

# Meter Test Inspection



## Paper or Electronic?

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The Changing World of Field Meter Testing

■ Is your company still performing field meter test inspections at the same frequency as was done for the last twenty or more years?

■ Do your field technicians now carry laptop computers, electronic test equipment and the latest technology in communications devices but still record meter test data onto a paper report and mail the reports to the main office for manual processing?

■ Does your company still rely on a desktop calculator to determine volume adjustments for meter calibration errors?

If you answered, "yes" to these questions then you may be able to improve your meter test process, reduce some O&M expense, reduce data entry errors, and improve customer relations by implementing an electronic meter test application.

Accurate gas measurement has become more difficult due to the changing world of natural gas measurement with the introduction of electronic flow computers, electronic calibration equipment and the use of new types of gas meters. At the same time consolidation of the gas business has resulted in downsizing of field operations staff. These changes in the business and staff reductions are forcing a change from the traditional gas measurement technician

to a multi-skilled technician responsible many different functions.

Therefore, efficient scheduling of the workflow of the field technician is a challenging prospect. In the past, the technician visited each and every meter on a regular fixed schedule and performed a detailed meter calibration inspection, regardless of size of the meter, gas volume flow, or reported anomalies with the calibration data. In order to meet the numerous demands placed on field technicians, some companies are re-evaluating the frequency at which meters are tested. Listed below are some of the factors that are commonly considered in determining the meter test frequency:

- Size of the meter
- The amount of gas volume flowing through the meter
- Quality of the gas
- Type of meter
- Type of measurement recording equipment (EFM or Chart)
- Contract or tariff requirements

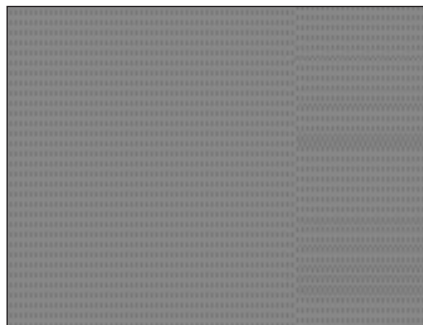
Field technicians today are responsible for the meter test inspections, maintenance and operation of many different types of electronic, and mechanical measuring devices. To help them perform these functions they now carry lap-

top computers, various types of electronic test equipment, and electronic configuration devices. Even with all of this modern electronic equipment, most technicians are still using paper reports to document meter tests and rely on the mail to send this test information to the volume processing group for manual data entry. The use of these paper test reports may be directly or indirectly costing your company money and adversely impacting customer relations. Late or improperly processed test reports can result in prior month volume adjustments, lost revenues and increased system imbalances.

The use of an electronic reporting system can help ensure timely test report data, reduce data entry errors and provide a method to schedule meter tests. This small change in meter test reporting methods could help increase the productivity of your field technicians and improve the speed of data communication to the volume processing group without adversely affecting the accuracy of the measurement process.

### Importance Of Meter Testing

One of the most critical tasks in gas measurement is the calibration inspection.



tion of the gas meter, commonly referred to as the meter test. This meter test determines the actual accuracy of the gas volume measurement device by comparison to a standard. When errors are detected they must be evaluated to determine if the error exceeds contractual limits and if any prior period volume adjustments will be required.

Meter testing is important to companies due to the following issues:

1. **Contractual Issues**—Meter test inspections of equipment requires that field technicians perform an accurate calibration check to determine the accuracy of the meter. If the meter is not measuring accurately, the field technician must bring the meter's accuracy up to standards, if possible. The results of this meter test is then documented and sent to the volume processing group. This group uses the meter test information to adjust the volumes if an error was found.

2. **Maintenance Issues**—The meters used to measure the gas volumes are mechanical devices that require some level of routine maintenance. The level of maintenance required depends on whether the device is an orifice, positive displacement, turbine or ultrasonic meter and the type of recording device. For example, an orifice meter requires very little maintenance while a turbine meter may require a complete teardown and cleaning on a regular interval. The field technician documents the "as-found" condition of the meter, performs the required field maintenance, and then documents the condition of the equipment after maintenance and calibration.

