

ACTIVITY REPORT FOR TRAINING COURSE ON Verification of Bulk Flowmetering Systems using a Master Meter

Dates : 22-25 February 2021

Venue : Online

Host : APLMF Secretariat (Malaysia)

Trainers: William Hartmann (Australia)

APLMF Representative: Marian Haire, APLMF Training Coordinator

1. Objective of the Training

The training was composed of lectures which cover a basic understanding of the test procedures required to verify bulk flowmetering systems using a master meter and a volume measure as the reference standard.

This course provides participants with the knowledge and skills to:

- understand the role of trade measurement within an economy
- identify the major components of a bulk flowmetering system
- analyse the operating environment to determine how it could impact on the performance of the meter
- identify sources of any possible operational errors
- verify a bulk flowmetering system in accordance with the test procedures and workplace health and safety guidelines
- train others to verify bulk flowmetering systems

2. Training Course Programme – see Annex 1

3. Target Group

This training is designed for people who verify bulk flowmetering systems or who have a responsibility for ensuring that bulk flowmeters are verified in accordance with OIML recommendations. 15 participants from 9 economies attended this training. All participants were expected to have some practical experience in the field using a master meter. Participants are also expected to train others within their economies. See **Annex 2** for a list of participants.

Photograph of participants taken with the APLMF President Dr Osman Bin ZAKARIA



4. Highlights/ Lessons Learned

A test Zoom meeting was held on Monday 22 February. The training was attended by 15 participants from across the Asia -Pacific region. The APLMF President Dr Osman Bin Zakaria joined us and welcomed everyone on behalf of APLMF. He wished everyone well for a successful training course and explained how important it is for each economy to have a sound measurement infrastructure to ensure the community has confidence they are receiving a fair measure. A group photo was also taken and then everyone had the opportunity to introduce themselves. Some time was spent going over some rules to ensure everyone knew how best to ask a question. Participants were encouraged to use the chat facility where possible. This is our second experience using Zoom to deliver training. While there are limitations it is still very effective for sharing knowledge. By day two of the training participants were asking questions using the chat facility and also providing answers for the learning activities. They were reluctant to speak but once there was two-way communication it seems to work well. On the final day, each economy commented on how the test procedures delivered during the training compared with what they currently do. There was an agreement that they were quite similar even if they did not implement all the tests. Participants generally found the training to be useful and were appreciate of the support provided by APLMF especially in light of COVID restrictions. Generally, APLMF training is for developing economies but with the online version, we were able to allow developed economies to attend. New Zealand and Canada were grateful for the opportunity to be involved.

During the test Zoom meeting, each participant provided some background about how they manage the regulation of bulk flowmeters in their economy. These have been collated and can be found in **Annex 3**. There was a mix of economies that have already implemented the OIML117 recommendation for bulk flowmetering systems either fully or partially and some that have not implemented regulation at all. Participants also provided a list of actions they intend to carry out after the course. The Action Plans are shown in **Annex 4**.

Feedback from the participants was very positive, with the overall rating for the course rated as good or excellent. The feedback related to the logistics, clarity of the presentations was also highly rated. All agreed the practice session was a good idea and that Zoom was a suitable platform to use for training delivery. The feedback indicated the objectives of the course were met and the participants were satisfied with the experience. Participants reported they learnt lots from the training and plan to work on their regulations and standards. Some said they would be reviewing their current verification procedures and would strive to be consistent with other economies. They appreciated the step-by-step guide on how to implement OIML recommendations. The trainer's skill and field experience gave the participants confidence he understood the

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topic really well. He was very willing to answer questions and managed to get the participants to answer questions well using the chat facility.

Under areas of improvement; we again got comments about the requirement for some videos or photographs to demonstrate the tests in practice. Under additional support, some pointed to funding being something that is holding up their implementation of these procedures.

Regarding the lessons learnt we feel sure that 3-hour sessions are the limit of time we should use for any session. Any longer and it becomes too hard to concentrate.

