COURSE OVERVIEW IE0119
Fiscal Metering

Course Title
Fiscal Metering

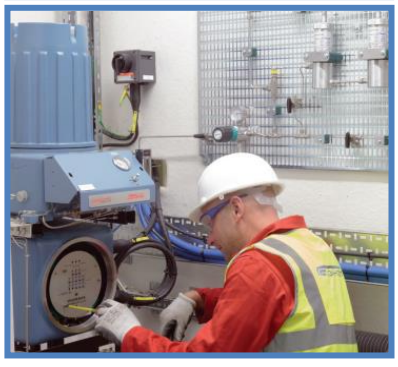
Course Reference
IE0119

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	August 31-September 04, 2025	Al Buraimi Meeting Room, Sheraton Oman Hotel, Muscat, Oman
2	November 09-13, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
3	January 11-15, 2025	Al Buraimi Meeting Room, Sheraton Oman Hotel, Muscat, Oman
4	March 29-April 02, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art fiscal and custody transfer metering simulators.

This course is designed to provide participants a detailed and up-to-date knowledge on fiscal and allocation metering. It covers the standard devices required for the metering system, types of sales contracts, international applied standards, CT practices, functions fiscal metering system, mutual performance expectations, OIML requirements for accuracy and proving and validation issues of fiscal and custody transfer.

The course will also discuss the loss control and lease automatic custody transfer (LACT); the importance of representative fuel samples; applied accuracy terminology; control chart tool for performance monitoring and verification; fluid dynamics as the basics of flow measurements that may influence the accuracy of any flow measuring device; the parameters influencing the flow pattern; API gravity measurement and oil classification; the cavitation and flashing; the phenomena of choked flow; gas compressibility and the principles of gas chromatography.

At the completion of the course, participants will be able to employ heating value measuring methods; moisture and HC dew-point measurements; interpret standard measurement recommendations; describe flow metering that are applied based on other principles; illustrate fiscal gas metering station design; and employ flow calibration, metering prover systems, multiphase flow and water cut measurements.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on custody and allocation metering
- Discuss the standard devices required for the metering system, types of sales contracts, international applied standards, CT practices, functions fiscal metering system, mutual performance expectations, OIML requirements for accuracy and proving and validation issues of fiscal and custody transfer
- Explain the loss control and lease automatic custody transfer (LACT) and the importance of representative fuel samples
- Define applied accuracy terminology and apply control chart tool for performance monitoring and verification
- Describe fluid dynamics as the basics of flow measurements that may influence the accuracy of any flow measuring device
- Identify the parameters influencing the flow pattern like viscosity, density, Reynolds number and Bernouli's theorem describing the energy balances in a flowing fluid
- Discuss API gravity measurement and oil classification as well as the cavitation and flashing, the phenomena of choked flow and gas compressibility
- Explain the principles of gas chromatography covering the basic principles to the quantitation methods of the analysis results
- Employ heating value measuring methods as well as moisture and HC dew-point measurements
- Interpret standard measurement recommendations that includes OIML best practices and requirements for fiscal metering and operation, OIML accuracy meter classification and permissible error and API MPMS
- Describe flow metering that are applied based on other principles and discuss the standardized gas flow metering standards
- Illustrate fiscal gas metering station design and employ flow calibration, metering prover systems, multiphase flow and water cut measurements

