

NULL METER ERROR REPORT**FINAL**

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

SITE NAME	Whitwell
LDZ	EA
START DATE (actual)	8 th July 2014
LAST GOOD DATE	8 th July 2014
END DATE	25 th June 2015
SIZE OF ERROR (No reconciliation required if under 0.1%)	148628 scm (over read) (0.015%)
ESTIMATE – Y/N?	N
ROOT CAUSE	Unknown.
ANALYSIS	HPMIS RBD data
METER TYPE	Orifice plate
AUTHOR	Piers Eldridge
CHECKED BY	Sarah Kimpton
ACCEPTED BY NGGD NETWORK	Andrew Finch

2. BACKGROUND

Gas is supplied to part of the East Anglia Network at Whitwell FWACV offtake. Whitwell is a dual stream orifice plate meter site using a gas chromatograph for RD and CV determination and PTZ correction.

During a routine meter validation MTB low differential pressure transmitter s/n 94104115440200230 failed its calibration check during procedure CP11. Figure 1 shows a screen shot of the test results in HPMIS. The transmitter's zero and span was adjusted with the communicator and the transmitter subsequently passed the CP11 test.

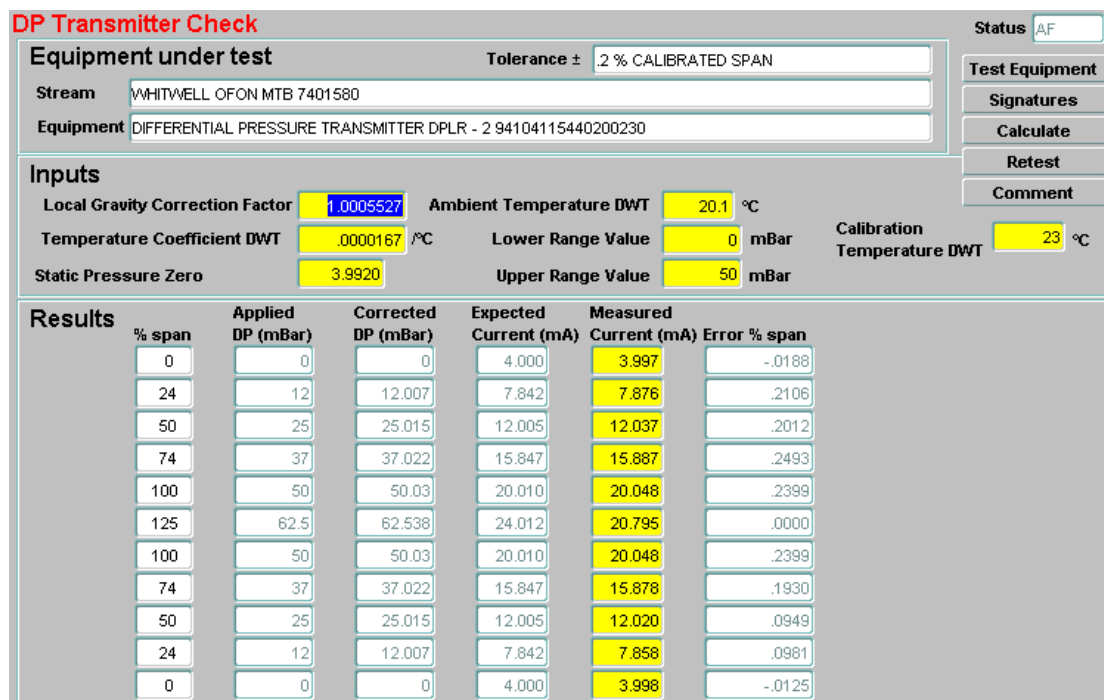


Figure 1 A screen shot and the failed test from HPMIS.

3. ERROR QUANTIFICATION AND IMPACT

RBD data and audit data from Whitwell from the 16th June 2013 to 16th June 2015 has been analysed. The difference between the low-range differential pressure measurement (LRDP) and the high-range differential pressure measurement (HRDP) has been plotted in figure 2. The high-range differential pressure has been plotted on the secondary axis to show when gas has flowed through the meter. The difference between the LRDP and HRDP has been averaged for each gas day and plotted in figure 3.

It can be seen from the graphs that a shift occurred when the previous meter validation took place and no significant shift occurred between validations.

Figure 4 shows a screenshot of the previous CP11 validation for the low pressure differential pressure transmitter. Figure 5 shows a screenshot of the validation summary for MTB at Whitwell. The validation results for CP11a, CP11b, CP4a and CP4b tests were AF/AL. Therefore no shift in the difference between LRDP and HRDP would be expected.

