

NULL METER ERROR REPORT

FINAL

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

SITE NAME	MAPPOWDER OFFTAKE
LDZ	SOUTH
LAST GOOD DATE	N/A
START DATE	N/A
END DATE	N/A
SIZE OF ERROR	NULL
ESTIMATE – Y/N?	N
ROOT CAUSE	Reported ME2 calibration failures
ANALYSIS	ME2 report, HPMIS data, DNCC data
METER TYPE	Orifice
AUTHOR	T Roberts
CHECKED BY	S Howells

2. BACKGROUND

Gas is supplied to part of the Southern network at Mappowder Offtake which employs an orifice meter to measure the volumetric flow rate.

3. ERROR QUANTIFICATION AND IMPACT

The 2012 ME2 revalidation carried out in May recorded calibration failures for both the gauge pressure and low differential pressure transmitters. The tolerance for both transmitters is +/- 0.2% fsd.

Gauge pressure transmitter

As-found results from the 22/05/2012 are copied below as fig 1, while the as-left results from the 23/05/2012 are copied as fig 2. Results for both calibrations have been plotted in fig 3. Gauge transmitter readings from HPMS have been plotted with telemetered inlet pressure P1 readings in fig 4.

The nature of the as-found results, particularly between 75% and 100% cast some doubt as to whether the calibration was flawed in some way. The comparison between gauge pressure transmitter and P1 in fig 4 does not reflect the as-found errors. The slight difference between the two can be accounted for by the pressure drop across the filters fitted between the P1 impulse and the orifice plate. Following adjustment and recalibration on the 23/05/2012 the pattern of gauge pressure just below P1 replicates the pattern before as-found calibration on the 22/05/2012. Immediately after the short period of flow following reinstatement of the gauge transmitter on the 23/05/2012 close agreement between gauge transmitter and P1 can be observed when the filter differential falls to zero with no flow passing.

ME2 As-found results 22/05/2012

% Span	Applied Pressure (BarG)	Corrected Pressure (BarG)	Expected Current (mA)	Measured Current (mA)	Error % span
0	0.00	0.00	4.0000	4.0014	0.0085
25	20.00	20.01	8.0016	8.0365	0.2176
50	40.00	40.02	12.0033	12.0067	0.0213
75	60.00	60.02	16.0049	15.9721	-0.2053
100	80.00	80.03	20.0066	19.9017	-0.6556
125	100.00	100.04	24.0082	20.7816	n/a
100	80.00	80.03	20.0066	20.0334	0.1675
75	60.00	60.02	16.0049	15.8846	-0.7522
50	40.00	40.02	12.0033	11.9495	-0.3362
25	20.00	20.01	8.0016	7.9572	-0.2777
0	0.00	0.00	4.0000	3.9936	-0.0399

Fig 1

ME2 As-left results 23/05/2012

Mappowder MER SO013 Rev1

% Span	Applied Pressure (BarG)	Corrected Pressure (BarG)	Expected Current (mA)	Measured Current (mA)	Error % span
0	0.00	0.00	4.0000	4.0060	0.0375
25	20.00	20.01	8.0016	8.0010	-0.0041
50	40.00	40.02	12.0033	12.0017	-0.0100
75	60.00	60.02	16.0049	15.9967	-0.0515
100	80.00	80.03	20.0066	19.9996	-0.0437
125	100.00	100.04	24.0082	20.7913	n/a
100	80.00	80.03	20.0066	19.9947	-0.0743
75	60.00	60.02	16.0049	15.9984	-0.0409
50	40.00	40.02	12.0033	12.0086	0.0331
25	20.00	20.01	8.0016	8.0099	0.0516
0	0.00	0.00	4.0000	4.0018	0.0113

