

Hardin County Water District No. 1

Serving Radcliff and Hardin County for Over 50 Years

1400 Rogersville Road
Radcliff, KY. 40160

Case No. 2008-00402

September 2, 2008

Mr. Reggie Chaney
Division Director
Division of Engineering
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, KY 40602

RECEIVED

SEP - 8 2008

PUBLIC SERVICE
COMMISSION

**RE: Report of Suitability and Accuracy of
Installed Electromagnetic Flow Meter**

Dear Mr. Chaney:

On 4th day of June, 2004, the Kentucky Public Service Commission issued an order (see attached Case No. 2003-00480) allowing the Hardin County Water District No. 1 (HCWD No. 1) to deviate from 807 KAR 5:066, Section 15(2), relating to water meter accuracy and testing requirements, so that it may use an electromagnetic flow meter (EFM) to measure the sale of water to its wholesale customers.

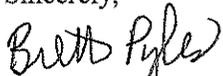
The EFM differs from the various mechanical meters (displacement, multijet, turbine, propeller, compound) included in 807 KAR 5:066, Section 15(2) in that flow velocity is measured by applying Faraday's principle of magnetic induction, whereas; a conductor (water) moving through a magnetic field (produced by a sensor) will induce an electric current proportional to the velocity of the fluid.

Over the past four years HCWD No. 1 has monitored the status and effectiveness through annual testing of the EFM to ensure and maintain flow accuracy. Please find attached our final report that demonstrates the suitability and accuracy of the installed EFM. During the monitoring period the installed EFM consisting met or exceeded the accuracy limits established in 807 KAR 5:066, Section 15(2) for the mechanical type meters.

Based on our historical testing and the known performance and accuracy of this type metering and technology being utilized in the water and sewer industry throughout the country, we respectfully request that permission to deviate from 807 KAR 5:066, Section 15(2) granted by PSC Case No. 2003-00480 be extended indefinitely or the administrative regulations be revised to include EFMs, and the testing thereof.

Please feel free to call if you need more information or have any questions.

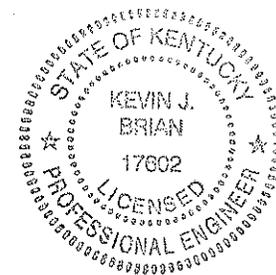
Sincerely,



Mr. Brett Pyles
Operations Manager
HCWD No. 1



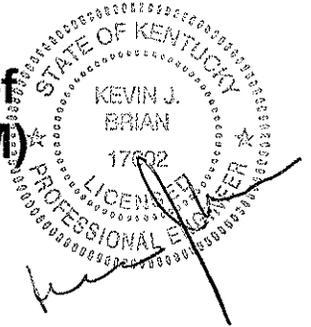
Mr. Kevin J. Brian, PE
HDR|Quest Engineering



Final Report of Suitability and Accuracy of Installed Electromagnetic Flow Meter (EFM)

PSC Case No. 2003-00480

September 3, 2008



BACKGROUND

On December 9, 2003 Hardin County Water District No. 1 (the "District") with assistance with HDR/Quest Engineers submitted a request to deviate from Kentucky Public Service Commission (the "PSC") regulations related to Water Meter Accuracy and Testing Requirements, specifically related to the use and testing of EFMs.

On June 4, 2004 the PSC issued order No. 2003-00480 allowing the District to deviate from 807 KAR 5:066, Section 15(2) to use an EFM to measure the sale of water. The provisions of this order require the District to demonstrate the suitability and accuracy of the installed EFM and monitor the status and effectiveness of the proposed EFM.

In July 2004 the District installed a 12-inch Siemens Model 5100W electromagnetic flow meter at the Pirtle Water Treatment Plant, downstream of the high service pumps. The purpose of this meter is to measure finished water flow used in the annual calculation of unaccounted for water and reported to the PSC.

FIELD TESTING PROTOCOL

Kevin J. Brian, P.E./HDR|Quest Engineering and District staff performed field-testing and meter calibration, if required, on the newly installed EFM during the four year monitoring period.

The field-testing process on the EFM consisted of measuring flow from two known standards when the high service pump was running. One standard involves volumetric measurement by measuring the level drop from the Pirtle clearwell over a specified time period. The other standard used a calibrated time-transit portable flow meter (TTFM). During the field-testing with the high service pump running, data was recorded from the EFM, volume measurement and TTFM during the same time period.

