

# FLOW MEASUREMENT TRAINING PROGRAM

In Collaboration with TÜV SÜD NEL

5 Days | Kuala Lumpur

**GOOD  
EXPLANATION ON  
FLOW  
MEASUREMENT  
TECHNOLOGIES  
AND SELECTION  
CRITERIA**

MEASUREMENT ENGINEER,  
EXXONMOBIL

## Program Overview

In today's challenging working environment it is vitally important to keep up to date with the latest developments within industry; both in terms of the most recent technology advances and knowledge that can make your job easier. However, this can be harder and harder to accomplish given tighter constraints on time and travel.

This training program organized by Pace Up in collaboration with NEL will aim to meet these issues head on by providing the most flexible event to date. You have the choice to attend all the interactive training courses, or you can choose the topic that is more relevant to your professional development. We offer five different courses over this 5-day event.

## Who Should Attend?

Anyone who is new to flow measurement both in a technical and non-technical capacity including technicians, engineers, sales people, administrators and managers. The course is intensive but will make an effective use of delegates' time.

## Key Modules

- ▶ Fundamentals of Flow Measurement
- ▶ Introduction to Measurement Uncertainty
- ▶ Custody Transfer Flow Measurement Systems
- ▶ Flow Calculations
- ▶ Hydrocarbon Allocation

## Course Methodology

- ▶ Workshop style
- ▶ Lectures
- ▶ Group activities
- ▶ Case studies
- ▶ Q&A



## FUNDAMENTALS OF FLOW MEASUREMENT

Flow measurement is vital to many industrial sectors: water supply, oil extraction, gas distribution, and much of the process and pharmaceutical industry depend on flow measurement for quality control and custody transfer. To obtain the required level of accuracy at an appropriate price, it is crucial that the right meter is selected for the application and that it is appropriately used. However, the flow meter user is faced with a bewildering array of technologies and conflicting claims from manufacturers.

### Objective

This course enables delegates to understand the issues surrounding flow measurement. It also provides the delegate with an unbiased view of the various technologies available and the basic knowledge required to make informed choices. Key aspects of flow measurement, all general meter types and their applications will be discussed and explained.

### Who Should Attend?

Anyone who is new to flow measurement both in a technical and non-technical capacity including technicians, engineers, sales people, administrators and managers. The course is intensive but will make an effective use of delegates' time.

### Course Content

- Basic of Fluid Flow
- Traditional Flow Measurement Technology
- Modern Flow Measurement Technology
- Multiphase Flow Metering
- Measurement Uncertainty
- Meter Management
- Network Management

## INTRODUCTION TO MEASUREMENT UNCERTAINTY

Measurement is fundamental to the control of quality, efficiency and safety. This one day course is designed to impart a basic understanding of measurement uncertainty. Delegates will learn about the impact of uncertainty in industry, to identify important sources of uncertainty in measurement systems and receive practical guidance on the design of measurement techniques to minimize uncertainty.

### Objective

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 for investment in new instrumentation.

The course is designed to impart a basic understanding of measurement uncertainty. Delegates will learn the appreciation of the impact of measurement uncertainty within the industry, to identify the important sources of uncertainty in measurement systems and receive practical guidance on the design of measurement techniques for improved uncertainty.

### Who Should Attend?

Research and Development Engineers, Instrumentation Engineers, Quality Managers, Technical Managers

### Course Content

- Overview of Uncertainty Concepts
- Basic Calculation Methods Type A Analysis
- Basic Calculation Method Type B Analysis
- Sensitivity Coefficients
- Combination of Uncertainties
- Practicalities of Uncertainty Estimation and How to Improve Measurement
- Monte Carlo Simulation Including Worked Example

## CUSTODY TRANSFER FLOW MEASUREMENT SYSTEMS

A transaction involving physical transfer of oil and gas from one operator to another is known as Custody Transfer. Accurate metering of the fluids being transferred between the two is therefore of vital importance. This one day training course will enable metering engineers to gain a knowledge of how fluids are metered in the oil and gas sector.

### Objective

- Understand the requirement for Custody Transfer Measurement.
- Basic sizing techniques.
- Select the optimum meter type.
- Appreciate the various standards and regulations applied.