5. Next Steps/ Follow-up

This training was recorded and could be used to deliver the course again in the future. Australia is not willing to have the recording freely available online, so the plan is to offer this training again in the future and to have an expert available to answer questions after each session. It would be good to advertise this training again in 6 months to see how this will work.

As a follow up the Secretariat will follow up on the action plans by contacting participants in 6 months and again in 12 months.

Annex 1: Agenda

Verification of Bulk Flowmetering Systems using a Master Meter

Test Run Monday 22 February at 11am AEST

Topic	Presenters
Technology check & VC protocols Introductions and course outline Economy reports Answers to pre-course questions	Marian Haire Will Hartmann

Session 1 – Tuesday 23 February at 11am AEST Presenter Will Hartmann

Topic	Time
Technology check & VC protocols	10 mins
National measurement systems Verifier obligations in Australia Components of bulk flowmetering systems Certificates of approval Reference standards of measurement	75 mins
Break to stretch and rest	15 mins
Applying to reference standard corrections Environmental factors Volume correction Questions - Session 1	75 mins
Complete Learning activities 1-7	After class

Session 2 – Wednesday 24 February at 11am AEST Presenter Will Hartmann

Topic	Time
Technology check & VC protocols	30 mins

Answers to learning activities and any questions from the last session	
<p>Overview of NITP 5.2</p> <p>Equipment required for testing</p> <p>Visual inspection</p> <p>Test procedure – Accuracy testing using a master meter</p> <p>Learning activity 8.</p>	50 mins
Break to stretch and rest and complete Learning activity 9	30 mins
<p>Test procedure continued</p> <p>Learning activity 10</p> <p>Questions</p>	75 mins
Complete Learning activities 11-13	After class

Session 3 – Thursday 25 February at 11am AEST Presenter Will Hartmann

Topic	Time
<p>Technology check & VC protocols</p> <p>Answer to learning activities and any questions from the last session</p>	15 mins
<p>Test procedures:</p> <ul style="list-style-type: none"> 4.1 indicating devices 4.2 zero setting 4.3 non-return valve 4.4 interlock 4.5 max. flow rate 4.7 repeatability 4.8 meter creep 	75 mins

4.9 conversion device Learning activities 14-15	
Break to stretch and rest	15 mins
Test procedures continued: 4.10 gas elimination 4.11 low-level cut-off 4.12 pre-set indications and accuracy 4.13 anti-drain/hose dilation 4.14 ticket printing Learning activity 16 Suggested sequence for testing Wrapping up Action plans	60 mins

Annex 2: List of Participants

Title	Name	Economy	Institution
Ms	Heather HAMILTON	Canada	Innovation, Science and Economic Development Canada
Dr	CHUNHUI Li	China	National Institute of Metrology
Mr	Hao-Hsi CHANG	Chinese Taipei	The Bureau of Standards, Metrology and Inspection, Ministry of Economic Affairs
Mr	Che-Wie YEH	Chinese Taipei	Industrial Technology Research Institution
Mr	Seesomphone YOYSAYKHAM	Laos	Department of Standardization and Metrology, Ministry of Science and Technology
Ms	Amartuvshin BATSUURI	Mongolia	Mongolian Agency for Standard and Metrology
Mr	Gantulga BANZRAGCH	Mongolia	Mongolian Agency for Standard and Metrology
Mrs	Anna Maria MONTANARO	New Zealand	Ministry of Business Innovation and Employment
Ms	Carlos OCHOA	Peru	INACAL
Ms	Michael ZAVALGA	Peru	INACAL
Ms	Ruben GIL	Peru	INACAL
Mr	Javier CHIA	Singapore	Enterprise Singapore
Mr	Kalaiselvam PANESILVAM	Singapore	Enterprise Singapore
Mr	NGUYEN Nguyen Khoa	Vietnam	Quality assurance and testing center 2 (quatest2)
Mr	NAUYEN Ba Hung	Vietnam	Quality assurance and testing center 3 (quatest3)

