



**nel**  
oil & gas services



**26th International North Sea  
Flow Measurement Workshop**  
Tuesday 21 - Friday 24 October 2008

Training Courses - Monday 20 October 2008:

Measurement Uncertainty  
Thermodynamics of Fluid Systems

Fairmont St Andrews Hotel,  
Scotland, UK

Organised by  
TUV NEL Ltd, EAST KILBRIDE, GLASGOW, UK  
BOOKING HOTLINE: +44 (0) 1355 272858  
ONLINE BOOKING: [www.tuvnel.com/events.aspx](http://www.tuvnel.com/events.aspx)



In Association With:



# 26th International North Sea Flow Measurement Workshop

Tuesday 21 - Friday 24 October 2008

Fairmont St Andrews Hotel,  
Scotland, UK



## Introduction

In a dynamic world it is important to stay ahead of developments in technology, regulations and practice. This is particularly true in the field of hydrocarbon flow measurement, where the measurements made have a high economic impact.

The North Sea Flow Measurement Workshop is established as the premier world event where leading figures involved with all aspects of oil and gas production meet to discuss flow measurement issues. The workshop focuses on the application and development of flow measurement methods. With a reputation for excellent quality, technical content and delegate participation; attendees can expect an informative and enjoyable event.

## About the Workshop

The annual event meets alternately in Scotland and Norway. In Scotland, it is hosted by TUV NEL, in conjunction with Tekna and NFOGM.

The technical programme covers key issues of concern to the international hydrocarbon production industry and is an excellent forum to learn from experiences in the North Sea and further afield.

The workshop is the single most important event in the flow measurement calendar, and is regularly attended by almost 300 of the worlds leading experts.

## Technical Content

This year's technical programme includes presentations from major producers, gas distributors, and equipment suppliers. The industry focused sessions will discuss production, allocation, fiscal and custody transfer measurement of oil, gas and multiphase flows.

Subjects covered include liquid metering, gas ultrasonics, multiphase, allocation and computing, advances in wet gas and uncertainty. Abstracts for each paper are available to view at [www.tuvnel.com/events.aspx](http://www.tuvnel.com/events.aspx).

## Format

A succession of technical presentations, (supported by fully written papers), form the main part of the workshop. In addition, there are poster presentations, informal networking, and vendor clinic sessions. There are two optional intensive training courses which precede the workshop.

The fully-inclusive nature of the workshop means that knowledge-sharing continues over dinner, during breaks and provides a superb opportunity for people at varying stages of their career to immerse themselves in all aspects of flow measurement.

## Training Courses

The workshop will be preceded by two optional training courses.

The Measurement Uncertainty Training Course is in response to industry demand. The course will give participants a chance to analyse all relevant aspects of uncertainty and the implications which it inherently brings.

The Thermodynamics of Fluid Systems Training Course will arm delegates with the practical thermodynamic knowledge required to successfully complete their calculations.

Full details of these courses can be found in this flyer.

## Partners Programme

It is hoped that delegates will take the opportunity to invite spouses / partners to accompany them to the workshop. The partner's fee includes the shared bedroom, all meals and the opportunity to participate in a scenic tour each day. However many partners just enjoy relaxing in the hotel spa or exploring the local villages independently.

## Workshop Fee

The workshop fee is £1610. This rate is fully inclusive including attendance at all workshop sessions, a hard and electronic copy of the proceedings, accommodation, meals and transport on the airport buses which we will be providing.

We expect the workshop to be over-subscribed so places will be allocated on a first-come first-served basis.

## Mentor and Student Package

To assist with career development and encourage the participation of less experienced measurement staff, applications are invited for a limited number of 'Mentor and Student' packages. If a senior staff member wishes to mentor a student/junior staff member during the workshop, then the student is eligible for a discount of £610 off the full delegate fee, when accompanied to the workshop by a full paying delegate. Each application will be assessed by TUV NEL.

The discount is awarded to companies who recognise the value of staff development and as such, each application should be accompanied by a brief (max 250 word) note from the student/junior staff member explaining why attendance would be beneficial. This note should be countersigned by the mentor and both workshop applications should be submitted at the same time.

## Who Should Attend?

- Metering & Instrumentation Engineers
- Production & Reservoir Engineers
- Hydrocarbon Accountants
- Regulators



## Transport

Buses will be available to transport delegates from Aberdeen Airport (leaving promptly at 10:00 am) and Edinburgh Airport (leaving promptly at 11:00 am) to the workshop venue on Tuesday 21st October and return after the close of the workshop on Friday 24th (departing hotel at 09:00 hrs). Please ensure that your flight arrival and departure times coincide with the above bus departure times.

