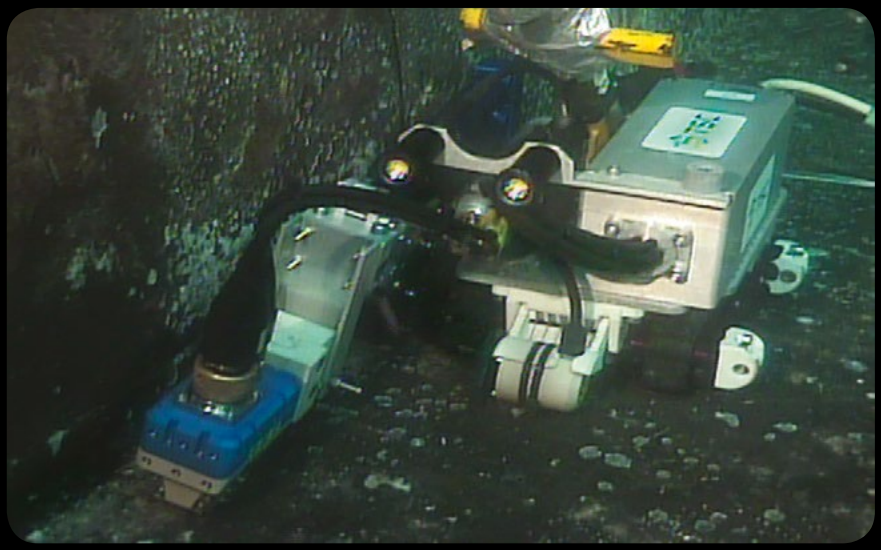
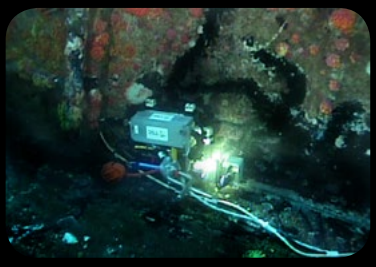
Application Note





ACFM® & UWILD Inspection

UnderWater Inspection in Lieu of DryDocking (UWILDs) are often required to ensure the structural and operational integrity of a marine asset. In current economic climates where saving cost is a key driver and safety and structural integrity are of critical importance, UWILD inspection programmes are becoming far more commonplace.

Conducting these surveys in situ with divers or with ROV deployed techniques, saves the asset owner and their clients both time and money by reducing downtime, cutting back on off-contract times and reducing or eliminating the need for expensive and limited drydock space.
Classification societies that issue guidelines on UWILD inspection, maintenance and certification for structures and vessels include the American Bureau of Shipping (ABS), Det Norske Veritas (DNV-GL), Bureau Veritas (BV) and Lloyds Register(LR).

Underwater NDT Techniques
Various NDT Techniques can be used in the UWILD environment such as MPI, Eddy Current techniques and Ultrasonics. TSC's Alternating Current Field Measurement (ACFM®) inspection technology has a well-established track record in subsea applications and is very adaptable on-site as solutions can be deployed by diver or ROV.

As a leading NDT technique ACFM® has been developed for detection of surface breaking defects through the application of an electro-magnetic field. Unlike conventional inspection techniques ACFM® technology can work through paint and coatings, so there is no requirement to strip away coatings, reducing downtime further. Requiring only one pass of the inspection area ACFM® has a high tolerance to variations in pass speed and lift-off, which means fast and reliable data is achievable consistently; and the length and depth of any crack defect found is measured and recorded instantly. As ACFM® detects metal defects through the application of an electro-magnetic field, it can be easily applied in an underwater setting without compromise and is becoming the technique of choice for underwater inspection work.

UWILDs are often highly scrutinized by supervising surveyors, as the inspector is the only one with direct access to the structure being inspected. Traditionally this will be the inspecting diver, who needs to be certified by a regulatory body, which can be expensive and increases the risk factors involved. Safety concerns around divers in the water is now being answered by the use of ROVs and robotic crawlers.

