29th International North Sea Flow Measurement Workshop
25th – 28th October 2011

Real-Life Experiences, and Lessons Learned Implementing The New European Measuring Instruments Directive

Mr Jim McCabe, SGC Metering
Mr Alister McGhee, SGC Metering

1. INTRODUCTION

Historically, the design, construction and operation of metering systems for fiscal or custody transfer purposes was carried out in accordance with national laws and regulations.
The new Measuring Instruments Directive, 2004/22/EC, (M.I.D), is part of the E.U 'New Approach' initiative intended to standardise the metrology requirements across the E.E.C [1].

In September 2009 SGC Metering received an order to manufacture an allocation metering system for the Oselvar sub-sea development project. Midway through the project the customer then indicated that the produced oil metering system would also need to comply with the M.I.D. As this was not considered in the original system design, it was therefore decided that an investigation should be carried out to determine what the requirements would be to achieve compliance and if this could actually be achieved.

This paper will concentrate specifically on how legal metrology, and in particular the M.I.D, apply to Norwegian offshore metering. The paper will present the real-life experiences and lessons learned during the Oselvar produced oil metering system M.I.D approval.

2. BACKGROUND

2.1 Legal Metrology

Legal metrology applies to the direct sales of goods and is concerned with measurements where these influence economic transactions involving consumers. Each country has its own government agencies who apply national regulations to measuring instruments used in trade, for calculations of governmental fees and taxes.

Legal metrology in Europe is controlled by Western European Legal Metrology Co-operation (W.E.L.M.E.C). Worldwide metrology is controlled by Organisation Internationale de Métrologie Légale (O.I.M.L).

The National Measurement Office (N.M.O) is the regulatory authority in the U.K.

There are two regulatory authorities in Norway who deal with legal metrology, namely:

- Justervesenet – are the government agency that has national responsibility for legal metrology in Norway. They are also authorised to prepare Norwegian regulation in the area of legal metrology.

- The Norwegian Petroleum Directorate (NPD) – set frameworks, stipulates regulations and makes decisions in areas where it has been delegated authority. They have a national responsibility for data from the Norwegian continental shelf.

3. THE MEASURING INSTRUMENTS DIRECTIVE

The complete title of the directive is:

"Directive 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments"[1].

The M.I.D, European quality legislation for measuring instruments, came into law 30 October 2006 and applies to instruments subject to legal metrology used for custody transfer metering for liquids and gases, and is applicable in all 27 EU-countries (plus Norway and Switzerland).

The M.I.D replaces the previous national regulations and is for the benefit of manufacturers and consumers across Europe. The M.I.D is intended to create a single common market for measuring instruments across all of the member states of the EU and E.E.C. The M.I.D enables a manufacturer to obtain a single approval certificate for a meter which is then valid throughout the whole of the E.U and can be used for billing purposes.

M.I.D aligns EU legislation to international standards, in particular those of O.I.M.L.

Meters/systems used for fiscal/custody transfer must typically first comply with the applicable normative documents, such as:

- OIML R117 – Dynamic measuring systems for liquids other than water
  - Part 1: Metrological and technical requirements
- OIML R137 - Gas meters
  - Part 1: Requirements

M.I.D sets out requirements which must be complied with before measuring instruments may be placed on the European market or put into use. These are set out as generic Essential Requirements (ER's) with which all instruments must comply.

The M.I.D aims at the elimination of technical barriers to trade and harmonises the requirements for the placing on the market and/or the putting into use of measuring instruments with a measuring function defined in the instrument-specific annexes MI-001 to MI-010. Measuring instruments must meet the essential requirements laid down in Annex I and in the relevant instrument-specific Annex" [1].

There are 10 categories of measuring instruments covered in the annexes however there are only two that are relevant to hydrocarbon liquid and gas fiscal metering applications, namely:

1. Gas meters and volume conversion devices (Annex MI-002)
2. Meters for liquids other than water (Annex MI-005)

3.1 M.I.D Scope

MID generally only applies to domestic, commercial and light industrial applications and is not applicable for industrial applications [2].

The distinction between "light industrial vs. industrial" however is up to national legislation and member states are free to choose from one of the following options for industrial meters:

i) No legislation
ii) M.I.D applies
iii) National legislation applies

3.1.1 Gas Metering

For gas measurement applications, the M.I.D refers to the components such as the flow meter and Electronic Volume Corrector Device (EVCD) ONLY. The responsibility for M.I.D approval resides with the manufacturer of the gas meter and, separately if applicable, with the manufacturer of the (EVCD) [2].

3.1.2 Liquid Metering

For liquid measurement applications, the M.I.D refers to the complete system. Liquid measurement systems for industrial applications are all unique and an EC examination certificate has to be gained for each one. For liquid metering the responsibility for M.I.D resides with the manufacturer of the complete system [2].

The following are the system minimum essential requirements:

- An MID approved meter
- A transfer point
- System piping design
    - M.I.D requires the liquid measurement system to have a gas eliminator fitted or some other means to ensure there is no gas breakout in the oil.
    - M.I.D requires some provision in the liquid measurement system to prevent back-flow (reverse).
- The system Maximum Permissible Error (MPE) must be less than ±0.3%

The following are some general examples of the range of M.I.D scope as applied by two E.E.C members:

 In the UK:

Only those instruments which were previously regulated are now also subject to the M.I.D.

