

MEDEA: Metrology – Enabling Developing Economies in Asia



REPORT FOR TRAINING COURSE ON Verification of Pattern Approval of Water Meters

Dates: 12-14 September 2017

Venue: NMIM and Nilai Springs Hotel, Sepang Malaysia

Host: National Metrology Institute of Malaysia (NMIM)

Trainers: Mrs Marian HAIRE, APLMF Secretariat

Mr Brad Craft, Australia, Veolia Australia and New Zealand

1. Objective of the Training

Accurate measurement in the marketplace is an important component of an economy's metrological system. APLMF has conducted training courses for the past 20 years to support the development of a sound measurement infrastructure that inspires confidence and trust within the region. This ensures both consumers and vendors are benefitting equally and promotes fairer trade with greater transparency, accuracy and long-term sustainability. Every economy has millions of water meters installed so it is essential the community has confidence in the system and ideally test procedures used should be harmonised within the region and based on OIML recommendations.

This course provides participants with the knowledge and skills to:

- identify the major components of a water meter testing system;

- analyse the economy's operating environment to determine how it could impact on the performance of a water meter;
- identify sources of any possible operational error; and
- pattern approve / verify a water meter in accordance with the test procedures and workplace health and safety guidelines.

2. Target Group

This program is designed for people who approve / verify domestic water meters for use in urban water systems or who have a responsibility for ensuring that these instruments are approved / verified in accordance with OIML recommendations. In addition to some training experience, all participants are expected to have practical experience in a laboratory used for the testing of water meters.

3. Description of the Training Course

This training is composed of lectures and practical activities. The lectures provided a basic understanding of the OIML R 49 test procedures required to pattern approve and verify water meters for use in urban systems. The practical component demonstrated the test procedures in a laboratory and explained how the calibration reference device is verified.

On Day 1 The training was opened by Dr Rahman of NMIM and Marian Haire welcomed participants on behalf of APLMF and PTB. Each economy delivered a short presentation outlining how they manage metrological control of water meters in their own economy. This allowed us to develop a summary of how these instruments are verified within the economies represented at the training. This Summary of Economy Reports is found in Annex 3 and identifies economies who are yet to include regulations for water meters in their economies. Very few of the economies attending have well developed systems at this stage.

To assist economies with the task of explaining the overall metrological control system for water meters, participants were shown a short presentation used to explain the system that is enforced within Australia. After this the difference between verification and pattern approval was explained in general terms. Samples of current meters used were examined to identify features and to become familiar with the markings that manufacturers are required to put on each meter. Further discussion involved conditions required to set up a test laboratory including safety considerations.

The welcome dinner was held on the lake at Putrajaya and was a very pleasant end to a day of hard work. We were joined by Dr Ahmad Fadzil Mohamad Hani, President and Chief Executive of SIRIM Berhad. He made a welcome speech on behalf of SIRIM and Mrs Marian Haire thanked everyone including PTB for making the dinner possible.

Day 2 focused on the the test procedures required to pattern approve water meters. Time was spent ensuring participants understood how to work out the flowrates and knew how many test runs were required. All tests set out in Table 6 of OIML R 49 were explained. After lunch the participants went to NMIM to observe a water meter test rig in use. They recorded test results and used them to to determine if the meters under test passed or failed. One meter out of 5 that were tested together was stuck which provided some excitement. There were debates about readings which showed the simple skill of reading a meter is not so simple. After all participants had completed the practical session, they were shown an actual 74 page, R49 Pattern Approval test report submitted to NMI Australia by Veolia. Bradley Craft had requested and received permission from the report owners to use this report for the OIML R49 training with the company, Fair Water Meters, in Australia stating they were happy to assist in this endeavour. Participants were grateful for this oppourtunity to see an actual report and also a little stunned at the detail of information involved. On route to NMIM we experienced a tropical thunderstorm where drivers showed us they could still drive with speed even though the roads were flooding. Luckily we avoided contact with other vehicles and we were all relieved when we arrived safely at our venue.

After dinner participants were offered a tour of KL with the opportunity to do some shopping. Participants appreciated the generosity of our host to give up even more of their own time to accommodate their guests.

Day 3 participants visited George Kent Ptd Ltd, a water metering manufacturer for a tour of their facilities. This was a very worthwhile experience as it showed how pattern approval and verification is carried out in a sophisticated automated laboratory. In addition to manufacturing water meters this company manufactures test rigs; either partially automated or fully automated. It was very impressive to see the degree of automation involved and how they were covering all OIML requirements. Company representatives sought opinions and clarifications from trainer Bradley Craft re aspects of how they actually perform R49 tests on their water meters. The company also designed and manufactured for themselves specialist equipment required for OIML R49 testing i.e. flow disturbance generators and orientation test pipework and frames.

The company offered to act as host for a further course on water meters in 2019 delivered in conjunction with NMIM trainers. This offer was made jointly by Hamdan Othman and Pan Lian Hong. Dr Rahman from NMIM agreed his staff would support this training.

When participants returned to the hotel they were each given a series of Test Questions (see Annex 4) to discuss and present their findings to the group. This provided further opportunity for participants to ask questions or to clarify issues. They also examined a summary of the test procedures for initial verification of domestic water meters. Some changes were made and a copy can be found in Annex 5. Finally participants shared their action plans which are shown at Annex 6.

