British Gas Comments and Questions on GL Noble Denton Draft SMER

13th September 2013

These comments and questions are associated with the draft SMER produced by Ben Kirkman of GL Noble Denton, Report Ref: 14291.

NB: Please note that the report page number is referenced below and not the .pdf actual page number, which is offset by +1 page to that of the report.

General Comments & Questions

- The position of the orifice plate has not been confirmed, it has been derived from the measurement errors. This approach has a weakness in that there may have been other errors present that we do not know about. i.e. just because there is a flow step of "approx." 30% or 50% at the time does not mean it is all attributable to the orifice plate position. These estimated "flows" are misleading as they are used as targets.

- There is no clarity provided as to why the plates were positioned at 99985 and 99950, although the ITE has made a statement as to why this occurred, there is no statement from the individuals concerned as to why they left the plates in those positions. The position of the plates remains a real concern and weakness in the report, based upon assumption rather that fact or evidence.

- The error for the insertion of the plates should be used and not the removal (this has been done) as both plates were being inserted and there is hysteresis in the winding mechanism.

- At the 99950 position there is considerable spread in the errors about 63% to 75%, depending on the flow rate, this spread of 10% or so has not been explained.

- The error must be determined by the errors at flow rates which are the closest to that on each day as there are differences in the errors wrt flows. The errors should not be averaged into a single figure to be applied to all of the days.

- The low differential pressure (DP) recorded should be used and not excluded, it does raise the question of whether the facility is being used outside of the agreed uncertainty and therefore commercial agreed operational envelope. It could be argued that no correction is applied as it has not been operated correctly. We can get into a situation where the uncertainties are so high that a random guess is as good as a calculated value.

Detailed Comments & Questions

1. Section 1, Page 7. The report states: "Subsequent interviews were held with the mechanical operatives who undertook the orifice plate changes on 21st July 2009 and 27th July 2010. The operatives were not able to confirm the counter reading on the orifice plate carrier at the end of the operations on 21st July 2009 or at the start of the operations on 27th July 2010. However, there is some confidence that the orifice plate was left at a counter reading of 99950 on 27th July 2010."

Therefore claims that Ben made during the two SMER presentations, that the orifice counter referenced position was confirmed by testimony, needs further clarification? The position of the orifice plate is critical to enabling accurate assessment of the error.

2. Section 2.5, Page 26. The report states: "This pressure range was deemed to be acceptable as it covered the vast majority of the data (>85 %) as indicated in Table 4 (and on later analysis the error was shown to be insensitive to pressure)."

On what basis, knowledge or experience was this deemed "acceptable"?

3. Section 2.6.2, Page 39. The report shows that the CFD broadly validities the practical tests, however the errors, with a range of 6.1% tests do appear scattered.

Were pre-test acceptance criteria set? What levels of error would be seen as unacceptable?

4. Section 2.6.2, Page 39 etc. The report shows a number of DP measurement uncertainties, for instance for Test 1 there is a dp of ~14mbar yet the DP measurement uncertainty is given as +/-5%, which appears high for such a nominal DP value.

How have these values been calculated? And if it is correct then it must mean that the measurement station is operating outwith it's contactrual uncertainties also?

5. Section 2.5.2, Page 27. The report states: Note: Test 5 was abandoned because the low pressure override was activated, affecting the flow rate. Therefore the results have not been included in the analysis.

From this it can only be assumed that all the other test were deemed valid?

6. Section 2.5.2, Page 28-. The report states a number of rate drift, which include a number over 10% at the higher flow rates, which are deemed acceptable.

Were pre-test acceptance criteria set? What levels of drift would be seen as unacceptable?

7. Section 2.1, Page 9. The report states: "low DP cut-off (0.9 mbar)",

Can it therefore be assumed that all differential pressures above this value are live in use and valid values, which were used as per the relevant contracts during the SMER for accountancy purposes. Can you please confirm that this is the case?

8. Section 3, Page 49. The report states:" The reduction in the standard deviation demonstrates that the two data sets are more reliable and support each other particularly well at DPs above 10 mbar."

Where does 10mbar come from?
If the low flow data set is invalid due to it's high standard deviation, on what basis are you stating this?
and/or please detail the uncertainty calculation you have used?
How can you state that it is better to use the medium and high flow data sets, which are only applicable to their associated flowrates, then real data at the low flowrate cases, especially when this data is still supported by the CFD, when considering how small the absolution errors are?
Please kindly detail and include the low flow correction assuming the data is accepted, so that the review can make their own informed decision?

9. Section 3.2, Page 49. The report states: "The on-site testing and CFD analysis show that the error is independent of process conditions and therefore a single value can be applied across the period."

*Within what **un-biased** uncertainty and with what confidence in % is this made?*

10. Section 3.2, Page 49. The report states: "The average error from the on-site testing was an under registration of 26.1 % with a standard deviation of 0.7 %. This results in a daily correction factor of 1.353066."

How can you state that it is better to use the medium and high flow data sets, which are only applicable their associated flowrates, then real data at the low flowrate cases, especially when this data is still supported by the CFD?

11. Section 2.1, Page 9. The report states: "Based on this the unknown counter reading between 21st July 2009 and 27th July 2010 was estimated to be around 99984"

And

Section 2.2.1, Page 13. The report states that all orifice plate positions are stated with tolerances of A (vertical) +/- 0.5mm and B (horizontal) +/- 2mm

And

Section 2.3, Page 16. The report states: "Following this examination an explanation for the incorrect counter readings was sought. The data plate suggests that the fully inserted position should be at a counter reading of between 9995 and 0005 however the counter has five digits and the fully inserted position is exactly 00000. From this it can be seen that the four digit 9995 counter reading was likely to have been misinterpreted as a five digit reading of 99950. There was no evidence to support a counter reading of 99984 as estimated from the initial tests and flow profile analysis. However it was thought that the 99885 which is stamped in two locations on the carrier information plate could have been misread as 99985"

And

Section 2.3, Page 17. The name plate is clearly unreadable and open to mis-interpretation.

The above are all examples of "On balance the best fit is", which is an approximation of unknown uncertainty, however you have thrown out the Low Flow test results based on high uncertainty?