

METER ERROR REPORTFINAL

| | |
|-------------------|---|
| Reconcile? | Y |
| Safety Issue? | N |
| Thesis Report No. | |

1. EXECUTIVE SUMMARY

| | | |
|--|--|----------------|
| SITE NAME | Aylesbeare | |
| LDZ | SW | |
| START DATE (actual) | 11th April 2011 (23:12) | |
| LAST GOOD DATE | | |
| END DATE | 12th April 2011 (00:18) | |
| SIZE OF ERROR (No reconciliation required if under 0.1%) | 5,500.59 SCM over registration (equivalent to 1.084%) | |
| ESTIMATE – Y/N? | | |
| ROOT CAUSE | Pressure transducer locked in over range state | |
| ANALYSIS | HPMIS RBD Data | |
| METER TYPE | Orifice Plate | |
| AUTHOR | S Western | |
| CHECKED BY | C Stock | |
| ACCEPTED BY UKD NETWORK | | |
| RECONCILIATION | Distribution | Transportation |
| | | |

2. BACKGROUND

Gas is supplied to part of the South West LDZ, Wales & West Utilities Network, at Aylesbeare FWACV offtake. The site metering system comprises a single Orifice meter with an isolated bypass.

During a period of 1hr 6mins (23:12 to 00:18) on Gas Day 11th April 2011, for some undiscovered reason the pressure transducer locked. This caused the standard flow rate to be incorrectly calculated. The condition was rectified by turning the power to the instrument off and then back on again.

3. ERROR QUANTIFICATION AND IMPACT

The RBD data was reviewed before and after the pressure transducer (PT) locked up. The PT readings, 5 prior and 5 after, were averaged to estimate the actual pressure reading during the period of the PT locking up. See spreadsheet.

Using the HPMIS orifice plate design calculation (See Fig. 1a & 1b) together with the 4 minute RBD and gas composition data, the volume flow for each 3/4/5 minute period was calculated. In each instance, the volume flows for the locked up PT and the estimated PT reading were calculated. By comparing these calculated flows over the period of the PT locking up it was estimated that orifice metering system over-registered 5,500.59 scm of gas.

From HPMIS, the Dvol for Gas Day the 11th of April 2011 was 0.507296mscm so the over-registration equates to 1.084% of Dvol. See spreadsheet.

Fig. 1a - HPMIS screen shot for flow calculation using locked pressure value (23:12).

The screenshot displays the 'Orifice Plate Meter Design (ISO5167(BS EN 1042)) and Deflection Calculations' software interface. The interface is organized into several sections:

- Site Information:** Site: AYLESBEARE OFON, Stream: MTA, Site Design Capacity: 2.928 mscmd, Design Mode: Flowrate, RBD Approved Design:
- Design Conditions:** Site Operating Pressure (Max: 70.0000 BarG, Min: 38.0000 BarG), Temperature: 9.006 °C, Pressure: 53.6170 BarA, Diff. Pressure: 5.62 mBar. Buttons: Upstream Temp Correct, Calculate Gas Properties.
- Gas Properties:** Gas Density: 45.3259893 kg/m³, Isentropic Index: 1.345, Viscosity: 116.3 µPoise, Calorific Value: 39.237 MJ/scm, Relative Density: 0.59832, Air Density: 1.22541 kg/scm. Radio buttons: User Defined, Calculated.
- Dimensions:** Certified Dimensions (Pipe Diam.: 305.213 mm at 19.00 °C, Orifice Diam.: 169.064 mm at 19.00 °C, Beta Ratio: 0.5539), Corrected Dimensions (Pipe Diameter, Orifice Diameter, Beta Ratio). Checkboxes: Temp Corrected Dimensions, Drain Hole Correction. Drain Hole: No, Drain Hole Bore: mm, Plate Expn Coeff: 1.60E-05 /°C, Pipe Expn Coeff: 1.10E-05 /°C.
- Flow Rates:** Gas Design Flow Rates (Mass Flow: 11,579.24 kg, Volume Flow: 15,792.94 scm, Energy Flow: 619,664.37 MJ, Discharge Coeff.: 0.604190, Reynolds Number: 1,154,047), Meter Operating Flowrate (Max: 2.928000 mscmd, Min: 0.000000 mscmd). Time Base: hour.

Buttons at the bottom include: View History, Plate Deflection, Comment.

Fig. 1b - HPMIS screen shot for flow calculation using calculated average pressure value (23:12).

Orifice Plate Meter Design (ISO5167(BS EN 1042)) and Deflection Calculations

Site : AYLESBEARE OFON
 Stream : MTA ...

Site Design Capacity : 2.928 mscmd Design Mode : Flowrate RBD Approved Design

Design Conditions

Site Operating Pressure
 Max : 70.0000 BarG
 Min : 38.0000 BarG

Temperature : 9.006 °C
 Pressure : 87.6270 BarA
 Diff. Pressure : 5.62 mBar

Gas Properties

User Defined
 Calculated

Gas Density : 80.6902007 kg/m³
 Isentropic Index : 1.472
 Viscosity : 132.3 µPoise
 Calorific Value : 39.237 MJ/scm
 Relative Density : 0.59832
 Air Density : 1.22541 kg/scm

Dimensions

Temp Corrected Dimensions
 Drain Hole Correction

Drain Hole : No
 Drain Hole Bore : mm

Certified Dimensions

Pipe Diam. : 305.213 mm at 19.00 °C
 Orifice Diam. : 169.064 mm at 19.00 °C
 Beta Ratio : 0.5539

Corrected Dimensions

Pipe Diameter : mm
 Orifice Diameter : mm
 Beta Ratio : mm

Plate Expn Coeff : 1.60E-05 /°C Pipe Expn Coeff : 1.10E-05 /°C

Flow Rates

Time Base : hour

Gas Design Flow Rates

Mass Flow : 15,448.11 kg
 Volume Flow : 21,069.69 scm
 Energy Flow : 826,707.15 MJ

Discharge Coeff. : 0.604123
 Reynolds Number : 1,353,578

Meter Operating Flowrate

Max : 2.928000 mscmd
 Min : 0.000000 mscmd

4. RECOMMENDATIONS AND LEARNING

HPMIS (RBD data) should be monitored to identify any such future errors. Should the error re-occur an assessment of the transmitter may be required to ensure its integrity.

REFERENCES

- ISO 5167
- HPMIS database

VERSION HISTORY

| Version | Changes | Author | Date |
|---------|-------------|-----------|------------|
| Rev0 | First issue | S Western | 18/04/2011 |