Fig 2

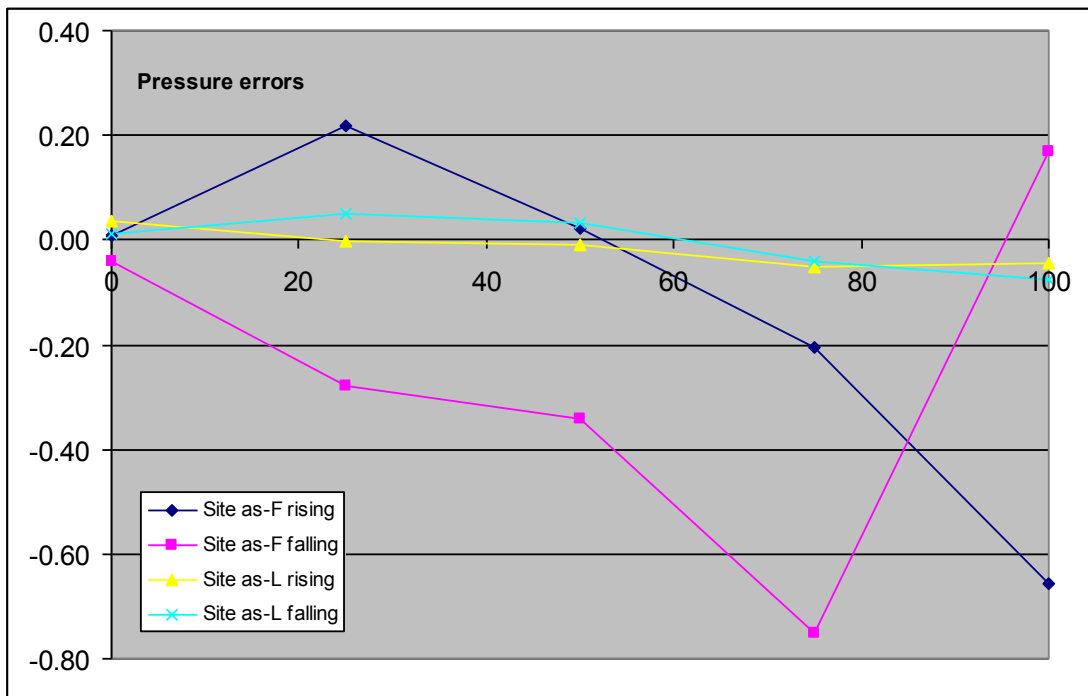


Fig 3

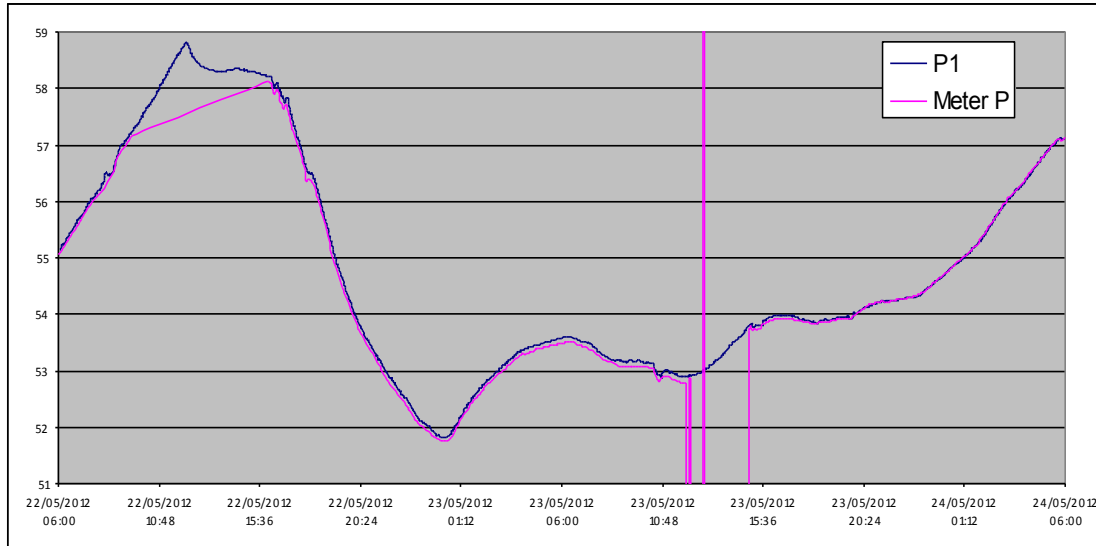


Fig 4

Low dp transmitter

The low differential pressure transmitter as-found calibration from 22/05/2012 has been copied below as fig 5. The as-left calibration from 23/05/2012 has been copied as fig 6. The transmitter was subsequently removed from service and replaced. Two further bench calibrations were performed, an as-found on 14/06/2012 copied as fig 7, and an as-left calibration on 09/08/2012 copied as fig 8. The average of rising/falling errors for all four calibrations have been plotted in fig 9. The high differential pressure transmitter, having passed calibration, has been used as a benchmark to plot Low dp – High dp in fig 10. Low dp reading has also been plotted to provide an indication of whether gas was passing.

Following site as-found and as-left calibrations the transmitter was assumed to be faulty and removed from service. However some doubt exists over the integrity of the site calibrations as the subsequent bench calibrations demonstrate that the transmitter was capable of being brought in to tolerance. Furthermore the comparison with the High dp transmitter in fig 10 does not indicate that the calibration errors of around 2mbar were in existence prior to the site as-found calibration on the 22/05/2012.

