

Flaw Detection at High Temperatures

This application describes how to detect flaws and gauge thickness of metal in extreme environments with ultrasonic testing.

Challenges of High Temperature Testing

Ultrasonic testing at high temperature is required in process industries. Temperatures are often above 300°C and maybe even 500°C. In particular, thickness measurement is often required since pipes and tanks often corrode in these environments. There are particular pain points, including:

- Dangerous and uncomfortable working conditions
- Limited time windows for inspection, because the ultrasonic probes can only be used for a limited time at high temperature
- Changing material properties due to high temperature, which result in non-standard ultrasonic velocity

Traditional Solutions

A range of specialist hardware exists for high temperature measurement including probes and couplant. This hardware meets the physical requirements for the harsh environment. However the inspection workflow itself remains very challenging because time for collecting data is very limited e.g. probes can typically be used for 5-10 seconds at a time at high temperature, before a 1-minute cooling-down period (this is referred to as 'duty cycling').

If errors such as bad positioning of gates are made, the entire inspection often needs to be repeated. Furthermore it is difficult to record exact inspection locations and take notes in this unpleasant environment. It is recommended that the zero and velocity calibration be undertaken at the exact temperature of the part to be inspected, as the ultrasonic velocity is temperature-dependent. These calibration procedures can be cumbersome.

Screening Eagle Technology Solution



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[Proceq UT8000](#) is an ultra-portable flaw detector that can be used with commercially available ultrasonic probes and couplant, including ones designed for high temperature. It has several software features which make high temperature inspection much easier and more reliable.

Calibration of velocity and zero offset only requires a couple of seconds of contact with the part. The A-scan peaks are saved and the user can calibrate comfortably off these with the probe off the part.

When the user is scanning a surface and presses save because they think they have found an indication of interest, the A-scan data for a few seconds before the save operation is also saved. This is known as 'time rewind'. It enables the users to scroll through the data and ensure that they report the A-scan directly over the defect. This ensures that results are reliable and reduces the amount of inspection rework.

When doing thickness gauging, the entire A-scan is recorded at each measurement location. By a simple swipe, the user is taken from the thickness reading on the grid to the full A-scan at that location. Settings such as gain and gate location can be adjusted. Again, this increases reliability and reduces rework.

A digital logbook is automatically appended to each data set. This can include photos of the test site, text comments and even audio clips. Notes can be added at any time from during the inspection to hours or even weeks afterwards. This ensures that all necessary information is stored with the ultrasonic data.

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