GL Noble Denton

Technical Note Number: 12025
Issue: 1.0
Date: 8th December 2011

Response to Technical Measurement Issue TMIN NT008 301111 Relating to Report 11827 Horndon SMER NT008

Q1. It would also lead to incorrect pipe bore and orifice diameters being used as the temperature would be higher than actual temperature.
A. Correct this has been taken into account in the calculation of the daily volumes, although it is a secondary effect (~100 times less) compared to the change in density.

Q2. How is the start date defined or captured?
A. Figure 3.6 highlights the difference in temperatures between Horndon and the other sites and defines the start of the error. The first day on which gas was flowing through Horndon after the error was present was 15th September 2008.

Q3a. This statement does not sound very confident.
A. The root cause is a loose connection on the temperature element, but because the temperature error didn't present itself instantaneously following the replacement of the transmitter, the author can only say that this intervention is most likely to be the event that lead to the loose connection.

Q3b. What about the negative error?
A. The negative error is discussed in section 3.1. After analysis it is not considered an error.

Q4. Impact of the simplification? This needs to be justified as it depends on gas line pressure, gas temperature and ambient temperature.
A. Over the range of pressures and temperatures experienced, the mean error resulting from this approximation is 0.24 ˚C/bar. Since the mean DP over the reconciliation period was less than 50 mbar, this equates to a temperature error of less than 0.01 ˚C at a particular site due to this simplification. The same simplification has been applied to all the sites and it is the difference in temperatures that is being investigated. Therefore the impact on the temperature difference is very small. Given the extra data and time required to calculate the exact temperature drop for each site on a four-minutely basis and the negligible impact on the overall error the author considered it efficient to use this approximation.

Q5. It is not clear why the measured temperature has to be converted to upstream temperature, surely as the error is on the measured temperature so these should be compared.
A. As discussed at the Offtake Arrangements Workgroup, converting the temperatures to upstream removes the differences between the sites due to differential pressure, which makes them more comparable.

Q6. Is this based on measured temperature or temperature converted to upstream?
A. Temperature converted to upstream.

Q7. The temperature difference will also depend on the temperature of the source gas feeding them which can impact the bias.
A. Yes.

Q8. Is this percent or degrees centigrade?
A. All in degrees Celsius

Q9. Need to be careful here as there is a bias so how is this addressed?
A. This is the standard deviation of the bias which the author has used to give the reader an indication of the spread of the individual biases. The standard deviation by definition is normally distributed about the mean.

Q10. This need to be explain how a change in gas composition result in a temperature change. The changes shown later are not significant so need to define what is meant by this term. In my experience small changes in gas composition do not affect the temperature as the change in thermodynamic properties of the gas a s a result in insignificant.
A. The report does not suggest that the change in temperature is caused by a change in thermodynamic properties. The report suggests that the change in gas composition is evidence that the gas source is changing and the two different gas sources have different temperatures, hence a step change in temperature.

Q11. The methane content was between 89.5% and 90.5% which is not a significant change likewise the change in ethane range was 5 to 5.8%.
A. The change is not significant in terms of thermodynamic properties. It is significant in terms of suggesting a change of gas source.

Q12. Disagree that a small change in gas composition can have such a significant effect. Consideration should be given to the flowing gas temperature effect if the flow is reversed, e.g. what is happening behind these measurement points.
A. The flow through the offtake metering would never be reversed, it is however fed from multiple feeders. As previously stated the significance is in the change of gas source and not the thermodynamic properties.

Q13. Exactly how does gas composition affect the change in flowing temperature? within GSMR limits this is should have a negligible effect.
A. Thermodynamically the change in gas composition does not affect the temperature. The change in gas source affects the temperature.

Q14. Becoming more vague as to whether it is a bias or real.
A. Example provided for the reader in 'TMI response – British Gas.xls' to clarify why this data needs to be excluded.

Q15. These distributions are poor, e.g. a bias of +1.15 at Shorne with a deviation of +/- 0.99.
A. The levels of bias are as expected between sites with different pipe work sizes and configurations, in different locations. The author has used 'the most appropriate data and methodology to ensure to ensure that as accurate an error assessment of the "Measured Data" can be made in an economic and efficient manner reflecting the size of the error' in line with the published guidelines.

Q16. This is the distribution you would expect, centred around zero.
A. The distribution is narrower for the period July to December 2010 because that is the period used to calculate the bias values.

Q17. This has a very wide distribution so something must be amiss.
A. The points where there are temperature differences that are greater in magnitude are explained in section 3.1.

Q18. These two should also be corrected for as they are biased.
A. The reason for the apparent bias is discussed in section 3.1. These differences are not related to the loose connection and are not considered to be errors.

Q19. How confident are you on the errors.
A. The +6.73 °C error was recorded in the T/PR/ME/2 CP13 check on 7th July 2010. This corroborates the findings of the analysis which show approximately 6.5 °C error between July 2009 and July 2010. The author has used 'the most appropriate data and methodology to ensure to ensure that as accurate an error assessment of the "Measured Data" can be made in an economic and efficient manner reflecting the size of the error' in line with the published guidelines.