The standby differential-pressure measurement was not available in the data file.

There is no evidence to explain the shift in the difference between LRDP and HRDP but 9th July 2014 has been used as the start of the reconciliation period.

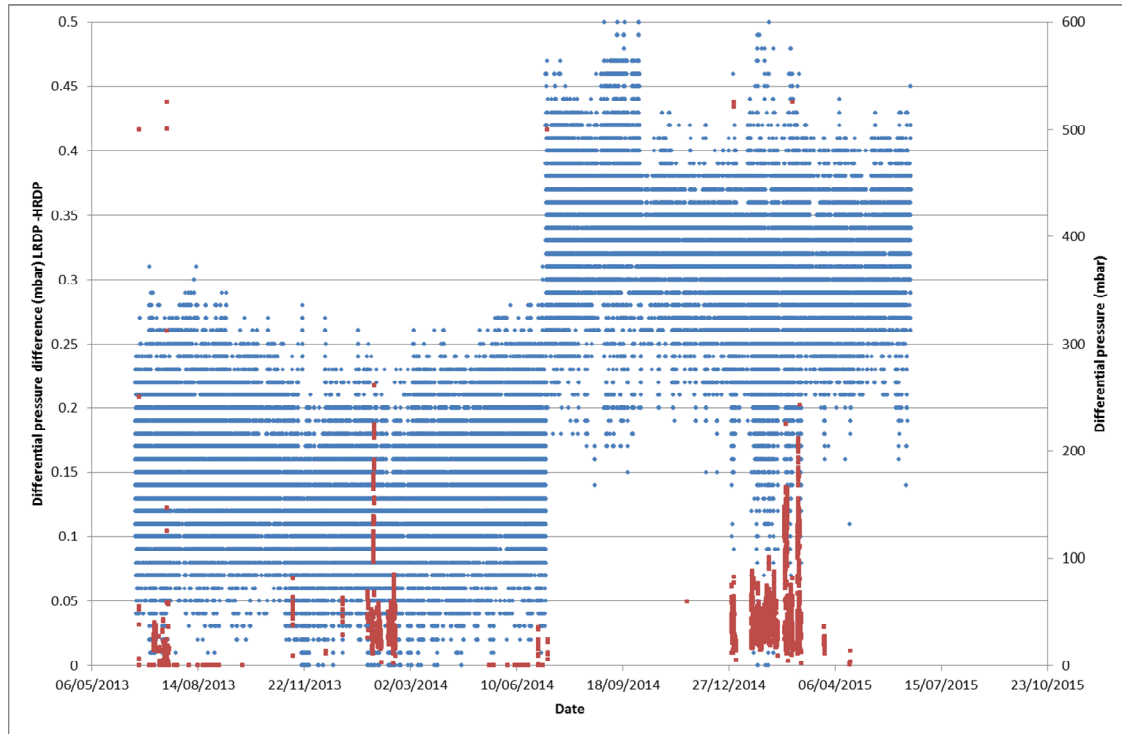


Figure 2 Plot to show the difference between LRDP and HRDP.