Participants recognised they now had a better understanding of what was required to implement OIML R 49. They also recognised they would need further training. They suggested they return to their economies and raise awareness of what is required to manage water meters and to share their progress over time.

The farewell dinner was held at the Nilai Springs Hotel where the participants were staying. Certificates were handed out after dinner. We experienced beautiful food, good company, severe thunder storms and shared happy memories. There was a high level of excitement and camaraderie amongst the participants.

Delivery of this training was supported by SIRIM staff lead by ZAINAL HJ MUSTAPA, Senior Executive, Metrology Support & Advisory Group. The two Malaysian participants, Hafidzi Hamdan and Mohd Noor Mohd Ghafar were in fact co-trainers as they presented the practical at NMIM laboratories. The whole team did a fantastic job of ensuring every moment was planned and well prepared. They are to be congratulated for their efforts. Dr Rahman was quietly supervising everything knowing the team had everything covered.

4. Highlights/ Lessons Learned

The objectives on the training were met and the participants were very keen to learn as much as possible. They all expressed a willingness to go back to their economies and work within their constraints to improve systems for regulating water meters. At the start of the course they appeared to know very little but were bursting with confidence after 3 days.

Malaysia has a reasonable degree of competence in this area and would be able and willing to host another course. My recommendation is we plan to run this course again in Malaysia in 2019 as part of MEDEA 2.

Initially it appeared some of the participants might not have been the most suitable as they were either from an NMI or a standards organization. However, it became apparent they did have a responsibility for establishing a metrology framework for water meters within their economy so they will be able to use what they have learnt. They seemed to like the interactive approach. A survey was conducted to obtain feedback from participants see Annex 7 for full feedback. While participants agreed they learnt a lot they felt the course was too short. They would have liked more time spent on pattern approval and more time on practical especially gaining an understanding of how a test bench should work. They would have liked the trainer slides in the google drive in advance of the course. One participant wanted hard copy materials.

The group work was considered very helpful for ensuring they had the correct ideas. The following list covers the new knowledge participants said they gained from the course:

- Pattern approval testing and the certification system

- Calculating Q values
- Ability to review their current system and suggest improvements
- Ability to start the process of introducing regulation for water meters – in some cases will need to collaborate with water management agencies
- Test methods
- Understanding of how other economies manage water metering.

When participants return to their own economies they will compare existing practices, train others, improve their test benches or install a test rig for the first time.

Participants were very clear they will require further assistance. They are willing to implement their action plans but would like the opportunity to come together again to discuss their progress.

There was also a suggestion that MEDEA needs to offer a course on electrical safety and energy meter verification.

5. Next Steps/ Follow-up

- Follow up on action plans
- Include another course on Water Meters in MEDEA 2 where we discuss testing larger meters, design of test rigs, comparison of the handbooks they have created.

Annex 1: Workshop Program

Pattern Approval and the Verification of Water Meters

Program 12–14 September 2017

Tuesday 12 September

Venue: Nilai Springs Hotel

Time	Details	Presenter
08:30 – 09:00	Registration	Host
09:00 – 09:40	Welcoming address from the host economy Opening ceremony (APLMF Secretariat) Group photo	APLMF and Host
09:40 – 10:00	Introduction	APLMF and Host
10:00 – 10:45	Overview of the course Economy reports - explains how water meters are tested & verified	Marian Haire Trainees
10:45 – 11:15	Coffee Break	
11:15 – 12:30	Economy reports continue	Marian Haire Trainees
12:30 – 14:00	Lunch break	
14:00 – 15:30	Equipment required for testing Safety considerations, Visual inspection	Bradley Craft
15:30 – 16:00	Coffee break	
16:00 – 17:00	Test procedures for Pattern Approval and the Verification of Water Meters	Bradley Craft
18:00 – 20:00	Welcome dinner hosted by MEDEA	

Wednesday 13 September

Venue: Nilai Springs Hotel and NMIM

Time	Details	Presenter
9:00 – 10:30	Test procedures for Pattern Approval and the Verification of Water Meters	Bradley Craft
10:30 – 11:00	Coffee Break	
11:00 – 12:30	Test procedures for Pattern Approval and the Verification of Water Meters	Bradley Craft
12:30 – 14:00	Lunch + bus to NMIM	
14:00 – 15:30	Demonstration of test procedures and completion of test report	All trainers
15:30 – 16:00	Coffee Break	
16:00 – 17:00	Demonstration of test procedures and completion of test report	All trainers

Thursday 14 September Venue: George Kent Water Meter Factory

Time	Details	Presenter
9:00 – 9:30	Bus to venue	All trainees
9:30 – 10:30	Visit to George Kent Ptd Ltd to view their facilities	All trainees
10:30 – 11:00	Coffee Break	
11:00 – 12:30	Visit to George Kent Ptd Ltd to view their facilities	All trainers
12:30 – 14:00	Lunch	
14:00 – 15:30	Students answer test questions and present answers to group	All trainers
15:30 – 16:00	Coffee Break	
16:00 – 17:00	Action plans	All trainers