## TUV NEL

TUV NEL is a leading provider of pipeline fluid management services to the global petroleum industry. We have an impressive track record in the development, design and application of leading-edge technology in order to reduce production costs and increase profitability, whilst maintaining safety. We provide consulting, training, R&D and laboratory testing services in the following areas:

- Flow Measurement (oil, gas, water, wet gas, multiphase & heavy oil)
- Produced Water Systems
- Computation Fluid Dynamics Modelling and Interpretation
- Environmental (produced water, emissions and oil-in-water)
- Erosion Assessment and Validation
- Umbilical Acceleration Life Testing
- Calibration of Metering Systems

TUV NEL is part of the TUV SÜD Group, the leading global testing services organisation. With over 13,000 employees, it is represented worldwide at more than 600 locations. For further details on how TUV NEL can help your business, please visit our website [www.tuvnel.com](http://www.tuvnel.com) or contact us directly.

## Members of the Committee

The Committee have input to the content and direction of the Workshop. They have selected papers based on their relevance to industry and the quality of content.

Richard Paton (Chairman), TUV NEL, [rpaton@tuvnel.com](mailto:rpaton@tuvnel.com)

Alan Downing, Solartron ISA

Dag Flølo, StatoilHydro

Douglas Griffin, BERR

Kåre Kleppe, StatoilHydro

Jacek Krawaczynski, Centrica Energy

Denis Pinto, Caledonia Flow Systems Ltd

Jim Ryan, Ineos

Eddie Spearman, CNR International (UK) Limited

Susan Tough, TUV NEL

James Trail, Shell U.K. Limited

## Registration, Enquiries & Administration

Registration can be made on-line at [www.tuvnel.com/events.aspx](http://www.tuvnel.com/events.aspx). All enquiries should be referred to the TUV NEL Events Team, tel: +44 (0)1355 272858 or email: [events@tuvnel.com](mailto:events@tuvnel.com)

## Venue

Fairmont St Andrew Hotel  
St Andrews  
Fife KY16 8PN  
UK  
Tel: 01334 837000  
Fax: 01334 471115  
[www.fairmont.com/StAndrews](http://www.fairmont.com/StAndrews)

## Exhibitors

At the time of printing, the following companies have confirmed their intention to exhibit at the workshop:





## Monday 20 October

- 09:30 - 16:30 Measurement Uncertainty Training Course  
 09:30 - 16:30 Thermodynamics of Fluid Systems Training Course

## Tuesday 21 October

- 12:00 REGISTRATION  
 12:00 - 14:00 LUNCH  
 14:00 - 14:15 **Welcome Address**  
 Michael Valente, Managing Director,  
 TUV NEL  
 14:15 - 14:30 **Keynote Address**  
 Sandy Hay, formerly Measurement Team  
 Manager, BP Exploration Operating  
 Company

### Session 1 **Liquid Metering** **Chairman: Richard Paton**

- 14:30 - 15:00 **The Importance of Proper Internal Surface and Alignment of Upstream Metering Tubes, When Metering Light Hydrocarbons with Turbine Meter**  
 Steinar Fosse, Norwegian Petroleum Directorate – Norway  
 Bjørn Ullebust and Henning Ekerhovd, StatoilHydro – Norway  
 15:00 - 15:30 **API/IP Density Referral Constants – An Investigation into the Impact of Changing From Custom KO and K1 Values to API/IP Standard Values for the Flotta Pipeline System**  
 David Stewart and Ian Reid, Kelton Engineering Ltd – UK  
 Baron Bennington, Talisman Energy Ltd – UK  
 15:30 - 16:00 COFFEE  
 16:00 - 16:30 **Infrared Water Cut Meter for Cost Effective Individual Monitoring of Complex Wells**  
 Muhammed Abdul-Rahman Al-Saiyed, Syed A. Warsi and James E. Phillips, Saudi Aramco – Saudi Arabia  
 Mazin Zareef and John Lievois, Weatherford – USA  
 16:30 - 17:00 **An Investigation into the Performance of Coriolis and Ultrasonic Meters at Liquid Viscosities Up To 300 cSt**  
 Gary Miller and Bob Belshaw, TUV NEL – UK  
 19:30 DINNER

