Case History

Robotic Inspection of Crude Oil Storage Tanks

The Challenge

Traditional methods of tank inspections are onerous in terms of preparation time to allow person-entry which can require weeks of cleaning and purging prior to isolating and setting-up venting and lighting to permit inspectors and surveyors to enter and often with rope access, a high-risk activity with many weeks of preparation and inspection and teams of 5 or 6 inspectors, tank sentry and standby rescue team, with an elevated degree of on and offshore management input to ensure the safety of the operation.

Regulatory guidelines generally require a 5-year rolling schedule of inspections including collecting hundreds or thousands of ultrasonic thickness measurements (UTMs). This is often unnecessary given that some tanks are less critical in terms of structural integrity and may have intact coatings that reduce or eliminate the need for thickness readings.

The challenge for EM&I was to reduce the risk and safety exposure of inspection whilst increasing tank availability and uptime to minimise extra shuttle-tanker offloads whilst FPSO storage capacity is reduced. The solution had to be both cost effective and acceptable to the classification society (class).

The Solution

EM&I's solution was to eliminate the need for personnel tank-entry by adopting HD digital optical video cameras with integral lighting adapted from the nuclear industry for remote deployment from outside of the tank space operated by highly qualified structural inspectors, re-trained as operators who deploy and manipulate the robotic camera. EM&I named this technique 'NoMan'.

The NoMan® solution included risk-based analysis followed by class approvals of the plans eliminating unnecessary inspections and reducing the amount of inspection. Class acceptance of the novel inspection plans and methods was sought and achieved.

The outcome was that EM&I performed inspections of all tanks with only two EM&I inspectors and with a thorough verification of the NoMan process resulting in all tanks being accepted by class over a three-year period with average inspection durations of only one to two days per tank and without a single tank-entry having been performed by personnel.

EM&I provided far superior (digital) reports than were previously possible whilst removing the need for purging, double blocking, lighting and other activities needed to enable safe man entry.

The cost savings in terms of tank preparation and inspection hours were vastly reduced (greater than 75% saving) whilst the safety exposure benefits were similarly significant. Tank availability was proven to be much reduced compared to conventional methods.

NoMan Inspection control

NoMan Scanner

NoMan Optical

The future is to validate synchronous laser scans and other techniques, such as coating and deformation surveys which enable the system to meet full class compliance as method that completely avoids the need for man entry for tank inspections.