Annex 2: List of Participants

<u>Name</u>	<u>Economy</u>	<u>Institution</u>	<u>Department</u>
Mr. Wangda Jamtsho	Bhutan	Bhutan Standards Bureau	Metrology & Laboratory Service Division
Mr. Namkha Dorji	Bhutan	Bhutan Standards Bureau	Metrology & Laboratory Service Division
Dr. Mao Vann	Cambodia	National Metrology Center	In charge of issuing type approval and regulation development
Mr. Polineavith NGI	Cambodia	National Metrology Center	Industrial Metrology
Mr. Ilimo Tara Koro	Fiji	Ministry of Industry, Trade and Tourism	National Trade Measurement and Standards
Ms. Ajeshni Lata	Fiji	Ministry of Industry, Trade and Tourism	National Trade Measurement and Standards
Mr. Hafidzi Hamdan	Malaysia	NMIM	Flow metrology group
Mr. Mohd Noor Mohd Ghafar	Malaysia	NMIM	Flow metrology group
Ms. Amartuvshin Batsuuri	Mongolia	Mongolian Agency for Standard and Metrology	Department of Verification and Inspection for Measuring Instruments
Ms. Enkhmaa Damdinsuren	Mongolia	Mongolian Agency for Standard and Metrology	Department of Metrology Institute
Mr. Tint Win	Myanmar	Department of Research and Innovation, Ministry of Education	Metrology Division, National Standards and Quality Department/Senior Metrology Officer
Mr. Bhuwan Dawadi	Nepal	Nepal Bureau of Standard and Metrology, Regional Office Butwal	Legal Metrology/to verify and regulate weight and measure and weighing and measuring instruments used for trade
Mr. Roshan Gautam	Nepal	Nepal Bureau of Standard and Metrology, Regional Office Butwal	Legal Metrology/to verify and regulate weight and measure and weighing and measuring instruments used for trade
Mr. Sylvester Vovovon	PNG	National Institute of Standards and Industrial Technology	Metrology
Mr. Jeffrey Gabriel	PNG	National Institute of Standards and Industrial Technology	Senior Legal Metrologist

<u>Name</u>	<u>Economy</u>	<u>Institution</u>	<u>Department</u>
Ms. Loreibelle Abian	Philippines	Industrial Technology Development Institute	National Metrology Laboratory/Staff
Mrs. Khemsai Rahannok	Thailand	Bureau of Weights and Measures	Department of Internal Trade
Ms. Pisakorn Pisankul	Thailand	Central Bureau of Weights and Measures	Department of Internal Trade, Ministry of commerce
Mr. Furkat Kurbanov	Uzbekistan	Uzbek National Institute of Metrology State Enterprise of Uzstandard agency	Specialist of laboratroy for measuring pressure and flow
Mr. Sheroz Ismatullaev	Uzbekistan	State Enterprise "Uzbek National Institute of Metrology" of Uzstandard agency	"Uzbek National Institute of Metrology" State Enterprise of Uzstandard agency
Mr. Ha Thanh Thuc	Vietnam	Directorate for Standards, Metrology and Quality	Metrology
Mr. Nguyen Nhu Y	Vietnam	Quality Assurance and Testing Center 3	Volume and Flow Metrology Department

There were 14 observers which included representatives from water meter manufacturers in Malaysia.

Summary of Economy reports

MEDEA (Project APLMF1): Course on Pattern Approval and Verification of Water Meters

Selangor, Malaysia 12-14 September 2017

Economy	Legislation	SI	MPE used	Inspector of 3 rd pty	Verification periods	OIML compliant	Type approval	Issues	Other
Bhutan	no	yes	n/a	n/a	No	?	no	No Act , no PA, no local manufacturers, no regional offices	Water meters not verified at all
Cambodia	yes	yes	n/a	n/a	n/a	Yes*	yes	Lack of facilities, technical assistance, budget	*Work with STAMEQ Vietnam Have water meter test bench
Fiji	yes	yes	±5% domestic, 1% high flow	inspector	5y	yes	yes	More training More staff	Has high/low flow water meter testing beds
Malaysia	yes	yes	I±3%, ±1% II±5%, ±2%	both	7-9y	yes	yes	Lack awareness re legal metrology	Installed meters not approved
Mongolia	yes	yes	±5%, ±2%	3rd pty	2y company 5y home		yes	Training Technical for over 150mm Lack of budget	No magnetic protection currently use Qn, Qt, Qmin flows for testing
Myanmar	yes	yes	no	no	none	no	no	Need training Advice to make regulations	Moving towards ISO/IEC 17025 compliance
Nepal	no	yes	n/a	Gov agency	n/a	no	no	No initial or annual verification	Has Act & Rules, use India & PTB for

Summary of Economy reports

MEDEA (Project APLMF1): Course on Pattern Approval and Verification of Water Meters

Sepang, Malaysia 12-14 September 2017

Economy	Legislation	SI	MPE used	Inspector of 3 rd pty	Verification periods	OIML compliant	Type approval	Issues	Other
								performed	traceability of lab
PNG	no	yes	n/a	3rd pty	n/a	Not clear	no	Need regulation	Trying to move towards ISO/IEC 17025 compliance, Use NMI Australia for traceability
Philippines	yes	yes	±5%, ±2%	3rd pty	5-7y	yes	Use model approval not based on OIML	Upgrade facilities	Want to establish a national training centre
Thailand	yes	yes	±5%, ±2%	3 rd pty licence	5y	yes	no	Limit knowledge Limit knowledge, ISO/IEC 17025 certified under old edition	Want a training centre to ensure skills are maintained
Uzbekistan	yes	yes	±5%, ±2%	3rd pty	6y	yes	no	Ensure water meters conform to standards	Use ISO 4064
Vietnam	yes	yes	±5%, ±2%	3rd pty	5y	yes	yes	More training	Conducts training for verifiers