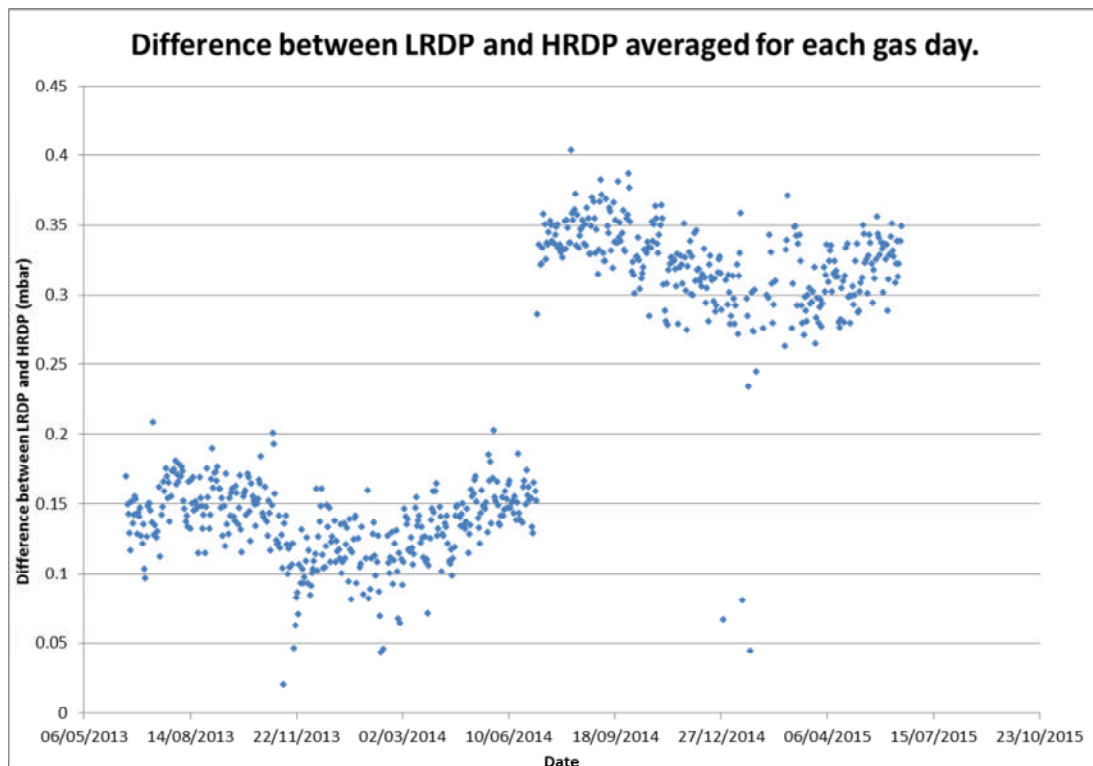


Figure 3 Plot to show the difference between LRDP and HRDP average for each gas day.

For each Danalyzer cycle where gas has flowed through the meter the flow rate has been re-calculated using a linear correction for the low-range differential pressure. The difference in the corrected and uncorrected flowrates for MO2 added to the station flowrate and a correction factor for each Danalyzer cycle has been calculated and applied to the difference between subsequent volumetric integrator readings. The daily correction factors are shown in table 1.

4. CAUSES

The cause of the meter error is unknown.

5. RECOMMENDATIONS AND LEARNING

HPMIS (RBD data and validation test results) should continue to be monitored to identify any such future errors.

Investigate the reason for the omission of the standby differential pressure measurement data.

REFERENCES

ISO 5167
HPMIS database
MER.xlsm

VERSION HISTORY

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
<i>Rev 1</i>	<i>Final</i>	<i>Piers Eldridge</i>	<i>24/08/2015</i>
<i>Rev 2</i>	<i>The flowrate error for MO2 has been applied to the station flowrate.</i>	<i>Piers Eldridge</i>	<i>26/01/2016</i>
<i>Rev 3</i>	<i>Some text was removed</i>	<i>Piers Eldridge</i>	
<i>Rev 4</i>	<i>The working was corrected to calculate the error when the LRDP was in use only.</i>	<i>Piers Eldridge</i>	<i>15/12/2016</i>

DISTRIBUTION

Asset Owner
Energy Performance
Network Lead Group
Asset Strategy

APPENDIX

Date	Error (scm)	Gemini Volume (MSCM)	Correction factor
09/07/2014	361.0758	2.930	0.999877
29/12/2014	3914.953	7.341	0.999467
30/12/2014	2958.584	7.057	0.999581
31/12/2014	4000.33	6.752	0.999408
01/01/2015	4590.617	5.650	0.999188
02/01/2015	3092.679	4.971	0.999378
16/01/2015	1487.058	6.590	0.999774
17/01/2015	2339.477	7.698	0.999696
18/01/2015	4421.48	6.811	0.999351
19/01/2015	3767.73	7.880	0.999522
20/01/2015	5174.263	6.914	0.999252
21/01/2015	4451.335	7.917	0.999438
22/01/2015	3054.322	8.161	0.999626
23/01/2015	4050.764	8.074	0.999498
24/01/2015	4285.825	7.326	0.999415
25/01/2015	4919.938	6.412	0.999233
26/01/2015	4680.416	6.282	0.999255
27/01/2015	5232.539	7.174	0.999271
28/01/2015	5058.047	6.836	0.99926
29/01/2015	2480.114	7.873	0.999685
30/01/2015	3244.327	7.853	0.999587
31/01/2015	906.6658	9.034	0.9999
01/02/2015	2261.643	7.925	0.999715
02/02/2015	3486.38	8.168	0.999573
03/02/2015	3190.361	7.587	0.999579
04/02/2015	4045.482	7.495	0.99946
05/02/2015	4909.666	7.733	0.999365
06/02/2015	2046.858	8.187	0.99975
07/02/2015	3338.795	7.290	0.999542
08/02/2015	4969.597	6.418	0.999226
09/02/2015	4357.038	6.774	0.999357
10/02/2015	4953.787	6.982	0.99929
11/02/2015	144.4803	6.644	0.999978
17/02/2015	1505.395	6.147	0.999755
18/02/2015	3232.706	6.428	0.999497
19/02/2015	1181.293	6.254	0.999811
20/02/2015	3154.312	6.039	0.999478
21/02/2015	3811.338	6.832	0.999442
22/02/2015	1215.883	7.171	0.99983
23/02/2015	1414.922	6.664	0.999788