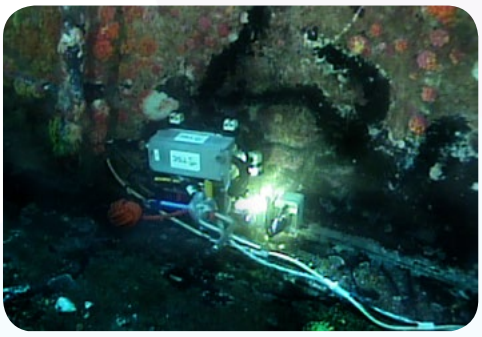
Remote underwater inspection solution - ACFM® MagCrawler™

In response to this and other environmental factors, TSC's Engineering solutions team have developed the ACFM® MagCrawler™. This unit has been designed specifically to enable the ROV deployment of ACFM® Array Probe Technology underwater, and can inspect a wide variety of subsea geometries including circumferential, fillet and full penetration welds in pipes and plates. Ideal for restricted access areas the MagCrawler™ is rated up to 150m (493ft) and is a robust, magnetic-tracked, remotely operated vehicle equipped with cameras. Traction is achieved by two rubber caterpillar tracks that are easily manoeuvrable on horizontal and vertical planes, as well as inverted surfaces. Probes are mounted onto the crawler with a metal sprung arm for passive compliance with the surface and a 360° rotational head allows full weld coverage. An electronic rotary encoder is also on board to determine the position of the crawler and simultaneously collect distance measurements whilst scanning.

Above shows Meridian's ROV Arm deploying TSC's MagCrawler to the inspection site. *(image courtesy of Meridian Ocean Services)*

Gulf of Mexico UWILD

Working with Meridian Ocean Services on the recent UWILD campaign on-board a drilling semi-submersible vessel, the Engineered Solutions team from TSC embarked on their first Gulf of Mexico (GOM) mobilisation deploying the MagCrawler™ to fulfil the specified NDT inspection requirements.



Above shows the MagCrawler working on the Column 4/Pontoon interface "Forward Weld" scan. *(image courtesy of Meridian Ocean Services)*

Directed by a surveyor from ABS part of the scope required inspection for surface cracking on the three port side column welds (1 x forward weld, 1 x aft weld on each) where they join with the pontoon, approximately 18m (59ft) below sea level. A 3m (10ft) length needed to be completely inspected on each weld. All welds were inspected subsea using TSC's ACFM® MagCrawler™ and U31R (array capable) systems. The Meridian Ocean Services' Super Mohawk II ROV deployed inspection tooling manually using a strengthened umbilical from the vessel deck and positioned at each location. ACFM® NDT scanning was completed using ACFM® Array probes, types 542 and 543, mounted on the ACFM® MagCrawler™ system.

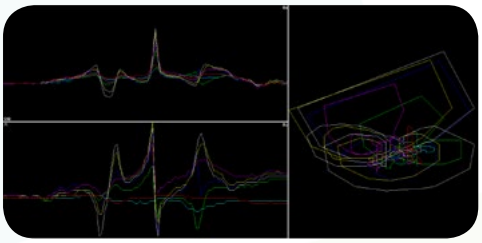


Figure 1 is an example of a function check scan performed before the inspection containing three defects (20mm x 2mm) in different orientations.

The data collected was of high quality at all locations allowing for accurate signal analysis by the ACFM® operators. As function checks were carried out before and after each daily inspection shift, a comparison between signals containing a defect and live inspection signals could be accomplished (see examples on the right).

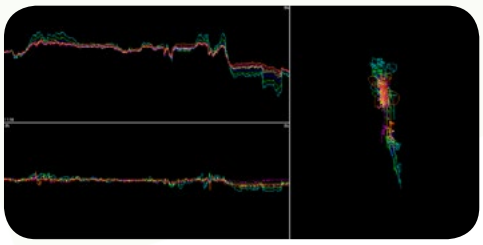


Figure 2 shows an examples of comparative data from the column 2 aft weld with no defects detected. This was consistent throughout the campaign.

Meridian completed the remaining scope of cleaning and visual inspection using the Super Mohawk II ROV. All of the UWILD survey work was conducted remotely without any requirement for diver support. The overall outcome of the inspection project was very positive and completed within the time constraints, providing a full auditable set of data.

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