GL Noble Denton

Technical Note Number: 12195
Issue: 1.0
Date: 6th February 2012

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

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.
Further Question: There is some ambiguity as to when the error did start as it was not immediately after the intervention on site, it therefore raises the question of whether the temperature difference was not just due to the different feeds gases?

A. During the initial period of the error the temperature at Horndon is up to 25 °C above the other sites, which cannot be attributed to different feed gases. Where there are thought to be changes in gas source the report provides evidence such as step changes in gas composition and highlights the correlation with the network pressures. The changes in temperature during the initial period do not correlate with the pressure differential between Matching Green and Horndon nor with step changes in composition and are therefore considered to show the start of the error.

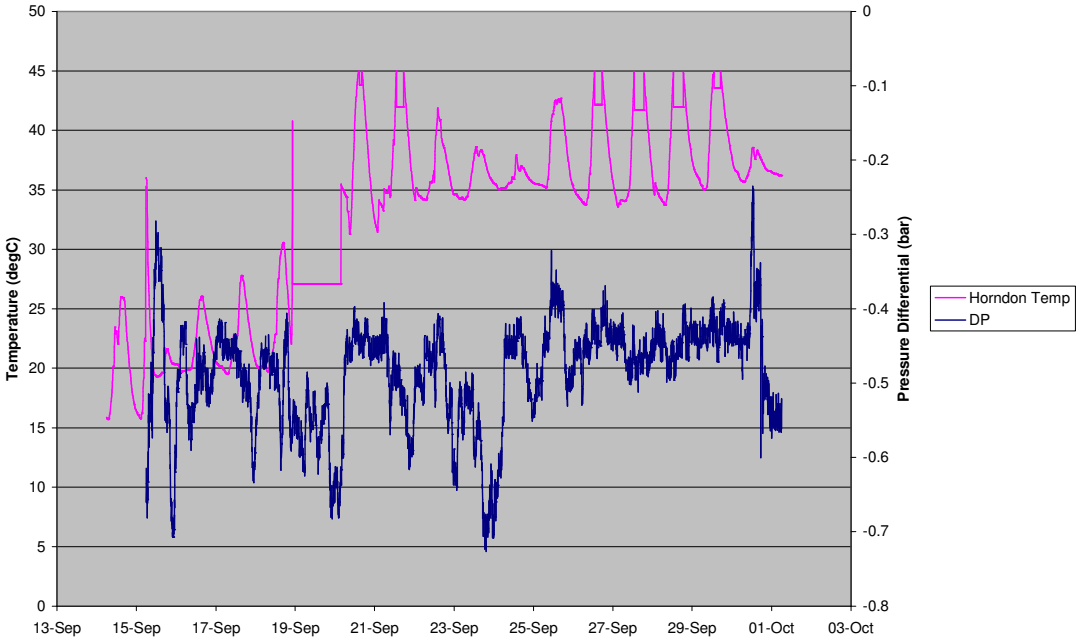

Figure 1 - No correlation between network pressure data and changes in temperature

Technical Note Number: 12195
Issue: 1.0
Date: 6th February 2012

Q3b and Q18 are related so a combined response follows

Q3b. What about the negative error?

A. The negative error is discussed in section 3.1. After analysis it is not considered an error.

Further Question: We believe that this needs to be supported by specific evidence, as stated the root cause of the error is a loose connection but the derivation has then been linked to measured temperatures on other sites and corrections to these other measurements which introduce additional uncertainties.

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.

Further Question: This bias is deemed unrelated to the source of the error (loose connection) as dismissed as a result, this approach is not valid unless it can be proved that this is not a bias. Some thoughts are given as to the source of the bias but not demonstrated to be correct/justified. If this bias can not be dismissed because of evidence then is must be considered as valid.

A. Specific evidence of the negative temperature has been provided in the previous response in the form of correlation with network pressures. If they were real intermittent negative errors, they would not correlate so closely with the network pressure data.

Q9 and Q15 are related so a combined response follows

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.

Further Question: The issue in this case is that the uncertainty around the value is so great that it can swamp the value itself which does not inspire confidence in the result. As the standard deviation is greater than the value, the true value of the different could be zero i.e. no error at all. So is there an error?

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.

Comment: This is linked to the question over the bias and uncertainty. The biases quoted are small compared to the standard deviations which indicate that there is little confidence in these biases. How can these biases be claimed to be "as expected" when dwarfed by the standard deviation. I would challenge "used the most appropriate data and methodology" when the standard deviation is so large is it really an appropriate method or would a guess be just as good?

A. The step changes in temperature at Horndon have been correlated to the network pressure data. This highlights the need for two bias correction values, a method which was shown to reduce the standard deviations. While these standard deviations indicate a level of uncertainty around the biases the distribution (see Figure 2) indicates that the mean is the most appropriate value to use.

