METER ERROR REPORT

FINAL

Reconcile?	Y
Safety Issue?	N
Thesis Report No.	

1. EXECUTIVE SUMMARY

SITE NAME	Peters Green 2 (South Mimms)	
LDZ	NT	
START DATE (actual)	6th May 2014	
LAST GOOD DATE		
END DATE	9th June 2014	
SIZE OF ERROR (No reconciliation required if under 0.1%)	0.4920% over-registration (799456 scm)	
ESTIMATE – Y/N?	N	
ROOT CAUSE	Failed validation checks for temperature transmitters on both streams, consequently leading to a step-change in temperature.	
ANALYSIS	Recalculation of volumes using corrected temperature.	
METER TYPE	Orifice	
AUTHOR	P. Eldridge	
CHECKED BY	H. Richardson	
ACCEPTED BY UKD NETWORK	A Finch	
RECONCILIATION	Distribution	Transportation

2. BACKGROUND

Peters Green 2 (South Mimms) is a dual orifice plate meter stream site using a gas chromatograph for RD and CV determination and PTZ correction. Stream MO5 (C) normally runs with MO6 (D) only running when additional capacity is needed.

A final pass status of the CP12 test (temperature transmitter) of the T/PR/ME/2 validation on 6th May 2014 on both meter streams of the Peters Green metering system was not able to be achieved. Both transmitters were Rosemount model 244R RTD types. In the interest of minimising measurement uncertainty, the Network technicians attempted to adjust the zero and span to pass the CP12 test with the maximum possible margin, but regrettably the aged transmitters did not survive the attempt and calibration adjustment became ineffective. Both transmitters and hence the associated meter streams were left in a failed state until replacement transmitters could be installed and calibrated. A large step change in temperature was consequently observed. The temperature transmitters were replaced and re-calibrated to the requirements of the CP12 test on 9th June 2014.

3. ERROR QUANTIFICATION AND IMPACT

The validation records were checked to ensure that the previous year's CP12 and CP13 tests had passed. Both tests on both meter streams were completed on 16th May 2013 and left in a passed state. The process data prior to the 2014 validation was analysed to find the start of the meter error.

Figure 1 shows the measured temperatures of MTC and MTD when gas is flowing through the meter before and after the May 2014 validation. It can be seen that the difference between measured temperatures before the validation is very small and the difference between measured temperatures after the validation is greater than 4 °C. This suggests that the failed attempt to adjust the transmitters for maximum accuracy resulted in the temperature mis-measurement and the consequential meter.

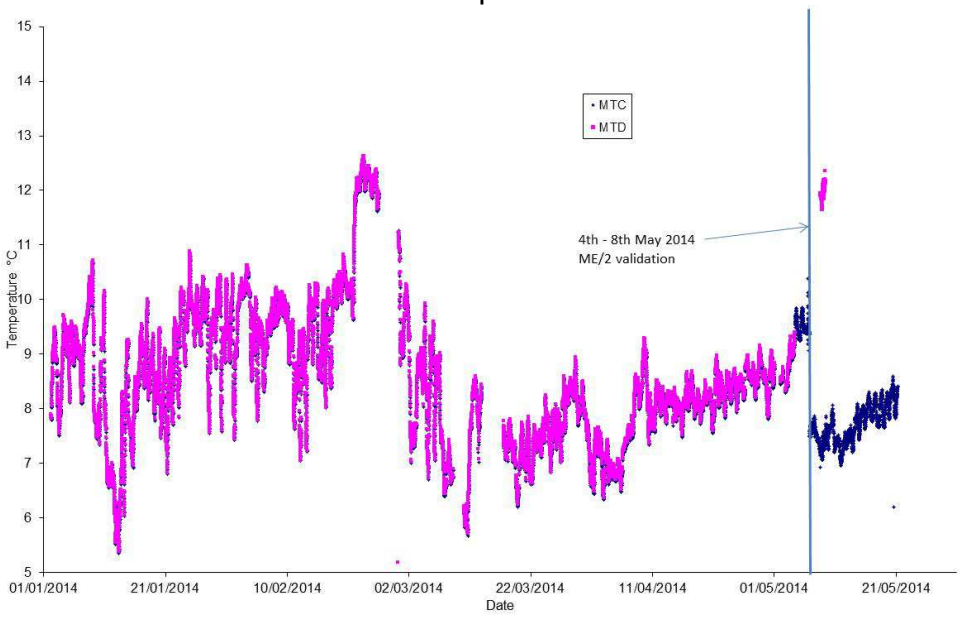

Figure 1 The measured temperature of MTC and MTD before and after the 2014 validation.