## Wednesday 22 October

- Session 2 **Gas Ultrasonics****  
**Chairman: Jacek Krawaczynski**  
 08:30 - 09:00 **On Line Condition Based Monitoring of Ultrasonic Flow Meters**  
 Stephen Peterson, Shell UK Expro – UK  
 Colin Lightbody, Emerson Daniel Division – UK  
 09:00 - 09:30 **Characterizing Ultrasonic Meter Performance Using A Very Large Database**  
 Thomas Kegel, Colorado Engineering Experiment Station, Inc. – USA  
 Richard Britton, Saudi Aramco – Saudi Arabia  
 09:30 - 10:00 **Practical Experiences of Operating Small Bore (4") Gas Ultrasonic Meters for Fiscal Measurement on a FPSO**  
 Craig Coull and Jason Laidlaw, METCO Services Ltd – UK  
 Eddie Spearman, CNR International (UK) Ltd – UK  
 10:00 - 10:30 COFFEE  
 10:30 - 13:00 **Poster & Manufacturers Sessions / Clinic**  
 13:00 - 14:00 LUNCH  
**Session 3 **Multiphase****  
**Chairman: Alan Downing**  
 14:00 - 14:30 **The Influence of Liquid Viscosity on Multiphase Flow Meters**  
 Bruno Pinguet, Schlumberger (Venezuela) – Venezuela  
 Gary Miller, TUV NEL – UK  
 14:30 - 15:00 **Multiphase Flow Meter Experience in PETRONAS**  
 Feroz Sultan, Duhita Sharma and Aida Azni Zulkifli, PETRONAS Research Sdn Bhd – Malaysia  
 15:00 - 15:30 **Deepwater Measurement Verification – A DeepStar-RPSEA Mandate**  
 Jim Hall and Chip Letton, Letton-Hall Group – USA  
 Bob Webb, BP – USA  
 15:30 - 16:00 COFFEE



- Session 4**      **Differential Pressure Flow Metering**  
**Chairman: Eddie Spearman**
- 16:00 - 16:30    Diagnostic Methodologies for Generic Differential Pressure Flow Meters  
 Richard Steven, DP Diagnostics – USA
- 16:30 - 17:00    The Effects of Drain Holes in Orifice Plates on the Discharge Coefficient  
 Michael Reader-Harris, David Hodges and Ronnie Rushworth, TUV NEL – UK
- 19:30             DINNER

## Thursday 23 October

- Session 5**      **Allocation and Computing**  
**Chairman: Denis Pinto**
- 08:30 - 09:00    Allocation Computer Systems – Considerations for Vendors and Customers  
 Richard Alderson and James Arthur, Smith Rea Energy Limited – UK
- 09:00 - 09:30    Flow Computers & Control Systems Interface or Integrate (2008 Feedback)  
 Ben Leach, Swinton Technology – UK
- 09:30 - 10:00    Features of Allocation Systems Incorporating Long Pipelines: How Apparently Simple Allocation Equations Can Lead to Bias in the Allocation System  
 Phillip Stockton, Smith Rea Energy Limited – UK
- 10:00 - 10:30    COFFEE
- Session 6**      **Gas Ultrasonics**  
**Chairman: James Trail**
- 10:30 - 11:00    Pressure and Temperature Effects for Ormen Lange Ultrasonic Gas Flow Meters – Results from a Follow-Up Study  
 Per Lunde, University of Bergen – Norway  
 Kjell-Eivind Frøysa, Christian Michelsen Research AS – Norway
- 11:00 - 11:30    A General Methodology for Geometry Related Pressure and Temperature Corrections in Ultrasonic Time for Flight Flowmeters  
 Richard Whitson, TUV NEL – UK
- 11:30 - 12:00    Installation Effects on the Easington Ultrasonic Fiscal Metering Station  
 Kjell-Eivind Frøysa and Anders Hallanger, Christian Michelsen Research AS – Norway  
 Anfinn Paulsen, Gassco AS – Norway
- 12:00 - 13:00    LUNCH

- Session 7**      **Wet Gas**  
**Chairman: Douglas Griffin**
- 13:00 - 13:30    Advanced Modelling & Correction of Venturi Meters for Wet Gas Metering Applications  
 Géraldine Salque and Jean-Paul Couput, TOTAL – France  
 Pierre Gajan, ONERA – France
- 13:30 - 14:00    Liquid Property and Diameter Effects on DP Meter Wet Gas Over-Readings  
 Charlie Britton and Richard Steven, Colorado Engineering Experiment Station, Inc. – USA
- 14:00 - 14:30    Measurement of the Liquid Water Flow Rate Using Microwave Sensors in Wet-Gas Meters: Not As Simple As You Might Think  
 Hans R E van Maanen, Shell Global Solutions Intl – The Netherlands
- 14:30 - 15:00    COFFEE
- Session 8**      **Environmental & Uncertainty**  
**Chairman: Dag Flølo**
- 15:00 - 15:30    Gas Densitometer Applied for Simple Method in Standard Density Determination – Approach to CO<sub>2</sub>-Emission Factor Determination for Fuel Gas  
 Maron Dahlstrøm, StatoilHydro – Norway
- 15:30 - 16:00    Handbook of Uncertainty Calculations – Ultrasonic Fiscal Oil Metering Stations  
 Per Lunde, University of Bergen – Norway  
 Kjell-Eivind Frøysa, Christian Michelsen Research – Norway  
 Svein Neumann, ConocoPhillips – Norway  
 Steinar Vervik, Norwegian Petroleum Directorate – Norway
- 16:00 - 16:30    Thermal Lagging – The Impact on Temperature Measurement  
 Sarah Kimpton and Ali Niazi, Advantica Ltd – UK
- 16:30             CLOSING SPEECH
- 19:30             PRE-DINNER NETWORKING
- 20:00             WORKSHOP GALA DINNER

