…the solution to web-enabled meter performance management

www.ambrit.com/approve
**Introduction**

All meters need to be proved regularly to ensure that they are operating within specified limits and comply with the Pipeline and Sales Agreements in operation. Flow computers perform rudimentary checks on the K factor / meter factor but the API Chapter 4.1 (Metering Systems Hierarchy of Proving Systems) calls for more stringent tests than the flow computer alone can provide. Furthermore, the prove data recorded has often been limited in scope, relying either on the basic prove reports generated by the flow computer or the use of nonstandard, unvalidated spreadsheets.

Approve™ is a web-based tool designed to manage the prove data generated by flow computers. Prove results from every prove performed are stored in a centralised database, creating a comprehensive and accurate prove history. Prove data and control charts can be shared instantly and securely over a corporate intranet or across the Internet, enabling technicians, auditors, operations and management to monitor the performance of every meter on the system.

Developed in conjunction with METCO, Approve™ is fully compliant with the specifications defined in API chapter 13.2 (Statistical Methods of Evaluating Meter Proving Data) for evaluating the performance of turbine or displacement meters in custody transfer and non-custody transfer metering applications.

**Meter Factor Verification**

The prove results can either be manually entered into Approve™ or automatically collected from the flow computer (when used in conjunction with Acquire™ or Profile™). Approve™ runs a series of tests on the data and presents the results with a clear pass or fail indication. These tests include:

- **Deviation From the Base Curve** - This test determines that the prove is within a set of limits (typically 0.1%) from the meter’s base performance curve.

- **Within the Tolerance Limit** - This test passes if the K factor / meter factor is within the tolerance limits of the control charts. The tolerance limits are based on a 99.5% confidence level of the t-distribution table as per API 13.2.

- **Deviation from the Previous Prove** - This test passes if the new K factor / meter factor has not deviated from the previous prove beyond a defined limit (typically 0.1%).

The prove results are presented on a printable prove certificate that clearly explains the test results and the reason for the pass or fail, as well as providing advice on the next steps should a prove fail its tests. The flow computer generated prove report can also be attached to the prove results, providing full traceability all the way back to the originally generated prove data.

When used with Acquire™ or Profile™, Approve™ will also store proves that have failed the flow computer’s internal run repeatability tests.

**Control Charts**

Approve™ uses the historical data from each prove to generate a series of high quality control charts that clearly illustrate the results of each test and how the meter has been performing over extended periods of time.

The control charts make it easy to see the deviation from the base curve or previous prove and check that the K factor / meter factor is within the required tolerance limits, enabling operators to quickly identify potential problems.

**Base Curve**

Every time a meter’s base curve is updated, Approve™ stores the results for the previous base curve, resets the current prove history and control charts, and automatically allocates all new proves to use the new base curve. Historical prove results recorded against previous base curves are retained for full auditability and traceability.

**Predicted Prove**

Approve™ performs data regression analysis on data from historical proves to predict what the meter factor should be for any given flow rate. This predicted meter factor is calculated alongside the predicted value. Approve™ will allow the metering engineer to accept the predicted meter factor instead of the proved meter factor if they are unable to obtain an acceptable meter factor from the prove for any reason.

**Prove History**

Every prove result from every flow meter is stored in the database, providing a complete and auditable prove history that tracks each meter’s performance.

**Metrology™**

The prove history on its own does not give a complete picture of how the meter is performing; metering data from other sources also need to be taken into account. Approve™ is part of the Metrology™ suite which includes applications for recording logbook events, calibration tracking, audit management and data collection. The applications can be deployed as stand alone solutions or linked together to provide a unique platform for collection, analysis and reporting of metering data.

**Inventory™**

At the heart of Metrology™ is Inventory™, an equipment register which maintains a record of all the equipment in service on every asset, including location, model number, manufacturer, serial numbers and service status. Once the equipment has been defined in Inventory™, it can be shared with any of the other products in the Metrology™ suite.
Approve™ is one of the components in a suite of web enabled metrology asset management applications, created to streamline the collection and management of metering data.

Approve™, one of the elements of the Metrology™ suite, is a web-enabled application designed to manage and verify the meter factors generated by a flow computer. It runs a series of calculations and other tests to ensure the prove complies with the guidelines as set out in API chapter 13.2.

Details of every prove from every meter are stored in the Approve™ database to create a centralised prove history for multiple metering stations.

Approve™ helps visualise the performance of the meter by presenting the historical prove data as a series of high quality control charts that clearly demonstrate the results of each prove. This prove data builds up over time to provide a complete picture of the performance of every meter and can be used to quickly identify those meters that need to be re-calibrated or replaced.

A unique feature of Approve™ is its ability to share data with any of the other applications in the Metrology suite. For example, all prove data can be transferred from Approve™ to Record™ to automatically record prove events in the logbook. These proves are chronologically interlaced with other data in the logbook to provide a comprehensive audit trail of the entire process.

Approve™ simplifies the process of recording prove data and verifying the prove results. By storing this data centrally and making it easily accessible to those users who need to be able to view it, Approve™ helps ensure all flow meters are measuring accurately and in accordance with industry best practice; whilst easily demonstrating compliance to auditors and other interested parties.

Prove Tracking
- Support for Bi-Directional, Uni-Directional, Compact and Master Meter provers
- Complies with API Chapter 13.2
- Automatic / Manual prove entry
- Flow Computer generated prove reports
- K Factor / Meter Factor linearisation
- Prove prediction
- Meter Factor regression analysis
- Base curve management and tracking
- Multiple installations / multiple stations
- Multi-product
- K Factor / Meter Factor acceptance
- Complete prove history
- Import / export of prove results
- Prove certificates

Prove Tests
- Run Repeatability
- Deviation from Base Curve
- Within Tolerance Limit
- Deviation from Previous Prove

Web Interface
- State of the art web-based HMI
- Multi-user access
- Multi-language support
- Browser access using Internet Explorer® 9 or greater
- Secure access via private networks (Intranet)
- Secure access via World Wide Web (Internet)
- World-wide overview via Inventory™

Secure
- Integrated 256 bit SSL encryption
- Digest authentication for secure password control
- Individual user access privileges

Integration
- Link to Record™, Profile™ and Acquire™