Annex 4 Test Questions

Group 1

You have the following information re a DN20 water meter supplied for Pattern Approval under OIML R49-2:2013 requirements,

$Q_3 = 4$

$Q_2 = 0.0256$

Find the meter Q_3 - Q_1 ratio and identify the six required flow rates to be used in the Determination of Intrinsic Errors (of indication) test procedures. Express required test flow rates in Litres per Hour and Litres per Minute.

Group 2

Assuming a batch sampling rate of 15% and utilizing the meter marking in the attached photo, identify the following,

All required tests for the Initial Verification of 2000 x complete water meters,

The size of the batch to be verified,

The maximum permissible error (MPE) for each test point.



Note: Initial Verification testing is to be performed as per OIML R49-2:2013 requirements

Group 3

Utilizing the meter marking in the attached photo, identify the following,

Meter Manufacturer, Date of Manufacture, Meter Serial Number, Meter Size (diameter), Meter Type, Meter Class, Value of Q3, Value of Q3- Q1 Ratio, Temperature Class, Maximum Permissible Pressure (MAP) and NMI Certificate of Approval Number



Once all items identified, verify that marks and inscriptions meet the requirements of OIML R49-1:2013

Annex 5 Summary of verification test procedures for domestic water meters

Test Name	Summary of Test Procedure
TEST SET-UP	Manufacturers verify all meters they manufacture. Imported meters are either individually tested or batch tested.
	Meters are pattern/type approved and are marked accordingly.
	Water meters of the same size and series can be tested in groups as long there is no significant interaction between the meters.
	Test meters in the same position indicated on its markings (V/H). If there are no markings test in the horizontal position.
	No supplementary device is attached to meters during testing unless they cannot be removed.
	All filtration systems on the test rig are clean, operational and maintained.
	Water temperature is maintained at 20°C ±10°C
	Influence factors – ranges are maintained Ambient temperature is between 15°C and 25°C. Ambient humidity is between 45% and 75%. Atmospheric pressure is between 86 kPa and 106 kPa. Outlet gauge pressure is between 0.03 MPa and 1 MPa Control excessive vibrations
	Batch Testing Batches comprise water meters of the same pattern, manufactured in the same location. Samples are selected at random using an acceptable batch sampling system such as that described the Australian Standard AS 1199.1.
	Determine flowrates used for testing Each meter is marked with flowrate Q_3 and a ratio. Use these values to calculate flow rates for Q_1 and Q_2 . $Q_1 = Q_3$ divided by the ratio $Q_2 = Q_1$ multiplied by 1.6 Meters are tested once at the following flowrates: <ul style="list-style-type: none"> • between Q_1 and 1.1 Q_1; • between Q_2 and 1.1 Q_2; • between 0.9 Q_3 and Q_3; • for combination meters, between 1.05 $Q \times 2$ and 1.15 $Q \times 2$ For value of Q see R49-2 Section 7.4.3.2
	Determine the minimum quantity of water required for testing Use a test volume appropriate to maintain the measurement uncertainty as quoted for the laboratory. Note: A spreadsheet can be generated that can be used before each test. Enter the resolution of the meter and the uncertainty of the laboratory to calculate the amount of water required for testing. Use a larger tank or run the system for longer to lowers the uncertainty value.

CONDITIONING THE SYSTEM	<p>Conduct a dummy run to remove air and to pressurise the system.</p> <p>Install the meters in the test rig either singly or in groups.</p> <p>Open the valve allowing water to flow through the meters.</p> <p>Ensure the pressure is constant and free of pulsations.</p> <p>Ensure the test rig is free of leaks.</p> <p>Ensure flow rate can be maintained at a constant value during each test.</p> <p>Ensure influence factors are within the permitted ranges.</p>								
STATIC PRESSURE	<p>The purpose of this test is to ensure each meter can meet the pressure requirement of 1.6 X MAP.</p> <p>Connect the meter to the test system.</p> <p>Open the valve and allow water to run through the meter.</p> <p>Bring the system up to the pressure required.</p> <p>Allow the system to run for 1 min monitoring the pressure gauge.</p> <p>Note: Test can be carried with for individual meters or groups of meters. This will depend on the quality of the test rig. If pressure cannot be maintained the problem could be in the rig.</p>								
ACCURACY	<p>Close the valve that controls water flow through the meters.</p> <p>Record the flowrates required for testing.</p> <p>Select the first flowrate Q_1.</p> <p>Record the reading initial reading on all meters (m^3).</p> <p>Open the valve to allow water to flow through the meters</p> <p>Run the required volume through the meters.</p> <p>Close the valve allowing water to flow through the meters.</p> <p>Record the final reading (m^3).</p> <p>For each meter subtract the initial reading from the final reading to determine the indicated volume V_i.</p> <p>Read the actual volume V_A from the calibrated reference device.</p> <p>Calculate the relative error using:</p> <p>$\{(V_i - V_A) \div V_A\} \times 100$</p> <p>The errors shall not exceed the MPEs given in Table 1.</p> <p>Table 1. MPEs for water meters</p> <table><tr><th rowspan="2">Accuracy class</th><th colspan="2">Flow rate range</th></tr><tr><th>$Q_1 \leq Q < Q_2$</th><th>$Q_2 \leq Q \leq Q_4$</th></tr><tr><td>Class 2</td><td>$\pm 5\%$</td><td>$\pm 2\%$</td></tr></table> <p>If all the errors have the same sign, at least one of the errors shall not exceed one half of the MPE.</p> <p>Repeat this procedure for each flowrate required.</p> <p>Note: A batch is verified when all samples tested meet the acceptance criteria within the sample plan.</p> <p>Apply the verification mark to meters that meet these requirements.</p>	Accuracy class	Flow rate range		$Q_1 \leq Q < Q_2$	$Q_2 \leq Q \leq Q_4$	Class 2	$\pm 5\%$	$\pm 2\%$
Accuracy class	Flow rate range								
	$Q_1 \leq Q < Q_2$	$Q_2 \leq Q \leq Q_4$							
Class 2	$\pm 5\%$	$\pm 2\%$							

