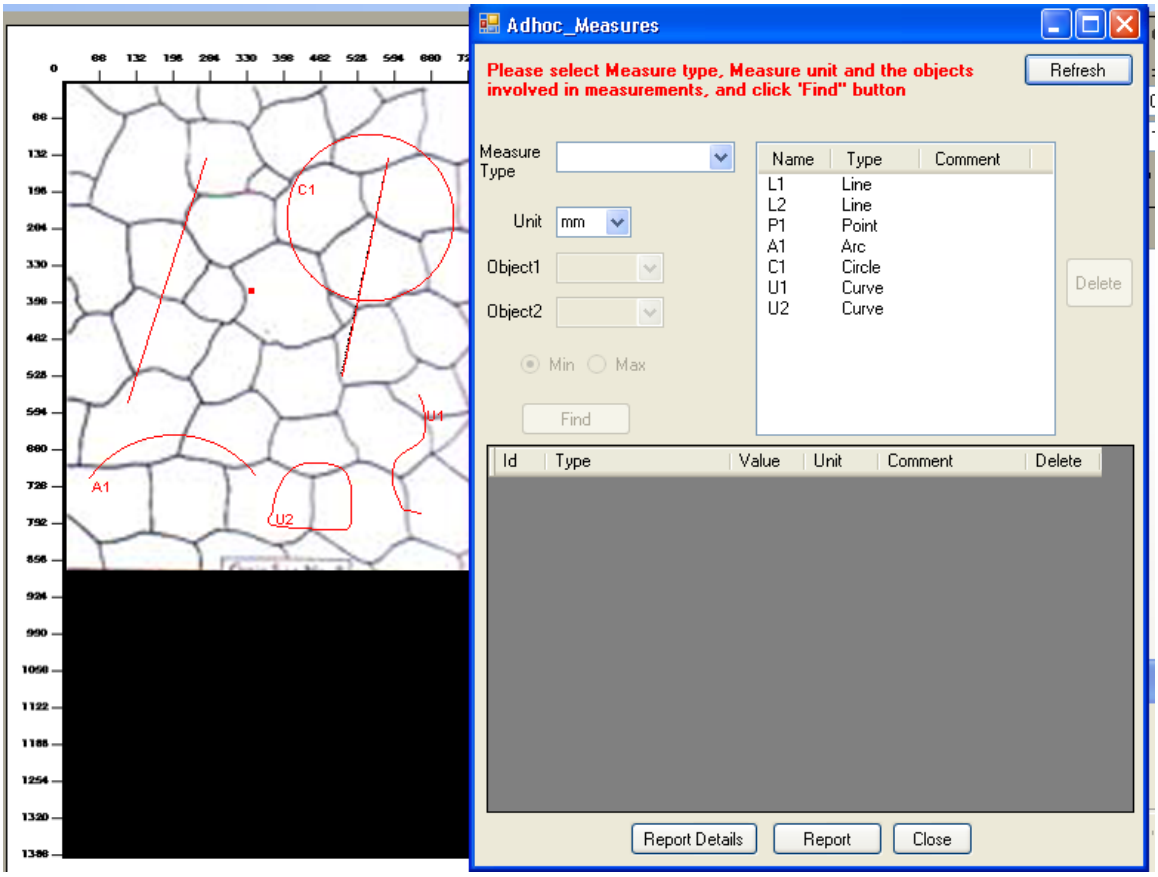
This method is for identifying the depth of decarburization in steel. This method can be accessed through “Measurements Decarburization”. You can measure for multiple samples and add each result to the final result for report generation.

There are two methods with which we can measure Decarburization. They are

- Trace method
- Total Decarb

Adhoc Measurements

Adhoc measurement window provide the option to do dimensional measurement on the image like length, area, radius or diameter or circumference of a circle etc. This option can be accessed through “Measurements Adhoc Measurements”. The Adhoc measurement window is as shown below.



User can do the following measurements using this option.

- Length
- Radius

- Diameter
- Circumference

Measurements are done with the following steps

- Draw necessary objects like Line, Circle, Point, Arc, Curve or Closed curve. Please refer this section for more information on this.
- Open the “Adhoc Measurements” window if not open
- You can see the list of all objects drawn in the object list box. If not, click “Refresh” button on top right corner of the window. This will update the object list with all objects drawn on the image
- Select measure type – LENGTH, RADUS, DIAMETER, CIRCUMFERENCE
- Select unit – mm, microns, cm or inch
- Select the object1 and object2 (optional) for measurement. Please refer the below sections for guidelines on selecting object1 and object2.
- You can generate report by clicking the “Report” button. The report will be generated with images in the format selected in the System Configuration

Measurements

Length of line

To find the length of a line, select the line in the object1 list and click “Find” button. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between lines

To find the shortest distance between the lines, select those lines as object1 and object2 and click “Find” button. The order of selection does not matter. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should LENGTH.

Distance between point and line

To find the distance between a point and a line, select the point and line as object1 and object2 and click “Find” button. The order of selection does not matter. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between point and point

To find the distance between 2 points, select the points as object1 and object2 and click “Find” button. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between point and arc

To find the distance between a point and an arc, select the point and arc as object1 and object2 and click “Find” button. The order of selection does not matter. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between circle and circle

To find the distance between 2 circles, select the circles as object1 and object2 and click “Find” button. The order of selection does not matter. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH. If the circles are intersecting, the distance will be 0 (Zero).