Annex 3: Summary of Economy Reports

Economy	Adequate Legislation	Who carries out inspections?	Verification period	MPEs	Traceability?	OIML R 117 Implemented?	Type approval?	Problems
Canada	YES	Inspectors, 3 rd parties	Varies by trade sector / Petroleum: generally 2 y	Varies but +/- 0.25% to +/-1%	The device used in trade are approved & initially inspected. Standards used for inspection are traceable to Measurement Canada's 1 kg reference standard MR-1	Not implemented yet	YES	Logistics – it will impact all of our current requirements. Some of our newer requirements are aligned with R-117.
<p>NOTE: In China, there are domestic technical committees (TC) responsible for each area. There is a national technical committee of fluid flow (TCFF) and technical committee of volume (TCV) referred to the content of OIML R117. In general, the verification regulation is made and released by each TC according to the content of the instrument. And, the regulation is made according to the principle of the instrument, not the applied field. For example, the verification regulation of ultrasonic meter for liquid and gas is made and released by the TCFF. There are general requirements on the ultrasonic meter for liquid, not specified for liquid other than water. The requirements on verification period, MPEs and traceability are all detailed regulated in the regulation for each kind of flowmeter, not specified for the applied field.</p>								
China	NO	Inspectors	N/A	N/A	N/A	Not implemented yet	NO	
Chinese Taipei	YES	Inspectors	2 y	±0.5 %	Keep the test records	Partially implemented	NO – by Verification	None
Laos	YES	Inspectors	Every 6 months	±0,2%	Traceability obtained through the Vietnam verification Unit every year.	Partially implemented	NO	None

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Mongolia	YES	Inspectors	The verification period is 1 year	±0.3%	YES According to the Law of Mongolia on metrology, traceability is managed by the metrology institute department	Not implemented yet	YES	Need funding and infrastructure, Need calibration facilities, Lack of qualified human resources.
New Zealand	YES	Inspectors	One year	MPE is related to the Class of Instruments used.	We have in place a National system according to OIML recommendations.	Fully implemented	YES	N/A
Peru (1)	N/A	N/A	N/A	N/A	N/A	N/A	The INACAL (NMI of Perú) carries out model approval for water, electricity and gas meters. Our plan is to add bulk flow meters to this list.	Need to make the government aware of the importance of regulating bulk flowmeters
Peru (2)	N/A	N/A	N/A	N/A	N/A	N/A	INACAL (NMI) is currently carrying out model approval for measuring instruments such as gas meters, water meters and electric energy meters. It has not yet included these systems on this list.	Industry institutions understand the importance of using a standard to ensure measurement accuracy and fair business transactions. Note: These measurement systems have not yet been adequately regulated by the competent institution in Peru, INACAL. Currently, the inspection institution is in charge of its regulation under aspects that at the moment we do not know.

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Singapore	YES	3 rd Party	12 months	As per either Class 0.3 or Class 0.5 meters of OIML R117	Under Singapore's Weights & Measures Act, bulk flow meters (e.g., volumetric and mass flow meters) must be pattern registered and verified by an Authorised Verifier (AVs) prior to using it for trade. The references and/ or working standards e.g., master meter, prover tanks, used by the AVs to verify the bulk flowmeters, must be periodically calibrated by ISO/IEC 17025 accredited laboratories	Partially implemented - verification is focused on the meter only; ancillary devices e.g., printing devices are not covered. For a certain category of flowmeters, there are also national standards to comply with with.	NO - Singapore does not conduct type approval but requires patterns of WM instruments that are for trade use to be registered. Registration is based on the instrument having a valid OIML Certificate of Conformity and relevant technical documentation, such as test/ evaluation reports indicating compliance/ tested to relevant OIML Recommendations.	N/A
Viet Nam	YES	Inspectors	5 years for portable water meter, 1 year for the fuel meter	MPE = ± 0.2 % for fuel meter with accuracy class 0.3 MPE = ± 0.3 % for fuel meter with accuracy class 0.5 MPE = ± 0.6 % for fuel meter with accuracy class 1	Flowmeter after passing the verification process is stamped, sealed and issued with a certificate	Partially implemented - In my country, bulk flowmeter is used for custody transfer must have the type approval certificate and must be verified initially, periodically and after repair	YES	My economy still lacks facilities, test equipment and staff trained to test the bulk flowmeter

