FIELD DATA CAPTURE WITHOUT PAPER FORMS

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INTRODUCTION

Meter inspections, configuration changes, calibration verification, troubleshooting, and gas sampling generate important subsets of measurement data. Automated computer systems capture, process, store, and report this data better than manual, paper-based systems; minimizing effort, time, resources, and error for field and office workers.

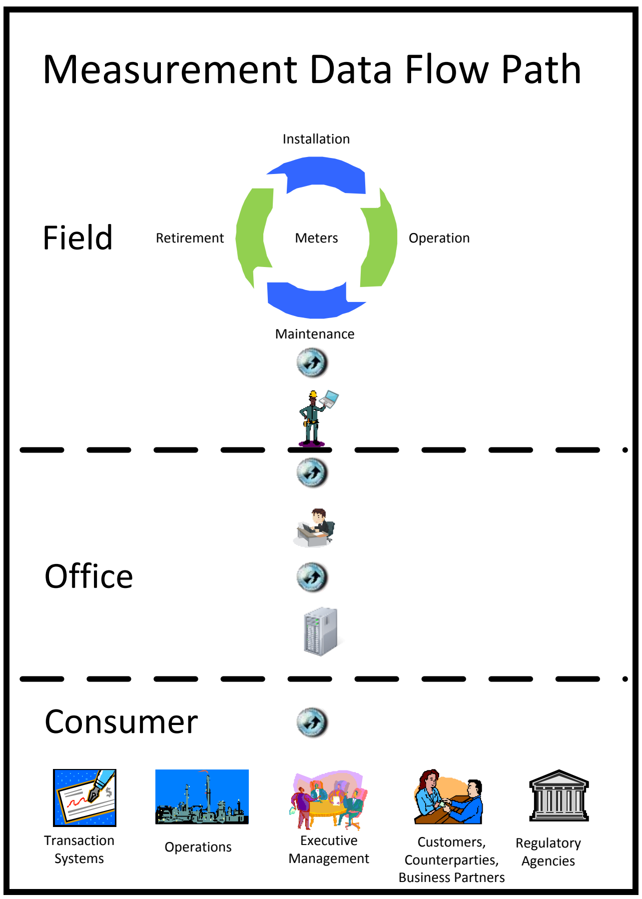


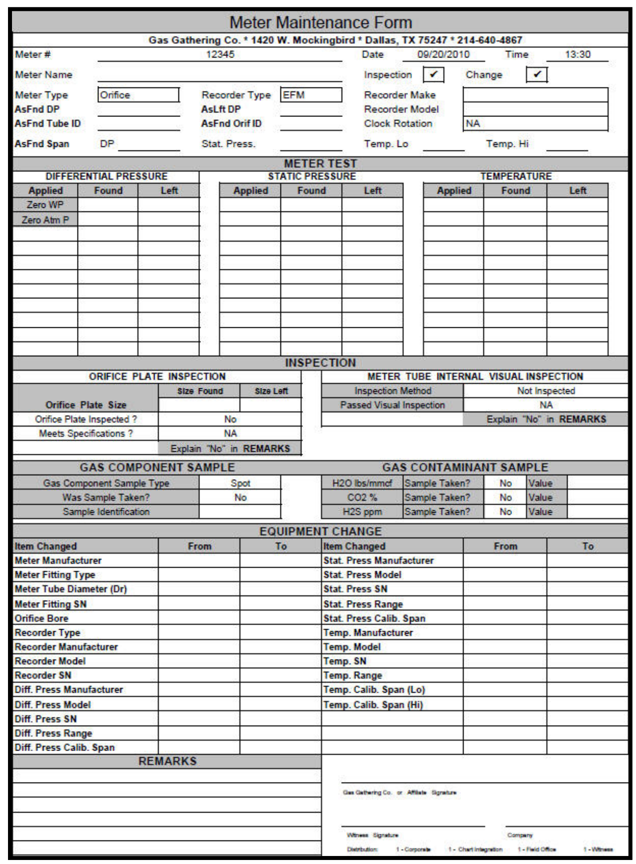
Figure 1. Measurement Data Flow Path

Measurement Data Flow

Measurement data is generated throughout the life cycle of a meter and must be shared between the office and the field as it makes its way to consumers. See Figure 1. The office begins by creating a unique meter identification number. Field technicians generate reports after meter installation and commissioning, using the meter's identification number to record descriptive information such as: type, configuration, location, and purpose. After installation and commissioning, the meter begins performing its primary function, generating and recording volume data. Periodic maintenance and troubleshooting occur for the remainder of the meter's life. It is this maintenance data that this paper is concerned with.

