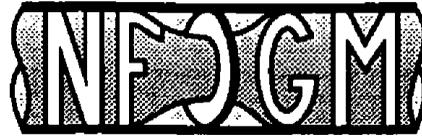




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*Standardisation of Multiphase
Flow Measurements*

by

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STANDARDISATION OF MULTIPHASE FLOW MEASUREMENTS.

By

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An introduction to the Discussion Group

"Standardisation and user requirements for multi phase flow meters"

1. MULTIPHASE FLOW MEASUREMENT TECHNOLOGY IS MATURING.

The development of multiphase metering technology for oil/gas/water flow started in the early eighties. Over these years there has been made several attempts to develop a suitable multiphase meter, and by now there are in the order of twenty active projects. Norway has been particularly active in this area. As a result of this massive effort we now begin to see the first multiphase meters for topsides installation becoming commercially available.

Together with a maturing technology, a requirement for standardisation also arise. This refers to definitions of terminology, standards for specification of instrument performance, calibration standards etc.

This short-paper, which serves as an introduction to the discussion group "Standardisation and user requirements for multi phase flow meters", will raise some of the questions which have to be answered in a work of standardisation. It will however not attempt to give any of the answers. The paper will also present the status and objectives of some ongoing work in the area of multiphase standardisation.

2. WHY DO WE NEED STANDARDISATION?

Several multiphase meters are becoming available to the oil industry, all with different performance specifications. The specifications are given by the manufacturer of the instruments, but without reference to any common standards. The different meters have all been tested on different, and in many cases proprietary, test facilities, and conventions for good practice for testing and specification of multiphase meter performance are lacking.

- On this background, how can the users make any comparative evaluation of the meters?
- And how can they decide which meter will best suit their particular application?

Metering for product allocation between companies is an other application where the lack of standards may be prohibitive for the use of multiphase meter. In this case both the involved companies, as well as governmental bodies, will have to agree measurement and calibration procedures.

- When no calibration standards exist, how can the overall measurement uncertainty be established, maintained and accepted?
- Which calibration routines should be undertaken?
- How do you prove a multiphase meter?
- How do you calculate the overall measurement uncertainty?

Resulting from the development of multiphase technology within the oil industry, a whole new world of "multiphase terminology" has been established. Unless there exist commonly agreed definitions for this terminology, confusion and misunderstandings will be unavoidable.

- Do we recognise the difference between gas fraction, gas hold-up, GOR, GLR and gas quality factor?
- What do we mean by a *multiphase meter*? Is it any meter that measures a multiphase parameter?
- And where do we find the definitions of these terms?

3. STATUS OF MULTIPHASE METER STANDARDISATION

The requirement for starting a work on standardisation within multiphase metering has been discussed at several previous venues, also at the previous North Sea Flow Measurement Workshop, and some work has been initiated both in Norway and in UK.

Norway:

A proposal for starting a work within multiphase standardisation was presented and discussed at the NFOGM (the Norwegian Society for Oil and Gas Measurement) seminar in Haugesund in March '93. Encouraged by the positive response received here, the NFOGM in May '93 initiated a working group consisting of representatives from R&D, oil companies and manufacturers of multiphase meters.

The objective for the work in this group is to develop a guide for users and manufacturers of multiphase meters. It is further the aim that the "handbook of multiphase measurement" resulting from this work should form the basis of an initiative to develop an international standard for multiphase measurement. The scope of work for this group includes multiphase terminology, requirements to multiphase meters, specifications of multiphase meters and procedures for calibration of multiphase meters.

UK:

The NEL in Scotland have recently built a completely new flow laboratory. As part of this flow laboratory a new multiphase meter calibration loop has been built, which NEL denotes as "the UK multiphase flow measurement standard". This facility will provide a possibility for independent testing of multiphase meters over a wide range of flowrates, compositions, and flow regimes. It will be possible to operate the facility on dead crude oil.

But it will of course be difficult to keep a "hard standard", i.e. a calibration loop, unless there is also a "soft standard" to reference it against. NEL therefore suggest to develop a calibration standard for multiphase meter, and propose this to be undertaken as part of a "multiphase club".

4. CONCLUSIONS.

Based on the status as described above, the following conclusions may be drawn:

There is a need for standardisation.

Standardisation will promote the use of multiphase meters, it will make it easier to choose the right meter for a given application, and it will provide a platform for agreement between the different involved parties in the case of production allocation metering based on multiphase meters.

The timing is correct.

Several different multiphase meters have passed their first pilot installations, and are becoming readily available. The market has already responded to this fact by seriously considering the use of multiphase meters in new satellite field developments. Governmental bodies will demand that the uncertainty involved with allocation based on multiphase meters is documented, and that acceptable procedures for maintaining the accuracy have been established.

Activities should be co-ordinated.

Duplication of work within standardisation of multiphase metering must be avoided. It would be preferable to all parties if only one multiphase metering standard document was developed, and that this was widely accepted among governmental bodies, oil companies and meter manufacturers. Steps to co-ordinate the ongoing work across borders must be taken at an early stage, i.e. now.

A fruitful discussion here at the North Sea Flow Measurement Workshop 1993, will be an important step towards a widely accepted international standard within multiphase metering.

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.