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				MPE = $\pm 2\%$ (Q2 to Q4); $\pm 5\%$ (Q1 to Q2) for water meter accuracy class 2 MPE = $\pm 1\%$ (Q2 to Q4); $\pm 3\%$ (Q1 to Q2) for water meter accuracy class 1				
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Annex 4: Summary of Action Plans

	Name	Economy	Due Date	Activity	Who and how many people will be involved?
1	Heather Hamilton	Canada	March 31st, 2021	Sharing information: Internal presentation about course learning activities and competencies acquired	About 20 experts
			Apr-21	Form a Working Group to identify applicability to Canada’s existing requirements and knowledge transfer (training)	WG of 5 to 10 experts and inspectors
			September 2021	Integrate and Deploy training	+500 inspectors and Authorized Technicians
2	Chunhui Li	China	June 2021	Delivery a training course for the related field on the bulk flowmeters	The professional person, about 50 attendants.
3	Hao-Hsi Chang	Chinese Taipei	31 December 2021	Delivery a training course	About 40 attendees
4	Che-Wie Yeh	Chinese Taipei	1 December 2021	Discuss at a laboratory staff meeting	laboratory staff
5	Amartuvshin Batsuuri	Mongolia	(3-4) month	Provide a report	to the head of metrology
			(5-6) month	Provide a training course	Colleagues who perform verification from MASM headquarters and provincial branches. I expect that approximately 25 to 30 trainees will participate.

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			(8-12) month	Make amendments and improvements to the standard	Volume calibration laboratory.
6	Gantulga Banzragch	Mongolia	March 2021	Share experience with co-workers	30 verification officers
			June 2021	Start training verification of bulk flow metering system using a master meter	Qualified verification officers
			Oct.2021	Start training verification of bulk flow metering system using a master meter	Verification officers of the local area
7	Anna Maria Montanaro	New Zealand	July 2021	Cascade Training to TSO's and TA Tech's	12 colleagues
			July 2022	Increase surveillance programs	12 colleagues
10	Carlos Ochoa Michael Zavalaga Ruben Gil	Peru	May 2021	Review documents	3 people
			Sep-21	Write the draft of the standard	3 people
			January 2022	publication of the standard	3 people
11	Javier Chia	Singapore	31 Dec 2021	Ensuring AVs conduct verification as per OIML recommendation for bulk flowmeters	Officers directly involved in implementing metrological control of bulk flowmeters
			31 Dec 2021	Introduction to flowmeters for new onboarding officers	Officers directly involved in implementing metrological control of bulk flowmeters
12	Kalaiselvam Panesilvam	Singapore	31 Dec 2021	Ensuring AVs conduct verification as per OIML recommendation for bulk flowmeters	Officers directly involved in implementing metrological control of bulk flowmeters

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			31 Dec 2021	Develop an introduction to flowmeters for new officers	Officers directly involved in implementing metrological control of bulk flowmeters
13	Seesomphone Yoysaykham	Laos	2021	Prepare a manual for working instructions. Promote this to the involved companies	Our department and involved companies
			2022	Organize training for provincial inspectors	Division of Science and Technology all over the country
14	Nguyen Nguyen Khoa	Vietnam	Jun-21	Organize a discussion with my colleagues, then consider the suitability for our company and send feedback to the metrological Technology Department	My colleagues 4 people My manager, my director metrological technology department
15	Nauyen Ba Hung	Vietnam	June 2021	Train other staff to verify bulk flowmetering system	12 staffs in my laboratory