Radius/Diameter of circle

To find the radius of the circle, the type of the parameter should be RADIUS. Select the circle to measure in the object1 list and click “Find” button. The result will be added to the result box below. The unit of measurement will be the unit set for the job. If the type is DIAMETER, the returned value will be the diameter of the circle.

Distance between line and circle

To find the distance between a line and circle, select the line and circle as object1 and object2 and click “Find” button. The order of selection does not matter. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should LENGTH. If the line and circle are intersecting, the distance will be 0 (Zero).

Distance between circle and point

To find the distance between a circle and a point, select the circle and point as object1 and object2 and click “Find” button. . The order of selection does not matter. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between curve and point

To find the distance between a curve and a point, select the curve and point as object1 and object2 and click “Find” button. . The order of selection does not matter. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between curve and line

To find the distance between a curve and a line, select the curve and line as object1 and object2 and click “Find” button. . The order of selection does not matter. This will by default return the shortest distance between the curve and the point. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between curve and curve

To find the distance between curves, select the curves as object1 and object2 and click “Find” button. . The order of selection does not matter. This will by default return the shortest distance between the curves. The type of the parameter should be LENGTH.

Distance between curve and circle

To find the distance between curve and circle, select the curve and circle as object1 and object2 and click “Find” button. . The order of selection does not matter. This will by default return the shortest distance between the curve and circle The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between arc and circle

To find the distance between arc and circle, select the arc and circle as object1 and object2 and click “Find” button. . The order of selection does not matter. This will by default return the shortest distance between

the arc and circle. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between arc and arc

To find the distance between 2 arcs, select the arcs as object1 and object2 and click “Find” button. The order of selection does not matter. This will give the shortest distance between the arcs. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH. If the arcs are intersecting, the distance will be 0 (Zero).

Distance between arc and line

To find the distance between arc and line, select the arc and line as object1 and object2 and click “Find” button. . The order of selection does not matter. This will by default return the shortest distance between the arc and line. The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should be LENGTH.

Distance between arc and curve

To find the distance between arc and curve, select the arc and curve as object1 and object2 and click “Find” button. . The order of selection does not matter. This will by default return the shortest distance between the arc and curve The result will be added to the result box below. The unit of measurement will be the unit set for the job. The type of the parameter should LENGTH.

Area of closed curve

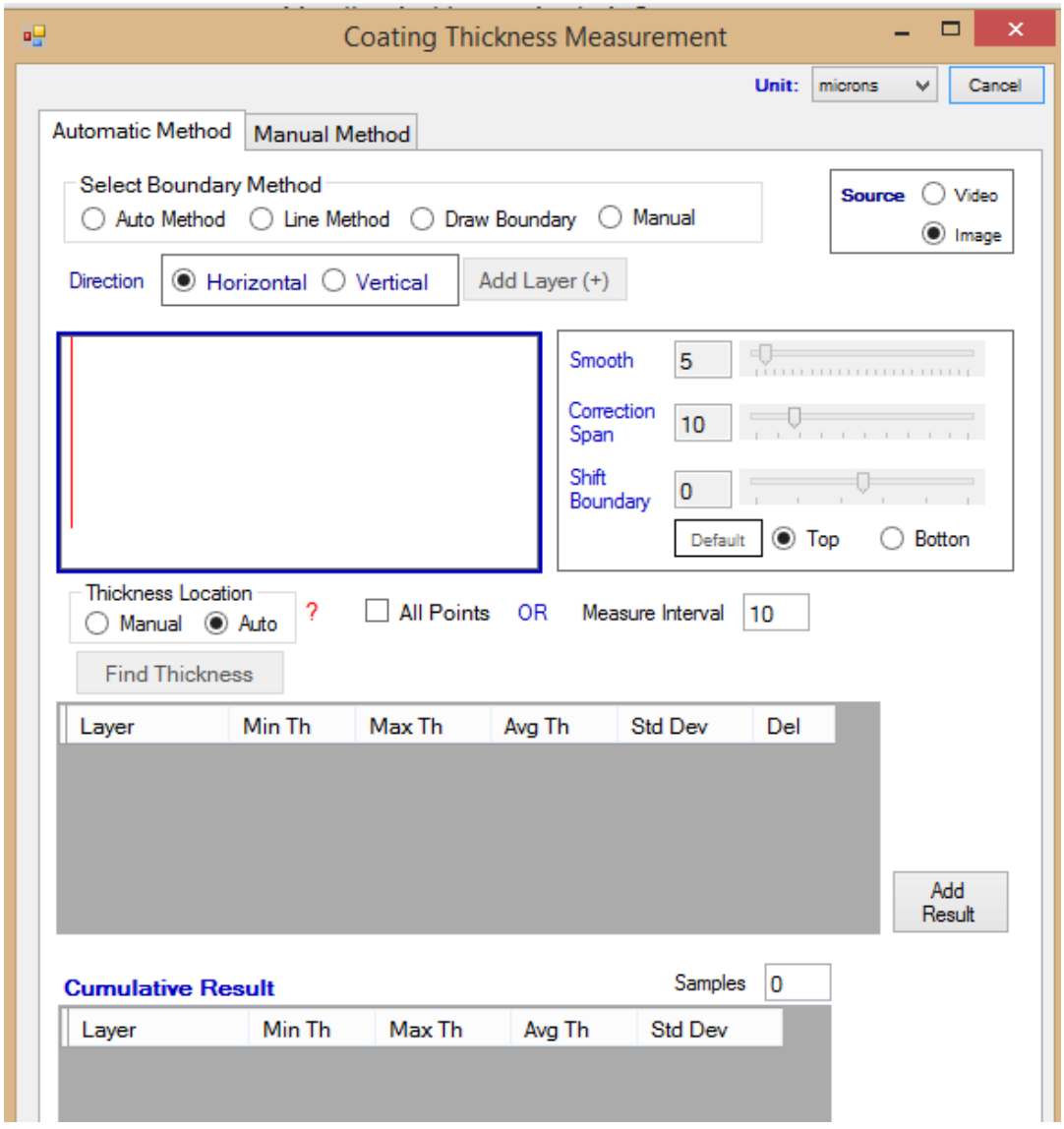
To find the area of a closed curve, select the closed curve as object1 and click the “Find” button. The measure type for the parameter should be “AREA”. This will give the area of the closed curve in the unit selected.