The validation test results were examined to determine if they could be used to calculate a corrected temperature. Table 2 and Table 1 contain the as-left CP12 test result with an additional calculation for the temperature error. These test results do not match the observed effect. Figure 2 and Figure 3 show that during the meter error the temperature of MTC was measured low and the temperature of MTD was measured high. The temperature of the gas when it is flowing through the meter is compared with MTB of Peters Green 1 in figure 2. The two offtakes are fed from feeder 3 and figure 2 shows that there was no step change in the measured temperature in MTB.

No as-found CP12 tests were done immediately prior to removing the faulty temperature transmitters.

The observed effects are consistent with the CP13 test results shown in Table 3. The temperatures from MTB of Peters Green 1 were applied to the process data and the flow rate and volumes were recalculated. The correction factors are shown in the appendix.

Span	Applied resistance	Expected current	Measured current	Span error	Temperature equivalent to applied resistance	Temperature equivalent to the measured current	Temperature error
%	Ω	mA	mA	%	°C	°C	°C
0	96.09	4	4.668	4.175	-9.99	-7.91	2.08
25	100.98	8	8.504	3.15	2.51	4.08	1.57
50	105.85	12	12.351	2.194	15.00	16.10	1.10
75	110.7	16	16.182	1.138	27.49	28.07	0.58
100	115.54	20	20.014	0.088	40.00	40.04	0.05
75	110.7	16	16.182	1.138	27.49	28.07	0.58
50	105.85	12	12.351	2.194	15.00	16.10	1.10
25	100.98	8	8.504	3.15	2.51	4.08	1.57
0	96.09	4	4.668	4.175	-9.99	-7.91	2.08

Table 1 MTC CP12 test results completed

Span	Applied resistance	Expected current	Measured current	Span error	Temperature equivalent to applied resistance	Temperature equivalent to the measured current	Temperature error
%	Ω	mA	mA	%	°C	°C	°C
0	96.09	4	3.905	-0.594	-9.99	-10.30	-0.31
25	100.98	8	7.959	-0.256	2.51	2.37	-0.14
50	105.85	12	12.031	0.194	15.00	15.10	0.10
75	110.7	16	16.054	0.338	27.49	27.67	0.18
100	115.54	20	20.066	0.413	40.00	40.21	0.21
75	110.7	16	16.054	0.338	27.49	27.67	0.18
50	105.85	12	12.031	0.194	15.00	15.10	0.10
25	100.98	8	7.959	-0.256	2.51	2.37	-0.14
0	96.09	4	3.905	-0.594	-9.99	-10.30	-0.31

Table 2 MTD CP12 test results completed

Meter stream	Thermometer reading	Displayed temperature	Temperature error
MTC	24.7	22.63	-2.07
MTD	31.4	34	2.6