3. **Lost and Unaccounted for Gas (LUAF)**—Many factors can attribute to LUAF, but one significant factor can be a metering station that is found to be out of calibration month after month. The field technician is responsible for performing calibration inspections of the meters and making the necessary corrections. It is also the responsibility of the field technician to alert the volume processing group about errors so that the necessary corrections can be made to the historical gas volumes.

4. **Lost Revenues**—There are many fac-

Total Information		Apex JEP Test		Revised		Print	
Station	1000	Test	1000	Test	1000	Test	1000
Station	1000	Test	1000	Test	1000	Test	1000
Station	1000	Test	1000	Test	1000	Test	1000

Total Information		Apex JEP Test		Revised		Print	
Station	1000	Test	1000	Test	1000	Test	1000
Station	1000	Test	1000	Test	1000	Test	1000
Station	1000	Test	1000	Test	1000	Test	1000

tors that can affect the accuracy of a field meter and related recording device. A proper meter test documents the condition of the meter before any calibration or maintenance is performed. The volume processing group uses this as-found condition to determine if a volume adjustment is necessary and amount of volume adjustment required. If the as-found calibration indicates a measurement error exist then a volume adjustment should be performed on the gas volumes that were measured by this meter. If this volume adjustment is not performed correctly then the result could be lost revenues.

## Paper Vs. Electronic Meter Test Application

An electronic Meter Test application offers many benefits to both the field and corporate office:

1. **Electronic Scheduling**—A Field Technician's challenges include "juggling" many different scheduled activities. The use of an Electronic Scheduler provides a method to schedule meter tests and track the status of scheduled meter tests. There are numerous activities a field measurement technician is required to perform with most occurring periodically on fixed time intervals. For example, a company may require that a meter inspection be performed monthly, detailed calibration quarterly, and internal tube inspection every five years. Without the use of a central scheduling tool it becomes almost impossible to determine if these activities are being performed and at the correct intervals.

2. **Scheduling Parts of Test**—Time management is a Field Technician's most valuable skill. In the paper past, a field technician performed a complete calibration test each time the meter was scheduled for test. Today, the field technician does not possess the luxury of time or money to perform a detailed calibration test each time for every meter. This is forcing companies to rethink the way meters are tested and the frequency functions related to a meter test are performed. With an electronic Meter Test application that is integrated with an electronic scheduler, a company can define when a meter should be tested and what functions should be performed as part of the test. For example, this provides the flexibility to schedule a basic inspection be performed monthly and a complete calibration check of the meter be performed quarterly.

3. **Required Data Entries** - The central gas measurement group's greatest frustration can be "incomplete or blank" information on the meter test form. This missing information can result in additional expense and time to contact the field office and request the data before the meter test processing can be completed. An electronic Meter Test application has required data entries, which prevent the field technician from saving/exiting without entering data in specified fields.

## Interfacing with Existing Measurement Systems

Paper meter test forms require that the data be manually entered into some existing meter test or other measurement application before the data is meaningful to the volume processing group. Even if the company has an electronic Meter Test application, it may not interface with their existing gas measurement system, which could eliminate the manual entry of meter test data.

The ideal solution is an electronic meter test system, which seamlessly interfaces with existing Gas Measurement Systems for the following reasons:

1. **Measurement Systems Can Pre-fill Most Information:** Gas Measurement Systems are the repository of meter configuration data. This configuration data can be extracted from the measurement system and used to pre-fill an electronic Meter Test report. Pre-filling a report will reduce the time required for a field technician to complete a test report. For example, meter configuration data that could be used to pre-fill a meter test report includes:

- Meter ID
- Meter Name
- Company Name
- State
- Technician Name
- Meter Status

- Meter Make
- Meter Model
- Temperature Range
- Static Pressure Range
- Differential Pressure Range
- Differential Pressure Standard Test Points
- Orifice Diameter
- Tube Diameter



2. Checking vs. Auditing - In the paper meter test days, data was written on paper, sent into the gas measurement group, where sometimes it was reviewed and the gas volumes were corrected based on the reported data as needed. The problem was the time required to manually review and compare the reported meter test data to the values within the measurement system.