Q20. Disagree as the graph shows definite negative errors.
A. 'Temperature differences that were greater in magnitude' refers to both positive and negative errors.

Q21. This source gas temperature is likely to be the true cause of the temperature differences and not the gas compositions.
A. Correct, it has not been suggested otherwise.

Q22. This is not convincing showing a very small time window of 2 days to justify a correlation over many days.
A. This was provided as an example of the correlation, the author is satisfied that this correlation exists over the period discussed. Further examples are provided for the reader in 'TMI response – British Gas.ppt'.

Q23. It is not clear on this is there is the data superimposed on each other or if it is missing. Shorne and Luxborough are not visible.
A. This is because Shorne and Luxborough Lane were not flowing at that time. This is in line with the methodology.

Q24. How is this derived.
A. The default temperature error is defined in section 3.3 as the mean of the daily temperature errors in the surrounding period.

Q25. These assumptions have been changed to explain events maybe trying to derive errors where there are none and excluding others.
A. The methodology had to be changed for this initial error period because of the transient nature of the error and the lack of flowing data. An error is definitely present as the temperature is in excess of 30 °C during the nights. The author has used 'the most appropriate data and methodology to ensure to ensure that as accurate an error assessment of the "Measured Data" can be made in an economic and efficient manner reflecting the size of the error' in line with the published guidelines.

Q26. Why is only the first 24 hours used for all of this error? Surely there are other stable periods but these are not shown.
A. In the initial period of the positive error the magnitude of the error varied significantly as shown in the figure below. Following the period of flow on 15th September 2008 the error stabilised by 01:59 on 16th September 2008. The error was then stable until approximately 07:13 on 17th September 2008. Following the period of flow on 22nd September 2008 the error stabilised by 16:54 on 22nd September 2008. The error was then stable until approximately 11:47 on 24th September 2008. The 24 hour periods were chosen to remove the subjectivity of the end of the stable period.

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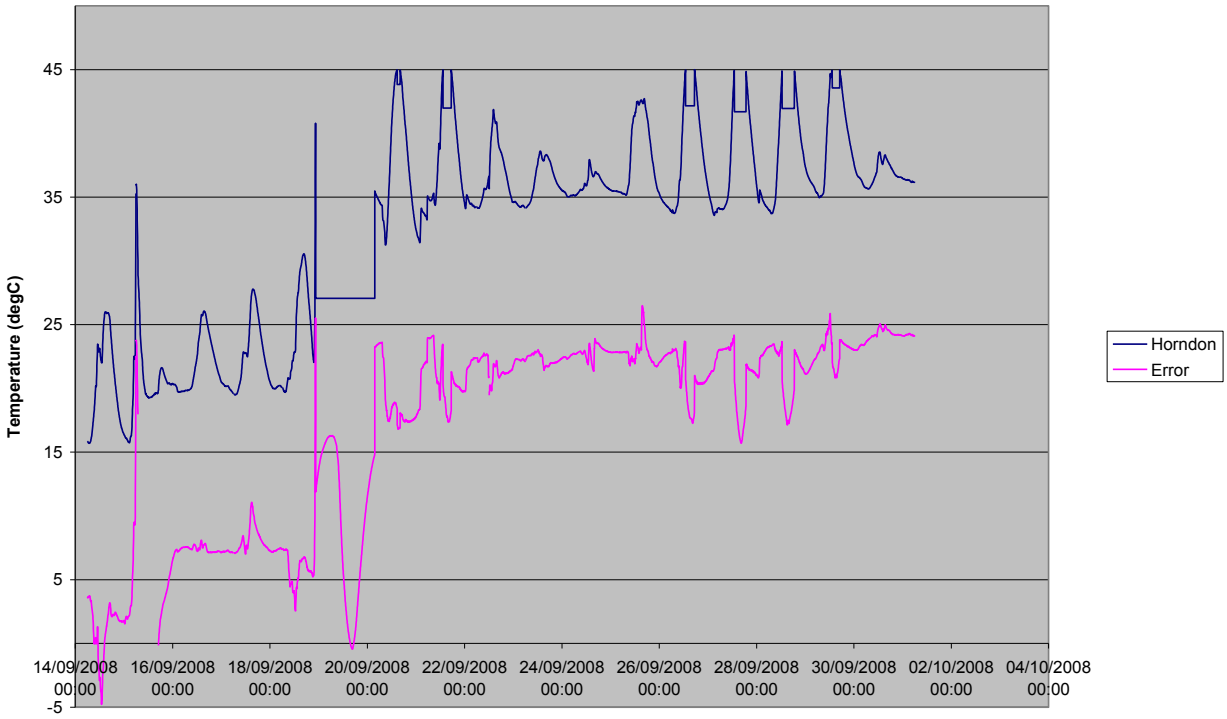
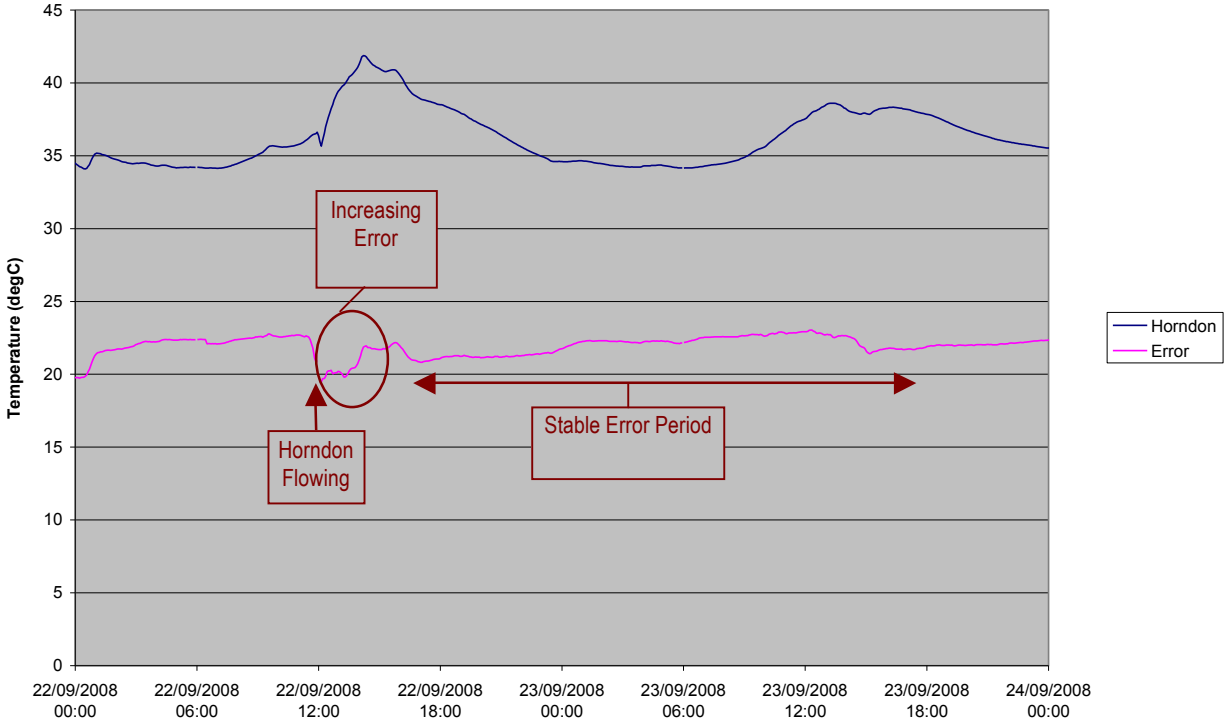


