

Application Note

The inspection of nozzles and nodes requires a high level of skill and experience for both inspection and interpretation. Here we show the improvements to detection and sizing by using the CAD import feature in the WAVE 1.8 update allowing complex geometry profiles and scanning.

Under normal circumstances a technician would have to manually draw out the weld profile to aid in positioning and interpreting indication signals. With some nozzles and node configurations this could require 3 to 5+ diagrams to cover the different profiles around the weld.

With the Wave 1.8 CAD import feature, all of the profiles can be viewed on a single scan plan screen, and utilising the live ray tracing for the probe being used the technician is able to accurately position any signal received and interpret that signal with confidence.

Inspection

The test shown in the data were carried out on a set through nozzle sample with induced defects. The nozzle was 12mm thick x 200mm diameter set at 90° through a 25mm thick curved plate with a single bevel weld.

The probes used in this inspection were 4MHz, 0°, 45°, 60° and 70° Sonatest Starc shear wave transducers. The transducers were positioned on both the main pipe and the nozzle itself to achieve full coverage of the weld.

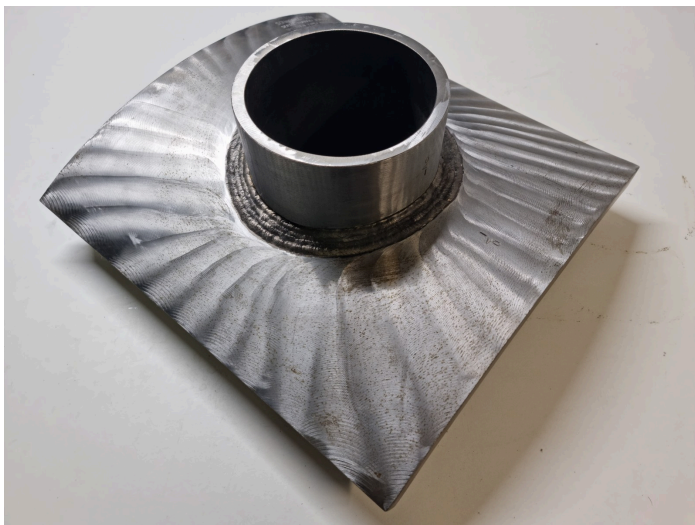


Fig. 1 – Nozzle sample inspected

Industries

- Chemical & Petrochemical
- Mining
- Oil & Gas
- Nuclear Power
- Pipelines

Typical Parts

- Nozzles (all variations of weld type and angle of protrusion)

Inspection Techniques

- Conventional UT weld inspection utilising the WAVE 1.8 CAD import features

Features & Benefits

- Ability to create exact weld profiles for a known asset
- Ability to view multiple weld profiles in a single screen allowing for quick signal reviews during inspection
- Ability to record images of indications for reporting

Recommended Tool Package

- WAVE ultrasonic inspection unit with software version 1.8
- Companion Software
- Procedure defined probes and cables e.g. 0°, 38°, 45°, 60°, 70° probe with a frequency of 2-4MHZ
- Procedure defined calibration blocks e.g. V1, DAC
- Laptop with CAD software capable of exporting DXF files e.g. Beamtool

With a CAD DXF file created on Beamtool we had the profiles for 0°/180°, 90°/270° and 45°/135°/225°/315°, once the scanning surface, reflective and non-reflective surfaces were assigned this was imported to the WAVE for the inspection.

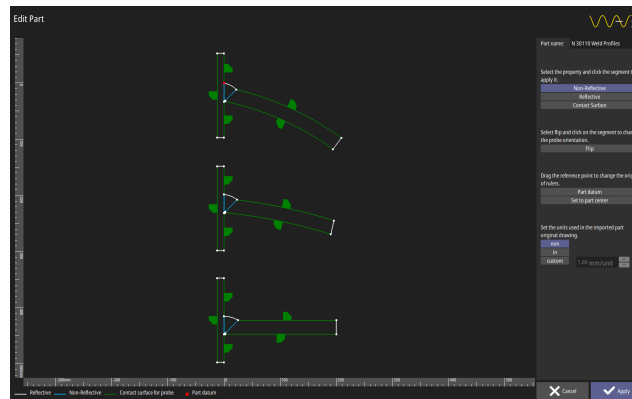


Fig. 2 – Assigning the surface properties.

Inspection Results

All 4 defects were identified and correctly positioned using the interactive scan plan. The live ray tracing and ability to quickly switch between each profile made the process of evaluation and interpretation easier and much quicker than the manual positioning using diagrams and beam spreads.



Fig. 3 – Lack of Root Penetration indication



Fig. 4 – Lack of Side Wall Fusion Indication



Fig. 5 – Side Wall Crack



Fig. 6 – Grouped Porosity

Conclusion

Benefits of using the WAVE 1.8 CAD import feature:

The Wave replaces the need for a set of manually created drawings for an inspection, it also concentrates everything needed into the screen being used for inspection, this removes the need to go between flaw detector and paper to locate indication signals.

A digitally created scan plan can be created before the site visit or on the day, providing a more detailed representation of the item under inspection with the ability to include multiple profiles in the same scan plan. this can reduce time spent on site and inaccuracies associated with creating diagrams manually on paper.

Live ray tracing provides an accurate representation of the ultrasonic beam and takes into account curved surfaces or complex geometries which can be difficult to replicate with paper diagrams and beam spreads.

While the inspection is underway, screenshots can be easily taken by one touch, making reporting much easier. These images can be quickly downloaded using Sonatest "companion" software and then placed into reports so that the customer has a clear visual identification of where a defect is positioned within the weld.

The Sonatest WAVE gives greater confidence for inspectors and clients by giving clear and precise images of where a defect is located or even identifying if a reflection is from a defect, geometry or mode conversion.

Get in touch with your local Sonatest expert, available in more than 50 countries over 5 continents!



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