Manual Field Data Capture

Manual methods of field data capture make use of paper forms, or use electronic forms that emulate paper.



Meter Maintenance Form

Gas Gathering Co. * 1420 W. Mockingbird * Dallas, TX 75247 * 214-640-4867

Meter # 12345 Date 09/20/2010 Time 13:30
Meter Name Inspection ✓ Change ✓
Meter Type Orifice Recorder Type EFM Recorder Make
AsFnd DP AsLft DP Recorder Model
AsFnd Tube ID AsFnd Orif ID Clock Rotation NA
AsFnd Span DP Stat. Press. Temp. Lo Temp. Hi

METER TEST

DIFFERENTIAL PRESSURE			STATIC PRESSURE			TEMPERATURE		
Applied	Found	Left	Applied	Found	Left	Applied	Found	Left
Zero WP								
Zero Atm P								

INSPECTION

ORIFICE PLATE INSPECTION		
	Size Found	Size Left
Orifice Plate Size		
Orifice Plate Inspected ?	No	
Meets Specifications ?	NA	
	Explain "No" in REMARKS	

METER TUBE INTERNAL VISUAL INSPECTION	
Inspection Method	Not Inspected
Passed Visual Inspection	NA
	Explain "No" in REMARKS

GAS COMPONENT SAMPLE	
Gas Component Sample Type	Spot
Was Sample Taken?	No
Sample Identification	

GAS CONTAMINANT SAMPLE				
H2O lbs/mmcf	Sample Taken?	No	Value	
CO2 %	Sample Taken?	No	Value	
H2S ppm	Sample Taken?	No	Value	

EQUIPMENT CHANGE

Item Changed	From	To	Item Changed	From	To
Meter Manufacturer			Stat. Press Manufacturer		
Meter Fitting Type			Stat. Press Model		
Meter Tube Diameter (Dr)			Stat. Press SN		
Meter Fitting SN			Stat. Press Range		
Orifice Bore			Stat. Press Calib. Span		
Recorder Type			Temp. Manufacturer		
Recorder Manufacturer			Temp. Model		
Recorder Model			Temp. SN		
Recorder SN			Temp. Range		
Diff. Press Manufacturer			Temp. Calib. Span (Lo)		
Diff. Press Model			Temp. Calib. Span (Hi)		
Diff. Press SN					
Diff. Press Range					
Diff. Press Calib. Span					

REMARKS

Gas Gathering Co. or Affiliate Signature

Witness Signature Company

Distribution: 1 - Corporate 1 - Chart Integration 1 - Field Office 1 - Witness

Figure 2. Spreadsheet Version of Paper Meter Maintenance Form

An example of a paper form, translated to electronic format, is shown in Figure 2. These forms are used for data entry by the technician. They also serve as reports for internal and external customers.

Because the data being generated requires distribution to several stakeholders, there must be a mechanism to generate multiple report copies. For paper copies, this can be accomplished using multi-part forms. Once the work is finished and the form is completed, copies are separated and mailed, faxed, or hand-delivered to the office and to external customers. Office clerks and analysts then manually key the report data into the measurement data management system, or other computer systems, as required. Paper copies of the report are stored for future retrieval.

Electronic forms that emulate paper forms are processed with some of the same inefficiencies as with paper forms. However, because the forms are electronic, they can be distributed and stored more efficiently than the paper forms they replace.

Automated Field Data Capture

Automated field data capture tools allow data to be entered once. For meters with chart recorders, the technician keys data into a specially designed computer application on his portable computer. The data is then automatically transmitted, via a communications network, to the central measurement system for validation, processing, and reporting. For meters having flow computers, the technician eliminates much of hand keying by populating the field data capture application with data electronically transferred from the flow computer.

Data flow examples between manual methods and automated methods of field data capture (shown in Figures 3 and 4) give quick, visual comparisons of the relative complexities of one method to the other. Having less complexity helps reduce costs, improves data quality, and provides better and faster data accessibility.

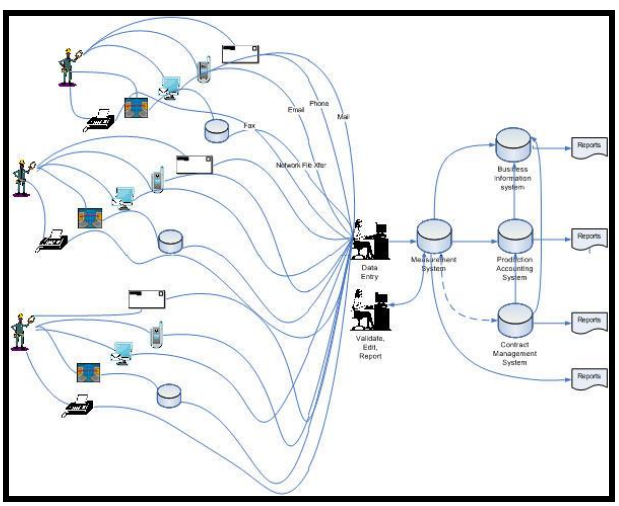


Figure 3. Manual Field Data Capture - Data Flow

BENEFITS OF AUTOMATED FIELD DATA CAPTURE

Cost Reduction

The initial capital outlay to implement an automated field data capture system is recovered quickly. A company that switches from paper forms that develops well-defined processes and procedures can experience hundreds of thousands of dollars in savings each year. As an example,