- The M.I.D applies to gas measurement in domestic, commercial and light industrial applications.
- Gas measurement in the onshore industry is regulated by the Office of the Gas and Electricity Markets (O.F.G.E.M.)
- The M.I.D does not apply to offshore gas measurement.
- The M.I.D is required for all onshore liquid measurement systems.
- Liquid measurement in the onshore industry is regulated by the N.M.O.
- The M.I.D does not apply to offshore liquid measurement.
- All offshore measurement is regulated by the Department of Energy and Climate Change (D.E.C.C).

 In Norway:

- Gas measurement in domestic and light industry use is not regulated.
- The M.I.D does not apply to offshore gas measurement.
- Gas measurement in the offshore industry is regulated by the NPD.
- The M.I.D is required for all liquid measurement systems.
- Liquid measurement in the onshore industry is regulated by Justervesenet.
- Liquid measurement in the offshore industry is regulated by the NPD.

3.2 The M.I.D Approval Process

Once it has been determined that M.I.D approval is required, the appropriate assessment route is then chosen. The M.I.D provides manufacturers with a range of possible conformity assessment routes to gain certification, see Fig 1.

Module B (Product type examination) + Module D (Production process verification)

Module B (Product type examination) + Module F (Product verification)

Module G (Complete system examination and verification)

Module H (Verification by full quality assurance of manufacturer design and production)

The following actions are then required by each party:

The Manufacturer:

- Applies to the notified body for M.I.D approval of the meter/system
- Submits to the notified body
  - Technical documentation
  - Supporting evidence for the adequacy of the technical design solution
  - Specimen(s), representative of the production envisaged, as required

The Notified body:

- Ascertains conformity with essential requirements
- Examines technical documentation and supporting evidence to assess adequacy of the technical design
- For specimen(s): carries out tests, if necessary
- Issues EC Type Examination Certificate (module B)
- Issues EC Declaration of Conformity (module F)

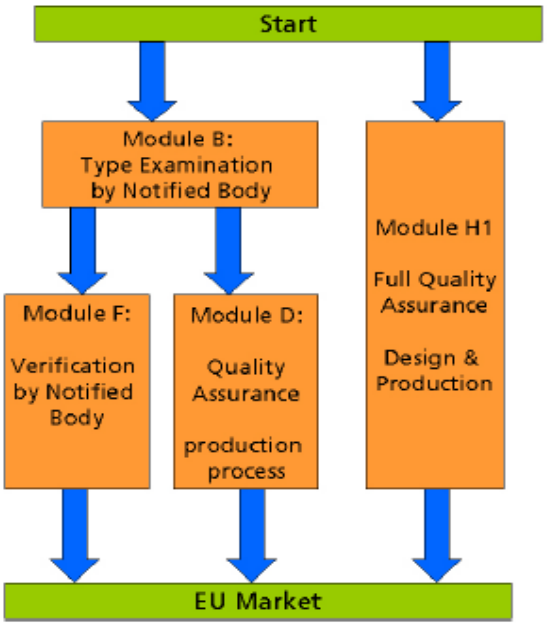

Fig 1 – The M.I.D. Approval Route (Courtesy of NMi)

After consultation with NMi it was decided that the most appropriate assessment route for the Oselvar produced oil metering system would be module B + F.

3.3 Oselvar Allocation Metering System

The Oselvar field is a subsea development and production arrives at the existing BP Ula platform. After reception the Oselvar production is processed and measured before being commingled with Ula oil production for further processing and fiscal export metering.

Ula is equipped with a three phase separator for processing the Oselvar fluids, see Fig 2. The produced gas, oil and water outlets from the Oselvar separator are equipped with fiscal quality metering to determine the Oselvar production. The Oselvar Produced Oil is metered by a new, dedicated, metering system at the exit point from the inlet separator on the Oselvar reception module. The Oselvar metering is designed to fiscal standards and will be used for ownership allocation in accordance with NPD regulations. The required uncertainty level for "Oil metering for sale and allocation purposes" as defined in NPD regulations is +/-0.3% of standard volume [4].