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As-found 22/05/2012

% Span	Applied Pressure (BarG)	Corrected Pressure (BarG)	Expected Current (mA)	Measured Current (mA)	Error % span
0	0.00	0.00	4.0000	3.9881	-0.0743
25	25.00	25.01	8.0018	8.3306	2.0549
50	50.00	50.02	12.0036	12.3153	1.9481
75	75.00	75.03	16.0054	16.2900	1.7788
100	100.00	100.04	20.0072	20.2774	1.6888
125	125.00	125.06	24.0090	20.7943	n/a
100	100.00	100.04	20.0072	20.2862	1.7438
75	75.00	75.03	16.0054	16.2816	1.7263
50	50.00	50.02	12.0036	12.2898	1.7888
25	25.00	25.01	8.0018	8.2981	1.8519
0	0.00	0.00	4.0000	3.9940	-0.0374

Fig 5

As-left 23/05/2012

% Span	Applied Pressure (BarG)	Corrected Pressure (BarG)	Expected Current (mA)	Measured Current (mA)	Error % span
0	0.00	0.00	4.0000	4.0026	0.0163
25	25.00	25.01	8.0018	8.3740	2.3263
50	50.00	50.02	12.0036	12.2413	1.4856
75	75.00	75.03	16.0054	16.1301	0.7794
100	100.00	100.04	20.0072	19.9911	-0.1006
125	125.00	125.06	24.0090	20.7991	n/a
100	100.00	100.04	20.0072	20.0041	-0.0194
75	75.00	75.03	16.0054	16.1299	0.7781
50	50.00	50.02	12.0036	12.2547	1.5694
25	25.00	25.01	8.0018	8.3705	2.3044
0	0.00	0.00	4.0000	4.0024	0.0150

Fig 6

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14/06/2012 As-found bench calibration

% Span	Applied Pressure (BarG)	Corrected Pressure (BarG)	Expected Current (mA)	Measured Current (mA)	Error % span
0	0.00	0.00	4.0000	4.0054	0.0337
25	25.00	25.01	8.0023	7.8841	-0.7389
50	50.00	50.03	12.0047	11.7586	-1.5379
75	75.00	75.04	16.0070	15.6639	-2.1443
100	100.00	100.06	20.0093	19.5685	-2.7551
125	125.00	125.07	24.0117	20.8017	n/a
100	100.00	100.06	20.0093	19.5428	-2.9158
75	75.00	75.04	16.0070	15.6637	-2.1456
50	50.00	50.03	12.0047	11.7762	-1.4279
25	25.00	25.01	8.0023	7.8938	-0.6783
0	0.00	0.00	4.0000	4.0064	0.0400

Fig 7

09/08/2012 As-left bench calibration

% Span	Applied Pressure (BarG)	Corrected Pressure (BarG)	Expected Current (mA)	Measured Current (mA)	Error % span
0	0.00	0.00	4.0000	4.0019	0.0121
25	25.00	25.01	8.0023	8.0062	0.0241
50	50.00	50.03	12.0047	12.0020	-0.0166
75	75.00	75.04	16.0070	16.0068	-0.0012
100	100.00	100.06	20.0093	20.0081	-0.0076
125	125.00	125.07	24.0117	20.8029	n/a
100	100.00	100.06	20.0093	20.0079	-0.0089
75	75.00	75.04	16.0070	16.0172	0.0638
50	50.00	50.03	12.0047	12.0075	0.0177
25	25.00	25.01	8.0023	8.0012	-0.0071
0	0.00	0.00	4.0000	4.0023	0.0141