## Friday 24 October

- 08:00             BREAKFAST
- 09:00             BUSES LEAVE FOR AIRPORTS

# Optional Training Courses

## Measurement Uncertainty Training Course

Monday 20 October  
09:30 – 17:00

### Course Introduction

Measurement is fundamental to the control of quality, efficiency and safety. It is vital that all those using industrial measurement recognise that measurement is not an exact science. Understanding the magnitude of the uncertainty associated with any measurement is the first step to improving accuracy. An ability to identify the key issues affecting accuracy is the crucial step in ensuring that limited resources are correctly targeted in any drive to improve accuracy.

This course will introduce delegates to the techniques required to identify what affects measurements and by how much. By ranking the effects, delegates will be able to guard against invalid conclusions and ensure that the key measurements are targeted prior to investment in new instrumentation.

Designed to impart an understanding of measurement uncertainty using examples tailored to the oil and gas sector, delegates will learn the appreciation of the impact of measurement uncertainty on the oil and gas industry, identify the important sources of uncertainty in measurement systems and receive practical guidance on the design of measurement techniques for improved uncertainty.

### Course Directors

Richard Paton has worked with measurement uncertainty throughout his 28 year career with TUV NEL and has presented measurement uncertainty training courses around the world. His experience has been gained from extensive contact with commercial companies as well as with UK government through the National Standards.

Michael Reader-Harris has worked at TUV NEL since 1981. His first projects were in the area of computational fluid dynamics. He was responsible for the analysis of the EEC Orifice Plate database and the production of the orifice plate discharge coefficient equation. He was the Convener of the ISO working group responsible for the revision of ISO 5167.

### Who Should Attend?

- Research and development engineers
- Instrumentation engineers
- Quality managers
- Technical managers

Delegates should bring a scientific calculator with them for the worked examples section of the course.

Course Fee: £450 plus VAT

## Thermodynamics of Fluid Systems Training Course

Monday 20 October  
09:30 – 16:30

### Course Introduction

Production system design, operation, maintenance and decommissioning are all dependent on an accurate knowledge of the fluid streams within the operation. Legislative and economic pressures make it imperative that properly validated data are used appropriately. In particular, successful production system optimisation requires appropriate use of the basic thermodynamic and transport properties of the process streams involved. The risks involved with incorrect calculations or assumptions are significant – entire operations can be stalled and / or unsafe working can result. Many people involved with production plant are not sure whether they are using the best data or the most suitable methods of using that data.

The course is intended for those who are new to the thermodynamic behaviour of fluids or who wish to refresh their basic understanding of the subject. Emphasis is on the modeling approaches used by industry and is aimed at both technical and non-technical staff with a focus on how to make informed decisions about which methods to use. To this end the mathematical content is kept to a minimum, although some science background of the delegates is assumed.

This brief, but comprehensive, course will arm delegates with the practical thermodynamic knowledge required to successfully complete their calculations.

### Course Directors

Andy Johns has worked in thermodynamics research and development for over 20 years and is a recognised expert in this area. He has a pleasant style of delivery, which ensures interest is maintained throughout his course.

Norman Glen has worked on a wide range of projects including heat exchanger fouling, stack emissions monitoring, the application of data reconciliation techniques to flow measurement in pipe networks and the traceable calibration of industrial densitometers, all of which require understanding of the key effects of uncertainty of measurement on the results obtained. By drawing on this diverse background, he is able to illustrate key learning points relating to the use of uncertainty for system design and data analysis.

### Who Should Attend?

- Hydrocarbon accountants
- Process/design engineers
- Metering engineers
- Chemists/chemical engineers

Course Fee: £450 plus VAT

---

Please note that the fee includes participation in the course, lunch, refreshments, certificate of attendance and comprehensive course notes. These notes form useful reference material for delegates to utilise in future. The fee does not include accommodation.