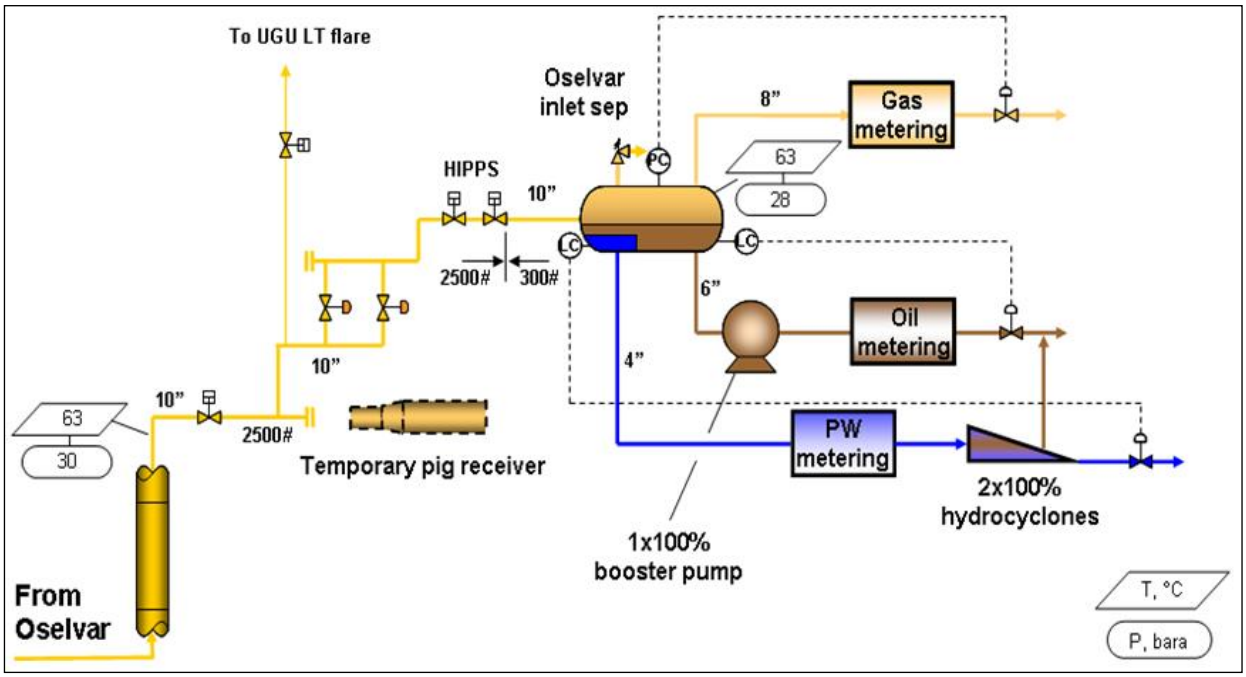

Fig 2 - Oselvar Allocation Metering System

3.3.1 Oselvar Produced Oil Metering System

The produced oil from the Oselvar separator is measured using 2 x 100% Coriolis based meter streams complete with a fast loop sampling system, see Fig 3. The system is furnished with equipment to provide daily grab sampling, monthly grab sampling, density measurements and water in oil analysis. The metering system and fast loop system are supplied on a single skid, see figure 4.

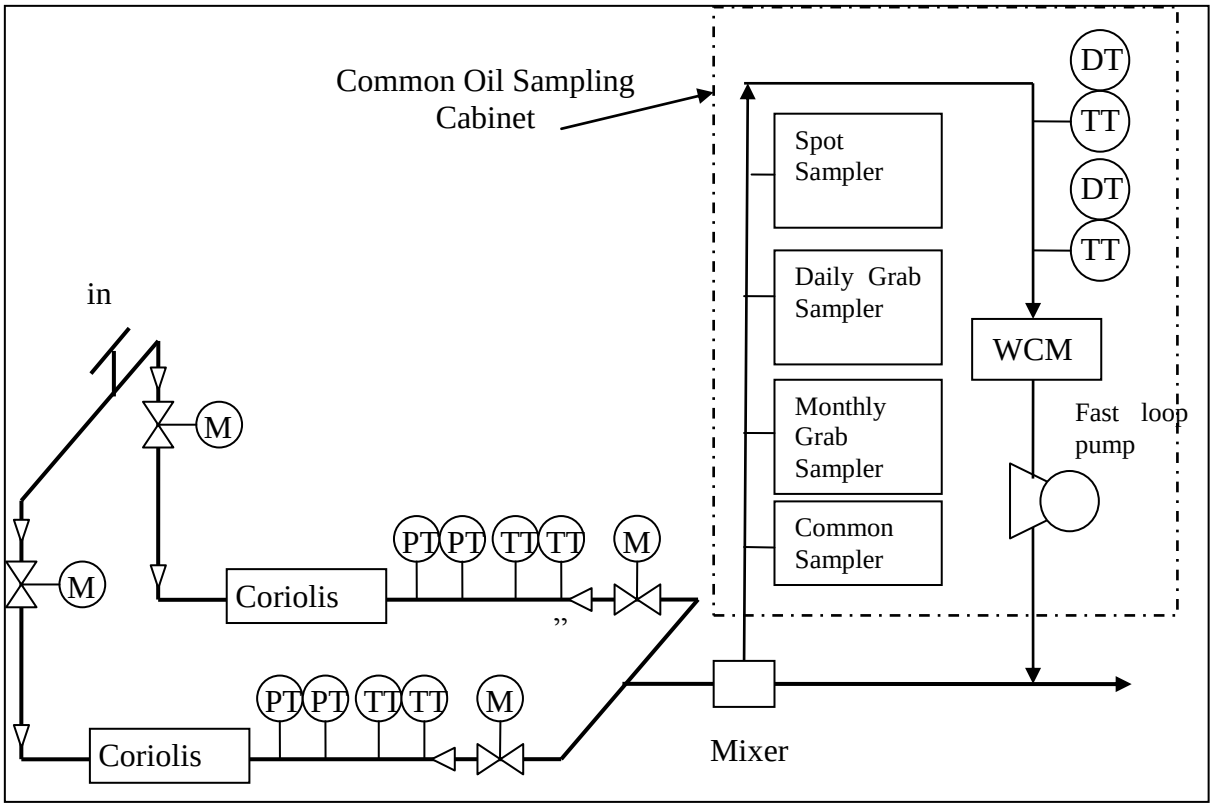

Fig 3 – Oselvar Produced Oil - Metering System

Fig 4 – Oselvar Produced Oil - Metering Skid

The meters and associated instrumentation interface to the flow computers in the Oselvar metering control panel, see Fig 5. A separate flow computer is provided to process the fast loop signals and to provide sampling control.