Area of circle

To find the area of a circle, select the circle as object1 and click the “Find” button. The measure type for the parameter should be “AREA”. This will give the area of the circle in the unit selected.

Coating Thickness Measurement

This method is for measuring the Coating thickness. This method can be accessed through “Measurementsà Coating Thickness Measurement”. The window for this method will be as shown below. You can measure multiple samples and add result of each specimen to the final result for report generation.



· You can measure Coating thickness using four methods: Auto method, Line method, Draw boundary method and Manual method. You can also check multiple layer checking in one sample, up to **maximum 4 layer per sample**. You can use any of the 4 methods in a sample for finding the thickness of

different layers in a sample. You can use a mix of above methods in a sample. For example, you can use Auto method for layer 1, Line method for Layer 2, Draw Boundary method for Layer 3.

The steps are explained below.

· Open the image or play the camera by clicking “Camera Play” button in the main screen.

· Select “Measurementsà. Coating Thickness Measurement”

· Select the Boundary method – Auto, Line, Draw Boundary or Manual

· **Select whether the Coating direction is Horizontal or Vertical. This is very important**

· Select the unit of measurement – Default is microns.

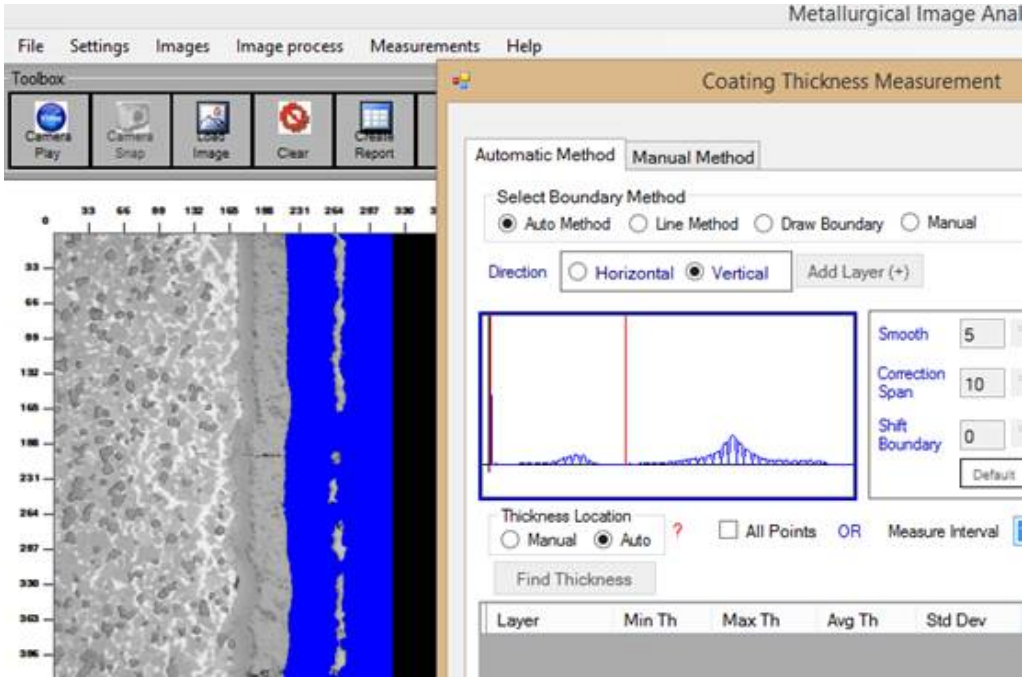
Auto Method

· Click on “Add Layer” button · System will threshold the image with default thresholding and also display the Histogram using which user can change he threshold to isolate the coating area