Q27. This is not shown and should be.
A. This period is shown below in detail.



Q28. This appears subjective if the supporting information is not given.
A. The supporting information is given in figure 2.5.

Q29. If data is missing then would it be prudent not to estimate the data.
A. The data is not estimated. The daily volumes are present and are corrected using the mean of the correction factors in the surrounding period. The author has used 'the most appropriate data and methodology to ensure to ensure that as accurate an error assessment of the "Measured Data" can be made in an economic and efficient manner reflecting the size of the error' in line with the published guidelines.

Q30. Why was the corrected temperature discussed earlier. *[It is not clear if the corrected temperature referred to in this case is the same as mentioned in section 2.2 (page 7) where there is reference to downstream to upstream temperature correction, later in the report it refers to temperature correction for the bias in temperature readings (page 10). There are two corrections referenced but later in it is not clear which is applied (one or both).]*
A. The corrected temperature is defined here as the measured temperature minus the mean daily temperature error.
The mean daily temperature error is calculated as the daily mean of the average temperature differences (calculated on a four-minutely basis) between Horndon and the other sites.
Where,
Temperature difference = Horndon Temperature – Other Site Temperature;
Horndon Temperature = Measured downstream temperature corrected to upstream temperature;
Other Site Temperature = Measured downstream temperature corrected to upstream temperature – Bias.

Q31. This needs more explanation e.g. why is 10% chosen, and the exception applied.
A. The 10% threshold comes from rules set out following the Farningham SMER. The exception is applied because the default daily correction factor is not appropriate to be applied due to the transient nature of the error at that time.

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Website: www.gl-nobledenton.com

Customer Reference: WRF 1-6IV925

Do Work Record – Templates

For Internal use only – do not include with Technical Note sent to customer.

Task 8. "Technical Governance" (Approval to Release)

Deliverable Number	**Approval to Release** *(Retain signed copy with document loaded into adms)*	
Details of deliverable -Technical Note		
Status *(DRAFT / FINAL)*		
Customer agreed Acceptance Criteria *(if defined)*		
Author	Name	Signature
Reviewed by	Name	Signature
Approved by	Name	Signature
Additional comments:		
Date Approved		