Annex 6 Summary of Action Plans

Name	Economy	Action Plans
Mr. Jamtsho Wangda	Bhutan	Share documents with my manager so they can be implemented Purchase a master meter so we can start to verify other meters
Mr. Namkha Dorji	Bhutan	Support my colleague to implement the verification of water meters
Dr. Mao Vann	Cambodia	Develop technical documents and procedures for type approval. Start to implement equipment purchased through UNIDO support .
Mr. Polineavith NGI	Cambodia	Prepare documentation for pattern approval testing Implement pattern approval system
Mr. Ilimo Tara Koroi	Fiji	Review whether we issue pattern approval certificates ourselves or recognise other countries. Engage a trainer to provide more information for all laboratory staff. Start to use the test rig recently purchased using OIML R 49 requirements
Ms. Ajeshni Lata	Fiji	Engage a trainer to provide training for OIML R 49 documents in order to build our understanding. Review our certificate of approval to ensure they are up to date Develop Standard Operating Procedures for Pattern Approval and Verification of Water Meters.
Mr. Hafidzi Hamdan	Malaysia	Improve pattern approval procedures and guidelines Share new knowledge with others
Mr. Mohd Noor Mohd Ghafar	Malaysia	Discuss with SPAN, NWC and manufacture to determine appropriate interval for verifying Update procedure to be in line with R 49 2013 Meet with Metrology Corporation to share knowledge
Ms. Amartuvshin Batsuuri	Mongolia	Provide a report to my chairman Share information with colleagues Develop a new standard for implementation in 2018.
Ms. Enkhmaa Damdinsuren	Mongolia	Look at implementing OIML 49 and pass on knowledge to colleagues Update the protocol for type approval Share information with colleagues
Mr. Tint Win	Myanmar	Report to the Director General and meet with Water Distribution Authority. Prepare regulation to support metrology law. Discuss implementation with donor organisations
Mr. Bhuwan Dawadi	Nepal	Share knowledge with colleagues Start to develop pattern approval documentation so we can implement in the near future

Mr. Roshan Gautam	Nepal	Report to top manager how we can implement pattern approval Develop a new standard for water meters Introduce water metering in legal metrology Share all I have learnt with my colleagues
Mr. Sylvester Vovovon	PNG	Engage with other stakeholders (Water PNG and EDA RANU)
Mr. Jeffrey Gabriel	PNG	Improve test methods and encourage relevant agencies to implement OIML R 49 Engage with relevant agencies to harmonise test procedures compliant with OIML R 49
Ms. Loreibelle Abian	Philippines	Conduct an echo seminar to NML employees Meet with the concessionaires of water utilities to report on the outcome of the training Prepare a technical procedure on the verification of water meters
Ms. Khemsai Rahannok	Thailand	Share what I have learn with my section Propose a plan to my department to improve our equipment Contact NIMT and together set up lab for pattern approval
Ms. Pisakorn Pisankul	Thailand	Discuss the new knowledge with my colleagues Use the knowledge to improve our legislation and regulation.
Mr. Furkat Kurbanov	Uzbekistan	Work to bring all national standards for water meter up to the OIML 49 standard Develop technical procedures and methods
Mr. Sheroz Ismatullaev	Uzbekistan	Hold a seminar on OIML R 49 and seek to develop verification methods
Mr. Ha Thanh Thuc	Vietnam	Look into cost and processes of implementing OIML R 49 Update test methods
Mr. Nguyen Nhu Y	Vietnam	Share the documents with manager and colleagues Review existing procedures to ensure they comply with OIML R 24 : 2013 Improving testing bench system to increase effectiveness and accuracy of verification testing