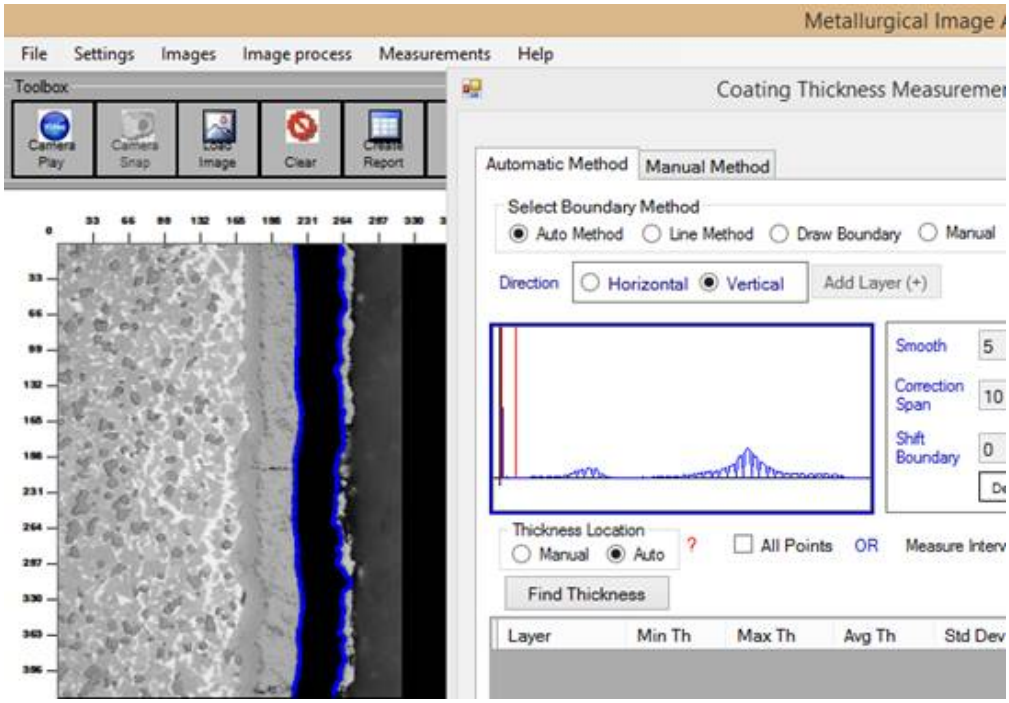
· Adjust the threhold Start and/or End points using mouse to isolate the coating area. The thresholded area shall be shown in “Red” colour.

· An example is as shown below with Before histogram adjustment and after Histogram Adjustment