Each produced oil flow computer provides the following calculations and functionality:

- Determine the stream pressure from two pressure transmitters via Hart communications.
- Provide a conditioned based monitoring routine for the dual pressure instruments.
- Determine the stream temperature from two temperature transmitters via Hart communications.
- Provide a conditioned based monitoring routine for the dual temperature instruments.
- Communicate to the Coriolis meter to receive the mass flowrate, mass total and other diagnostic data.
- Perform pressure correction on the mass flowrate.
- Perform net oil calculations.
- Maintain cumulative and period totals.
- Provide an operator selectable maintenance mode with associated totals.
- Provide flow-weighted averages of process variables.
- Provide time-weighted averages of flowrates.
- Provide Modbus TCP communication to the MSC

Fig 5 – Oselvar Produced Oil - Metering Control Panel

4. OSELVAR PRODUCED OIL METERING – MID APPROVAL

The Oselvar metering skids and control cabinets were delivered in November 2010. The requirement for the M.I.D approval of the produced oil metering system however was only requested in July 2010. The following key reasons were presented in a report given to the customer as to why the M.I.D was not applicable for the Oselvar produced oil metering system:

i) Oselvar was an allocation system and not for custody transfer purposes
ii) Fiscal metering was being performed by the existing export metering on Ula

The Norwegian metrology regulations state:

- "*The requirements apply when such flow meters are sold or offered for sale and when such flow meters are used as the basis for calculating the financial settlement.* " [3]

Tax is paid as a result of the metered quantities from the Oselvar produced oil metering system and the system was therefore deemed to require the M.I.D approval.

A separate new project was created to identify the requirements and to obtain the M.I.D approval for the Oselvar produced oil metering system.

The timeline for this project is shown in figure 6 below.

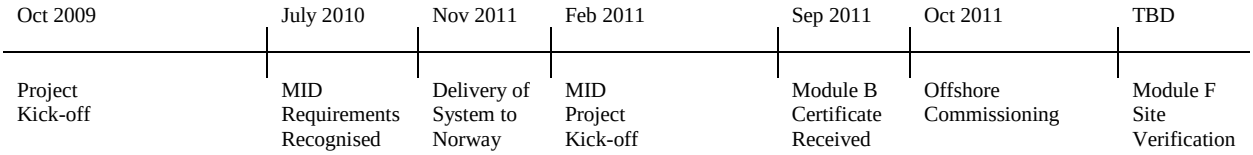

Fig 6 – M.I.D Approval - Project Timeline

4.1 MID INVESTIGATION

Before embarking on the M.I.D approval process, an investigation was carried out to determine the implications of the M.I.D and the expected scope of the approval process. SGC considered using N.M.O to approve the system however as the UK has only adopted M.I.D for certain existing product categories this was not possible. Justervesenet were approached and asked if they could perform the system M.I.D approval and the outline system design details were presented to them for review. Justervesenet indicated that as the system was already built, they would probably be unable to undertake the M.I.D approval process for the Oselvar produced oil metering system. It was decided therefore to look elsewhere for an alternative notified body. Contact was then made with the Netherlands Measurement Institute (NMi), and a meeting was scheduled to discuss the M.I.D requirements. NMi agreed to take on the task of M.I.D approval and were selected as the notified body for the approval of the Oselvar produced oil metering system.

The following are the results of our M.I.D investigations:

- The legal control of measuring instruments included in the M.I.D is still left to each member country and each can decide to regulate instruments under MID in line with current controls,

or they can decide whether or not to regulate specific instruments. If a country chooses to regulate then the regulations must comply with the Directive.

- The regulatory authority can decide make the decision as to whether a particular product or system falls under M.I.D. They can also provide exemption for the product or system from compliance with M.I.D.

- The latest amendment to the N.P.D regulations, effective from December 2009, now include a direct requirement for M.I.D compliance [4].

- The M.I.D and NPD have some differing requirements:
  - NPD regulations are flexible and can be adapted by agreement with NPD.
  - M.I.D/O.I.M.L requirements are more prescriptive and, fixed, and cannot be modified.

- The M.I.D is supposed to replace existing metrology controls so there should be no additional costs for the manufacturer.

- SGC would need to re-examine the proposed mechanical design to ensure it met, or would meet, the requirements of M.I.D.

- The SGC scope of supply was for the produced oil metering skid and metering control panel only. The M.I.D however requires that other elements of the liquid metering system are considered by the manufacturer (e.g. Transfer point, non-return valve, gas break-out prevention, separator level control).