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of custody and allocation metering for those in charge of custody transfer, measurements and metering of oil, gas and petroleum products at marine terminals, loading arms, oil depots, tank farms or bulk storage. This includes engineers and other technical staff.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Sydney Thoresson, PE, BSc, is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of extensive experience within the **Petrochemical**, **Utilities**, **Oil**, **Gas** and **Power** industries. His specialization highly evolves in **Process Control Instrumentation**, **Process Instrumentation & Control**, **Process Control**, **Instrumentation**, Troubleshooting & Problem Solving, Instrumentation Engineering, Process Control (**PCI**) & Safeguarding, **Instrument Calibration & Maintenance**, **Instrumented Safety Systems**, High Integrity Protection Systems (**HIPS**), Process Controller, **Control Loop & Valve Tuning**, **Compressor Control & Protection**, **Control Systems**, Programmable Logic Controllers (**PLC**), **SCADA System**, **PLC & SCADA** - Automation & Process Control, **PLC & SCADA** Systems Application, Technical **DCS/SCADA**, **PLC-SIMATIC S7 300/400**: Configuration, Programming and Troubleshooting, **PLC, Telemetry and SCADA** Technologies, Cyber Security of Industrial Control System (**PLC, DCS, SCADA & IED**), Basics of **Instrumentation Control System, DCS**, **Distributed Control System** - Operations & Techniques, Distributed Control System (**DCS**) Principles, Applications, Selection & Troubleshooting, Distributed Control Systems (**DCS**) especially in **Honeywell DCS**, **H&B DCS**, **Modicon, Siemens**, **Telemecanique**, **Wonderware** and **Adrioit,** Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Emergency Shutdown** System, Variable Frequency Drive (**VFD**), **Process Control & Safeguarding**, **Field Instrumentation**, **Instrumented Protective Devices** Maintenance & Testing, Instrumented Protective Function (**IPF**), **Refining & Rotating Equipment**, **Equipment Operations**, **Short Circuit Calculation**, **Voltage Drop Calculation**, **Lighting Calculation**, **Hazardous Area Classification**, **Intrinsic Safety**, **Liquid & Gas Flowmetering**, **Custody Measurement**, **Ultrasonic Flowmetering**, **Loss Control**, **Gas Measurement**, **Flowmetering & Custody Measurement**, **Multiphase Flowmetering**, **Measurement and Control**, **Mass Measuring System Batching** (**Philips**), Arc Furnace Automation-Ferro Alloys, Walking Beam Furnace, Blast Furnace, Billet Casting Station, Cement Kiln Automation, Factory Automation and Quality Assurance Accreditation (**ISO 9000** and **Standard BS 5750**). Further, he is also well-versed in **Electrical Safety**, **Electrical Hazards Assessment**, **Electrical Equipment**, **Personal Protective Equipment**, Log-Out & Tag-Out (**LOTO**), **ALARP & LOPA** Methods, Confined Workspaces, Power **Quality**, Power **Network**, Power **Distribution**, **Distribution Systems**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, Electrical **Substations**, **UPS** & **Battery System**, **Earthing & Grounding**, Power **Generation**, **Protective Systems**, **Electrical Generators**, **Power** & **Distribution Transformers**, **Electrical Motors**, **Switchgears**, **Transformers**, **AC** & **DC Drives**, **Variable Speed Drives** & **Generators** and **Generator Protection**. He is currently the **Projects Manager** wherein he manages projects in the field of electrical and automation engineering and in-charge of various process hazard analysis, fault task analysis, FMEA and HAZOP study.

During Mr. Thoresson's career life, he has gained his thorough and practical experience through various challenging positions and dedication as the **Contracts & Projects Manager**, **Managing Director**, **Technical Director**, **Divisional Manager**, **Plant Automation Engineer**, **Senior Consulting Engineer**, **Senior Systems Engineer**, **Consulting Engineer**, **Service Engineer** and **Section Leader** from several international companies such as **Philips**, **FEDMIS**, **AEG**, **DAVY International**, **BOSCH**, **Billiton** and **Endress/Hauser**.

Mr. Thoresson is a **Registered Professional Engineering Technologist** and has a **Bachelor's** degree in **Electrical & Electronics Engineering** and a **National Diploma** in **Radio Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an active member of the International Society of Automation (**ISA**) and the Society for Automation, Instrumentation, Measurement and Control (**SAIMC**). He has further delivered numerous trainings, courses, seminars, conferences and workshops

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 - 0830	***PRE-TEST***
0830 - 0930	***Introduction to Fiscal & Custody Transfer (CT) Metering*** *Standard Devices Required for the Metering System • Type of Sales Contracts • International Applied Standards • CT Practices • Functions Fiscal Metering System • Mutual Performance Expectations • OIML Requirements for Accuracy & Proving & Validation Issues*
0930 – 0945	*Break*
0945 – 1100	***Loss Control & Lease Automatic Custody Transfer (LACT)*** *Understand the Aim of Loss Control • The Importance of Representative Fuel Samples & Lease Automatic Custody Transfer*
1100 – 1230	***Applied Accuracy Terminology*** *Accuracy • Precision • Standard Deviation & Variance • Repeatability, Variability • Probability • STD • Systematic Error • Control Chart Tool for Performance Monitoring & Verification*
1230 - 1245	*Break*
1245 - 1420	***Fluid Dynamics*** *Basics of Flow Measurements that May Influence the Accuracy of Any Flow Measuring Device • Parameters Influencing the Flow Pattern like Viscosity, Density, Reynolds Number & Bernoulli's Theorem Describing the Energy Balances in a Flowing Fluid • Standard API Gravity Measurement & Oil Classification*
1420 - 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 - 0930	***Fluid Dynamics (cont'd)*** *Stability of the Flow Pattern is of Paramount Importance, Special Attention is Paid to the Types of Possible Disturbances like Swirl Flow & The Methods to Prevent it by Application of Flow Straighteners & Conditions • Cavitation & Flashing • The Phenomena of Choked Flow & Gas Compressibility*
0930 – 0945	*Break*
0945 – 1100	***Principles of Gas Chromatography*** *Process Gas Chromatography is Applied for the Required Analysis of a Fluid Composition as Part of the Flow Metering • Basic Principles to the Quantitation Methods of the Analysis Results*
1100 - 1230	***Heating Value Measuring Methods*** *Pros & Cons of the Different Methods to Determine the Heating Value of a Gas like Calorific Value Measurements & The GC Method using the "Du Long" Equation*
1230 - 1245	*Break*

