Increasing Operational and Inspector Safety with Remote, Scalable Ultrasonic Monitoring

通过远程、可扩展的超声波监测提高操作和检查人员的安全性

In-service, erosion monitoring to maximise well productivity, increase safety and reduce costs.

在使用过程中对侵蚀进行监测，以最大限度地提高油井产能，提高安全性并降低成本。

- Remote well asset integrity monitoring for increased safety and productivity
  偏远油井资产完整性监测，以提高安全性和生产率
- Data from ultrasonic monitoring used alongside that from coupons and ER probes to optimise inhibitor injection strategy
  超声波监测的数据与挂片和ER探针的数据一起用于优化抑制剂注入策略
- Secure data transmission and collection to centralised server
  安全地将数据传输和收集到中央服务器
- Manual Measurement Hub UT monitoring upgraded to automated remote system
  手动测量中心超声波监测升级到自动远程系统

Overview 概述

Working with our partners, Axess Corrosion and M2M Data Connect, a previously installed HotSense™ Measurement Hub UT wall thickness monitoring solution was upgraded to a fully automated logging system with secure data transfer from a remote well to centralised cloud storage location.

与我们的合作伙伴 Axess 腐蚀公司和 M2M Data Connect 合作，将之前安装的 HotSense™测量中心超声波壁厚监测解决方案升级为全自动测井系统，将远程井数据安全地传输到中央云存储位置。

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Globally, there are countless geographically remote wells requiring inspection engineers and technicians to travel extensively by vehicle to make manual ultrasonic thickness measurements for asset integrity and safety. Not only does this involve considerable time, resource, and expense, it also introduces risk to the staff who are travelling on dangerous travel routes and at hazardous sites.

在全球范围内，有数不清的地理位置偏远的油井需要检测工程师和技术人员通过车辆长途旅行到现场进行手动超声波厚度测量，以确保资产的完整性和安全性。这不仅需要花费大量的时间、资源和费用，还会给在危险路线和危险地点旅行的工作人员带来风险。

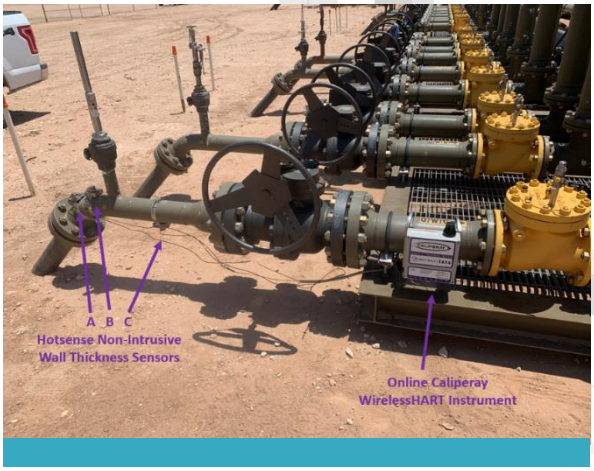

Figure 1: HotSense™ & CALIPERAY installation location

图1：HotSense™ & CALIPERAY安装位置

An oil major had previously installed Ionix HotSense™ ultrasonic thickness sensors at a well location connected via the Ionix HotSense™ Measurement Hub with measurements manually collected by an operator. The system was proven to be reliable and precise and delivered value by detecting and monitoring wall loss attributed to erosion. At this remote site, the oil company wanted to upgrade the data collection to a fully automated solution that could collect measurements at a pre-defined interval and transmit these back to a centralised location. Data security needed to be always maintained and through all stages of transmission from the wellhead to the customer.

此前，某大型石油公司在井位安装了 Ionix HotSense™超声波厚度传感器，并将其连接到 Ionix HotSense™测量中心，测量数据由作业人员手动收集。通过对侵蚀引起的壁厚损失的检测和监测，该系统的可靠性、准确性和价值得到了验证。在这个偏远的站点，此石油公司希望将数据收集升级为一个全自动的解决方案，可以以预定义的时间间隔收集数据，并将这些数据传回中央位置。数据在从井口到客户的传输过程中，需要始终保持其安全性。

The Challenge挑战

There were several key challenges to overcome to remove the potential limitations of deployment of remote wall thickness monitoring solutions in this case:

在这种情况下，为了消除远程壁厚监测解决方案部署的潜在限制，需要克服以下几个关键挑战:

- **Fully Automated Measurements** – to maximise the frequency and quality of data collection to detect rapid increase in wall loss as a result of an event.

  全自动测量 — 为了最大限度地提高数据收集的频率和质量，以检测由于某一事件而导致的壁损失的快速增加。

- **LTE telecommunication –** the remote location required a secure and dependable communication solution, to minimise the need for multiple site visits.

  LTE 通信 — 偏远地点需要安全可靠的通信解决方案，以尽量减少多次现场访问的需要。

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- **System and Data Security** was paramount for the solution considering the potential sensitivity of the safety critical data being collected.

  系统和数据安全 — 考虑到所收集的安全关键数据的潜在敏感性，对选择解决方案至关重要。
- **Centralised data management** – was critical to allow key client staff and contractors to access and analyse data effectively in real-time.

  集中数据管理 — 对关键客户员工和承包商实时有效地访问和分析数据至关重要。
- **Utilising existing sensors** deployed in the earlier test installation was essential to the cost effectiveness of the solution, validating the modular nature of the system.

  使用现有传感器 — 在早期的测试安装基础上实施对解决方案的成本效益至关重要，验证了系统的模块化性质。
- The system delivered had to be an **intrinsically safe solution** with FM Class 1 Div 1 certification required for the entire system.

  交付的系统必须是**本质安全的解决方案**，整个系统需要 FM Class 1 Div 1 认证。
- The solution had to be **cost-effective** for the application.

