OFFICIAL SPONSOR

Kuwait Oil Company
SAMER EL ISSA
Global Director of Sales & Marketing - Flow Metering Digital Systems
Plantweb Advisor for Metrology
The Plantweb Digital Ecosystem: Enabling Top Quartile Performance With the Industry’s Broader Integrated Portfolio of Digital Transformation Solutions
Anatomy of Measurement System Failure

Root Cause

- Lack of training
- Lack of expertise/Retiring personnel
- Outdated technology
- Ineffective measurement validation processes
- Manual data collection
- Incompatible or faulty measurement devices
- Too much human intervention

Process Changes

- Measurement programs become difficult to improve
- Measurement system performance is unknown
- Unreliable measurement data
- Unnecessary or excessive maintenance

Equipment Impact

- Undetected device failures
- Measurement Uncertainty

Environmental Impact

- Undetected Conditions
- Abnormal situations
- Avoidable Consequences

Business Impact

- Increased financial risk
- Increased OPEX
- Potential regulatory or contractual issues
- Can’t minimize loss/gain balance
- Increased Unaccounted for Gas (UAF)

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The Challenge

- **Unexpected downtime** as systems fail and result in lost or deferred revenue
- **Increased system uncertainty** resulting in increases in unaccounted for losses
- **Non-conformance** that may result in fines and/or legal action
- **Unnecessary travel** to detect issues resulting in travel costs, wasted resources and safety exposure
- **Scarcity of Metrology experts**

Emerson’s Approach

- **Remote Monitoring/Unmanned operations** reduces the amount of time personnel have to be at risk
- **Health Assessment dashboards** provide confidence to the measurement data
- **Data Reconciliation** made easier with access to verified data
- **System Reliability** improved with access to predictive diagnostics
- **Contractual obligations met** with streamlined data validation
- **Uncertainty** reduced

Solution Spotlight

**Plantweb Advisor for Metrology**

**Consider It Solved™**
When you encounter a Metrology challenge, Emerson pulls together its global resources to solve it for you. With Plantweb Advisor for Metrology, we can deliver actionable information using cutting-edge technology, helping you achieve Top Quartile Performance.

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Operational Improvement Options

Legacy Model
Operational Improvement Options

Plantweb Advisor for Metrology

Legacy Model
Legacy Model

Plantweb Advisor for Metrology

Centralized Expertise:
• On Premise or Customer Intranet
• Self-manage the monitoring of system assets through owned software
• Centrally monitor & diagnose remotely located systems

Operational Improvement Options
Plantweb Advisor for Metrology Helps Customers to Centrally Monitor & Diagnose Multi-Location Systems

Plantweb Advisor is a powerful tool for centralized management of assets & effective deployment of resources

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Plantweb Advisor for Metrology Diagnostic Modules

Device Diagnostic Modules
- Gas Chromatographs
- Ultrasonic Meters
- Coriolis Meters
- Differential Pressure

System Performance Modules
- Health Assessment Dashboard
- Flow Calculation Verification
- Device Manager
- Data Reconciliation

Predictive Analytic Modules
- Machine Learning
- Meter Factor Trending
- Mismeasurement
- Uncertainty

Available Now
Coming Soon
Remote Monitoring – Health Assessment Dashboards

Alert: Signal to Noise ratio issue on chord B for Ultrasonic meter on skid 346E in Facility A in Solventas, Turkey.

Possible causes: Failed chord....

Recommended actions: .......

“"I can reduce the time that resources are in risky locations""

“I can utilize experts in a central location to standardize how I manage metering”

Drill down to individual device level
## The Challenge
Operators follow a **calendar-based calibration** approach to check the health of their coriolis meters. This all results in:

- **Regular downtime** as the system may have to be taken offline while the meters are removed
- **Transportation risks** that may result in meter damage
- **Increased Cost** from transportation, downtime and re-calibration
- **Confidence** that the meter is operating ‘as installed’

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## Emerson’s Approach
Smart Meter Verification is an easy-to-use, automatic diagnostic tool that checks the entire Coriolis meter’s performance and integrity – and without ever having to stop your process flow:

- **Actionable information** reports on a periodic basis showing the health of the meters
- **Deferment** of periodic re-calibration or proving with significant cost savings
- **Reduced uncertainty** between re-calibrations as the software alerts the customer before issues cause mismeasurement
- **Detect meter damage** as a result of erosion, corrosion, coating, freezing and overpressure

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## Solution Spotlight
- **On-demand and scheduled reports**
- **Customizable dashboards**

"Is the meter working like it should? If not, what’s the root cause of the issue?"
To demonstrate to their stakeholders that they were operating within agreed measurement uncertainties, the operator recalibrated their five ultrasonic meters every year.

This all resulted in:

- **Regular downtime** as the system may have to be taken offline while the meters are removed
- **Transportation risks** that may result in meter damage
- **Increased Cost** from transportation, downtime and re-calibration - estimated by one operator to be **$30,000** per meter, per year
- **Confidence** that the meter is operating ‘as installed’

**Emerson’s Approach**

As their partner in Digital Transformation, Emerson delivered cutting edge condition monitoring software coupled with expert analysis that provided:

- **Actionable information** reports on a periodic basis showing the health of the meters
- **Deferment** of their periodic re-calibration saving **$150,000** per year
- **Reduced uncertainty** between re-calibrations as the software alerts the customer before issues cause mismeasurement
- **Detect meter damage or issues**

**Solution Spotlight**

On-demand and scheduled reports

Customizable dashboards
Gas Chromatographs Diagnostics

The Challenge
Gas chromatographs require periodic checks and calibrations to ensure they perform optimally:

• **Unnecessary Travel** and manual intervention to check the health of devices
• **Increased Uncertainty** as the GC is a critical component in calculating the custody transfer quantities
• **Non-Conformance** through failure to meet gas quality requirements

Emerson’s Approach
The Gas Chromatograph module provides an automated tool that gives a degree of confidence in the performance of the device:

• **Actionable information** reports on a periodic basis showing the health of the devices against a stored benchmark
• **Reduced uncertainty** as the software alerts the customer before issues cause mismeasurement
• **Detect damage or issues** to the equipment

Solution Spotlight
Customizable dashboards
Plantweb Advisor for Metrology DP Condition Monitoring can facilitate a Condition Based, rather than Time Based maintenance strategy.

**Benefits**

Prognosis can be used to monitor the operation of a DP meter with the intent of identifying uncertainty in the traditional calculated measurement and facilitating a Condition Based, rather than Time Based maintenance strategy.

Routine, scheduled inspection/calibration procedures can be modified such that technicians address known measurement problems immediately on detection – rather than waiting until the problem is discovered during the next scheduled inspection.

In one case study involving a 6” natural gas orifice meter, Prognosis detected a potential contamination issue, on inspection this was confirmed. The associated 3% error could have resulted in costs of over $450,000 over the course of one year.
Calculation Verification

The Challenge
Verifying flow computer calculations requires specialist manual checks on a regular basis:

- **Unnecessary Travel** and manual intervention to verify the performance of devices
- **Increased Uncertainty** as the flow computer is a critical component in calculating the custody transfer quantities
- **Non-Conformance** through failure to meet audit requirements

Emerson’s Approach
The Gas Chromatograph module provides an automated tool that gives a degree of confidence in the performance of the device:

- **Actionable information** automated reports on a periodic basis showing the performance of the flow computer calculations against a second calculation library
- **Reduced uncertainty** as the software alerts the customer before issues cause mismeasurement
- **Technically defendable data** for contract obligations and audits
- **Confidence in measurement data**

