

METER ERROR REPORT**DRAFT**

Reconcile?	Y
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Safety Issue?	Y/N
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Thesis Report No.	
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1. EXECUTIVE SUMMARY

SITE NAME	Ross	
LDZ	SW	
START DATE (actual)	09:35 on 20 th March 2009	
LAST GOOD DATE		
END DATE	12:49 on 7 th September 2009	
SIZE OF ERROR (No reconciliation required if under 0.1%)	16.192 % under-registration	
ESTIMATE – Y/N?	N	
ROOT CAUSE	Failed turbine meter calibration	
ANALYSIS	Recalculation of volumes using corrected flow rates	
METER TYPE	Turbine	
AUTHOR	B. Kirkman	
CHECKED BY	S. Kimpton	
ACCEPTED BY WWU NETWORK		
RECONCILIATION	Distribution	Transportation

2. BACKGROUND

Ross has two turbine meter streams using a gas chromatograph for CV determination and PTZ correction. Stream A normally operates as the duty stream with Stream B as a standby.

On 16th August 2010 the Stream B turbine meter failed a calibration with large errors particularly at lower flow rates. The meter was repaired and recalibrated before being reinstalled as the standby meter.

As the meter was normally standby, the error is limited to the period when Stream A turbine meter was removed at 09:35 on 20th March 2009 to be sent for calibration. Stream B turbine meter was duty from this point until 12:49 on 7th September 2009, when stream A was re-installed and used as duty.

3. ERROR QUANTIFICATION AND IMPACT

The turbine meter 'As Found' errors are shown in Table 1. The flow rates were calculated at 8 minute intervals using the measured data. This was then corrected for the calibration errors to give a corrected flow rate. The volume of gas was calculated on a daily basis from both the measured and corrected flow rates resulting in a daily correction factor to be applied to the billed total.

Frequency (Hz)	Reference Flow Rate (acm/h)	Indicated Flow Rate (acm/h)	Error (%)
373.89	1,008.88	1,009.30	0.04
261.39	712.86	705.61	-1.02
150.19	414.18	405.44	-2.11
86.49	253.33	233.47	-7.84
36.59	121.87	98.77	-18.94

Table 1 – Turbine Meter Calibration As Found errors

The total error for the period 20th March 2009 to 7th September 2009 was an under-registration of 16.192 %.

4. CAUSES

Failed turbine meter calibration due to deterioration.

5. RECOMMENDATIONS AND LEARNING

Lubricated turbine meters are allowed a longer interval between calibrations if the manufacturer's lubrication guidelines are followed. Non-lubricated turbine meters have a shorter interval between calibrations. If this meter was a lubricated type the lubrication regime should be investigated, if not

then consideration should be given to shortening the interval between calibrations.

As it is not known exactly when the deterioration of the turbine meter started, it is recommended that half of the error of 16.192 % under-registration be reconciled. The table in Appendix A shows the daily correction factors to be used and include only half the error for each day.

REFERENCES

HPMIS Database

'BA4776 - 6in Class 600 Q75 Instromet Turbine Meter sn 92552 - Ross - As Found.xls' – calibration spreadsheet

Ross005_Data.xls – calculation spreadsheet

Ross005_Summary.xls – results spreadsheet

VERSION HISTORY

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
<i>O</i>	<i>Original</i>	<i>B. Kirkman</i>	<i>23/09/10</i>

DISTRIBUTION

Wales & West Utilities Plc

APPENDIX A – Daily Correction Factors

Gas Day	Daily Correction Factor
20-Mar-09	1.064362
21-Mar-09	1.063166
22-Mar-09	1.064029
23-Mar-09	1.050869
24-Mar-09	1.051504
25-Mar-09	1.053862
26-Mar-09	1.053465
27-Mar-09	1.050694
28-Mar-09	1.066389
29-Mar-09	1.056154
30-Mar-09	1.050537
31-Mar-09	1.058271
01-Apr-09	1.058373
02-Apr-09	1.060822
03-Apr-09	1.057874
04-Apr-09	1.070585
05-Apr-09	1.068131
06-Apr-09	1.058888
07-Apr-09	1.060949
08-Apr-09	1.065206
09-Apr-09	1.059560
10-Apr-09	1.062653
11-Apr-09	1.074330
12-Apr-09	1.076188
13-Apr-09	1.076779
14-Apr-09	1.063817
15-Apr-09	1.071344
16-Apr-09	1.066610
17-Apr-09	1.059252
18-Apr-09	1.072223
19-Apr-09	1.077387
20-Apr-09	1.077333
21-Apr-09	1.081449
22-Apr-09	1.082161
23-Apr-09	1.082632
24-Apr-09	1.082576
25-Apr-09	1.085704
26-Apr-09	1.082906
27-Apr-09	1.070437
28-Apr-09	1.067984
29-Apr-09	1.074327
30-Apr-09	1.073411
01-May-09	1.078041
02-May-09	1.083794
03-May-09	1.084587
04-May-09	1.064862
05-May-09	1.077320