  解决方案必须对此应用具有**成本效益**。

The Solution 解决方案

- A CALIPERAY automated UT monitoring node was installed in place of the previously installed Measurement Hub. The previously installed sensors were directly connected to the CALIPERAY without the need for re-installation, Figure 1.

  安装了一个CALIPERAY自动化超声波监控节点代替以前安装的在先前安装的测量中心。先前安装的传感器直接与CALIPERAY连接，无需重新安装，如图1所示。
- An Ionix Field Deployment Kit containing a WirelessHART gateway and secure LTE comms was installed outside of the hazardous location. This provided a local WirelessHART mesh network for the site on to which the CALIPERAY was connected, Figure 2.

  Ionix现场安装套件包含WirelessHART网关和安全的LTE通信模块，安装在危险地点之外。这为CALIPERAY连接的站点提供了一个本地WirelessHART网状网络，如图2所示。

Figure 2: Field Deployment Kit installation
图2：现场安装套件安装

- The Field Deployment Kit is designed for deployment in harsh environments and can operate from -55 °C to +70 °C (-67 °F to +158 °F).

  现场安装套件适用于恶劣环境，可在-55° C至+70° C(-67° F至+158° F)范围内工作。
- The Field Deployment Kit was powered by a locally installed solar source and battery storage.

  现场安装套件由当地安装的太阳能和电池存储提供动力。
- A secure LTE connection on a private VPN and cloud data server was provided by M2M Data Connect.

  M2M data Connect在私有VPN和云数据服务器上提供了安全的LTE连接。

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- The WAMP software was installed on the cloud server for data collection, viewing and reporting.
  WAMP软件安装在云服务器上，用于数据收集、查看和报告。

Execution 项目执行

- The sensor install location had previously been validated as sites of accelerated wall loss as a result of erosion from sand extraction from the well. As such there was no need to relocate or re-install the sensors.
  此前，该传感器的安装位置已被验证为由于井中抽砂侵蚀而导致壁厚加速损失的位置。因此，不需要重新安置或安装传感器。
- The full system solution was successfully deployed during live operation with data immediately available at the data sever.
  整个系统解决方案在运行期间成功安装，数据在服务器上立即可用。

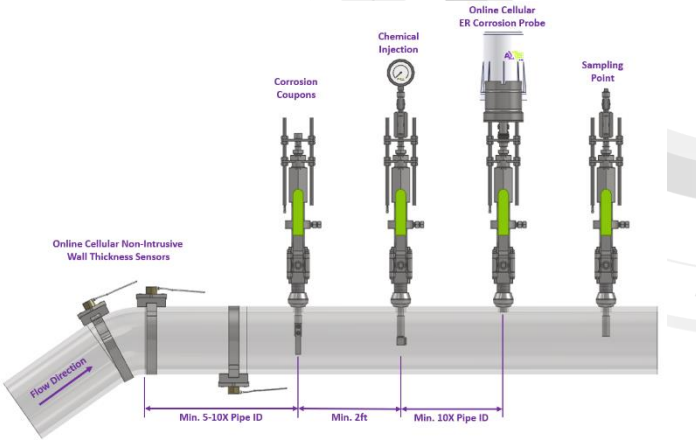

Figure 3: Complete flow line corrosion monitoring solution
图3： 完整的流动管线腐蚀监测解决方案

- The measurements correlated with those previously collected manually with the Measurement Hub ensuring continuity of trending.
  这些测量与之前通过测量中心手工收集的测量相关联，以确保趋势的连续性。
- Data from the UT sensors was also compared with that from other sources such as coupon and ER probes to optimise the local inhibitor strategy, Figure 3.
  超声波传感器的数据还与其他来源(如挂片和ER探针)的数据进行了对比，以优化抑制剂策略，如图3所示。
- Live trending and instant access to the data ensures that future events leading to rapid wall loss.
  实时趋势和对数据的即时访问确保了未来导致壁厚快速损失事件的及时发现。
- The solution may be scaled with additional CALIPERAY at the local site or by the addition of Field Deployment Kits at other wells.
  该解决方案可以通过在当地增加CALIPERAY或在其他井场增加现场安装套件进行扩展。

Key deliverables and benefits 关键的交付成果和收益

- A **fully automated** CALIPERAY thickness monitoring system was rapidly delivered by Axess Corrosion with secure LTE backhaul via the Field Deployment Kit and M2M Data Connect solution to a centralised monitoring server.
  Axess 腐蚀公司快速交付了**全自动的** CALIPERAY 厚度监测系统，并通过现场安装套件与 M2M Data Connect 的解决方案实现通过安全的 LTE 将数据回传到一个集中的监测服务器。
- The deployment allowed the successful and **economic upgrade** of a Measurement Hub thickness monitoring solution
  该安装使得测量中心厚度监控解决方案获得了成功且**经济的升级**。

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- **Wall thickness data available on demand 24/7** avoiding deploying lone personnel in remote and hazardous locations.
  全天候提供壁厚数据，避免单独人员前往偏远和危险的位置。
- This provides a **significant boost** to the **safe operation** of this site (and others like it) whilst also **reducing** the **costs** of labour and inspection.
  这**大大提高了**该站点(以及其他类似站点)的**安全运行**，同时也降低了人工和检查成本。
- Detection of rapid wall loss events using an automated remote monitoring system can **reduce the risk** of loss-of-containment and **focus maintenance** and corrosion inhibition activities.
  使用自动远程监控系统检测快速壁损事件，**可以降低泄漏风险**，并可集中精力在维护及抑制腐蚀上。
- Increased precision of the wall monitoring system enables **safer** and **more efficient operation** of the well.
  壁厚监测系统的精度提高了，能够让油井**更安全、更高效地**作业。

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