- SGC would have to take responsibility for the complete installation as the system "manufacturer".

- The complete system design was reviewed, including all of the system components beyond those on the metering skid. No modifications to the mechanical design were deemed necessary.

- For the M.I.D module B + F assessment route, all of the relevant system metrological components need to be already M.I.D certified. It was agreed with NMi that this would be limited to only the Coriolis meter, the pressure transmitter and the flow computer.

- The Oselvar produced oil metering system did not directly fall into any of the available O.I.M.L system classifications. The application category that "most suited" for this system was "Measuring Systems on Pipelines", with an Accuracy Class of 0.3.

- The produced oil metering system design uncertainty target was initially ±0.6% and not ±0.3% as required by the M.I.D. The overall system uncertainty was re-calculated and was found to be within the ±0.3% M.P.E required by M.I.D. The water content of the oil was considered and the system operator informed us that the water content would be below 1% and therefore would not unduly affect the system uncertainty.

- After consultation with NMi it was determined that, for a minimum system, only the mass total was required for the M.I.D approval. The volume measurements, water in oil analysers and oil densitometers could still included in the system but would serve only as non metrology elements for the purposes of the M.I.D.

- The original system was designed was to generate fiscal metering reports at the main control room. The M.I.D approval requirements however meant that the system MSC and the entire network infrastructure would form part of the approval and need to be assessed also. After consultation with NMi it was decided that the Metering Supervisory Computer (MSC) would not be considered part of the M.I.D approved system.

- The flow meter calibrations were initially performed at the manufacturers M.I.D approved facility, but these were not carried out to an M.I.D approved test procedure

4.2 MID APPROVAL PROCEDURE

The following procedure was followed to achieve the M.I.D approval:

- An M.I.D system design dossier was submitted to NMi which summarised the Oselvar produced oil metering system. This dossier included a system description, design documents, drawings (P&ID, block diagrams, labels, seals etc) and photographs of the completed skid.

- The Coriolis meters were returned from Norway and were re-calibrated at the manufacturers accredited liquid test facility to the NMi approved M.I.D calibration procedure.

- The system design dossier was updated.

The following modifications were made to the metering system design:

- The MSC was modified to remove any flow computer parameter download that could affect the M.I.D mass total.

The latest firmware used in the Emerson s600 flow computer was not M.I.D approved. The available options were:

  - ask the manufacturer to get the latest firmware M.I.D approved or
  - use an older version of firmware that was M.I.D approved

.

The manufacturer declined to seek approval for the latest s600 firmware but suggested updating the flow computer to their new s600+ flow computer as this was close to completing its M.I.D approval and this was the option chosen by SGC.

- The method of mass totalisation was modified at the flow computer to that agreed and approved by NMi.
- The flow computer display was also changed to specifically identify the M.I.D mass total.
- The flow computer was configured with a serial output to report the M.I.D mass total to a dedicated local printer.
- The system mass totalisation was tested using the Coriolis core processor and the flow computer.
- Repeat client witness tests were performed.

In addition to the M.I.D testing, the individual system component EC type-examination certificates had to be gathered, reviewed and submitted. Labels, name-plates, tagging and

sealing, requirements of the equipment were defined. The requirements for site verification were defined.

The next stage of the M.I.D approval process is to obtain the system EC Declaration of Conformity (Module F) after the "first verification" has been carried out offshore by the notified body. At the time of writing this paper, this process had not yet been completed. There were a number of issues encountered with the Module F, namely:

- The identification of the offshore verification requirements and the procedures to be used were problematic. The existing verification procedures were designed only for onshore installations and had to be modified by NMi for this project.
- NMi stated that they had no offshore qualified personnel to undertake the final examination and verification.
- NPD were contacted and it was agreed that they would be willing to undertake this verification on NMi's behalf. NMi agreed to train NPD personnel to perform the required activities.