Annex 7 Survey Results

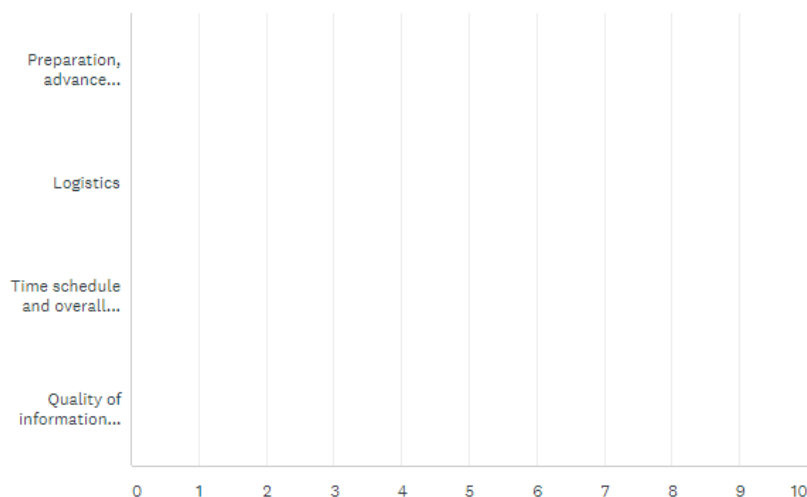
Q2

Customize

Export ▼

Organisation and logistics

Answered: 19 Skipped: 3



▼	1= PERFECT ▼	2= GOOD ▼	3=AVERAGE ▼	4=POOR ▼	TOTAL ▼	WEIGHTED AVERAGE ▼
▼ Preparation, advance information	57.89% 11	42.11% 8	0.00% 0	0.00% 0	19	0.00
▼ Logistics	52.63% 10	47.37% 9	0.00% 0	0.00% 0	19	0.00
▼ Time schedule and overall duration	31.58% 6	36.84% 7	31.58% 6	0.00% 0	19	0.00
▼ Quality of information material	36.84% 7	42.11% 8	21.05% 4	0.00% 0	19	0.00

[Comments \(8\)](#)

Comments:

1. All training materials I need a hard copy.
2. I think training should be 5 days
3. (skipped)
4. Timing was a problem.
5. This training is very important for most of the developing economies and as such the training would have been well accepted if there was sufficient time (2 days) for the pattern approval alone and another two days for verification of water meters. One day would have been for site visit (George Kent). However, the presentation was adequate given the fact that there was not enough time.
6. If possible 3 days training program could be extended up to 5 days training program in future
7. My suggestion If the training duration is minimum 5 days for this course.
8. Time to training is too short, it's not enough to know all subject. And we do not a chance to practice in all topic.

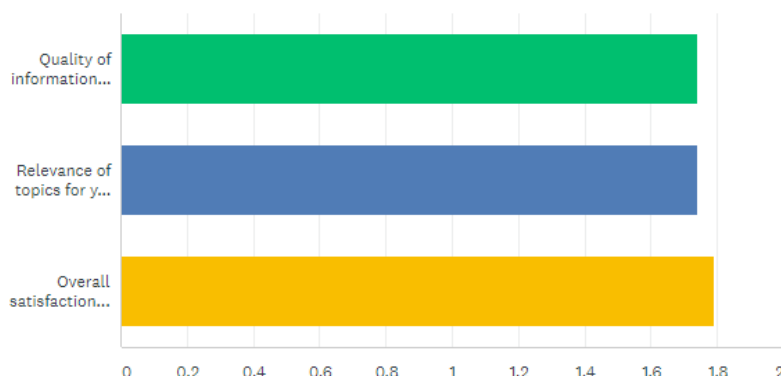
Q3

Customize

Export ▼

Program and Contents

Answered: 19 Skipped: 3



▼	1= PERFECT ▼	2= GOOD ▼	3= AVERAGE ▼	4= POOR ▼	TOTAL ▼	WEIGHTED AVERAGE ▼
▼ Quality of information material	31.58% 6	63.16% 12	5.26% 1	0.00% 0	19	1.74
▼ Relevance of topics for your work	42.11% 8	42.11% 8	15.79% 3	0.00% 0	19	1.74
▼ Overall satisfaction of your expectations	31.58% 6	57.89% 11	10.53% 2	0.00% 0	19	1.79

[Comments \(8\)](#)

Comments:

1. Group discussion and interaction helps us in understanding the topics covered. Also lecturer availing himself to answer questions outside classroom is an added bonus.
2. Should include the electronics meter such as electromagnetic flowmeter information material. And how those bigger size meter will be verify.
3. More training should be provided on the OIIML R49 1,2,3 so that we will understand each clause of OIIML R49.
4. PNG NISIT should be working in collaboration with Water PNG for a better understanding of such a vital training.
5. No comments
6. Due to short period of time i.e. 3 days training, it was difficult for me to get full information on the course contents.
7. The documents of the course too much so if possible all of them should be in google drive.
8. The document for training is not in the google drive so we cannot follow all the topic.

