

Oil Review

Oil · Gas · Petrochemicals

Middle East

VOLUME 19 | ISSUE 8 2016

Saudi Aramco expands downstream

- Ultrasonic technology for ship maintenance
- Promoting pipeline integrity
- Improving asset management with Cloud solutions
- Advancing Gulf petrochemicals
- ADIPEC addresses industry challenges

SEE US AT THE SHOWS

10th EDITION
**WORLD FUTURE
ENERGY SUMMIT**
PART OF ABU DHABI SUSTAINABILITY WEEK 2017
16-19 JANUARY 2017
ABU DHABI NATIONAL EXHIBITION CENTRE

intersec

PETROLEUM CONFERENCE
IRAN 2017

19
Years

Serving the
regional oil
& gas sector
since 1997

Ultrasonic technology for reliable ship maintenance

Ultrasonic technology (UT) is rapidly proving to be the most reliable, accurate and effective alternative to traditional methods of watertight integrity testing on ships, says Carl Stephen Patrick Hunter, CEO and managing director, Coltraco Ultrasonics.



Testing for watertight integrity is an important part of ship maintenance

TESTING THE WATERTIGHT / WEATHERTIGHT integrity of hatch covers is an imperative part of ship maintenance, to ensure the safety of vessel, crew and cargo. A leak in a hatch cover or watertight door can lead to water ingress which could cause vessel damage, cargo damage and ultimately pose a risk to human life through flooding and the potential for capsizing. Most commonly, water ingress through hatch covers with low watertight integrity has damaged valuable cargo held inside the ship. This is demonstrated by the fact that 33 per cent of large insurance claims in general cargo and bulk carrier vessels are caused by leaking hatch covers.

The risk is worsened by the ageing nature of many bulk carrier ships in particular. There

is also a degree of bending/deformation that naturally occurs in ships during travel, which puts pressure on hatch covers and can damage sealing. A recent wave of inexperienced crew members has swept across the shipping industry as a cost-saving mechanism, leaving vessel maintenance and

“ 33 per cent of large insurance claims in general cargo and bulk carrier vessels are caused by leaking hatch covers.”

hatch cover testing to decrease in quality.

While hatch covers are often perceived as indestructible due to their large size and bulky exterior, in reality they are complex, finely made structures that need to be handled with care, a point that many mariners do not realise. For example, a 4mm wear on the steel-to-steel contact is sufficient to damage rubber sealing gaskets beyond repair.

The limitations of current watertight integrity tests

Traditionally, the most common ways of checking critical seals are high pressure hose or chalk testing. During chalk testing, chalk is applied to the compression seals and the hatches are closed, sealed and reopened. The compression seals are then examined

and if there is any irregularity in the chalk pattern then the assumption is made that improper sealing is occurring in that section of the seal. As this gives no indication of the water pressure necessary for hatch cover failure, this method must be accompanied by hose testing. During high pressure hose testing a surveyor is present inside the hold. A jet of pressurised water is aimed all the way round the hatch cover to ensure all seams are tested. Any water ingress which occurs will be seen by the surveyor.

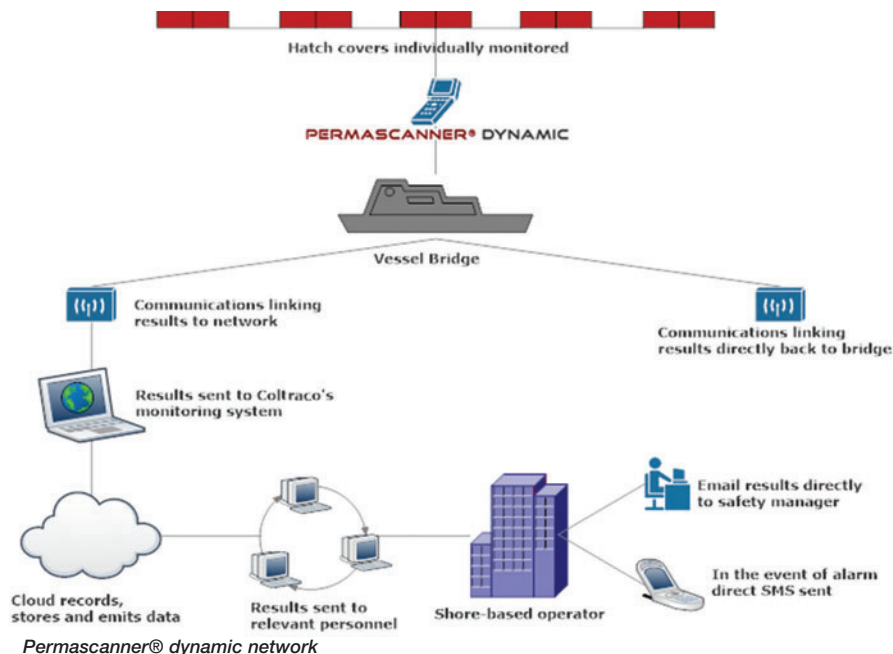
There are severe limitations to these methods, which are widely acknowledged across the shipping industry. The hose test is time consuming and inefficient, requiring two crew members for testing. The test is often performed incorrectly, or whilst the cargo is in situ, placing cargo at risk. Pollute run-off has raised environmental concerns and hose testing is now prohibited in many ports, reducing the likely frequency of testing. Most importantly, these methods are fundamentally inaccurate and thus ineffective. Hose testing relies on subjective variables such as distance, and provides almost no indication of the severity and/or location of leaks, nor does it provide recordable, verifiable readings. During chalk testing even if seals are touching there is no way of indicating if there is sufficient pressure between them to create a complete seal.