The two known standards for flow measurement are described below:

Clearwell Volumetric Measurement –

A level rod with graduations every one hundredth of a foot (0.01') was clamped in a plumb position to the inside of the clearwell access hatch located inside the pump room. A float driven indicator was installed on a guide pole next to the level rod to measure the change of water surface depth in the clearwell. To ensure the indicator moves freely and without resistance of friction, the draw down depth measured from the indicator was measured against an existing level transducer installed in the clearwell that is currently used with District's SCADA system. The transducer has an output reading to the nearest one tenth of a foot (0.1'). One of the high service pumps is turned on and the butterfly valves that isolate the clearwell from the clarifiers are closed.

The level rod reading at the beginning and the end of the time period is then recorded along with the duration of the test period. From this data, the measured flowrate is calculated by taking the level drop in feet times 31,126 gal/vf divided by the time duration in minutes. The clearwell volume per vertical foot was calculated from dimensions taken from as-built drawings of the clearwell. For clearwell volume calculations see Table 1 on the following page.

TTFM Measurement -

The same calibration information and factory settings stored in the EFM Sensorprom memory unit were also used for the TTFM settings. Before using the TTFM for field-testing, the meter was calibrated by the District at its certified meter test shop on the 2-inch line on the large test bench. The TTFM was then set-up on the 12-inch high service discharge main at the Pirtle WTP downstream of the installed EFM and total flow reading reset to zero. Total flow from the TTFM is recorded during the same test period for the volumetric measurement. The flowrate is calculated by taking the total flow reading divided by the time duration in minutes.

TABLE 1 – CLEARWELL VOLUME CALCULATION

Inside Dimensions	
• Length	66.17 ft
• Width	65.86 ft
• Area	4357.96 sq ft
Baffle Walls (subtract)	
• Length	56.17 ft
• Thickness	1.17 ft
• Area/Wall	65.72 sq ft
• # Walls	3
• Total Area	197.16 sq ft
Net Clearwell Volume	
• Volume	1 cu ft = 7.4808 gallon 4160.80 sq ft/vert 31,126 gallons/vert ft

The above protocol and data recording from all instruments are performed by four (4) people. One to record level rods readings and time, one to record transducer readings, one to record EFM readings and one to record the TTFM readings.

CALIBRATION PROCESS

A minimum of two field tests are then performed. The calculated flowrate from the volume measurement and TTFM reading are then compared to the EFM flowrate. If the EFM flowrate when compared to the two know standards is outside the accuracy limits of the 807 KAR 5:066, Section 15(2), the EFM was calibrated by adjusting the 4-20 ma output. A third test was then run on the calibrated EFM.

See Table 2 below for PSC Accuracy limits.

TABLE 2 - PSC ACCURACY STANDARDS

Type of Meter	Maximum Rate		Minimum Rate	
	Flowrate (gpm)	Accuracy Limits	Flowrate (gpm)	Accuracy Limits
Class I Turbine	4000	98.5% -101.5%	120	98.50% -101.50%
Propeller	1000	98% - 102%	140	95%

RESULTS

Table 3 on the next page summarizes the flow test results for the EFM and two known standards for each test year.

TABLE 3 - FLOWRATE COMPARISONS PER TEST YEAR

July 20, 2005 Field Test/Calibration	Flowrate (gpm)				
	EFM	Accuracy Compared to		TTM	Clearwell Drawdown
		TTM	Clearwell Drawdown		
Test #1	1700	97.25%	94.18%	1748	1805
Test #2	1980	98.12%	93.53%	2018	2117
Test #3 (1)	2081	100.63%	97.84%	2068	2127
July 12, 2006 Field Test/Calibration	Flowrate (gpm)				
	EFM	Accuracy Compared to		TTM	Clearwell Drawdown
		TTM	Clearwell Drawdown		
Test #1	1780	100.34%	96.95%	1774	1836
Test #2	1860	99.73%	104.85%	1865	1774
Test #3	1810	100.22%	100.28%	1806	1805
November 29, 2007 Field Test/Calibration	Flowrate (gpm)				
	EFM	Accuracy Compared to		TTM	Clearwell Drawdown
		TTM	Clearwell Drawdown		
Test #1	1576	101.16%	101.29%	1558	1556
Test #2	1632	100.87%	100.87%	1618	1618
Test #3	1614	99.32%	99.75%	1625	1618
July 30, 2008 Field Test/Calibration	Flowrate (gpm)				
	EFM	Accuracy Compared to		TTM	Clearwell Drawdown
		TTM	Clearwell Drawdown		
Test #1	1660	98.22%	98.81%	1690	1680
Test #2	1775	98.61%	100.06%	1800	1774
Test #3					

