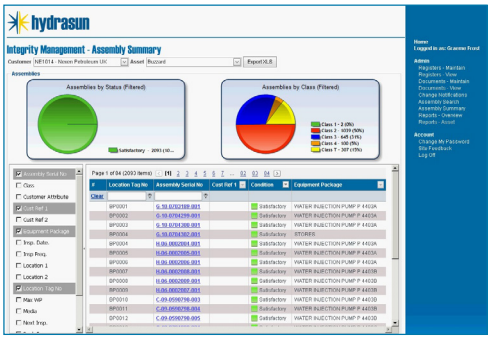
CASE STUDY

Identification and Mitigation of Hydrocarbon Leaks from Small Bore Tubing Systems



Background

In recent years a number of upstream oil and gas projects have suffered from hydrocarbon leaks from Small Bore Tubing (SBT) systems after the start-up of the plant. This loss of containment results in significant health, safety, environmental, operational and reputational risks for the operator. These leaks often highlight an underlying problem with the build quality, which if not addressed can lead to ongoing integrity issues over the life of the plant.

The root causes of such build quality issues include lack of competence, incorrect tools, poor quality control, poor routing of the SBT tubing, lack of support, non-project specified Original Equipment Manufacturer (OEM) parts and/or material specification.

Customer Issue

Managing the risks associated with leaks from SBT systems, following the start-up of the plant, is challenging if significant operational disruption is to be avoided. If the hydrocarbon gas leaks from SBT systems are not identified and rectified, it can lead to high potential incidents on the plant.

Technology such as Forward Looking Infrared (FLIR) camera technology can be used to identify hydrocarbon leaks, however, this relies on a breakdown maintenance philosophy and as such is an expensive and very reactive approach. Potential issues with the SBT systems need to be identified before a hydrocarbon leak occurs to enable appropriate maintenance to be planned and executed.

Core crew instrument personnel are trained and competent to manage the instrumentation but may not have the specialist technical knowledge to inspect the build quality of SBT systems and identify all of the potential issues that may result in a loss of containment. The volume of SBT systems on the plant also makes it impracticable to manage using core crew personnel.

At a glance...

Customers

Various

Location

Worldwide

Customer Issue

Manage risks associated with hydrocarbon leaks from SBT systems

Hydrasun Solution

Develop risk-based SBT system integrity management and maintenance programme specific to customer requirements

Benefits

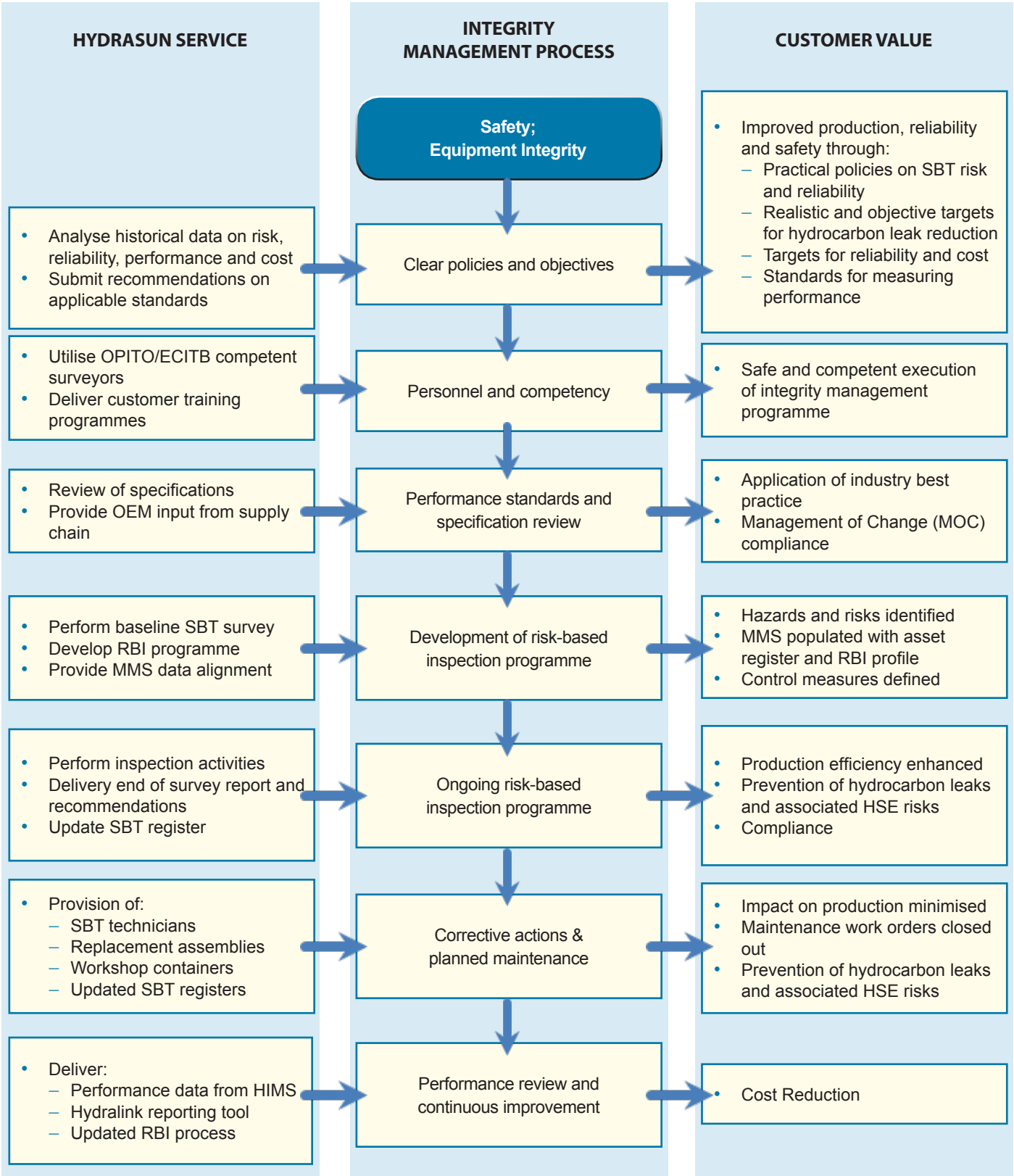
- Improved production, reliability and safety performance
- Application of industry best practice
- Safe and competent execution of integrity management programme
- Risk-based inspection programme
- Prevention of hydrocarbon leaks and associated HSE risks
- Compliance with regulatory authorities
- Fully integrated integrity management system