Date	Error (scm)	Gemini Volume (MSCM)	Correction factor
24/02/2015	3247.947	6.669	0.999513
25/02/2015	124.2929	4.914	0.999975
01/03/2015	2745.784	4.802	0.999428
02/03/2015	182.1664	6.560	0.999972
03/03/2015	3305.951	6.476	0.99949
04/03/2015	3771.535	6.551	0.999424
26/03/2015	3011.217	5.529	0.999455
27/03/2015	472.6765	4.136	0.999886
19/04/2015	52.35305	0.114	0.999541
20/04/2015	21.75305	2.173	0.99999

Table 1. Summary of the measurement error and the daily correction factors

DP Transmitter Check

Status: AF/AL

Equipment under test: Tolerance ± 0.2 % CALIBRATED SPAN

Stream: WHITWELL OFON MTB 7401580

Equipment: DIFFERENTIAL PRESSURE TRANSMITTER DPLR - 2 94104115440200230

Test Equipment

Signatures

Calculate

Retest

Comment

Inputs

Local Gravity Correction Factor: 1.0005527

Ambient Temperature DWT: 23.1 °C

Temperature Coefficient DWT: .0000167 /°C

Lower Range Value: 0 mBar

Upper Range Value: 50 mBar

Static Pressure Zero: 3.9980

Calibration Temperature DWT: 23 °C

Results

% span	Applied DP (mBar)	Corrected DP (mBar)	Expected Current (mA)	Measured Current (mA)	Error % span
0	0	0	4.000	3.997	-.0188
24	12	12.007	7.842	7.852	.0618
50	25	25.014	12.004	12.015	.0662
74	37	37.02	15.847	15.867	.1280
100	50	50.028	20.009	20.013	.0261
125	62.5	62.534	24.011	20.793	.0000
100	50	50.028	20.009	20.025	.1011
74	37	37.02	15.847	15.864	.1092
50	25	25.014	12.004	12.019	.0912
24	12	12.007	7.842	7.853	.0680
0	0	0	4.000	3.992	-.0500

Signatures

Date: 08-JUL-2014

Tested by: GAVIN, KERR

and: PETER, GOUDIE

Approved By: []

Has equipment been reinstated? Yes

Figure 4 A screenshot of CP11a completed in 8th July 2014

Site validation

Site ...

Stream ...

CP1A	DENSITY COMPUTATION CHECK (AGA8) (DETAILED METHOD)	AF/AL	15-JUN-2015		AF/AL	07-JUL-2014
CP2A	FLOW RATE CHECK (ORIFICE METER)	AF/AL	15-JUN-2015		AF/AL	07-JUL-2014
CP4A	ADC CHECK (4-20MA) INPUT PRESSURE	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP4B	ADC CHECK (4-20MA) INPUT LOW DIFFERENTIAL PRESSURE	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP4C	ADC CHECK (4-20MA) INPUT HIGH DIFFERENTIAL PRESSURE	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP4D	ADC CHECK (4-20MA) INPUT STANDBY DIFFERENTIAL PRESSURE	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP4E	ADC CHECK (4-20MA) (INPUT) TEMPERATURE	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP7	DIFFERENTIAL PRESSURE CELL SWITCH POINT CHECK (ORIFICE)	AF/AL	15-JUN-2015		AF/AL	07-JUL-2014
CP10	GAUGE FLOW PRESSURE TRANSMITTER CHECK	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP11A	DIFFERENTIAL PRESSURE TRANSMITTER CHECK (LOW) (ORIFICE)	AF	15-JUN-2015		AF/AL	15-JUN-2015
CP11B	DIFFERENTIAL PRESSURE TRANSMITTER CHECK (HIGH) (ORIFICE)	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP11C	DIFFERENTIAL PRESSURE TRANSMITTER CHECK (STANDBY) (ORIFICE)	AF/AL	15-JUN-2015		AF/AL	08-JUL-2014
CP12	TEMPERATURE TRANSMITTER CHECK	AF/AL	16-JUN-2015		AF/AL	09-JUL-2014
CP13	TEMPERATURE ELEMENT SPOT CHECK	AF/AL	16-JUN-2015		AF/AL	09-JUL-2014

Figure 5 A screenshot of the validation test summary