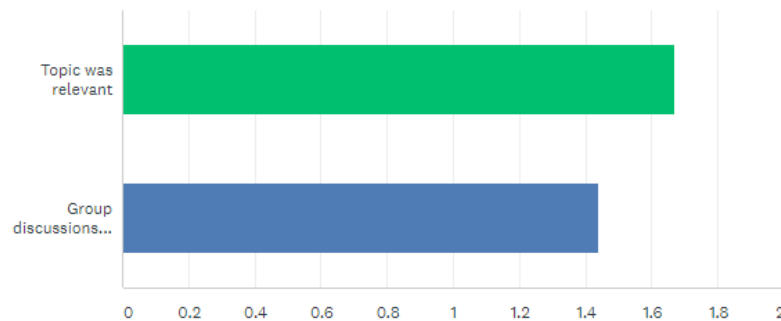
Q4

Customize

Export ▼

Group Work

Answered: 18 Skipped: 4



	1= PERFECT	2= GOOD	3= AVERAGE	4= POOR	(NO LABEL)	TOTAL	WEIGHTED AVERAGE
▼ Topic was relevant Comments (6)	33.33% 6	66.67% 12	0.00% 0	0.00% 0	0.00% 0	18	1.67
▼ Group discussions were helpful to gain a better understanding of the topic Comments (5)	55.56% 10	44.44% 8	0.00% 0	0.00% 0	0.00% 0	18	1.44

Comments: Topic was relevant:

1. Really helpful
2. Needed more time on practical.
3. Practical activity was incomplete, otherwise all groups were actively participating.
4. Sharing the experiences among the group members was informative, when we work in group during training.
5. Excellent
6. Group work is helpful to share the knowledge.

Comments: Group discussions were helpful to gain a better understanding of the topic

1. Yes
2. More question should be given so that we can understand the OIML R49 properly.
3. No comment.
4. Yes, it was very helpful to me to know more on the course from the experiences members in my group.
5. All the group members are helpful and good adviser to me

What new skills or knowledge have you gained? Was this workshop useful for you and why? How will the information gained during the workshop help you in your work? Please describe as precisely as possible

Comments:

1. For the first time, I gained new knowledge about pattern approval and verification of water meters. This training program is very important for improving my understanding to develop my organization of NMC. All information obtained during the workshop can help me in my work as a reference for technical documentation for the process of research and preparation to draft a certification scheme for pattern approval.
2. Information gained was really helpful. Calculation of Q1, Q2 and Q4 using R49 and working out MPE points .
3. Currently already done the pattern approval of water meter, I will review our procedure on current pattern approval and verification and discuss with my superior to implement edition 2013 OIML R49.
4. Give me updated new version of OIML R49, and gained to verification and calibration for water meter. Review and repair verification procedure.
5. Manage to understand importance of OIML Recommendation. Yes, I manage to identify where our Department is lacking in verification of water meters. This information was gained through training on OIML Recommendations.
6. I learned about overall pattern approvals and test parameters specifically on water flow meters. This workshop becomes helpful in the way that I got to know about water metering condition in different economy and in Malaysia. By visiting Laboratory of NMIM and George Kent and verification process on George Kent built confidence in me. Currently in my economy, water meter are not being verified while importing (no manufacturer in my economy). After this training I can help my organisation to start verification of water meters, initial verification, at least. And could control import of water meters some what.
7. I learned about pattern approval and verification of water meter. Currently another government organization is responsible for water distribution and water meter related work. In near future we may set up the equipment and can start verification.
8. Knowledge of pattern approval of water meters was vital for a developing economy like PNG and we need to collaborate with Water PNG to see the outcome of this useful training.
9. identify flow rate and type approval, verification of water meter
10. I have learned that mutual cooperation among the NMI and the different institutions (industrial sector & government agencies) should exist like I have observed in Malaysia. That relationship have helped a lot in realizing the projects and programs of the NMI. Also, my understanding in type approval according to OIML R49 widens especially in determining the flow rates to be used in the tests. The learning I have obtained out from this training will be utilized in the current project of our laboratory (Volume & Flow Laboratory) in which we will consolidate the training modules in a handbook as a guide to the private and government-owned calibration laboratories that conduct water meter verification.
11. I have got to read the meter and identify all the specifications on the meter. Really enjoyed calculating flow rates.
12. The new skills gained were types of test method, yes it was very useful as we are not doing it at present and the information gained will be helped for implementation of verification of water meters
13. Understanding of how different economies approach legal trade measurements in relation to utility water meters. Practical demonstration at NMIM and visit to George Kent facility helped reinforce training materials to participants and enabled discussions & interactions between participants to grow
14. The new skill I have gained from this training was as follows: 1. How to do the pattern verification of water meters label by the manufacturers. 2. How to find the 6 test procedure of flowrate. Workshop was useful to me because we don't have any pattern approval

- system and verification of water meters in our economy. The information that I got from this workshop will help me to plan and take next further step to implement the system in our economy.
15. The new skill I have gained are very important for me and I will introduce this procedure in my home country
 16. How to pattern approval and the verification of water meter using OIML R49. - Compare between method verification using OIML R49 and ĐLVN 251:2015
 17. The new knowledge is about pattern approval system and useful for to start the system in my country.
 18. The pattern approval system is the new thing for us so we get more information and method about that to helpful us improve our skill.