CASE STUDY

Identification and Mitigation of Hydrocarbon Leaks from Small Bore Tubing Systems

Hydrasun Solution

Hydrasun has worked with a number customers to develop a risk-based SBT integrity management and maintenance programme as outlined below: -



SBT Inspection Programme

To ensure costs are controlled and risks mitigated, Hydrasun works with the operator to identify the safety critical equipment packages that form the basis of the risk-based inspection programme. The P&ID drawings are reviewed and used to prepare the work packs for the survey team to inspect the critical SBT systems.

A typical inspection programme would include: -

- Locate the parent equipment for the SBT assemblies from P&ID drawing
- Complete thorough visual inspection of each SBT run from 'parent to child' detailing P&ID number, parent tag number, number and condition of fittings and clamps, condition and location of each run in accordance with industry standards
- All defects found will be tagged and a bill of materials recorded by the surveyor for completing the associated maintenance work
- Any SBT assembly connections that require further investigation will be isolated and drained by the customer's operations personnel to enable the surveyor to safely break the connection
- Process 'break in' locations will be recorded on P&IDs and integrity management system
- Where required, remedial maintenance work will be completed to ensure the safe re-make of the SBT assembly and continued operations of the SBT system
- All remedial work will be recorded on P&ID and integrity management system

Vibration Assessment

Through Hydrasun's involvement in industry initiatives to manage SBT assemblies, valuable experience has been gained in the identification and mitigation of known risks associated with static loads, dynamic loads and vibration.

Where such problems are encountered the Hydrasun surveyors will focus on identifying "high risk" SBT assemblies. Factors considered when evaluating the risk status of SBT assemblies include:

- Identification of static loads (weight, pressure and temperature), examples include:
  - deflection of host piping or tube due to high mass components
  - torque loads required for opening and closing high friction valves
  - pressure induced movement or deflection of host piping or tubing
  - mechanically induced movement or deflection in host piping and any resultant loads transferred into the tubing/associated components
  - thermal expansion of host piping and any resultant loads transferred into the tubing
- Identification of dynamic loads and vibration
- Focus on known high risk areas
  - well bays
  - trees and associated flow lines
  - reciprocating machinery – compressors, pumps, etc.
  - high fluid velocity/momentum pipework
  - heavy duty control valves – PSV's, ESD's etc.
  - sections of piping and tubing with inadequate supports
  - pipework mounted high mass or multi-component SBT assemblies
- Identification of ineffective support/bracketing arrangements
- Suitability of support/bracketing arrangements taking into consideration: the static/dynamic classification of the host piping, the static/dynamic classification of the tubing, steel work mounting points, length of tubing, routing of tubing, high mass components, etc.

SBT End of Survey Report and Register

On completion of the Inspection programme the following deliverables are provided to the customer: -

- End of Survey Report detailing our findings and recommendations
- SBT Register & marked-up P&IDs
- Bill of Materials for identified defects

All information is accessible to the customer via our secure web-based reporting tool, Hydralink.

Remedial Maintenance

The survey data gathered includes an outline bill of materials and definition of the remedial work to be completed for inclusion in the customer maintenance management system. Hydrasun can also provide skilled SBT fitters to complete the remedial work and training for existing customer personnel to ensure the effective execution of maintenance work.

The Result

Through working closely with our customers Hydrasun is able to develop and deliver an integrated Integrity Management and Maintenance programme that identifies and mitigates Hydrocarbon leaks from SBT systems. The risk-based programme minimises operational disruption and progressively reduces health, safety, environmental, production and reputational risks associated with hydrocarbon leaks.

Hydrasun
Gateway Business Park
Moss Road
Aberdeen
AB12 3GQ

Tel: +44 (0)1224 618618
e-mail: integritymanagement@hydrasun.com
www.hydrasun.com

HYDC025 - Apr16