

ACFM® ATI™ Drillstring Thread Inspection

TSC's improved Automated Thread Inspection (ATI™), for drillstring thread inspection, uses the AMIGO™ ACFM® instrument and customised array probes to provide rapid and reliable results. The method has been field proven in the North Sea and is now included in the latest North Sea Drilling Inspection Standard (NS2).

Compared to conventional inspection methods, ATI™ provides a number of significant benefits including:

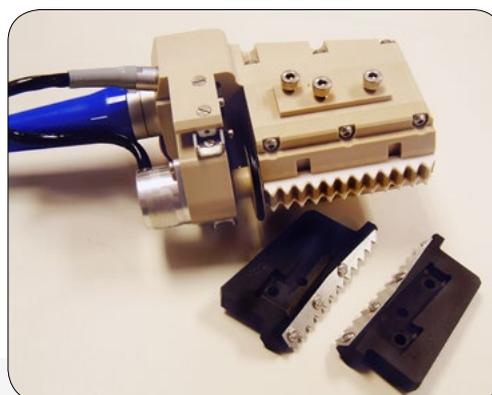
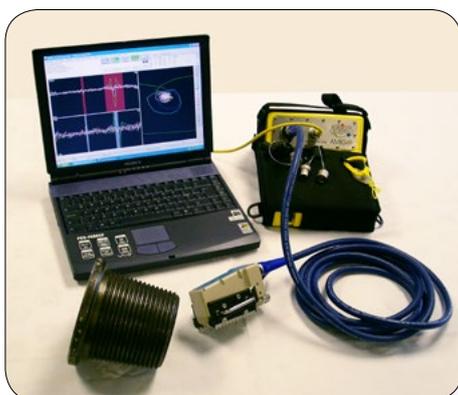
- Reduced cleaning requirement compared to MT, PT.
- Ability to work on magnetic and non-magnetic components.
- Improved inspection reliability by reducing reliance on operator.
- Provides information of crack location, length and depth.
- Easy transfer of data in electronic form for review off-site if required.
- In-service instruments and software will accept probes for inspection of non-threaded areas, including welds, stress relief features, etc.

Features of the ATI™ System

The new ATI™ system comprises a master control unit, built around TSC's rugged, battery-powered AMIGO™ ACFM instrument. Significantly lighter than the previous system, higher operating frequency is now supported for increased sensitivity on non-ferrous components. The system is controlled by a standard laptop PC, which can be supplied as a rugged version if required.

ATI™ Array Probes

TSC's ATI™ array probes cover a wide range of common drillstring connection sizes. Pictured below is a probe suitable for 4tpi tapered threads. With appropriate adapters fitted this probe can be used to inspect a variety of pin and box threads and has been used successfully on NC38, NC 46, NC50, 4 ½ IF, 6 5/8 Reg, 7 5/8 Reg and HT40 connectors. Probes for other thread forms or pitches are also available.



Far Left: The ATI™ Inspection kit.

Left: A 4 TPI array probe with adapters for 3.5" pin connector, ideal for tapered threads.

Adapters are fitted to either side of the probe to position the thread sensors correctly for the thread size (Pin or Box) to be inspected. Integral stainless steel scrapers engage in the thread and closely follow the thread profile. The scrapers remove dirt and contaminants from the thread and prevent wear to the thread sensors which are held close to, but not in contact with, the thread.

Pin Threads

When the ATI™ probes are deployed on a pin thread, an elasticated strap can be used to hold the probe in contact with the thread. This allows a stationary drill pipe or tool to be inspected so no rotation of the thread is required. The operator moves the probe by hand through one revolution around the thread to inspect the 12 most highly loaded thread roots. An encoder tracks the probe movement. When an inspection has been completed, the data is analysed automatically, and any defects found are reported to the operator. Full details of the inspection are recorded for detailed analysis or audit purposes. End to end, the inspection cycle takes around three minutes.