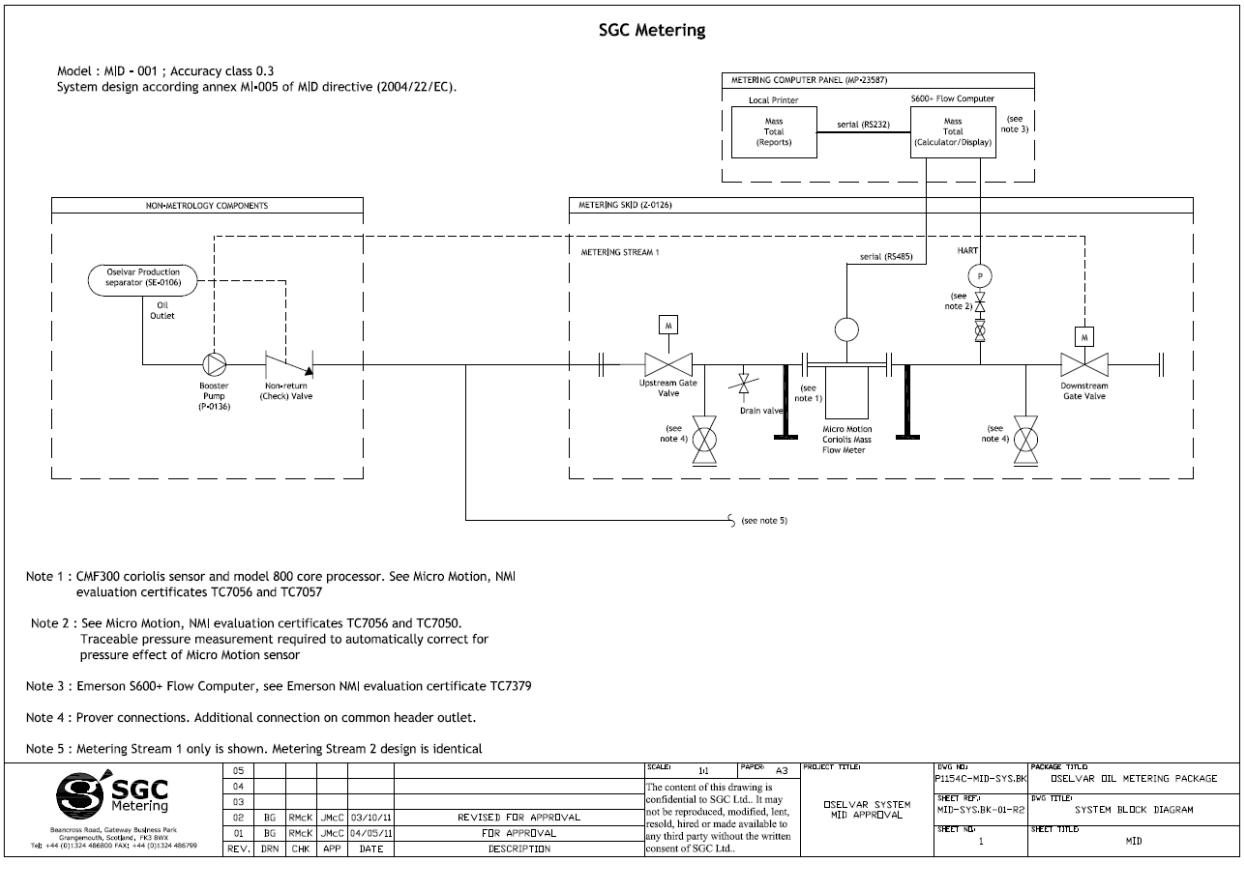

Fig 7 - Oselvar Produced Oil - M.I.D approval, system P&ID

4.3 Volume or Mass

The Oselvar produced oil metering system was originally designed to report in standard volume totals. It was found however that to obtain M.I.D approval for such a volume based system would be very difficult and complex due to the following:

- **ALL** of the metrology system components and functions would need to be assessed

- Some system components, such as the water-cut meter did not have M.I.D approval
- NPD regulations state that densitometers of the "vibrating element type" should be used for density measurement [4].
- The project densitometer has NMi product type approval but is not currently M.I.D certified. The type approval also restricts limits the maximum process temperature of the fluid to +55°C, whilst the Oselvar process temperature is stated as +69.4°C.

An alternative density solution therefore had to be found and two possible methods were considered:

- The Coriolis mass flow rate and the Coriolis line density could be used to calculate gross volume flow rate. Pressure and temperature could then be used to calculate standard volume as required by both NPD and M.I.D.
- Alternatively daily sampling and determination of density and water quality could be used for calculation of gross volume flow rate.

After discussions with NMi, it was decided to restrict the M.I.D approval to the measurement of the system mass total only. The Coriolis meter is M.I.D certified to provide mass total and the flow computer is also M.I.D certified to read the mass total directly from the core processor. Density would still be used but would only be used for non-metrology reporting of the standard volume.

The NPD regulations stipulate that dual process transmitters for pressure etc should be used [4]. This however was not part of the functionality for the M.I.D approved flow computer software. This additional functionality detailed for NMi and was implemented in the flow computer application software.

4.4 Totalisation Accuracy

The M.I.D certification for the coriolis meter and the flow computer does not include the use of the mass flowrate and is certified for mass totals only. The original system design was for the flow computer to read the mass flowrate from the Coriolis meter and then integrate this to calculate the mass total. This method of totalisation was rejected by NMi as in their experience, this method was found to be inaccurate when there is fluctuating flow and for small batch deliveries. The Oslevar produced oil metering system should not be subject to fluctuating flow and is for continuous operation so this should not be an issue.
Both the Coriolis meter and the flow computer were M.I.D certified to provide and read the mass total from the Coriolis meter. The mass total is a 32 bit IEEE floating point number which provides 7 significant digits. As the system is for continuous flow and not for batch operation, over time the accuracy of the derived period totals would reduce to an unacceptable level. The flow computer period totals are calculated from the difference in the Coriolis inventory totals in consecutive readings, therefore as the Coriolis inventory totals grow, the accuracy of the difference decreases and the period totalisation accuracy will eventually exceed 0.001% (NPD requirement) [4].

It was decided to look at possible solutions for this problem

i) One solution was for us to periodically reset the total.
ii) The other was to use 64-bit totals.

