

## **Considerations for measuring ferrite content in Duplex Stainless Steels with image analyses, IA.**

The value of having specific ferrite contents have been discussed for many years. It is also often specified in different standards and then need to be measured with adequate accuracy.

Image analyses (IA) is normally considered the most accurate of the ferrite measurement methods and this has also been shown through numerous round-robins through the years. Comparison has also been performed with point counting (PC), historically being the most common method.

A short description of the image analyses method includes can be as below:

- Polishing/Etching step where enough contrast is needed between the ferrite and the austenite.
- Image analyses is taken in appropriate magnification over examined area
- A threshold is set between the normally darker etched ferrite and the brighter etched austenite
- The fraction of darker pixels below threshold representing the ferrite is measured and a mean value with statistics over taken images is calculated.

Presented work will show some considerations with examples that enables image analyses to be performed as accurate as possible and also situations when other methods should be preferred.

For certain types of structures with large variations image analyses should be the preferred metallographic method. For instance, one might then be interested in distributions of the ferrite. There are however situations where one need to consider other methods or be careful how measurements are performed. Especially very fine structure can be hard to measure where relatively heavy filtering might have to be performed to actually being able to find an adequate threshold and reliable results. For these types of structures references could be one option which can be explored.

For point counting the polishing and etching steps is very important and for image analyses even more so, but today relatively good etching procedures exists for the duplex grades that normally give high and adequate contrast also for image analyses. One structure that sometimes present difficulties with etching procedures is weld metal of duplex grades. Sometimes enough contrast is hard to achieve, and sometimes very different contrast may appear locally in the weld.