Vertical can pumps are commonly used to pump hydrocarbon liquids, and with onshore facilities the pump casing is often installed below ground level.

External coatings are typically applied before installation, but they can break down through long-term use and the casing exterior is then potentially exposed to ground water. External corrosion has been observed on a number of pumps and should be considered as a potential threat to integrity. Internal corrosion should, depending on the fluids being pumped, also be considered as a potential degradation mechanism. Pump casings can fail by corrosion leading to release of hydrocarbons with severe safety, environmental and business consequences. Assurance of integrity of pump casings relies on inspection with techniques that provide a high probability of detection for both internal and external wall loss associated with corrosion.

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Sonomatic has offices in strategic global locations so we can respond quickly to customers’ requirements wherever they may be situated. Our high quality products are matched only by our customer service. In addition to our field services, we offer training and consultancy at our sites in the UK or at clients’ premises anywhere in the world. Sonomatic is committed to improving asset performance through applied and innovative technology; to delivering these benefits to our customers in the products and services that we provide; and to working with our customers, as value-added partners, to realise the maximum benefits of inspection technology.
Access to the exterior of the casing for inspection is not possible with below ground installations, and the height of typical casings, together with limited accessibility, means that automated systems are necessary. Sonomatic has developed and proven an automated ultrasonic inspection approach specifically for Vertical Can Pump Casings. This uses purpose-built scanners, with Sonomatic’s established Nautilus automated inspection system providing the drive control for accurate deployment of the ultrasonic probe head to any location within the pump casing. Sonomatic’s Microplus systems are used for ultrasonic data collection, presentation and analysis.

The inspection involves lifting and removing the pump drive motor and discharge barrel to expose the interior of the casing. The casing is then filled with water before the scanner is attached to the pump motor mounting flange, as shown in Figure 1.

The ultrasonic inspection then takes place with the probes immersed in water, using transducers designed for subsea deployment. The inspection employs two techniques:

- 0 degree ultrasonic corrosion mapping for areas of pipe/plate
- Time of Flight Diffraction (TOFD) for welds.

Corrosion mapping is carried out initially on a fine increment, typically 1 mm in the circumferential direction and 4 mm in the longitudinal (vertical) direction. The data is provided in the form of a colour-graphic corrosion map which allows evidence of wall loss to be readily identified. Areas of localised wall loss can be investigated further at an even smaller scan increment – a 1 mm by 1 mm increment would typically be used for additional investigation to quantify areas of degradation. Figure 2 shows a corrosion map (at standard resolution) collected from a pump casing with localised external corrosion. Figure 3 shows a high resolution scan over areas of pitting.

Time of Flight Diffraction is used to inspect the welds. This is a twin probe technique allowing the minimum thickness in the weld to be determined accurately. The ultrasonic data is collected at 1 mm intervals along the length of each weld to provide an accurate definition of the wall thickness profile. Typical TOFD data over a pump casing weld with external corrosion is shown in Figure 4.

The inspection approach developed allows 100% coverage of the pump casing cylinder, from the end cap weld to the mounting flange weld, and also allows 100% inspection of the welds by TOFD. The inspection system is suitable for a wide range of pump casing sizes, the only restriction being that the diameter should be >4ins.

Where degradation is found, Sonomatic can assist with a fitness for service and life assessment based on detailed analysis of the data collected. Sonomatic can also recommend approaches to monitoring future corrosion and provide advice on corrosion management.

QA and HS&E

It is Sonomatic’s ongoing commitment to quality and HS&E compliance that underpins our long-term success in the field of non-destructive testing and inspection services. Sonomatic’s commitment to quality is maintained through continuous assessment and review of our Quality Management Systems to BS EN ISO 9001:2008. Sonomatic actively promotes the development, implementation and improvement of our QMS as a part of our ongoing drive to enhance customer satisfaction by meeting or exceeding customer requirements. In 2009 Sonomatic achieved UKAS accreditation as an Inspection Body to BS EN ISO/IEC 17020 (UKAS IB4276).