Table 3 CP13 test results completed

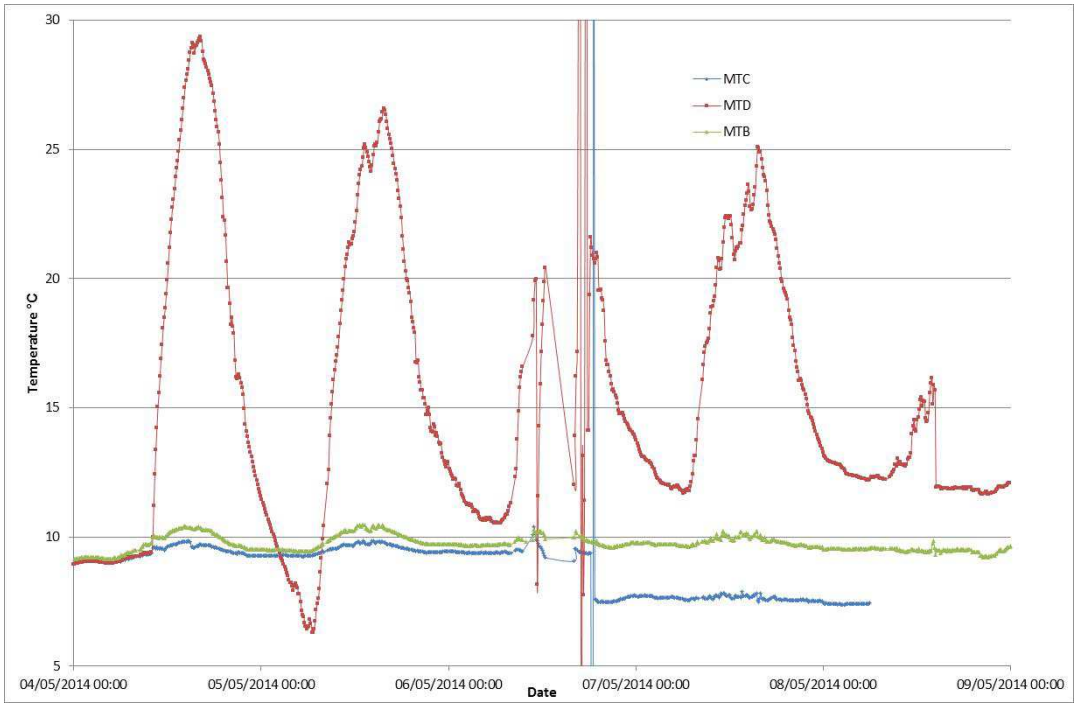

Figure 2 The measured temperature of MTB, MTC and MTD before and after 2014 validation

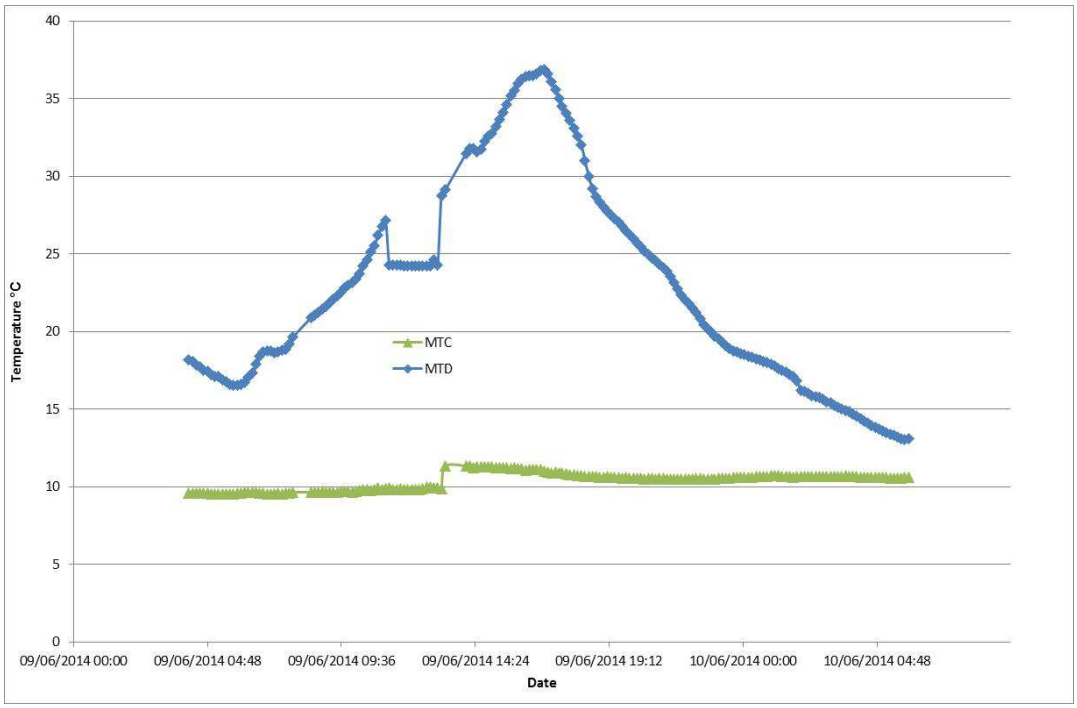

Figure 3 The measured temperature of MTC and MTD before and after the replacement temperature transmitters were installed.

