HDPE Butt Fusion Weld Inspection and Imaging Using Evisive Scan™ Technology
Use of Standard Scans

- In this example, four piping standards are used for scan technique standardization.
- Each pipe was a 4 inch diameter PE pipe with a known good weld.
- The scans were done in an identical fashion to the scanning technique used when examining the defective samples.
Typical PE Pipe Scan Procedure

- Approximately 4 times the pipe wall thickness (2 times on each side of the weld) is included in the length of the scan.
- The welds are centered in the scan field and run from left to right, that is the radial direction is the “X” axis and the axial direction is the “Y” axis.
- All scans are displayed using default color values.
- The “B” channel is used for the standard comparison.
  - Note that both channels are reviewed by Level II Inspector.
Standard PE Pipe Weld Scan 1

Good strong unbroken return from the weld line. Two circled areas are surface gouges. Regular signal return from the inner beads.
Standard PE Pipe Weld Scan 2

Good strong signal return from the weld line with minimal voltage variation and regular reflections from the inner bead.
Standard PE Pipe Weld Scan 3

Good signal return from the weld line with minimal voltage variation and regular reflections from the inner bead. Thickness of weld line is less than other welds, and thus sets the lower limit of acceptance.
Standard PE Pipe Weld Scan 4
Good strong signal return from the weld line with minimal voltage variation and regular reflections from the inner bead.
Standard Scan Acceptance Criteria

- Acceptance Criteria for Good Weld
  - All signal returns from the welds are crisp and typically unbroken lines of blue/magenta color
  - Weld signal returns are as thick as standards
  - Weld lines are singular in nature (i.e. – not dual lines)
  - Reflections from inner beads are close to the weld line, uniformly spaced, and not thick when compared to the standard
This weld was made with a 10 second delay between end of heating and start of fusion. The circled area has a minor voltage variation over a large length and the remainder of the weld line does not appear as substantial as the standards. This weld would be considered marginal to unacceptable based on comparison with the standards.
This weld was made with a 20 second delay between end of heating and start of fusion. The dual weld line is not within the bounds of the standards. This weld would be considered unacceptable based on comparison with the standards.
This weld was made with several end drilled holes in the pipe. The four circled areas outside the weld line show the holes. They appear as breaks in the reflections from the inner bead. The appearance of the weak and dual weld line is not within the bounds of the standards. This weld would be considered unacceptable based on comparison with the standards.
This weld was made with a several cloth threads put into the weld. The three circled areas indicate dual weld lines and are not within the bounds of the standards. This weld would be considered unacceptable based on comparison with the standards.
This weld was made with localized dirt on the weld. The circled area indicates dual weld lines and large voltage change and is not within the bounds of the standards. This weld would be considered unacceptable based on comparison with the standards.
This weld was made with lightly sprinkled dirt on the entire weld. The circled area indicates lack of strong weld line indication and irregularly shaped weld line. This weld would be considered unacceptable based on comparison with the standards due to the difference in appearance of the weld.
This weld was made with WD-40 put on portions of the weld. The circled area indicates a dual weld line which is considered unacceptable based on comparison with the standards.
This weld was made with WD-40 put on the entire weld. The circled areas indicate a dual weld line which is considered unacceptable based on comparison with the standards.
This weld was made with higher than normal pressure during the fusion phase. This results in a small melt zone and large external and internal weld bead. It is likely that this problem would be detected during visual inspection. The weld is slender when compared to the standards and the circled area indicates a large inner bead reflection. This weld would be considered marginal to unacceptable based on comparison with the standards.
Above is an Evisive Scan® image of a 12” high density ploy-ethylene (HDPE) thermal butt fusion weld. The several small indications in the melt zone of the weld are reconcilable to surface features, and do not represent weld defects. The scan above was performed using a manual raster-type pipe scanner (shown in the previous slide), but fully automated piping inspections are also available.
Advanced materials require advanced NDE methods.

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