The benefits of ultrasonic technology integrity testing

Developed specifically to solve the issues outlined above, testing models using ultrasonic technology are proving to be the most accurate alternatives to traditional methods for hatch cover maintenance.

Ultrasonic technology is being rapidly adopted as a safe, easy and reputable method of identifying seal leak sites in a highly accurate and convenient way. UT is utilised in the form of portable ultrasonic watertight integrity test indicators for inspecting hatch covers in the shipping industry. The use of UT can expand to include testing of W/T doors, multiple cable transits, scuttles, shell doors, flanges, bulkheads and other watertight compartments on multiple vessel types, offshore and in defence. Generally, UT equipment is comprised of two main components: a generator and a receiver. The ultrasound generator emits a modulated signal of a specific frequency of ultrasound (in most cases 40,000Hz). The receiver then picks up the signal and converts it into a result indicating watertight (or weather tight) integrity.

The equipment is portable, easy to use and requires only one individual for testing. Contrary to a common misperception that use of ultrasonic equipment requires extensive training, many new models can be used by any crew member who oversees the ship's maintenance in transit and/or the shore-based safety operator. This ease of use allows for



more regular testing which will improve vessel, cargo and crew safety, ensuring preventative maintenance procedures are taken on board. Moreover, this technology is clean, non-invasive, non-destructive, non-harmful and does not violate any environmental codes, which also means there are no IATA transportation restrictions.

The use of UT can provide a data recordable audit trail, which can prove vital for insurance companies should a claim have to be made. Moreover, creation of recordable, comparative results is a quantifiable method of ensuring the long-term safety of a vessel.

“ Coltraco is looking to see this technology fully utilised by 2020.”

Most importantly, using UT can not only provide an indication of how secure a hatch cover is, but can also show the precise location of any leakage sites, and is of unmatched accuracy. Coltraco's Portascanner® Watertight, for example, is proven accurate to 0.06mm \pm 0.02. Research carried out by Coltraco showed that 'a linear relationship was found between signal leakage out of a certain sized hole (in a watertight box) and the quantity of water able to enter that hole'.

The current and future importance of UT

As well as hatch cover testing, the application of UT extends to testing manway access, ventilation inlet and exhaust covers, tanker tank access man-ways, ullage covers and various deck accessed lockers. UT offers flexibility by its ability to test both large

bulk carrier holds of up to 45,000 sq m, right through to multiple cable transits in very small locations.

However, there are issues which need to be addressed. The main issue is that without continuous ultrasonic monitoring, a leak could still occur at any point in between tests during a journey, and a crew member is still needed for testing. Research is being carried out by enterprises such as Coltraco to create the most comprehensive and safe model using ultrasonic technology. Current technologies available to provide continuous ultrasonic watertight monitoring include Coltraco's fixed ultrasonic system called Permascanner® Hi-Life. Currently this system consists of a generator with a minimum 10 day continuous emission i.e. a possible voyage of 3000NM (nautical miles), which allows testing of seals at sea by a manual operator during calm to mild sea conditions. Permascanner® Hi-life is the first step in remedying problems, however there are still limitations. Permascanner® Dynamic is a comprehensive, autonomous continuous monitoring system for the watertight integrity of a ship's cargo hatches, weathertight doors and other seals. This model is capable of automatically detecting emerging leak sites, alerting officers and crew to the location and severity of the leak site and logging all data by hatch cover for future review. Coltraco is looking to see this technology fully utilised by 2020, as part of a pioneering wider vessel system integration and shore-based data management.

It is becoming clear that UT is developing into an integral component of water tight integrity testing for ship hatch covers in particular, and is best positioned to secure the safety of vessels in the shipping industry. There is more work to be done, and the future of UT must be condition-based monitoring of hatch covers, providing continuous monitoring. ■