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Paper 7.4

Recent Developments in the UK Regulatory Regime

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1 INTRODUCTION

The UK Department of Trade and Industry Guidelines have been completely restructured from the 1997 Issue 5. Issue 6 of the Guidelines was released for consultation in its final draft form in October 2001, and published officially in March 2002.

For the first time the decision was taken to use industry experts to help formulate certain sections of the Guidelines. These contributions were then edited and compiled by the DTI. Approximately 60% of the Document was completed in this way – the remainder was drawn up entirely by the DTI.

Each of the Modules of the Guidelines is intended to be, as far as possible, a 'stand-alone' document. It is hoped that as a result its readership may extend beyond those with a direct interest in Fiscal Measurement. For example, reservoir engineers may find the Sections on Separator and Multiphase measurement of use, as their models may be based on measurements that use the techniques covered there.

Issue 6 of the Guidelines is significantly longer than the previous edition (116 pages as opposed to 41, not including Appendices). This is a reflection of the increased use of relatively new measurement techniques, which is itself a reflection of the fact that the days of multi-stream, single-phase measurements solutions, at least on the UKCS, are almost certainly behind us. Increasingly, as fields become more marginal, fiscal measurements have to be made under conditions where the relevant measurement techniques are not yet well understood.

The purpose of this paper is to highlight the most significant developments in the Guidelines. The document has now been in general use for 6 months, and it is fair to say that already there is some doubt over some of the views expressed in the more 'contentious' areas! This is a reflection of the very high rate of change in what is regarded as best practice in certain sectors of the measurement industry.

The relative proportions of each section, with the relative proportions of the same sections (where applicable) from Issue 5 of the Guidelines, are indicated in the Table below:

Module	***Length/ pages***	***Approx. % of Total – Issue 6***	***Approx % of Total – Issue 5)***
Introduction	8	7	7
Measurement Approaches	14	11	5
Fiscal-Quality Liquid Petroleum Measurement	24	20	32
Fiscal-Quality Gaseous Petroleum Measurement	16	13	22
Separator Measurement	6	5	2
Wet Gas Petroleum Measurement	24	20	2
Multiphase Petroleum Measurement	10	8	7
Flow Computers – Guidelines for Manufacturers	4	3	2
Measurement Stations – Supporting Documentation	6	5	2
New Systems – Design Considerations	6	5	n/a

2 MEASUREMENT APPROACHES

The measurement 'Categories' referred to in Issue 6 have been redefined as measurement 'Approaches'. To some extent this is a purely semantic distinction, but the intention is to more closely describe the practical reality. The use of the term 'category' suggests a far more rigid distinction than 'approach'.

As is stated in the Guidelines, the only the very best measurement systems (±0.25% for liquid, and ±1.0% for gas) are commonly defined as belonging to a particular category. The boundaries for everything else are somewhat blurred, so there is little to be gained by the DTI, or anyone else, 'categorising' a given measurement solution. It is certainly difficult to define 'boundaries' on the basis of uncertainties, since as fields become more and more marginal, and measurement solutions less and less 'ideal', determining the measurement uncertainties of these solutions becomes more and more problematic.

Nomenclature – Use of the Term 'Fiscal'

Finding appropriate names for the Measurement Approaches proved to be very awkward, and I am still not fully satisfied with those adopted.

In my opinion, it is crucial the DTI puts across the message that *any* measurement solution has the potential to be 'fiscal'. Almost every day I hear people refer to 'fiscal' meters, as if this implied a given level of uncertainty. However, something like a downhole venturi meter has the be potential to be a fiscal meter, is that is the last measurement point for a given field before its hydrocarbons are commingled with those from another licensed area. In certain allocation systems, measurement of flare and utility gas can potentially be fiscal.

In order to reinforce this point, it was decided to preface each of the Measurement Approaches with the term 'Fiscal'. Essentially, if a measurement system is not fiscal, then the DTI Measurement Team is not interested in it. Therefore we have the terms 'Fiscal Allocation' or 'Fiscal Multiphase'.

However, how should the very best measurement systems be defined? These systems are commonly known by a variety of names, e.g. Customer Transfer, Sales, or, as we have seen, simply 'Fiscal', erroneous though this may be. None of these terms were felt to be suitable on their own. 'Fiscal Best Quality' was considered, but this would have involved the use of the clumsy 'Fiscal Near-Best Quality'. Eventually a compromise was made with the use of the terms 'Fiscal Quality' and 'Near Fiscal Quality'.

While all this may seem academic, I believe that the terminology used to define measurement systems is in fact of great practical significance. I have seen many examples where metering systems were neglected because they were 'only' for Allocation purposes, despite the fact that some of them had 'Fiscal' significance. The use, where appropriate, of the term 'Fiscal', potentially to measurement systems of any standard, should help to prevent such occurrences by raising the profile of the systems concerned.

