



# **NORTH SEA FLOW MEASUREMENT WORKSHOP**

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*OPENING ADDRESS*

by

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Ladies and gentlemen, I am really honored to address this experienced and professional audience at the 13 th venue of the North Sea Flow Measurement Workshop here at Lillehammer. I have the pleasure to know many of you for many years and this makes my opening address more challenging, at least for me, but also perhaps more open as I can touch upon central issues which I feel are of concern to all of us.

The metering specialists of all kinds such as the users of equipment, the manufacturers and the R&D community are all involved in the broad effort initiated by the oil& gas industry to reduce the development costs in the offshore activities by 50% in the years to come.

The question comes inevitably in mind: how does metering contributes to this effort? I pretend that we have a significant role to play. To demonstrate my statement I will focus on the following examples:

- the implementation of new technologies
- cooperation between the different metering actors
- development of appropriate standards and procedures
- Quality assurance

### **Implementation of new technologies**

We have for the first time at the North Sea Flow Measurement Workshop offered a separate session on **Multiphase metering** demonstrating the importance that this topic deserves. Every one is familiar with the potential cost savings which can be realised if the production fields are developed based on a multiphase transport. To make such development possible we need, among other things, a reliable and performant metering equipment. Even though the development of the technology of multiphase or more precisely two-phase flow metering started back in the 60 ties, essentially to meet

the requirements of the nuclear industry, it took some time before the oil and gas industry in the North Sea area became interested in the technology. This occurred in the beginning of the 80ties. The task to adapt the technology gained from the nuclear industry to the needs of the oil and gas industry has been arduous. If our managers at the very early beginning had anticipated how long time and how much it would cost to reach the level of knowledge and competence that we have today, they might have denied to put money in that race. My estimate is that at least 1500 million Norwegian crowns ( 150 MGBP), based on an average spending of 10 MNOK per year by, let say 10 oil companies over 15 years, have been invested into the development of the multiphase flow technology, including metering, pumping and process technology. It is a huge amount of money, but only approximately 2% of the investment made for the construction of the Eurotunnel.

To day the technology of metering multiphase flow has reached an almost mature level, which means that we have the understanding of the problems to be solved in order to manufacture reliable and performant meters. The manufacturers, the reasearch institutes and universities and the users have jointly contributed to this achievement. Intentionnally I do not nominate any of them because I could forget some, but all of them deserve a great thank for having made possible real cost savings in the development of new production fields.

The results of the ongoing test programmes on multiphase metering which will be presented on Wednesday will offer an updated status of the achievements which have been reached since the last Workshop in Peebles.

As a contribution to attain a common platform of technology understanding some of our colleagues in Norway have prepared what we have called Handbook of Multiphase Metering. I take the opportunity to acknowledge the excellent job that they have done which should help us to reach a common understanding on the terminology and the functional requirements of multiphase flowmeters.

The second domain that I would like to address is the **ultrasonic flowmeter** for gas metering. It is recognised that its features will bring substantial cost savings into the metering installations, especially offshore. Today we are at a breakthrough. After a promising start at the end of the 70ties it has taken some years before the technology reached the industrial stage. In that respect we have to acknowledge the constant effort and belief in the device demonstrated by some pioneers. It remains today to assess the performance of the ultrasonic gas flowmeter under the different operation conditions that we experience along the gas production and transportation chain, especially the meters behaviour in high temperature and noisy environment.

Although the meter has not yet reached the complete fiscal status, it is accepted as an allocation meter by the Norwegian authorities, research work initiated by GERG, the European Group for Gas Research, and the GRI-sponsored research in USA should lead to the definite recognition of ultrasonic flowmeter as fiscal meter within a couple of years.

My conclusion from these two examples is that these new technologies will effectively contribute to improve the economics of the gas production and transportation activities. The experience has however proved that the time and the money spent from day one, when the bright idea comes to your mind, to the day you can offer to the user a reliable and performant equipment is always underestimated.

### **Cooperation between the different actors**

Here we touch upon the second topic that I would like to address and which summarises to: pull and push together!

It has always been a conflict between the strategic objective of a company to protect its R&D activities and technology and the benefit which could arise by joining in pools of actors. The world is only from time to time as we would like to see it, so my above statement should be amended based on the particularities present in each special situation.

The cost of developing new tools to improve metering has become very expensive as the requirements to qualify new equipments imply testing at operating conditions, which tend to be extremely severe when we consider offshore installations. On the other side it is offshore where the largest savings with respect to investment cost can be made. In that situation making appropriate alliances reduce the cost involved with a project and make possible a higher activity level.