The use of 64-bit IEEE floating point totals would provide 14 significant digits. It was found that 64-bit totals were actually already implemented in the current Coriolis firmware and also the flow computer firmware but these functions had not yet been certified for M.I.D use. We asked the manufacturers of the Coriolis meter and flow computer to obtain a variation to their Module B EC type examination certificates, but they declined to do this at that time although it was indicated that they planned to do this at some time in the future. As SGC Metering cannot request changes to the product certification, and this function was needed for the Oselvar project, the route that was chosen was to test this extra functionality for the Oselvar module B system certification.

5. REAL-LIFE EXPERIENCES

Some countries state that M.I.D should apply when measurement is being made for custody transfer purposes (implying high accuracy), whilst others state that it should be for fiscal (tax) purposes. This can mean that it is unclear when exactly M.I.D actually has to be applied and advice has to be sought from the national authorities of the country involved.

M.I.D provides a very comprehensive list of instruments that member states can choose to regulate and provides the option as to whether to regulate them or not. This is supposed to give a high degree of flexibility around implementation and also remove previous restrictions on what technologies can be used. What SGC found was that this "flexibility" has actually caused vagueness in what exactly is required for M.I.D because this is not now clearly defined and the detailed implementation of the M.I.D process is open to individual interpretation. This however conflicts with the views of the notified bodies who do think that the M.I.D is flexible.

In theory a product with M.I.D approval should be suitable for use throughout the whole of the E.U. What SGC found however is each country has a slightly different version of MID and the cost and the time to complete the M.I.D approval also differs.

In most countries, it is usually clearly defined which regulatory authority is responsible for implementation of legal metrology. In Norway however there are two regulatory authorities for metering systems, Justervesenet, who are also an M.I.D notified body, and NPD. This led to a somewhat confused situation as to who now has what roles and responsibilities for each type of product and application area.

Norway is the only country that has adopted M.I.D for offshore liquid metering installations. The existing NPD and Norsok regulations still have to be complied with. But now there are the additional requirements for M.I.D which, for offshore metering, have been added into the NPD regulations. The M.I.D approval process adds considerable time and expense to a project and does not provide any tangible benefits as the offshore metering facilities were already suitably regulated with the previous regulations prior to the M.I.D approval requirements.

SGC found that the M.I.D approval process was protracted and expensive and it took eight months to obtain the system EC type-examination certificate (Module B) for the Oselvar produced oil metering system. This did not include the additional time that would also be required for the first verification offshore and the issue of the declaration of conformity thereafter. The M.I.D approval project dragged on for many months more than had originally been anticipated. Some of this was due to the time taken to determine what would be acceptable for the M.I.D approval. SGC found that the approval costs for the notified body were not the main cost factor. It was the length of time and number of iterations to agree on the requirements and then for the notified body to complete their evaluation. Most of the additional time, was the time taken to complete the approval process and was partly caused by a lack of continuity of personnel involved in the approval by the certifying authority. SGC found that there is nothing that the manufacturer, or even the customer, can do to influence the notified body and therefore speed-up the approval process.

M.I.D is supposed to replace the previous national regulations and is for the benefit of manufacturers and consumers across Europe. Consumer protection regulations and laws however differ in various member states and hence the requirements governing the use of instruments also become the subject of national legislation.

There should be no additional costs for the manufacturer to implement the M.I.D. This may be true for products but it is not the case for liquid metering systems as just by having certificates for all of the metrology components does not constitute an approved metering system. Most liquid measurement systems for industrial applications are unique and an EC examination certificate has to be gained for each one incurring large costs in the process.

Some manufacturers do make liquid metering systems however that fit perfectly with the aims and design ideals of M.I.D ie fuel dispensers, petrol pumps, See Fig 8.