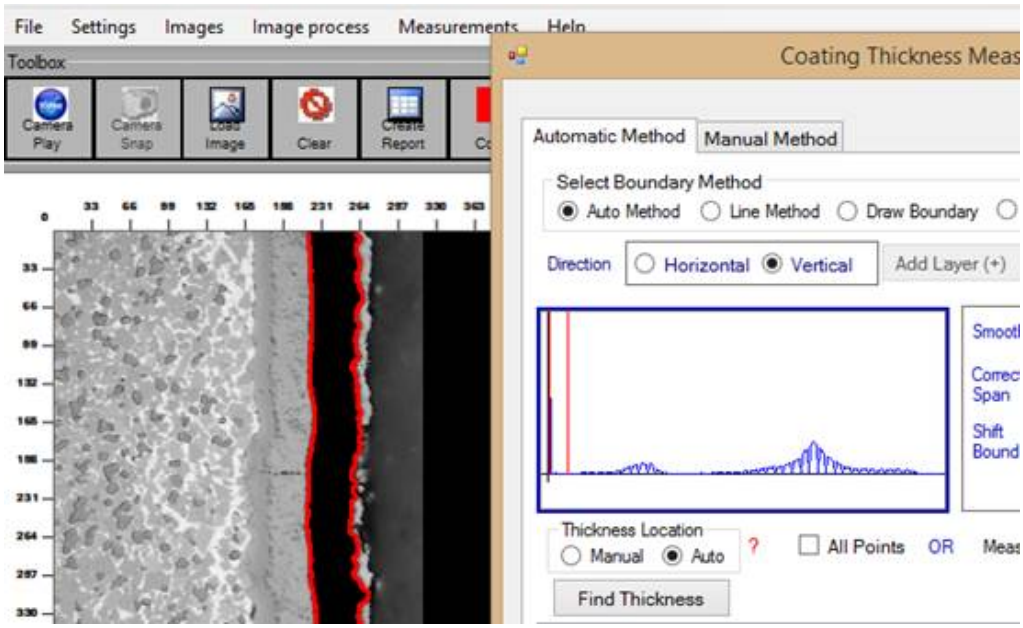
Before Histogram adjustment



After Histogram adjustment



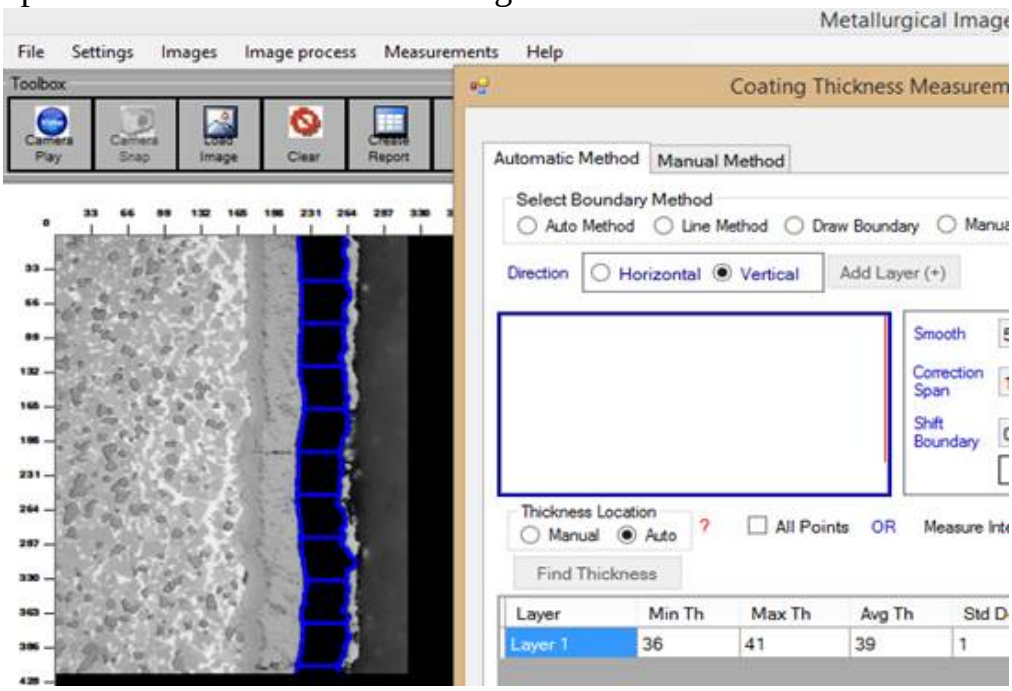
· Once the Coating area is isolated correctly, click using mouse left button inside the Coating area. This will create the coating boundary as shown below



· Click on “Find Thickness” to get the Coating thickness for this boundary.

- Here also, you can use “Auto” mode, where the coatings will be measured at equa intervals of value for “Measure Interval”. Default is 10, which you can change. You can also select “All Points” so that coating thickness shall be calculated at all points on the boundary.
- Other option is “Manual” method, where you user can select the location where the thickness should be measured. User needs to click on the location inside the boundary where he/she wants to measure the coating thickness. User can select any number of points here. When user selects this option, system will add a row for this layer to the result box with zeros for all. As user clicks on different locations for measurement, system will calculate thickness at that location and

update the result row · Result image shall be as below



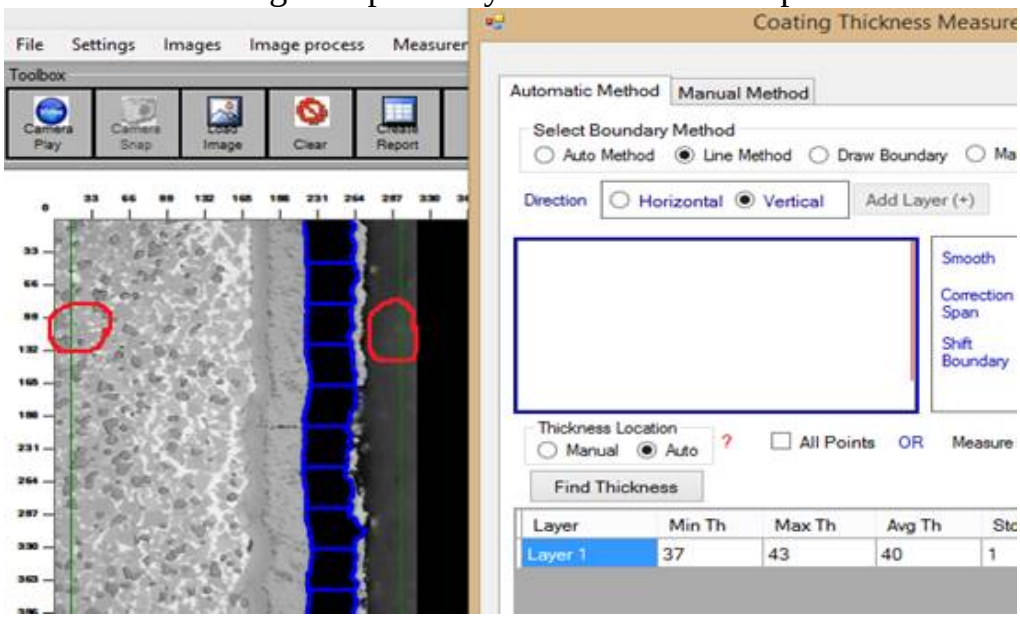
· Once you get the current layer result, you can repeat the above process for any new layer if any. You can use any of the 4 methods in a sample for finding the thickness of different layers in a sample.

· Once measurement is complete for the sample, click “Add Result” to add the current sample result to the Cumulative result. Cumulative result will be the average of all samples