### Who Should Attend?

Anyone who is new to flow measurement both in a technical and non-technical capacity including technicians, engineers, sales people, administrators and managers. The course is intensive but will make an effective use of delegates' time.

### Course Content

- |                             |                       |                             |
|-----------------------------|-----------------------|-----------------------------|
| • Introduction and Overview | • Density Measurement | • Secondary Instrumentation |
| • Flow Meters               | • Crude Oil Sampling  | • Flow Computers            |
| • Meter Provers             |                       |                             |

## FLOW CALCULATIONS

Accurate measurement of produced hydrocarbons has always been a very high priority for oil and gas operating companies. To satisfy this requirement, stringent requirements are set for the various calculations that are adopted to define the quantity and quality of the fluids being measured. There are numerous standards which define these parameters and this half day course explains the commonly used equations and standards by detailing the source of the calculations, the parameters used, the required inputs/outputs and their effect on the uncertainty of measurement.

### Objective

This course provides for the delegates an introduction into the importance of and the requirements for the calculations and standards applied on orifice gas metering systems and liquid turbine metering systems. The course covers:

- |                                          |                                             |
|------------------------------------------|---------------------------------------------|
| • Appropriate ISO, AGA and API standards | • Liquid calculations including corrections |
| • Their background and application       | • Sources of error                          |
| • Gas calculations including corrections |                                             |

### Who Should Attend?

Delegates who require a basic understanding of measurement system calculations, their role and Effect in the measurement process, such as Metering Technicians & Engineers, Research and Development Engineers, Instrumentation Engineers, Quality Managers, Technical Managers, Metering System Designers. The course is intensive, to make effective use of delegates' time.

### Course Content

- |                              |                                |
|------------------------------|--------------------------------|
| • Introduction & Standards   | • API & IP Liquid Calculations |
| • ISO 5167 Flow Calculations | • Sources of Error             |

## INTRODUCTION TO HYDROCARBON ALLOCATION

In Oil and Gas production environments, it is often necessary for operating companies to share production and transportation facilities. It is therefore important that the hydrocarbons entering such facilities are equitably allocated between the companies contributing to the system. The process of dividing the produced hydrocarbons, ensuring that each operator gets their allotted share is known as hydrocarbon allocation. This one day course is designed to describe the development of an allocation system and explain the different types of allocation calculations that are commonly applied.

### Objective

The course will cover:

- What is Hydrocarbon Allocation?
- Design and development of an allocation system
- Functions of an allocation system
- Proportional allocation
- Mass Allocation
- Uncertainty based allocation by difference allocation

These modules will be complemented by a series of examples and case studies to illustrate the concepts being covered.

### Who Should Attend?

- Allocation Engineers
- Instrument engineers
- Production engineers
- Technical managers
- Quality managers.

### Course Content

- What is Hydrocarbon Allocation?
- Design and development of an allocation system
- Functions of an allocation system
- Proportional allocation
- Mass Allocation
- Uncertainty based allocation
- By difference allocation



### CRAIG MARSHALL

As a Flow Measurement Consultant at NEL, Craig's responsibilities include working on a large variety of R&D, training and consultancy projects focused on single and multi-phase metering technology. He performs a variety of roles including project formulation, project management, technical lead, planning/delivering test work, data analysis and report writing.

Craig has completed work in the technical areas of engineering design and review for custody transfer and fiscal metering measurement systems, measurement allocation philosophy documents, measurement system audits and financial exposure calculations.

Currently, Craig is undertaking a doctorate degree at Coventry University in the area of low Reynolds number flow measurement.

## COMMENT AND REVIEW

"This training is a very good for a new metering engineer to attend."

*Engineer, Sabah Shell Petroleum*

"Provide good introduction/refresher to fluid mechanics and types of flow models and its respective functions."

*Senior Instrument/Control Engineer, Murphy Oil*

"Course is well organized and informative."

*Instrument Engineer, EnQuest Petroleum Development*

"Good exposure on actual case study."

*Metering Lead, SEA Hibiscus*

"Good explanation with details."

*Technologist, ExxonMobil*