Fig 8

Mappowder MER SO013 Rev1

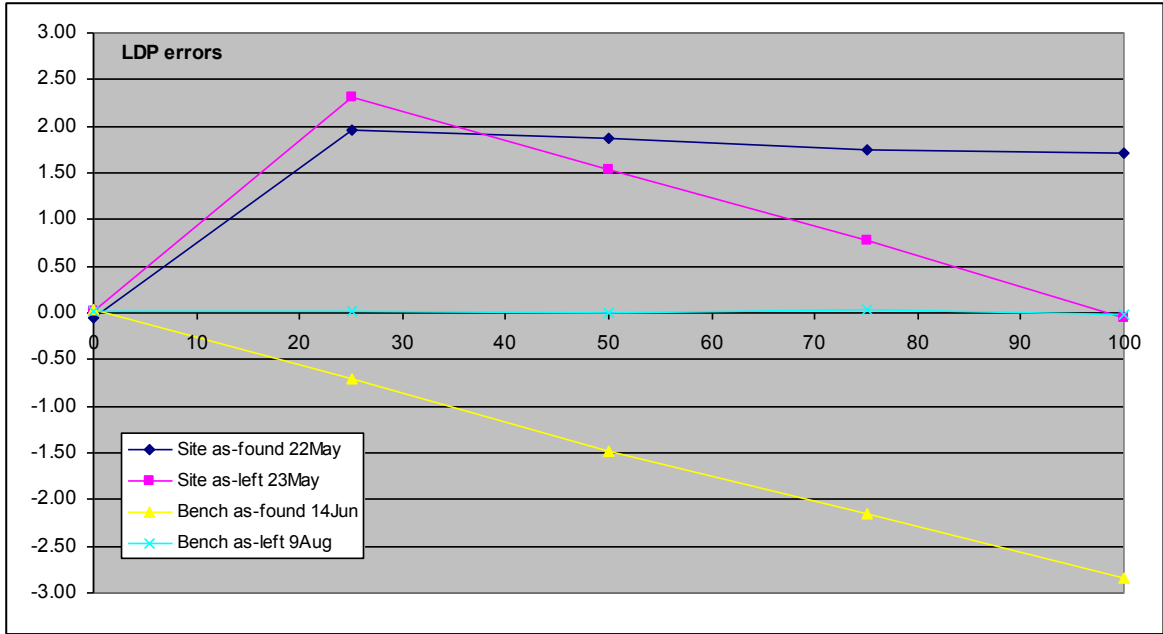


Fig 9

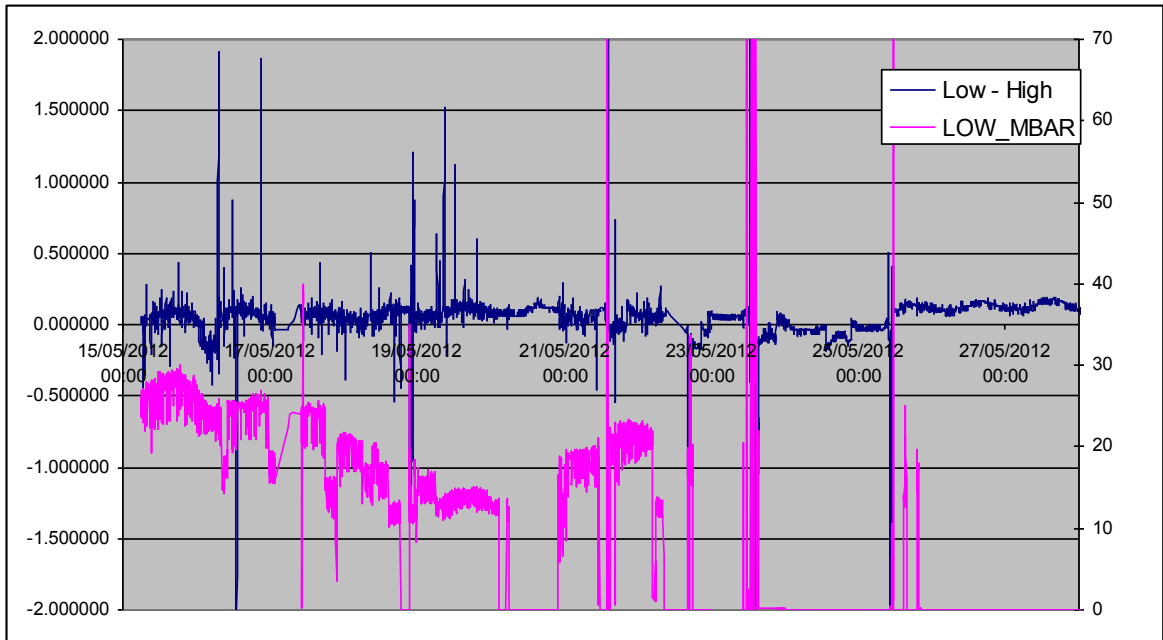


Fig 10

4. CAUSES

Unknown but suspected to be related to the calibrations themselves rather than pre-existing transmitter errors.

5. RECOMMENDATIONS AND LEARNING

It is a recommendation of this report that no reconciliation is carried out based on the as-found transmitter errors for either transmitter.

Consideration should be given to adopting a procedure where the ME2 is halted temporarily when results are recorded as in the Mappowder 2012 ME2. Testing could then be repeated with different test equipment and staff. If unusual results are still obtained the problem should be escalated at the time to management.

REFERENCES

ME2 reports

HPMIS rbd data

DNCC data for P1

VERSION HISTORY

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
<i>Rev 1</i>	<i>Final</i>	<i>T Roberts</i>	<i>15/03/13</i>

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