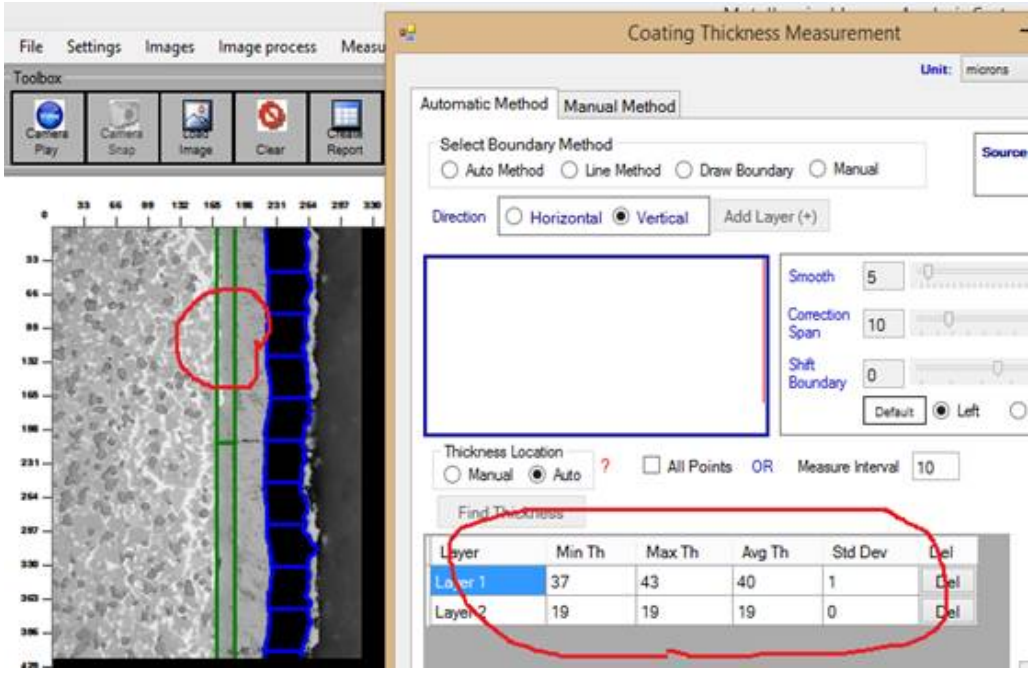
Line Method

· Select the direction – Horizontal or Vertical · Click on “Add Layer” button · System will by default create 2 lines close to the image edge. If you have selected direction as Horizontal, these lines shall be close to top and botton respectively. If you have selected direction as Vertical, these lines shall be

close to left and right respectively. Below is an example



· You can use mouse to drag these lines to define your coating boundary. After that click on “Find Thickness” button to find the coating thickness. Since this is a line method, Standard deviation shall be Zero. The result image shall be as below



· Once you get the current layer result, you can repeat the above process for any new layer if any. You can use any of the 4 methods in a sample for finding the thickness of different layers in a sample.

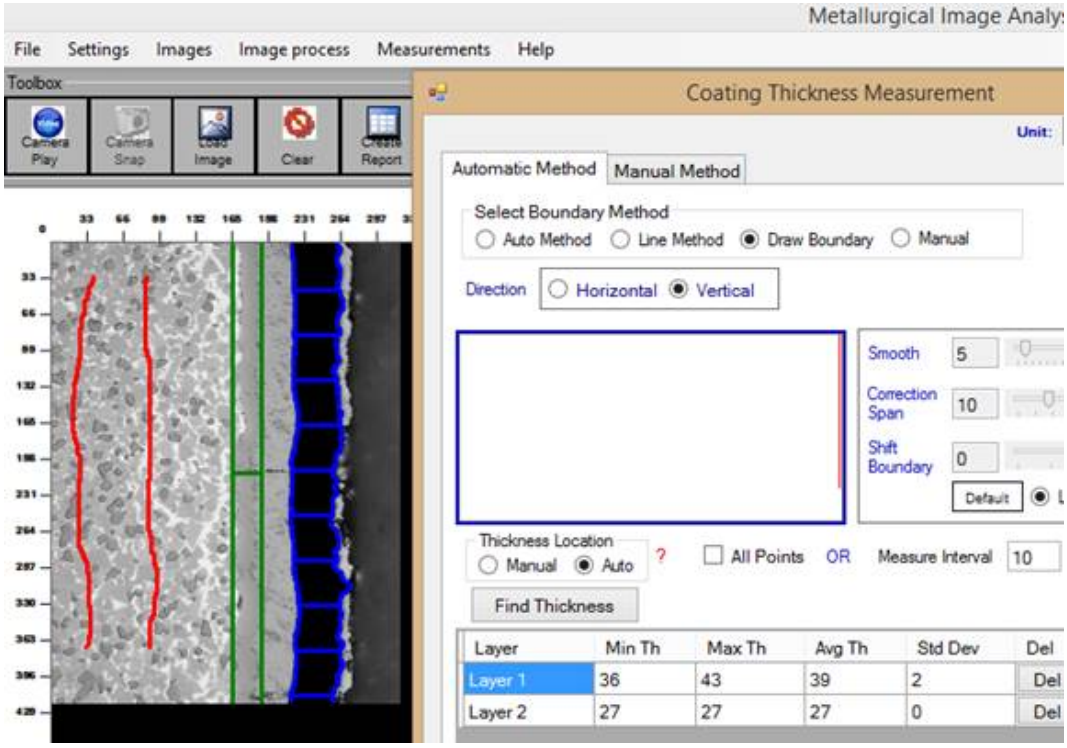
· Once measurement is complete for the sample, click “Add Result” to add the current sample result to the Cumulative result. Cumulative result will be the average of all samples

Draw Boundary Method

· Select the direction – Horizontal or Vertical · You can see that the “Add Layer” boundary shall be hidden for this option, as this is not needed

· Draw 2 boundaries manually. If you have selected direction as Horizontal, the boundary direction should be horizontal. If you have selected boundary direction as Vertical, the boundary direction should be vertical.