The author would prefer to separate the 'bias' from the 'error' to avoid confusion. There is the possibility that the bias is zero, but it is more likely to be the value that has been used (i.e. mean). Even if the bias were zero this would not result in zero error.

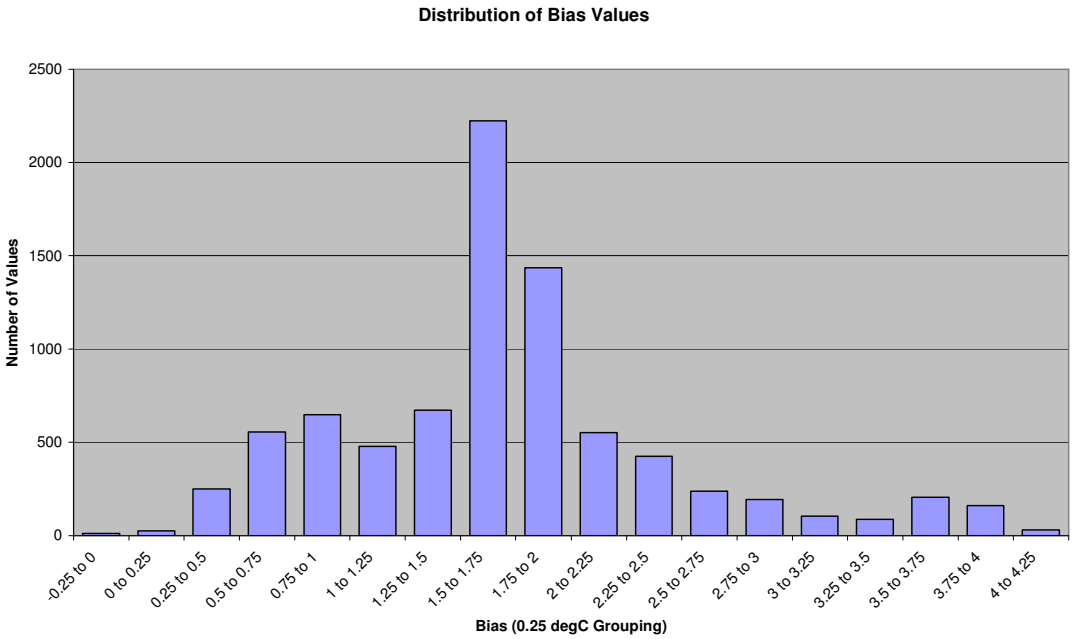

Figure 2 - Distribution of Bias values (Matching Green H)

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.
Further Question: Stated in section 2.2 second paragraph, only the later clarification has confirmed the nature of the temperature change. Therefore we believe that there is a requirement to amend 2.2 to reflect your response.

A. A note can be added to section 2.2 to clarify this for the reader.

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.
Further Question: Does not answer the question of the confidence of all the errors. Therefore we would be grateful for some further explanation.

A. The uncertainty on the temperature errors is ±1.2 °C using a confidence interval of 95 % (k=2).

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.
Further Question: Use of the standard response phrase does not answer the question. Therefore we would be grateful for some further explanation.

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. Section 3.2 explains the necessity of using a different methodology for this period:
'On 15th and 22nd September 2008 Horndon was flowing for a short period of time when none of the nearby sites were. This meant the proposed methodology did not produce a temperature difference for these days and so a default temperature error would have been used. The transient nature of the error at this point would have led to an inaccurate assignment of default temperature error therefore a detailed analysis was undertaken for both of these days to establish a more robust temperature error. As there was no flow at any of the sites at this time the measured temperatures reflected that of ambient and all the sites roughly followed each other. Comparing all sites illustrated the change in the magnitude of the error over this period.'

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.
Further Question: The response does not answer question, would it not be prudent to omit the days if no data is missing, that introduces no additional error unlike an estimate of the missing data.

A. Where data is missing the evidence (data from previous period and subsequent 'As Found' validation) suggests that the error was present and was of a similar magnitude to the surrounding period. When choosing between a) the methodology used and b) not correcting for the error on these days, the more accurate calculation of the real energy flowing through the meter comes from the methodology used.

Prepared for:	**Prepared by:**
Stuart Gibbons	Ben Kirkman
National Grid Gas Distribution	GL Industrial Services UK Ltd
Hinckley Operational Centre Brick Kiln Street Hinckley Leicestershire LE10 0NA	Holywell Park Ashby Road Loughborough Leicestershire LE11 3GR United Kingdom Tel: +44 (0) 1509 282266 Fax: +44 (0) 1509 283080 E-mail: Ben.Kirkman@gl-group.com Website: www.gl-nobledenton.com
Customer Reference:	WRF 1-6IV925