3 GUIDANCE ON RE-DESIGNING MEASUREMENT SYSTEMS

Many of the larger fields on the UKCS are now significantly beyond their production plateaux. Many measurement systems are now operating at flowrates considerably lower than their design maxima. This has implications for the effective measurement of the hydrocarbons won and saved from these fields.

It is relatively straightforward to 're-size' metering systems in typical gas applications based on orifice plates. However, the task is more complicated with typical oil metering systems based on turbine meters and pipe provers. In particular, with turbine meters there is a danger that Licensees may be forced to operate turbine meters at the lower end of their operating range, where the meters' characteristics are less linear. By gradually reducing the number of

metering streams used, it is possible to mitigate this effect to some extent, but eventually a more radical solution may be necessary.

In such cases the Guidelines place a strong emphasis on the need to consider the possible benefits of re-designing the systems altogether. Given that the fields concerned are becoming more marginal, there is little chance of the new systems simply replicating existing ones on a smaller scale. Instead the use of 'master-meter' technologies is becoming increasingly suitable. Until comparatively recently, such an approach has generally only been acceptable to the DTI provided that the 'master' and 'duty' meters operate on different physical principles, in order to prevent the possible occurrence of common-mode errors. However, with the availability of highly linear turbine meters, this may no longer be necessary in all cases.

The use of 'turbine' master meters is of course not the only possible solution. Where scaling problems have been experienced, it is more appropriate to use full-bore meters, which in practice means ultrasonic meters. There are other cases where the use of Coriolis meters would be preferable – this is particularly true in those cases where the probability of common-mode error is relatively high.

4 UNCERTAINTY MODELS

The Guidelines stress the need for Operators to place the uncertainties of their systems under continuous review. This applies especially to those systems where one of the fields is measured 'by-difference'. The uncertainty of the 'by difference' field depends on 2 factors:

- The measurement uncertainty of each of the other elements of the system
- The relative proportion of the 'by-difference' flowrate to the total flowrate(s) of the remaining elements in the allocation system

Clearly, although the first of these factors may remain constant, the second will not.

Ideally, the 'by difference' quantity should be as large a proportion as possible of the total system throughput. However, in practice this may not always be the case. The 'by-difference' technique is widely used when tying small satellite developments across existing infrastructure, and here, where the 'host' field is in decline, the 'by difference' quantity may in fact constitute significantly less than 50% of the total throughput, at least in the initial stages of the satellite development's field life.

There is scope to use predicted production profiles for the contributing fields as a basis for dynamic uncertainty models in order to predict the changing levels of uncertainty in 'by-difference' systems. This approach can be used by pipeline operators to allow maintenance visits to be targeted at those measurement systems where a reduction in measurement uncertainty will have the greatest effect. This has the potential to save operating costs and to thereby extend field life.

The DTI strongly encourages Operators to actively consider new calibration and maintenance strategies based on the use of uncertainty models. This applies equally to those systems with 'by difference' measurement and to those without.

5 NEW SYSTEMS – DESIGN CONSIDERATIONS

There is little doubt that taking a 'life-of-field' approach has the potential to significantly cut operating costs for many field developments. However, the current emphasis within the Industry is on a 'project-based' approach, whereby project teams are under pressure to deliver systems at the lowest possible cost and within the shortest possible timeframe. As a result there can be a tendency to cut corners, and mistakes are inevitable to a greater or lesser extent. The consequences of these are often felt only later in the field life, and they can be very expensive to rectify, particularly in offshore applications.

Were Operators to begin to take more full account of 'life-of-field' costs when designing measurement systems, many of these costs could potentially be reduced or avoided altogether.

The Guidelines contain specific examples, from the DTI's experience, where savings could have been made. There may be scope for future work in this area to highlight more fully the scale of the potential savings from a 'life-of-field approach'.

6 FUTURE WORK

There are a number of significant changes planned to the next revision of the Guidelines. In particular, by the end of 2002 there will be guidance on:

- The installation, operation and verification of Coriolis meters
- The verification strategy for gas ultrasonic meters. This is felt to be necessary in view of some of the current issues surrounding the recalibration of these meters (for example, the effect of calibration .v. operating pressure, installation effects, history of reference meters). The new policy will recommend the use of diagnostic tools in combination with direct recalibration as required.
- The reverification of 'stand-alone' measurement systems for non-PRT/Royalty paying hydrocarbons. These have typically been designed to ±1.0%. The new policy will suggest several alternative means to verify that this level is being met in practice; Operators will be required to put in place at least one of these verification methods.
- The use of 'geochemical fingerprinting' techniques for allocation purposes.
- The operation and verification of subsea and downhole meters

Each of these policies will be in 'Draft' form for a consultation period of not less than 3 months, in order to allow industry input.

The new policies should therefore be in place by the beginning of April 2003.

References

[1] Paper presented at the North Sea Flow Measurement Workshop, a workshop arranged by NFOGM & TUV-NEL

Note that this reference was not part of the original paper, but has been added subsequently to make the paper searchable in Google Scholar.