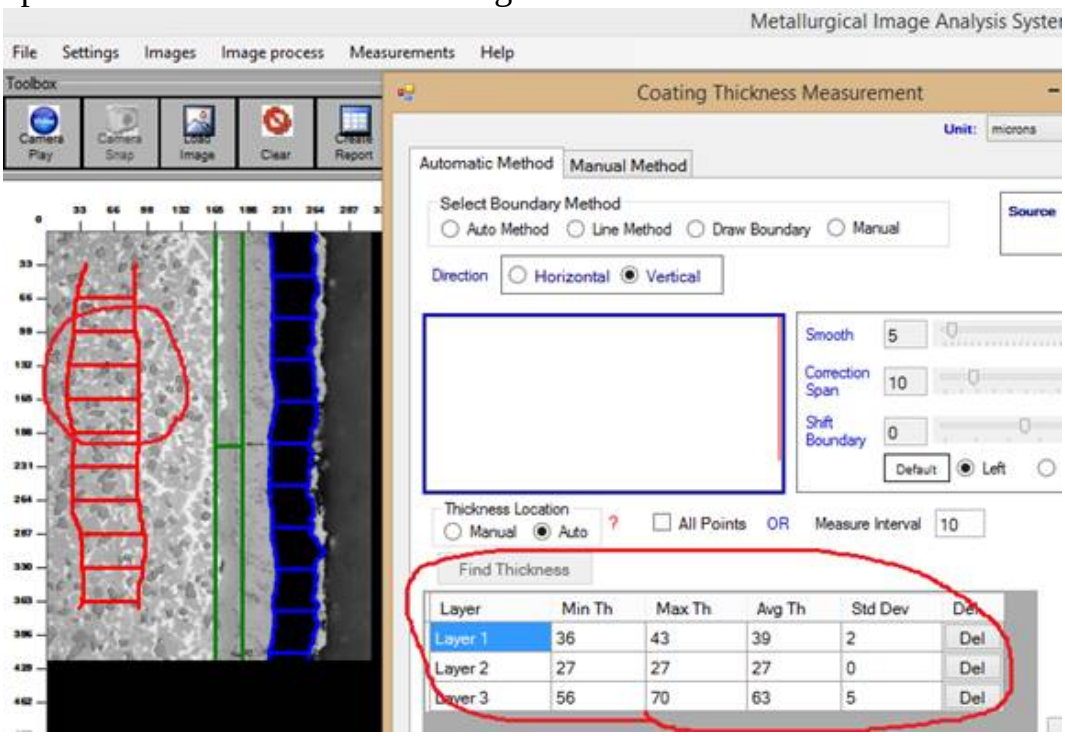
· To draw a boundary, mouse left click and release to initiate the boundary draw, move the mouse along the border of the coating layer and to end the draw, mouse left click again. Repeate the same process to draw the next boundary. The boundaries should not touch each other. An example shown below:



· Click on “Find Thickness” to get the Coating thickness for this boundary.

- Here also, you can use “Auto” mode, where the coatings will be measured at equa intervals of value for “Measure Interval”. Default is 10, which you can change. You can also select “All Points” so that coating thickness shall be calculated at all points on the boundary.
- Other option is “Manual” method, where you user can select the location where the thickness should be measured. User needs to click

on the location inside the boundary where he/she wants to measure the coating thickness. User can select any number of points here. When user selects this option, system will add a row for this layer to the result box with zeros for all. As user clicks on different locations for measurement, system will calculate thickness at that location and update the result row · Result image shall be as below

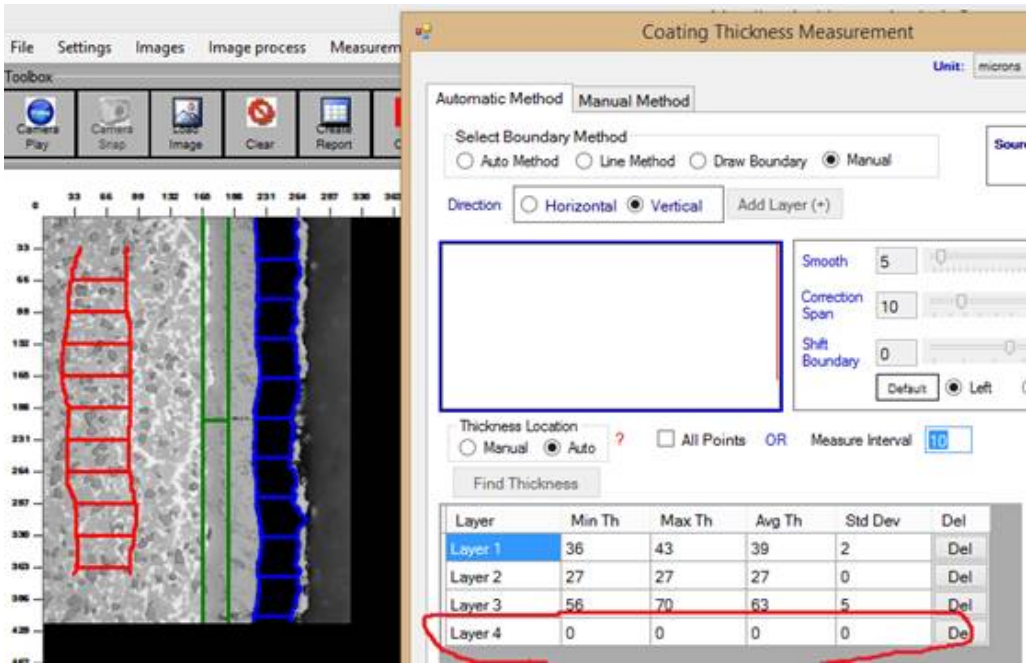


· Once you get the current layer result, you can repeat the above process for any new layer if any. You can use any of the 4 methods in a sample for finding the thickness of different layers in a sample.