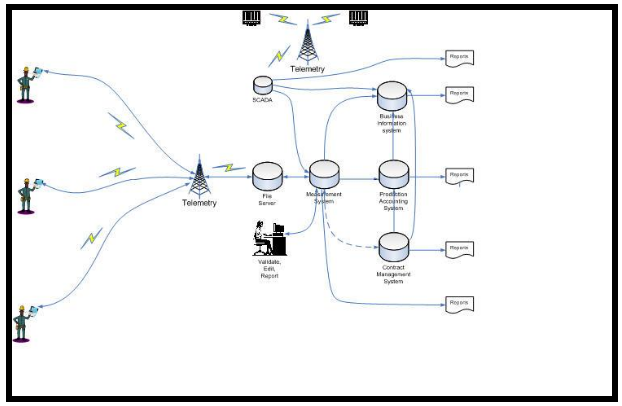


Figure 4. Automated Field Data Capture - Data Flow

a company with 2000 meters and a quarterly meter testing schedule can save over $100,000 annually with reduced printing, labor, and postage costs. See Table 1.

Additional cost savings that are less easily quantified, but often more substantial are realized due to better data quality and less re-work.

Cost Considerations	Paper Multi-Part Forms	Electronic Forms	Automated FDC Forms	Notes:
Cost to Print/Purchase (per form)	$0.40	$0.00	$0.00	
Cost to Enter Data (per form) onto Form and into Measurement System (assumes 0.5 hours for each Manual Entry @ $30/Hr including 25% salary loading)	$30	$30	$15	Paper Forms and Electronic Forms require at least 2 entries, One on Form and One into Measurement System. Automated FDC Forms Import Directly into Measurement System
Cost to Distribute (Assumes 10 Form Copies Per Env at $0.32/Env)	$3	$0	$0	For Electronic Forms and FDC Forms, assumes network infrastructure in place for email and file transfer
Number of forms generated each year (Assumes 2000 meters with quarterly tests/inspections)	8,000	8,000	8,000	Does not include unscheduled tests and troubleshooting events
Annual Forms and Forms Processing Costs	$268,800	$240,000	$120,000	
Savings Compared to Paper Multi-Part Forms	$0	$28,800	$148,800	
% Savings Compared to Paper Multi-Part Forms	0	11%	55%	

Table 1. Field Data Capture Forms - Cost Comparison

Improved Data Quality

Along with direct cost savings, field data capture using a single, automated software application and good procedures help ensure data is accurate and complete. This is accomplished with data entry reduction, duplicate entry elimination, and automatic data validation.

Paper forms, for practical reasons, require entry of the same data fields each time a form is completed. These fields include equipment make, model, serial number, and other descriptive values that may impact volume calculations, but rarely change. Entering illegible or incorrect values can cause confusion or result in incorrect volume calculations. An automated field data capture tool eliminates this repetitive entry by the technician. The field data capture tool maintains all meter information in a relational database. When starting a form for new activities, all meter descriptive data from the last saved activity is automatically displayed in the form. The technician only needs to enter the data that will change, depending upon the work being performed.

Paper forms and stand-alone electronic forms require multiple entries of the same data by different personnel. As the data makes its way along the data management path, from field to office, every human involved creates greater potential for error. At a minimum, the data is entered twice; once on the form and once from the form into the central measurement system. It is possible with ineffective processes and procedures that the data is entered many more times into different computer applications. These applications may include individual spreadsheets and databases. Manual entry and storage of the same data multiple times, and in multiple repositories, invites error and confusion. The automated field data capture tool, along with good processes and procedures, eliminates multiple data entries. Data is entered once at the time of the work and transferred into a single company repository for reporting.

Data validation at the point of entry increases data quality assurance. Obviously, paper forms have no data entry validation abilities and no data entry controls. An automated field data capture tool possesses configurable validation and control functions. Controls, including drop-down boxes and required entry fields, are configured so that data entered is the correct type, is selectable from a preconfigured list, and may be a required entry before the application allows saving and transfer. See Figure 5.