---

Please complete both sides.

Please copy this form for any additional delegates.

**Please tick as required**

**Workshop**

- |                          |   |             |
|--------------------------|---|-------------|
| <input type="checkbox"/> | Delegate Package (accommodation included) | £ 1610      |
| <input type="checkbox"/> | Discount for Presenting Author            | minus £ 420 |
| <input type="checkbox"/> | Discount for Mentored Student Package     | minus £ 610 |

- |                          |  |       |
|--------------------------|--|-------|
| <input type="checkbox"/> | I will be accompanied by a spouse/partner (who does not attend the technical sessions) | £ 280 |
|--------------------------|--|-------|

His / her name is.....

**Training Courses**

- |                          |   |       |
|--------------------------|---|-------|
| <input type="checkbox"/> | Measurement Uncertainty Delegate (accommodation NOT included)         | £ 450 |
| <input type="checkbox"/> | Thermodynamics of Fluid Systems Delegate (accommodation NOT included) | £ 450 |

**Additional Accommodation**

Workshop delegates have accommodation booked for 21st, 22nd and 23rd October. If you require additional bed & breakfast accommodation reserved for you please note dates below.

Dates required.....

- |                          |  |   |
|--------------------------|--|---|
| <input type="checkbox"/> | £205 per night single                    | £ |
| <input type="checkbox"/> | £225 per night double (partner included) | £ |

**Total** £ \_\_\_\_\_

**Plus VAT @ 17.5%** £ \_\_\_\_\_

**INVOICE TOTAL** £ \_\_\_\_\_

- I am interested in the golf tournament taking place on Friday 24th October from 08:00 to 13:30. Please contact me with further details

- I am interested in transport to and from the venue: (\*Delete as applicable)

I land at Edinburgh / Aberdeen\* Airport at \_\_\_\_\_  
(Must be before 10.00 am on 21st October)

I need to be at Edinburgh / Aberdeen\* Airport by \_\_\_\_\_  
(Must be after 11.00 am on 24th October)

**Note: Please ensure arrival and departure flight times coincide with the above bus departure times.**

26th International North Sea Flow Measurement Workshop

21 - 24 October 2008

Full Name (inc. title) \_\_\_\_\_

Preferred Name for Badge \_\_\_\_\_

Job Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Postcode \_\_\_\_\_ Country \_\_\_\_\_

Telephone \_\_\_\_\_

E-mail \_\_\_\_\_

We expect the event to be heavily subscribed. Places are strictly limited and are allocated on a first come, first served basis. Under UK excise regulations delegates from all countries are required to pay VAT at 17.5% on any conference/course taking place in the UK. Your place will be confirmed upon receipt of a completed booking form. If you do not receive confirmation within five working days please contact TUV NEL.

**Method of Payment**  
 (Payment by credit card only)

Visa  Mastercard  Amex  Diners Card      Start Date \_\_\_\_\_ Expiry Date \_\_\_\_\_

Card No \_\_\_\_\_ Security Code \_\_\_\_\_ (on back of card)

Card Holder's Name \_\_\_\_\_

Signature \_\_\_\_\_

Receipt address (if different from above) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Company VAT number (EC member states only - COMPULSORY) \_\_\_\_\_

Where did you hear about this event? \_\_\_\_\_

**Cancellation Policy**  
 Any cancellations must be received in writing at least 14 days prior to the commencement of the event. A cancellation fee of 25% will be incurred. Once within this period the booking cannot be cancelled or any fees refunded, but a substitute delegate can be named at any time before the programme begins, provided that TUV NEL Ltd is notified in advance. TUV NEL Ltd reserves the right to cancel the event due to unforeseen circumstances. TUV NEL Ltd is not liable for any expenses incurred by the delegate. This programme may be subject to change due to circumstances beyond the control of the organisers.

**Venue Details**  
 Fairmont St. Andrews Hotel, St. Andrews, Fife, KY16 8PN, UK  
 Tel: +44 (0) 1334 837000, Fax: +44 (0) 1334 471115  
[www.fairmont.com/standrews](http://www.fairmont.com/standrews)

Please complete and return this form to the  
 Events Team,  
 Fax back on: **+44 (0) 1355 272999**

TUV NEL Ltd  
 East Kilbride, Glasgow G75 0QF, UK

Booking Hotline: +44 (0) 1355 272858  
 Email: [events@tuvnel.com](mailto:events@tuvnel.com)  
 Online Booking: [www.tuvnel.com/events.aspx](http://www.tuvnel.com/events.aspx)

Signed: \_\_\_\_\_ Date: \_\_\_\_\_