Box Threads

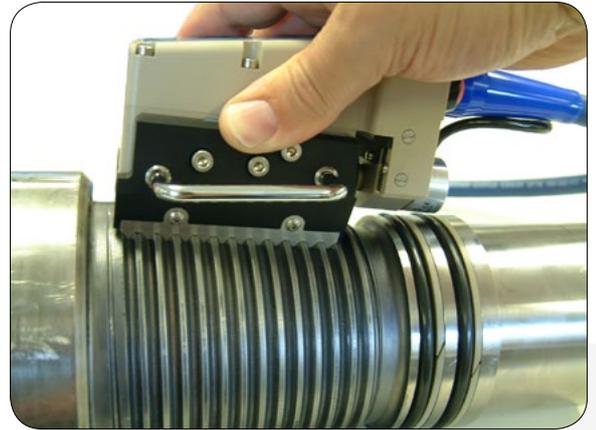
By changing scrapers, the same ATI™ array probes can be used to inspect box threads. Again the twelve most highly loaded threads are inspected. Process indicators and controls are on the rear of the probe which allows correct use whilst the probe is within the box thread. The ATI probes can inspect components with or without bore-back.

Control Software

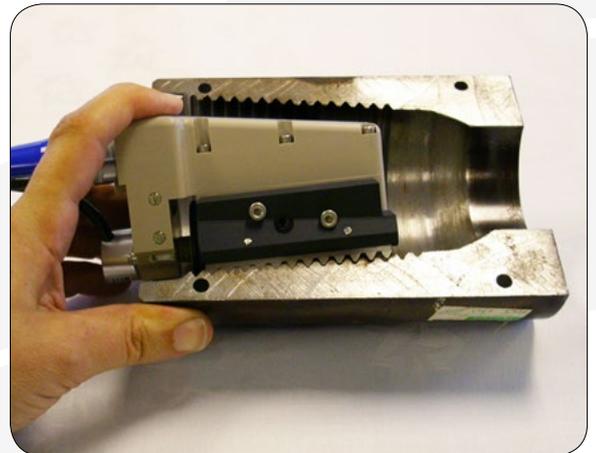
The ATI™ system has been designed to reduce the need for skilled operators and to allow inspection data to be made available for audit. A key feature of the ATI system is its ability to detect, locate and size defects without an operator's interpretation. This is achieved by using an advanced version of TSC's ASSIST™ software, which interprets the inspection data automatically. The software controls the data acquisition process, maintaining data quality and delivers a simple result detailing all defects found. Management reports are produced in "shift summaries" detailing all the inspections conducted. The software allows input from an inspection specialist, who can set reporting thresholds and review detailed data not available to the site operator.

Other Areas

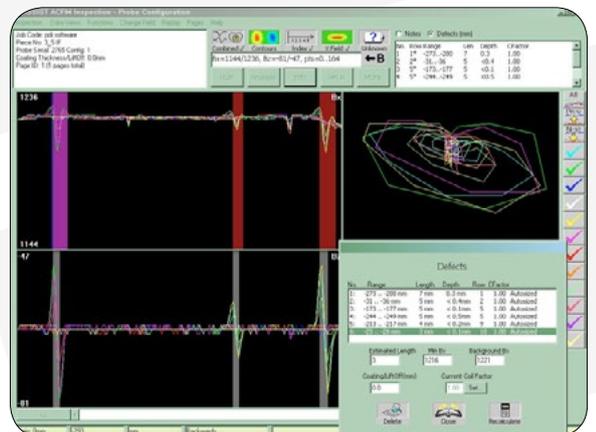
In addition to providing automated data interpretation using specialist probes, the hardware and software can be configured to accommodate simple hand held probes. These probes and resulting data interpretation rely more on the operator. This capability can create a very flexible inspection solution on site and enabling easy adaptation to work on other regions in situ such as shoulder areas, stress relief grooves, weld areas, bearing grooves etc.



Above: Shows a type 369, ATI Array Probe 4TPI (threads per inch) with a drill string pin.



Above : A TPI probe on a sectioned 4.5" (114 mm) box.



Above : ASSIST™ software screen showing auto-detected and sized defects during an inspection.

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