(1) EFM was calibrated 3% after Test #2

As shown above the electromagnetic flow meter is within the accuracy limits of 807 KAR 5:066, Section 15(2) in 3 of the 4 test years without calibration. In only the first test year was the EFM calibrated. Thereafter, no calibration was required. This demonstrates the reliability, suitability and accuracy of the EFM when compared to mechanical type meters.

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF HARDIN COUNTY WATER)	
DISTRICT NO. 1 REQUESTING DEVIATION FROM)	
REGULATIONS RELATED TO WATER METER)	CASE NO.
ACCURACY AND TESTING REQUIREMENTS)	2003-00480

O R D E R

Hardin County Water District No. 1 ("Hardin No. 1") has submitted an application requesting permission to deviate from 807 KAR 5:066, Section 15(2), which provides that all new meters shall be tested for accuracy as specified therein. Hardin No. 1 states in its application that it wants to use an electromagnetic flow meter ("EFM") for the sale of water to Meade County Water District ("Meade District"). Hardin No. 1 currently has three EFMs measuring their sources of supply in order to comply with 807 KAR 5:066, Section 6(1).

The Commission, having reviewed the application and being otherwise sufficiently advised, finds that:

1. Hardin No. 1 is not in compliance with 807 KAR 5:066, Section 6(1), which requires the utility to install a suitable measuring device at each source of supply.
2. Hardin No. 1 has requested permission to deviate from 807 KAR 5:066, Section 15(2), so that it may use an EFM to measure the sale of water to Meade District.
3. The EFM Hardin No.1 proposes to use differs from meters addressed in 807 KAR 5:066, Section 15(2), in that flow velocity is measured by the voltage produced when fluid moves through a magnetic field.

4. 807 KAR 5:066, Section 15(2), does not describe testing procedures for determining the accuracy of an EFM. In order for Hardin No.1 to use such a meter; permission to deviate from 807 KAR 5:066, Section 15(2), is therefore required.

5. Hardin No.1 asserts that an EFM will provide equal or better accuracy than old technology mechanical meters as referenced in 807 KAR 5:066, Section 15(2), and will lower the cost to purchase, test, and operate over their 20-year life cycle.

6. Hardin No. 1's motion should be granted and it should be permitted to install and use an EFM until December 31, 2007 in order to demonstrate the suitability and accuracy of this type of installation.

7. Hardin No. 1 should monitor the status and effectiveness of the proposed EFM and be prepared to demonstrate to the Commission the suitability and accuracy of the proposed flow meter installation.

8. The proposed plan for annual testing of the meter(s) to ensure and maintain flow accuracy includes the following: performing a drawdown test from the Pirtle WTP clearwell, measuring depth (volume) and time to compute flowrate and total volume; using a portable time-transit flow meter upstream of the proposed finished water electromagnetic flow meter to compare the flows of both meters; and measuring a number of selected parameters in the flow sensor and signal converter, which affect the integrity and accuracy of the flow measurement.

IT IS THEREFORE ORDERED that:

1. Hardin No. 1 is granted permission to deviate from 807 KAR 5:066, Section 15(2).
2. Hardin No. 1 shall have until December 31, 2007 to demonstrate the suitability and accuracy of its installed EFM.
3. Hardin No. 1 shall monitor the status and effectiveness of the proposed EFM and be prepared to demonstrate to the Commission the suitability and accuracy of the proposed flow meter installation.

Nothing contained herein shall limit the authority of the Commission to review the appropriateness of the flow meter installation approved herein at anytime during the period that it is in service.

Done at Frankfort, Kentucky, this 4th day of June, 2004.

By the Commission

ATTEST:



Executive Director