1245 – 1420	***Moisture & HC Dew-Point Measurements*** *Principles of Moisture Analysis • The Effects & Risks like Hydrate Forming by the Combination of Water (WDP) & Hydrocarbon Dew Point (HCDP) in Natural Gas*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Standard Measurement Recommendations*** *OIML Recommended Best Practices & Requirements for Fiscal Metering & Operation • OIML Accuracy Meter Classification & Permissible Error • API MPMS • Practical Case Example*
0930 – 0945	*Break*
0945 – 1100	***Flow Metering Using Δ P*** *Advantages & Disadvantages Compared to Other Flow Measuring Principles • Flow Devices like Venturi, Nozzle & Their Particular Applications • What is the Actual Effect of the Measurement Rangeability, Turn-Down Ratio in Relation to the Measurement Accuracy?*
1100 - 1230	***Flow Metering that are Applied Based on Other Principles*** *What Issues Need to be Considered Before Selection of Any Type of Flow Meter for the Measurement Volumetric, Mass & Totalized Flow ?*
1230 - 1245	*Break*
1245 – 1420	***Flow Metering that are Applied Based on Other Principles (cont'd)*** *What are the Other Measuring Principles, their Significant Advantages & Disadvantages, Interferences & Typical Applications for Accurate Flow Measurements like PD Meters, The Turbine Flow Meters, Transit Time Type Ultra Sonic Flow-Meters, Coriolis Mass Flow Measurement, Thermal Mass Flow, Electro Magnetic & Vortex?*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Standardized Gas Flow Metering Standards*** *AGA Applied Terms & Factors that are Used in the Different Calculation Equations for the Main Types of Gas Flow Measuring Principles as Indicated in the Applied Standards • What are the Reasons for Application of a Dedicated Flow Computer and What are the Special Functions Like the Standardized Calculations & Additional Functions?*
0930 – 0945	*Break*
0945 – 1100	***Fiscal Gas Metering Station Design*** *How is the Recommend Design of a NG Fiscal Metering Station? • Which Facilities are Required & What are Generally Applied Practices for Installation?*
1100 - 1230	***Flow Calibration*** *What are the Reasons for Flow Meter Calibration & Practical Considerations? • What is the difference Between Calibration & Proving? • What are the Different Types of Flow Meter Calibration Systems?*
1230 - 1245	*Break*

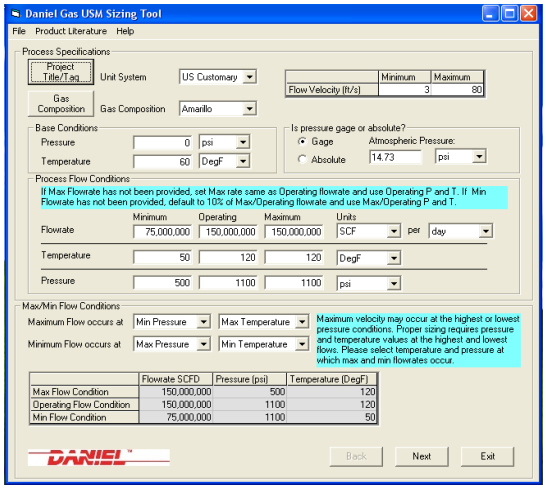
1245 – 1420	***Flow Calibration (cont'd)*** *What are the Issues Concerning Testing, Calibration & Presentation of Proving Data? • What Alternative Type of Turbine Meter Calibration is Applied? • What are the Trends & Best Practices?*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

