METER ERROR REPORT

Reconcile?	Y
Safety Issue?	N
Incident Report No.	IMS 509699

1. EXECUTIVE SUMMARY

SITE NAME	Thornton Curtis NTS to LDZ Offtake
LDZ	EM
START DATE (actual)	3th May 2016
LAST GOOD DATE	n/a
END DATE	6th May 2016
SIZE OF ERROR (No reconciliation required if under 0.1%)	2.449 Msm^3 (over-read of 261.357%)
ESTIMATE – Y/N?	N
ROOT CAUSE	An incorrect viscosity figure was deployed in the flow computer configuration
ANALYSIS	RbD, Audit and flow computer configuration data
METER TYPE	Orifice plate
AUTHOR	Andrew Finch
CHECKED BY	Yasser Zadeh and Simon Howard
ACCEPTED BY NGGD Ltd./Cadent Gas Ltd.	Stuart Gibbons

2. BACKGROUND

Gas is supplied to part of the East Midlands Network at the Thornton Curtis NTS to LDZ FWACV offtake. Thornton Curtis is a single stream orifice plate meter site using a gas chromatograph for RD and CV determination and PTZ correction.

On 3rd May 2016, the viscosity figure in the flow computer changed from the required 0.0000119 Pa.s figure (as listed in the NGGD Ltd. 2016 Fixed Factors publication) to 1.0000000. This happened during site attendance during a monthly FWACV and LGT maintenance activity and specifically CT21 checks. The reason for the change taking place is unclear, but a capture of the flow computer configuration was undertaken on the day. This has been standard practice within some DNs as has been thought to provide alternative or complementary means by which any significant milestones can be captured for future possible use as required. We note that T/PR/ME/2 part 3, 5. Statutory Compliance During maintenance, section c may also have contributed in some way as this involves the requirement to enter a '1' in the flow computer to place it into maintenance mode for the purposes of applying a manual LGT injection rate during maintenance. The speculation is that the '1' was possibly mistakenly entered into the wrong data area on this occasion.

At the time, no untoward operation was detected. The metering system was operating in flow setpoint control and the anticipated flow rate continued to be reported. No Meter Suspect alarm was active.

On 4 May 2016, the NGGD Ltd. System Operator started to suspect a fault as wider LDZ evidence was suggesting an unexpected demand from the LDZ. The ODP reading from the standby differential pressure transmitter was also suspected. Support was then sought from EM Network Operations commencing 4th May 2016 and investigations commenced in conjunction with the System Operator. On 5th May 2016 (pm), an increase in the rate of reported PREs became evident. On 6th May 2016 (am), assistance from the Measurement and Process Group of Network Integrity was requested.

A comparatively low differential pressure for any given flow rate during similar operating conditions (flow pressure, flow temperature, gas composition etc) was then confirmed. This was shown on all 3 differential pressure transmitters.

Careful inspection of the flow computer configuration revealed that a change in the viscosity figure has taken place on 3rd May 2016.

Subsequent detailed inspection of the RbD file for 3rd May 2016 revealed a significant event at approx. 12:12 hours and further analysis showed that this was the point at which the erroneous viscosity figure became active.

Once the cause was unambiguously identified, it was immediately corrected on 6th May 2016 at approx. 09:40 hours. Subsequent analysis of the resulting RbD data confirmed that the issue had been corrected as intended. Normal operation was also observed by the System Operator.

3. ERROR QUANTIFICATION AND IMPACT

Gas property (from Audit data files) and raw meter data (from RbD files) applicable for dates 3rd May 2016 through and including 6th May 2016 was used in the analysis.

Within the resolution capabilities of the data (circa 4 min updates), the period of error was unambiguously identified as being from 3rd May 2016 at 12:12 hours (first bad reading) to 6th May 2016 at 09:37 (last bad reading).

Four complete Gas Days' worth of flow computation was used to reconstitute corrected flow. Apart from 3 cycles of process data (5th May 2016 20:10 through to and including 5th May 2016 20:17) where, as part of the investigation on site, the equalisation valve associated with the differential pressure transmitters in question was temporarily opened, the data was used verbatim. For the period where the equalisation valve was open, the site was operating in direct valve control maintaining a constant flowrate. Differential pressure data was observed immediately prior to and post this short period and it was determined that static replacement values in the data set, taken from the snapshot immediately prior to 5th May 2016 20:10 (i.e. the differential pressure captured at 5th May 2016 20:06) be used as a legitimate substitute.

It was possible to recreate the original reported flows using the viscosity figure of 1.0000000 Pa.s at the identified timestamps. Having established this, the calculations were then re-run using the correct viscosity figure of 0.0000119 Pa.s for the duration of the four Gas Days in question. The re-calculated values were then compared with the billing positions on a per Gas Day basis and correction factors were deduced.

It should be noted that the System Operator applied manual corrections within (D+5), but this was undertaken based on limited telemetered information available at that time. Subsequent analysis of detailed process data, once made available, revealed that whilst within (D+5) corrections were made, and in the appropriate direction, insufficient quantity was applied. The correction factors published in the appendix of this report correct the manually corrected (D+5) figures to the fully reconciled values. It was the manually corrected (D+5) figures that were processed through to billing.

In view of the quantity involved and the non-ambiguity of the cause, times and subsequent analysis, application of this extra reconciliation is strongly recommended.

4. CAUSES

A significantly incorrect viscosity parameter was deployed in the flow computer configuration.

5. RECOMMENDATIONS AND LEARNING

Determine the ongoing applicability of manual, regular (monthly in this case) flow computer configuration capture and whether or not the perceived intended benefit is outweighed by the risks.

Investigate whether or not access to change flow computer parameters can be better protected, initially investigating whether an access password was active on this particular computer.

Determine whether or not a Network Technician briefing update may be helpful, with an emphasis on careful inspection of the as found and as left status following any work.

Determine whether or not T/PR/ME/2 part 3, 5. Statutory Compliance During maintenance, section c or other relevant section may require suitable revision and re-approval as required.

Consider enhancement of the to-end reporting suite capability to better reveal configuration changes of this nature.

REFERENCES

ISO 5167:1991
Audit, RbD and flow computer configuration information
NGGD Ltd. 2016 Fixed Factors publication
NGGD Ltd. Incident Report no. IMS 509699.
T/PR/ME/2 part 3
NGGD Ltd. DNCC manual correction data
NGGD Ltd. DNCC dialogue/correspondence/logbook entries
Network Operations dialogue/correspondence/logbook entries
MERUKD19316 Data and Calculations.xlsx

STANDARD REFERENCE CONDITIONS STATEMENT

Unless stated otherwise, all volumes stated here are for the real dry gas at ISO Standard Reference conditions of 15°C and 1.01325 bar. Any stated energy values are calculated using a gross calorific value for the real dry gas at ISO reference conditions of 15°C (combustion) and 15°C and 1.01325 bar (metering).

VERSION HISTORY

Version	*Changes*	*Author*	*Date*
Rev O	*Draft for review and comment*	*Andrew Finch*	*15/07/2016*
Rev A	*Re-worked and issued for processing*	*Andrew Finch*	*05/07/2017*

DISTRIBUTION

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NGGD Ltd. System Operator, Network Strategy
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APPENDIX

Correction Factors

Gas Day	**Re-Calculated Volume** (Msm^3)	**Billed Position (post (D+5) Manual Correction)** (Msm^3)	**Applicable Correction Factor**
03/05/2016	3.883571	5.13	0.757031
04/05/2016	1.468880	2.10	0.699467
05/05/2016	1.250414	1.67	0.748751
06/05/2016	2.767994	2.92	0.947943