A spreadsheet detailing the calculations is available on request.

4. CAUSES

It is not clear how the temperature transmitters failed, although it is assumed that they were at the end of their life and simply mechanically failed during the attempt to undertaken recalibration

5. RECOMMENDATIONS AND LEARNING

Consideration should be given to measuring each dialed up resistance with a suitable DMM calibrated from an UKAS approved calibration facility and calculating the expected current from the measured applied resistance.

Consideration should be given to removing the temperature transmitters and wiring a class A or better 4 wire temperature sensor to analogue inputs of the flow computer.

T/PR/ME/2 part 1 states “Where the results of a test procedure do not meet the stated pass criteria, the tester should re-check the figures that have been used in the calculations, the figures that have been entered into the flow computer and the method of testing.
The test should then be re-performed. If the test subsequently fails, the instrument in question shall be recalibrated and the test re-performed. Results of any retest shall be entered onto the test results form with a comment to explain what actions were taken.” There should not be any deviation from these instructions or additional recalibration following the as left test result.

Consideration should be given to conducting as-found tests immediately prior to decommissioning the faulty instruments.

REFERENCES

Network Technician

T/PR/ME/2 parts 1 to 3

Measurement and Process Group of Network Integrity

HPMIS Database

Peters Green 2 MER v3.xls

VERSION HISTORY

Version	*Changes*	*Author*	*Date*
Rev 0	*Original*	*Piers Eldridge*	*09/10/2014*

DISTRIBUTION

Asset Owner
Energy Performance
Measurement and Process Group
Asset Strategy
Measurement Assurance Group of NGGT
Joint Office of Gas Transporters

Appendix – Daily Correction Factors

Gas day	Error (scm)	Gemini data (Mscm)	Correction factor
06/05/2014	-9667.4	5.0105	0.9981
07/05/2014	-30820.9	4.9581	0.9938
08/05/2014	-11115.3	6.3320	0.9982
09/05/2014	-28792.2	5.3864	0.9947
10/05/2014	-35337.9	5.5337	0.9936
11/05/2014	-46985.9	7.4353	0.9937
12/05/2014	-39716.8	6.2932	0.9937
13/05/2014	-43275.6	6.8736	0.9937
14/05/2014	-35744.6	5.4274	0.9934
15/05/2014	-28065.1	4.2862	0.9935
16/05/2014	-22256.6	3.3843	0.9934
17/05/2014	-24866.8	3.486	0.9929
18/05/2014	-23271.8	3.2586	0.9929
19/05/2014	-24776.9	3.42	0.9928
20/05/2014	-26888.3	3.8219	0.9930
21/05/2014	-29783.3	4.3416	0.9931
22/05/2014	-21199.3	4.4039	0.9952
23/05/2014	-21131.1	4.842	0.9956
24/05/2014	-21662.1	5.0056	0.9957
25/05/2014	-19673.6	4.2233	0.9953
26/05/2014	-23394.0	5.6429	0.9959
27/05/2014	-10263.5	6.786	0.9985
28/05/2014	-23130.4	5.9626	0.9961
29/05/2014	-18294.8	4.2702	0.9957
30/05/2014	-22196.0	5.3328	0.9958
31/05/2014	-19520.2	4.543	0.9957
01/06/2014	-16342.1	3.5605	0.9954
02/06/2014	-19291.1	4.1566	0.9954
03/06/2014	-19095.6	4.3589	0.9956
04/06/2014	-17156.2	4.2132	0.9959
05/06/2014	-20866.0	4.6393	0.9955
06/06/2014	-13196.0	2.9147	0.9955
07/06/2014	-14009.8	3.1765	0.9956
08/06/2014	-13178.7	2.7919	0.9953
09/06/2014	-4490.0	3.2796	0.9986