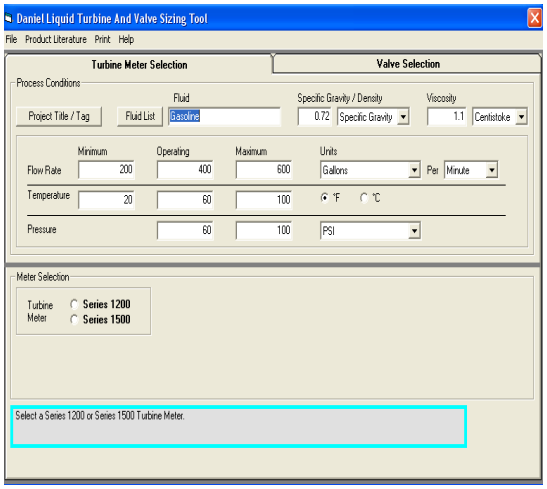
0730 – 0930	***Metering Prover Systems*** *What are the Main Types of Prover Systems & Their Specific Reasons of Application • How is the Way of Operation of Tank Provers, Piston Provers, Displacement Types Prover, Bi-Directional Pipe Prover & Ball Prover*
0930 – 0945	*Break*
0945 – 1100	***Metering Prover Systems (cont'd)*** *What are the Reasons for Application of a Master Meter System? • What are Important General Prover Issues?*
1100 - 1230	***Multiphase Flow & Water Cut Measurements*** *Why is MPF Metering Not Suitable as CT / Fiscal Metering? • What are the Three Phase Flow Properties? • What is Meant by "Water-Cut" & How is it Measured?*
1230 – 1245	*Break*
1245 - 1400	***Multiphase Flow & Water Cut Measurements (cont'd)*** *What are the Measuring Principles for WC like Absorption Spectroscopy? • What are the Applied Three Phase Metering Techniques? • What is Meant by GVF & WC & What Influences Do They Have on the Performance? • Industrial Types that will be Discussed are the Developed MPF Meters from Roxar, Daniel, Agar, Expro, Haimo, Framo /Schlumberger & Jiskoot*
1400 – 1415	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1415 – 1430	***POST-TEST***
1430	*Lunch & End of Course*

Simulators (Hands-on Practical Sessions)

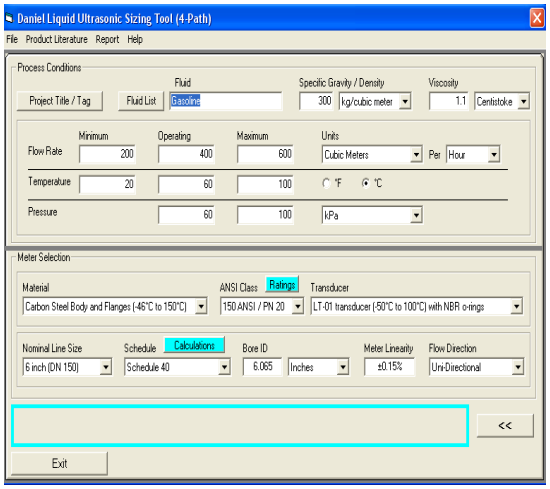
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art "Gas Ultrasonic Meter Sizing Tool", "Liquid Turbine Meter and Control Valve Sizing Tool", "Liquid Ultrasonic Meter Sizing Tool" and "Orifice Flow Calculator" simulators.



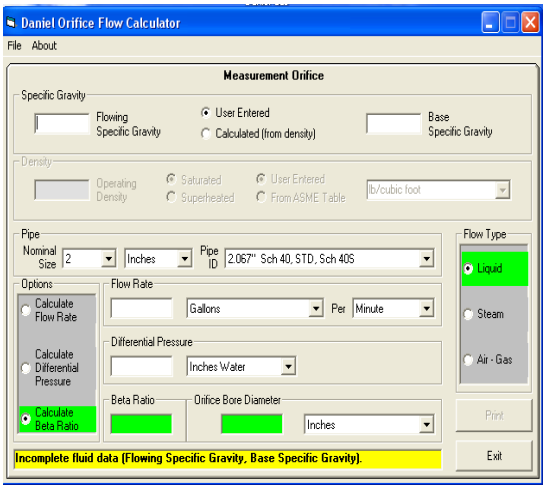
Gas Ultrasonic Meter (USM) Sizing Tool Software



Liquid Turbine Meter and Control Valve Sizing Tool Software



Liquid Ultrasonic Meter Sizing Tool Software



Orifice Flow Calculator Software

Course Coordinator

Mari Nakintu, Tel: +971 230 91 714, Email: mari1@haward.org