Solution Spotlight
Calculation dashboards

Supported Calculations

<table>
<thead>
<tr>
<th>Gas Calculations</th>
<th>Liquid Calculations</th>
</tr>
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<tbody>
<tr>
<td>GPA 2172</td>
<td>ASTM D1250 / IP 200</td>
</tr>
<tr>
<td>ISO 6976</td>
<td>API MPMS 11.1</td>
</tr>
<tr>
<td>AGA 5</td>
<td>API 11.2.1</td>
</tr>
<tr>
<td>GPA 2145</td>
<td>AGA 11.2.2</td>
</tr>
<tr>
<td>AGA 8</td>
<td>GPA TP 27</td>
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<tr>
<td>NX 19, Redlich-Kwong</td>
<td>API 11.2.5 / GPA TP 15</td>
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<tr>
<td>AGA 3 / API MPMS 14.3 Part 1,2,3,4</td>
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<tr>
<td>ISO 5167</td>
<td>API 12.2</td>
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<td>AGA 7</td>
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<td>AGA 10</td>
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<tr>
<td>ISA 1932</td>
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Return On Investment (ROI) – Reduce Financial Risk

<table>
<thead>
<tr>
<th>Daily Gas Volumes</th>
<th>500 MMSCFD</th>
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</thead>
<tbody>
<tr>
<td>Sales Price (2019)</td>
<td>$4 USD Per MSCFD</td>
</tr>
<tr>
<td>365 Days Per Year</td>
<td>Per 1% drift in Uncertainty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of time with undetected drift</th>
<th>Yearly Exposure (USD)</th>
</tr>
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<tbody>
<tr>
<td>0.1 %</td>
<td>$7,300</td>
</tr>
<tr>
<td>1 %</td>
<td>$73,000</td>
</tr>
<tr>
<td>3 %</td>
<td>$219,000</td>
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<tr>
<td>5 %</td>
<td>$365,000</td>
</tr>
<tr>
<td>10 %</td>
<td>$730,000</td>
</tr>
<tr>
<td>25%</td>
<td>$1,825,000</td>
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<tr>
<td>100%</td>
<td>$7,300,000</td>
</tr>
</tbody>
</table>

Minimizing exposure time on one system with remote monitoring and predictive analytics tools alone will have a payback time in months.

Reducing the risk of having personnel at site, reducing travel costs, and the ease of verifying and validating data will bring additional value.

Plantweb Advisor for Metrology will **reduce the time to detect and correct issues** and move customers towards lower exposure.

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Live system uncertainty gives real-time visibility to the performance of your system, based on operating conditions and diagnostics.

- Uncertainty calculated according to GUM and ISO 5168.
- Gas Ultrasonic Meter system uncertainty in progress.
- Combines the live operating conditions alongside any bias detected by the Condition Based Monitoring and verification components.
- Can be linked to the Business System to provide real-time financial exposure.
- Allows the metrology experts to prioritize issues across multiple sites, driving efficiency in the team.
Design Studio models the system using function blocks.

Calculation results are passed to the user interface for visualization and reporting.
Advanced Neural Network, capable of proactively identifying potential issues in the measurement system.

- Learns the system specific relationships and patterns 24/7/365
- Performs parameter prediction
- Identifies outliers based on historical data training
- Auto corrects abnormal data based on predicted values
- Patents submitted
- Proof of concept in development
Solution Deployment

Legacy Model

Plantweb Advisor for Metrology

Connected Services

3rd Party Expert Service:
- Daily / weekly / monthly / annual health assessments
- Recommended actions
- Guaranteed mobilization to site

Centralized Expertise:
- On Premise or Customer Intranet
- Self-manage the monitoring of system assets
- Centrally monitor & diagnose remotely-located systems

Solution Optimization

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The Plantweb Advisor for Metrology platform aims to **improve:**

- **Reliability**
- **Uncertainty**
- **Conformance**

A number of diagnostic tools are provided at the **device level** and **holistic system level** to provide **actionable information** to the user.

This is an **open platform** that supports 3rd party devices and can integrate 3rd party diagnostic applications, giving analysis coverage across metering assets. The package is **independent of the metering supervisory** and can interface with 3rd party flow computers and supervisory systems where required.

Remote monitoring capabilities and persona-based access allow **the right information to get into the right hands** at each level of the organization.

**Cybersecurity is a key focus.** Working closely with the customer’s IT team and the Emerson Security experts to safeguard critical data.
THANK YOU