Gas Day	Daily Correction Factor
06-May-09	1.077557
07-May-09	1.078298
08-May-09	1.076479
09-May-09	1.080327
10-May-09	1.085819
11-May-09	1.078835
12-May-09	1.076070
13-May-09	1.067223
14-May-09	1.075013
15-May-09	1.078130
16-May-09	1.081756
17-May-09	1.073507
18-May-09	1.071885
19-May-09	1.076443
20-May-09	1.081506
21-May-09	1.082949
22-May-09	1.086381
23-May-09	1.091710
24-May-09	1.092988
25-May-09	1.092283
26-May-09	1.091565
27-May-09	1.083876
28-May-09	1.091591
29-May-09	1.093407
30-May-09	1.094490
31-May-09	1.094700
01-Jun-09	1.093725
02-Jun-09	1.093293
03-Jun-09	1.093124
04-Jun-09	1.093638
05-Jun-09	1.092166
06-Jun-09	1.088659
07-Jun-09	1.089512
08-Jun-09	1.084634
09-Jun-09	1.089337
10-Jun-09	1.089730
11-Jun-09	1.090904
12-Jun-09	1.089358
13-Jun-09	1.093629
14-Jun-09	1.094488
15-Jun-09	1.093715
16-Jun-09	1.092445
17-Jun-09	1.092295
18-Jun-09	1.091496
19-Jun-09	1.092069
20-Jun-09	1.093731
21-Jun-09	1.094077

Gas Day	Daily Correction Factor
22-Jun-09	1.092845
23-Jun-09	1.093398
24-Jun-09	1.092961
25-Jun-09	1.093352
26-Jun-09	1.093275
27-Jun-09	1.094208
28-Jun-09	1.094670
29-Jun-09	1.094277
30-Jun-09	1.094202
01-Jul-09	1.094023
02-Jul-09	1.093899
03-Jul-09	1.093815
04-Jul-09	1.094632
05-Jul-09	1.094697
06-Jul-09	1.093932
07-Jul-09	1.093538
08-Jul-09	1.093878
09-Jul-09	1.091734
10-Jul-09	1.092555
11-Jul-09	1.093666
12-Jul-09	1.094651
13-Jul-09	1.092053
14-Jul-09	1.093100
15-Jul-09	1.093059
16-Jul-09	1.092494
17-Jul-09	1.091285
18-Jul-09	1.093490
19-Jul-09	1.094083
20-Jul-09	1.092103
21-Jul-09	1.091635
22-Jul-09	1.091411
23-Jul-09	1.092718
24-Jul-09	1.092541
25-Jul-09	1.093723
26-Jul-09	1.093452
27-Jul-09	1.092304
28-Jul-09	1.092834
29-Jul-09	1.090591
30-Jul-09	1.092563
31-Jul-09	1.090956
01-Aug-09	1.093015
02-Aug-09	1.093887
03-Aug-09	1.091745
04-Aug-09	1.091882
05-Aug-09	1.093420
06-Aug-09	1.092174
07-Aug-09	1.092907
08-Aug-09	1.093929
09-Aug-09	1.094673
10-Aug-09	1.093392

Gas Day	Daily Correction Factor
11-Aug-09	1.092954
12-Aug-09	1.093851
13-Aug-09	1.094214
14-Aug-09	1.094365
15-Aug-09	1.094511
16-Aug-09	1.094606
17-Aug-09	1.093789
18-Aug-09	1.093175
19-Aug-09	1.094170
20-Aug-09	1.093941
21-Aug-09	1.093794
22-Aug-09	1.094540
23-Aug-09	1.094683
24-Aug-09	1.093725
25-Aug-09	1.093196
26-Aug-09	1.092026
27-Aug-09	1.089860
28-Aug-09	1.081013
29-Aug-09	1.092703
30-Aug-09	1.091549
31-Aug-09	1.093811
01-Sep-09	1.091177
02-Sep-09	1.088754
03-Sep-09	1.089238
04-Sep-09	1.090846
05-Sep-09	1.090180
06-Sep-09	1.093017
07-Sep-09	1.027708