· Once measurement is complete for the sample, click “Add Result” to add the current sample result to the Cumulative result. Cumulative result will be the average of all samples

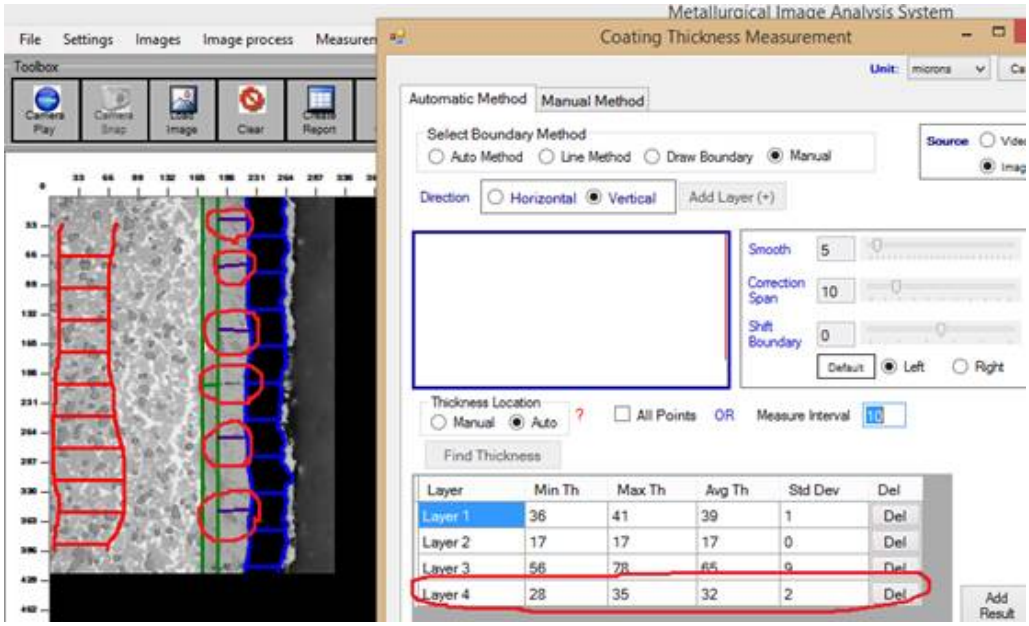
Manual Method

· Select the direction – Horizontal or Vertical · Click on “Add Layer” button · System will add a record with Zero values for this layer as shown below



· Now manually define the boundary using mouse left button – Mouse click on start point and mouse click again on end point to define the coating thickness. System will calculate the distance between the 2 click points and take as coating thickness at that location and will upate the result for that layer.

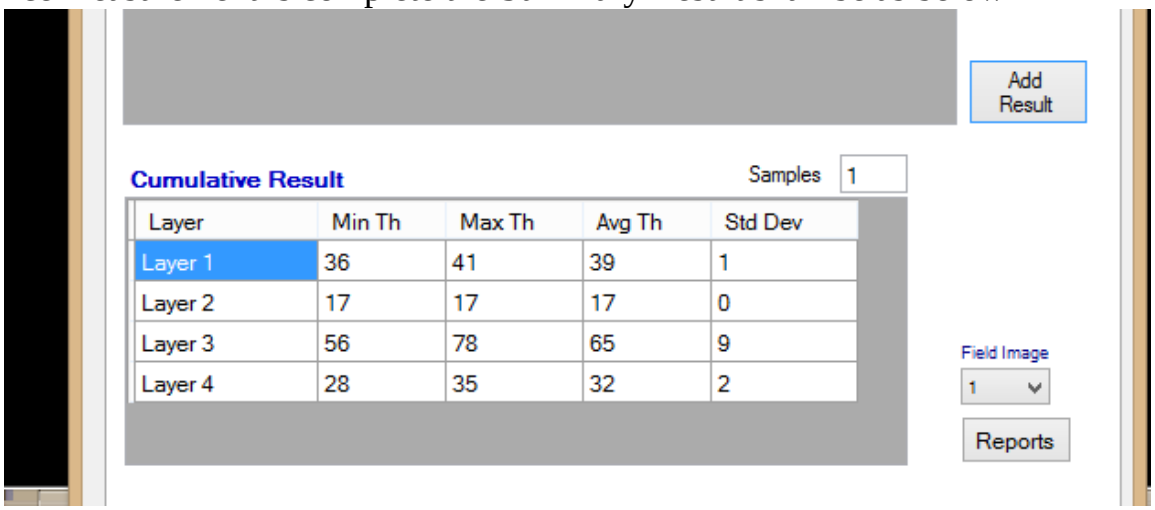
· You can define any number of such thicknesses manually. The result shall be as below



· Once you get the current layer result, you can repeat the above process for any new layer if any. You can use any of the 4 methods in a sample for finding

the thickness of different layers in a sample.

· Once measurement is complete the Summary Result shall be as below



· You can click on reports to generate reports in PDF/Excel