During the last year we have seen the creation of at least 2 such alliances.

First within Multiphase metering where a task force of 4 meter manufacturers, namely Fluenta, Framo, Kongsberg Offshore and MultiFluid International and 3 oil companies, Norsk Hydro, Saga Petroleum and Statoil have jointly initiated and conducted an extensive test programme to investigate and assess the performance of the 4 different multiphase meters. To set up such a programme it requires from all parties involved, perhaps especially the manufacturers, a mutual respect to each other and a very strong confidence in their own product.

The other alliance that I would like to emphasize is the recently created GERG-project within ultrasonic gas flow metering where 12 companies, GERG and non-GERG members, have put together their resources and experience from ultrasonic flowmeters. The aim of the project is to make this type of meters conform to the fiscal requirements set by the authorities. Similar project, sponsored by GRI has also been started in th USA.

These 2 projects will contribute to bring us a large step forward in the assessment of multiphase and ultrasonic metering.

If all problems could be solved by a judicious choice of alliances between manufacturers and users it would have been nice. One of the many challenges that we encounter in the process to create powerful alliances is the timing aspect. In general no one is prepared to share its competence and

knowledge in an alliance unless he sees a benefit in the process and is sure that he cannot solve the problem he faces with his own resources.

### **Development of adequate standards and procedures**

It would have been really nice if we could have had access to ready of the shelf solution for all type of metering installation. The reality is that we have to make investigations to look for the most appropriate equipment using our experience, digging into manufacturers brochures, visiting installations in operation and applying the recommendations provided by available standards.

Today the development of new metering technologies proceeds very rapidly and the publication of adequate standards is slipping behind. The needs of the end users are not longer met and the lack of available standards which take into account the latest findings and improvements provided through extensive R&D activities delay to a large extent the implementation in the oil and gas industry of new metering equipment, generating additional and unnecessary workload and costs.

On the other side the preparation of new standards or the revision of the existing ones is a very arduous and expensive task. In addition to the delays due to the administratives procedures involved, we see a certain reservation from the end users to involve themselves. The industry has a very cautious approach to an active participation in the standardisation work and when someone is authorised by his boss to involve himself directly in the basic work, it generally becomes a left hand side work because the topic does have the highest priority in our daily work. Look at your own situation: are you involved and to what extent? It is evident that those companies who dedicates some of their specialists to participate in the standardisation work will inevitably have their views and strategy reflected in the content of the documents being prepared by the standardisation committees.

Look at the present situation of ISO-5167-1 which was partially revised in 1991 using still the original Stolz equation. In 1995 the new findings leading to an improved discharge coefficient equation, better flow conditioning devices and better knowledge of installation effects have not yet been implemented in the standard and we are stuck to the 1991/1980 revision. How could we then benefit from the new knowledge. Should we go for API 2530 which has implemented some of these findings in their revised issue.

Take another example! The very confused situation with respect to uncertainty calculations in flow measurements. We have ISO-5168 which has not been withdrawn, simultaneously with a revised 5168 that the central ISO secretariat in Geneva refuses to publish because it does not comply with the content of a report on uncertainty measurements prepared by a joint Task Force from ISO and OIML among other organisations. This mix-up creates for the users a very confused situation resulting for us here in Norway to the creation of a working group which shall prepare a code of practice on how to calculate uncertainty in flow measurement.

Now we are preparing a European standard for gas metering stations which will probably be in the public domain from 1997. This standard which is in line with the NORSOK standards in Norway and the CRINE approach in UK will become mandatory to refer to when we request for a quotation.

In that respect we recognise the open mind that the national authorities currently demonstrate by accepting new technologies and new systems as long as the operator can document the reliability and the performances of these new systems.

### **Quality Assurance**

Quality Assurance is an ingredient which has been applied to a lot of activities. I think that it has, or if not should have, a central position within metering.

Combining quality and cost efficiency will provide you with the best solution available when designing or operating a metering station. This could be done by looking at the different phases in the life of a metering station. We can clearly identify the following phases:

- conceptual design
- choice of the primary element and secondary equipment
- inspection
- improvement

If we during all these phases ensure to have the best available tools, spending from CFD simulation programs to the footprint mark of THE reference metering station and in addition adequate inspection devices we will achieve high quality to optimal cost in our stations.

I have tried to present to you some of my thoughts on how we, the metering fellows, could contribute to make oil and gas production and transport more efficient in order achieve the economical goal that the oil industry has targetted.

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## 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.