In comparison, the electronic meter test report form is designed to have most of the meters configuration information pre-filled when the technician opens the form on the laptop within the Meter Test Application. Now the technician is validating the measurement system's configuration data and correcting any inaccurate data at the same time the meter is being tested. If errors are found with the pre-filled data, the technician just types over the pre-filled data with the correct value. For example, the pre-filled form indicates an orifice diameter is 2.0 inches, but the field technician determines that the orifice size is actually 2.5 inches. The technician edits the pre-filled value to indicate the correct orifice size on the electronic Meter Test. When the completed report is electronically imported into the gas measurement system. If any of the reported configuration data items do not match the gas measurement database the test report should be held for operator review. Since key field changes can affect the accuracy of volume calculations, it is important that these reports be reviewed and discrepancies reconciled.

3. Automatic Calculation of Volume Adjustment: When a meter test report is electronically imported or manually entered into the measurement system, the system should automatically calculate a total calibration error and a composite volume adjustment factor based on calculated historical averages of the measured variables and the “as-found” calibration results. If the total calibration error is greater than the allowed contractual limit then the composite adjustment factor is applied to the appropriate historical volumes. The result is a cor-

rected volume, which has been adjusted to remove the bias caused by the calibration error.

4. **Effective Date Calculation:** When a meter test record is accepted for volume adjustment, the system applies the calculated composite adjustment factor to the affected volume records. The normal process in the gas industry is to apply the adjustment for half the time period since the previous calibration test. The gas measurement system should automatically calculate the effective date based on this logic.

5. Delinquent Meter Test Report: A delinquent meter test report should be part of an electronic meter test reporting system. The meter test scheduler application tracks the scheduled frequency of the different types of test assigned to each meter plus the date each test was last performed. The application can use this information to generate a status report indicating when a meter is scheduled for test and if the test is delinquent.

Additional Requirements of an Electronic Meter Test Application:

1. **Support Test Reports for Different Types of Meters**—It is essential that the Meter Test application provide support for many different types of gas meters. The application should support the following meter types:

- Orifice
- Turbine
- Rotary
- Positive displacement
- Turbine
- Ultrasonic

In addition to the different types of meters the application should also provide support for the different test methods commonly used for each meter type. For example, for a turbine meter the application should provide support for the following test methods:

- Spin test
- Electronic prover
- Sonic nozzle test
- Critical flow plates
- Transfer proving

By supporting these many different types of meters and tests, the electronic Meter Test application should meet most field meter test reporting requirements.

2. **Laptop Field Usability**—In most cases, the field technician will enter a complete test report at the field location. This means that the technician does not have a large easily visible

monitor, a mouse for navigation, or a full sized keyboard for data entry. Usually the technician will set the computer on the tailgate of a truck along with other test equipment. For this reason, the program must be very easy to read and not require the use of a mouse for screen navigation.

3. Printing of Blank or Pre-Filled Forms  
- No matter how simple and easy the Electronic Meter Test Application is to use, some technicians will still prefer to print a hard copy of the test report and use this to document the test at the field location. The test results are then entered into the laptop application at a later time, usually when the technician is at an office location. This may be necessary because the laptop computer is frequently used during the field test to also communicate with a flow computer. Since many of the flow computers still use DOS based calibration applications, it becomes very complicated to switch between a Microsoft Windows™ based Meter Test application and the old-style flow computer application.

4. **Record Retention Process**—The application should have a record configurable retention process that is used to control the number of saved reports within the Meter Test database for each meter.

In conclusion, an Electronic Meter Test Application will improve your company's meter test process by allowing many of the manual data handling functions to be automated. A fully integrated electronic meter test application can perform the scheduling of field meter tests, track the status of late reports, electronically transfer completed reports to the host measurement system, automatically process calibration errors and adjust volumes. These functions should help your company virtually eliminate data entry errors, minimize prior period volume adjustments due to late arrival of meter test reports, and significantly reduce the time your staff spends on processing of meter test reports. **P&GJ**