<u>Improved Work Processes and Data Availability</u>

Gas price volatility over the last 10 years has influenced the need for better, more efficient work processes and for faster access to reliable data, including field data. Automated field data capture tools best meet these needs.

Improved work efficiencies and faster access to data is achieved via:

- Automated work scheduling
- Automated reporting of overdue work
- Automated data distribution
- Elimination of data entry duplication
- Automated data validation
- Relational database storage and retrieval

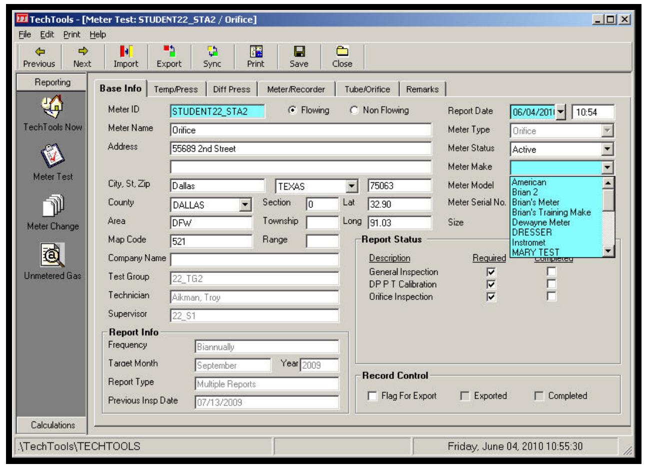


Figure 5. Automated Field Data Capture – Date Entry Controls

MANUAL DATA COLLECTION POLICY EXAMPLE

Incomplete field data collection can cause incorrect volume reporting. If an organization's policy is to use forms with no mechanism to force required data to be entered, critical activities may be overlooked or critical data may not be recorded. An example might go something like this.

On a Friday afternoon, before taking two weeks of vacation, a technician performs a quarterly scheduled meter test at one of the higher volume meter sites. The other company's witness is unable to make it to the site. Company policy is to record all meter test activities on a four-part paper form that is distributed to the required stakeholders after work completion. All goes well with the meter test and facility inspection until the technician prepares to inspect the orifice plate. He receives an emergency call that a pipeline rupture has occurred and is directed to a mainline valve location several miles away to assist in shutting off flow to the rupture. The technician has performed most of the critical tasks at the meter site, but does not have time to check the orifice plate. He travels to the rupture site and assists. After helping with the rupture, the time is late and the technician has forgotten the orifice plate inspection. Thinking about vacation and not needing to go back to the office, except to turn in paperwork, he asks a co-worker to take the paperwork to the office on Monday and give it to the office assistant for filing, processing, and distribution.

In this example a critical maintenance activity was left uncompleted and a potentially damaged orifice plate was left in a flowing meter with little chance of discovery until the next quarterly inspection. If company policy had been to utilize a field data capture tool with required data entry functionality, the missed orifice plate inspection would not have allowed the technician to save his data report.

The meter test activity would have been caught by a delinquent activity report and any error caused by orifice plate problems could have been minimized.

In this case, let's assume the orifice plate became permanently deformed when an ice block bent it one month prior to the meter test. Below are the particulars of the meter, its flowing conditions, and the dollar impact of missing the plate inspection.

- Tube diameter – 3.068"
- Orifice diameter – 1.5"
- Average pressure – 50 psia
- Average temperature – 60 deg F
- Average differential pressure with deformed plate – 50"
- Btu/scf – 1000
- Flow computer calculated flow rate, deformed plate – 672 mcfd
- Orifice deflection – 0.125"
- Approximate error percentage from deformed plate – -5.21%
- Flow rate adjusted for plate deflection error – 709 mcfd
- Volume rate difference – 37 mcfd
- Energy rate difference – 37 mmBtud
- Dollar impact for one month at $4/mmBtu – $4,440
- Total time the orifice problem is undiscovered – 4 months
- Dollar impact for 4 months at $4/mmBtu – $17,760
- Likely volume adjustment period – 1.5 months
- Likely period of time without volume adjustment – 2.5 months
- Energy never recovered – 2,775 mmBtu
- Dollars never recovered – $11,100

CONCLUSION

As previously stated, field data is an important subset of all measurement data. It is useful to both internal and external customers. It affects volume and energy calculations and reporting. It impacts correct determination of lost-and-unaccounted for quantities, triggers contract-specified changes in settlement rates, and is an important audit source. Replacing manual field data capture systems with an automated software application to generate and distribute field data is the best method to reduce costs, improve data quality, and provide better and faster data accessibility. It's called "Getting it right the first time."