How will the gained knowledge be used in your institution? How will the gained expertise contribute to your plans of developing the metrological services in your country? Please describe as precisely as possible

Comments:

1. Make sure that standard operating procedures of our Department is in line with the requirements stipulated under OIML /NMI R49 requirements
2. Need another session or further training within NMI and government authorities for verifying water meter practice and harmonised legal metrology in Asia Pacific region on OIMLR49.
3. Improvement test bench system
4. Using this knowledge I will be assisting the metrology department to engage trainers to provide training on OIML R49 to build their understanding the OIML R49.
5. Gained knowledge will be used to install and initiate test rig, develop a standard. It will also help to control water meter which are being imported from some foreign manufacturer.
6. I can help my organization to start verification of water meters by sharing my gained knowledge with my colleagues.
7. We will need to collaboratively work hand in hand with Water PNG and even the government to fully develop the metrological services in the country for water meters.
8. The knowledge I have obtained will be used in the current project of our laboratory in which we will consolidate all the information from the training modules into a handbook that will be used as a guide for the verification of water meters as we aim to establish a harmonized verification system in the country. The gained expertise will be employed in carrying out the provisions of the currently amended National Metrology Act in which the type approval of measuring instruments shall be done by the National Measurement Institute.
9. Guide to our regulation of verification of water meter.
10. I will talk with my superior to have collaborations with relevant agencies to see if we have been OIML compliant.
11. We will share the training documents to all the staff and head of management for the compliance
12. Help develop new training materials for OIML R49 series and grow discussions with NMI Australia
13. Organize other training course on the verification of water meter in our country
14. The gained knowledge will be implemented and the expert contributed will be fair and justice to all customers
15. Gave the idea to set up the pattern approval system in my country.
16. We have the plan to set up the pattern approval system so the knowledge that we get from this course will be advantage.

Are any follow-up measures after the training planned or needed to support and ensure that the training content is used and implemented at your institution? Please describe as precisely as possible

Comments:

1. We need assistance of an experienced expert to train the team at home on OIML R49 recommendation and to assist us in deciding what is in the OIML R49 recommendations that we need to follow and what is what we can change to best suit our country
2. Need more information to verify big size of meter and calibration procedure
3. Assistance in giving training in our own country to set up the water meter lab for verification.
4. Assistance in developing standards and certification schemes. Assistance in design and requirement of test rig in relevant economy. Help in developing technical expertise by conducting workshop and training in relevant country.
5. We will submit a report to Management with the recommendation and once the recommendation is approved by management then we will be implement the recommendation.
6. Definitely, action plan will be implemented.
7. Yes, a follow-up will help. It can be done by requiring us to provide you a copy of the handbook we are planning to make. Thank you in advance.
8. Yes, I got very useful and valuable information and knowledge for our economy
9. Yes, we will very much require more expert advice and training to implement OIML R49.
10. Yes, follow-up training for every year as we are starting from the scratch and the implementation follow up on email after every 6 months
11. Follow up discussions/training with individual participant groups in own economy seen as way to keep program moving forward. Discussions on accepting Issuing Authority Type Approval certificates in own economy should be explored
12. Training documents will be submitted to the head of the management for implementation and review of the support if needed. My suggestion for the future training to be conduct by MEDEA project on following field: 1. Electrical safety laboratory. 2. Energy meter verification training on power consumption in our economy.
13. In next year, we organize at least training course on the verification of water meter
14. Training documents will be submitted to the head of the management for implementation and review
15. Shall follow the action plan.
16. We will run the action plan.

Please tick one box below to rate the training on an overall basis

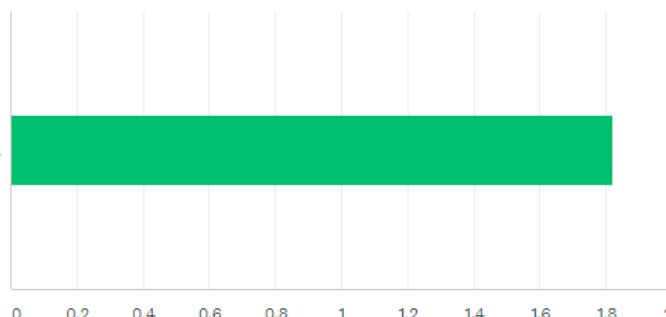
Q8

Customize

Export ▼

Please tick one box below to rate the training on an overall basis.

Answered: 17 Skipped: 5



	1= PERFECT	2= GOOD	3= AVERAGE	4= POOR	TOTAL	WEIGHTED AVERAGE
.	23.53% 4	70.59% 12	5.88% 1	0.00% 0	17	1.82

Comments (6)

Comments:

1. Just the duration of the workshop. We were doing a lot of travelling in this training within a short period of time and it was a bit tiring.
2. Should make more training on this verifying water meter
3. Need more training on water meters.
4. The training was very new subject to me and I learnt a lot from the experience and knowledgeable master trainers from Australia and from the host country.
5. Trainers are well experience and knowledgeable

What was the most effective part of the training? Please describe as precisely as possible

Comments:

1. Interactive session between the participating countries
2. Pattern approval documentation
3. Explain about verification procedure
4. Lab visit, class discussion work, manufacturing industry visit, trainer presentation
5. The most effective part was that question were given which makes us understand on the verification of water meters.
6. Practical part at NMIM and the visit to George Kent.

How could the training course be improved? Please describe as precisely as possible

Comments:

1. Extend training to 5 days and let participants do a complete session in a test bench. Full procedure test for water meter verification and later the full procedure for issuing Pattern Approval.
2. Make more day and practical session

3. No ideas
4. By increasing duration of workshop.
5. More question should be given while the training, this will make us understand the concepts more.

Annex 8 Photographs