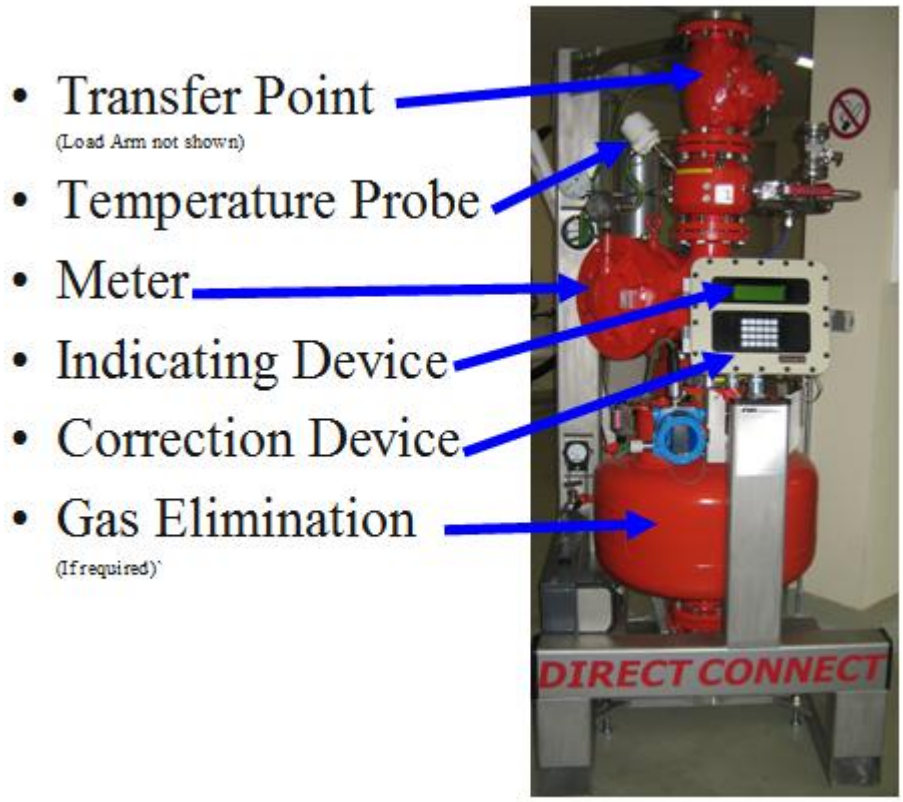

Fig 8. (Picture courtesy of FMC)

The system manufacturer cannot apply for changes to the existing component certificate. This has to be done by the component manufacturer and also has to be done by the same notified body who issued the original approval certificate. If the component manufacturer declines to seek to obtain a variation then this can cause the system manufacturer big problems. If any changes are needed to the existing component certification, this can however be assessed as part of the overall system certification. (For example, to use 64bit floating point totals, this was assessed as part of the system certification.)

The original system design documentation, specifications, drawings, procedures all need to be modified to reflect the changes required to comply with the M.I.D. Some specific new technical documentation, write-ups, label drawings, sealing details also had to be created for approval purposes.

6. LESSONS LEARNED

Wherever possible it would be best to try to avoid having to obtain M.I.D approval. An option would be to try to seek dispensation from the regulatory authorities to waive the M.I.D requirement for any specific project. NPD regulations are flexible and can sometimes be adapted by prior agreement with NPD. The M.I.D requirements however are more prescriptive and in most cases cannot be modified.

If M.I.D approval is required then adequate budgets and scheduling should be made to undertake this process and these should be reflected in any project planning. The M.I.D requirements should be designed into the system from day one and additional time should be added for the certification process. Some contingency should also be factored in to cover unforeseen activities and delays. Many of the problems that SGC encountered obtaining the M.I.D approval would have been minimised had the requirements for M.I.D been known and considered during the initial bid and design stage of the project. It is very difficult to take a system that has been designed for one set of requirements and then try to make this suit another set of different requirements. The system design and approval processes should be performed in parallel. If this is not possible then the system design should be assessed by the notified body and agreed before the system manufacture commences. It is important that every effort should be made to ensure that the same manufacturers' personnel and notified body certification engineer are involved throughout the project.

The system manufacturer should select only M.I.D approved components and ensure that all of these components are operated within the design parameters listed on the certificates. All flow meters, and possibly other instruments, need to be calibrated to a specific approved M.I.D calibration procedure. Because of the prescriptive nature of M.I.D/O.I.M.L there is the possibility that the use of new or innovative solutions may be stifled and additional system functionality may be limited. Keep the system design simple and only implement the minimum functions required by the M.I.D. For the M.I.D purposes, it is perfectly acceptable, to use only the Mass total as the M.I.D metrology value. Many systems have to comply with the existing regulations but also require implementation of specific additional customer, or project, functionality. In the Oselvar produced oil metering system much of the original additional system functionality remains but because of time and complexity issues this was not included in the system M.I.D approval and can only be used therefore for non-metrology purposes.

The M.I.D is meant to be applicable to direct sales and to protect the consumer. It could be argued that as offshore systems are operated in a remote, secure and regulated environment and there is no consumer to protect and therefore M.I.D should not apply. Some developments may not be possible if the M.I.D and O.I.M.L requirements cannot be met. Development of some marginal fields may be put on hold or even cancelled altogether if the M.I.D is deemed to be mandatory for such projects. If there is enough support then it may be possible for manufacturers and operators to lobby for a change in the regulations to remove the requirement that offshore liquid installations in Norway need to be M.I.D approved.

7. CONCLUSIONS

This paper has shown that the M.I.D approval process is not always straightforward. The M.I.D can present many problems for system manufacturers and in particular system integrators. For system M.I.D approval, the requirements must be known up front and taken into account at the start of the project to achieve realistic costing and scheduling of the project. As very few offshore systems have been through the M.I.D approval process, a consensus has yet to be established and all of the parties involved are still in a learning process. The opinion of SGC (and the consensus of most manufacturers and some operators) is that M.I.D does not provide any tangible benefits for metering systems on fixed Norwegian offshore installations that were not adequately already catered for by existing national regulations.

References

[1] EU (2004): Measurement Instrument Directive, Directive 2004/22/EC on measuring instruments, Official Journal of the European Union L135/1, 30 April 2004.

[2] P. Vanenckevort, NMI Dordrecht, presentation: "Gas and Liquid measurement M.I.D requirements & Situation in EU", 28th July 2010.

[3] Norway (2007): Norwegian metrology regulations: "FOR 2007-12-21 nr 1738: Regulations on requirements for flow meters (for liquids other than water)."

[4] Norwegian Petroleum Directorate: "Regulations Relating to Measurement of Petroleum for Fiscal Purposes and for Calculation of CO2 tax (The Measurement Regulations)".