

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



Dates: 15 – 18 October 2019

Venue: Nilai Springs Hotel and NMIM, Sepang, Malaysia

Host: National Metrology Institute of Malaysia (NMIM)

Trainers: Dr Abdul Rahman Mohamed

Mr Mohd Noor Mohd Ghafar

Mr Hafidzi Hamdan

APLMF Rep: Mrs Marian HAIRE

1. Objective of the Training

This program was designed for authority personnel who approve / verify water meters for use in urban water systems or have responsibility to ensure that these instruments are pattern approved / verified in accordance with OIML recommendations. In addition, participants were expected to have prior hands-on practical experience in a laboratory. This training was composed of lectures and practical activities. The

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lectures covered the basic understanding of the test procedures required to pattern approve and verify water meters for use in urban systems as per OIML R49. The practical component demonstrated the test procedures used and explained how the reference standard is verified.

This course provided participants with the knowledges and skills to:

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

2. Target Group

This training course was designed for personnel with responsibility to develop an appropriate metrological infrastructure for testing of water meters in their own economies. Participants are expected to train others when they return to their own economy.

3. Training Course Programme

The course programme is found in Annex 1

Day 1 Dr Osman Zakaria, Senior Director of the National Measurement Institute of Malaysia (NMIM) opened the training course and welcomed all participants to Malaysia. He also thanked the MEDEA project and the German government for their ongoing support of developing economies within Asia. Marian Haire, APLMF Training Coordinator then welcomed all on behalf of APLMF and encouraged participants to ask lots of questions during the 4-day training course.

The ice breaker activity allowed participants to meet each other and to introduce all participants in a fun and lively manner. Then Dr Rahman presented the course outline and then provided a comprehensive history of water meters. He also showed us the different varieties of water meters that are available for use within communities.

Dinner on day 1 was held in the wonderful Songket Restaurant in Kuala Lumpur where they served very tasty traditional food and, also provided us with cultural dancing as entertainment. Included in the trip was a stopover to take photos of the twin towers. We also experienced KLs weather in all its excitement as a heavy downpour of rain came out of nowhere suddenly but it dried up just as quickly when we needed to leave the bus.

Day 2 started with Mohd Noor explaining how to work out the calculations required to test water meters. Participants were divided up into 3 groups in preparation for the practical sessions held in the afternoon. After lunch the groups went to NMIM to see

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the water meters being tested and to collect results they could then analyse to determine if the water meters were suitable for verification. Each group was given a different water meter and asked to determine how they would go about carrying out pattern approval testing and verification. This focused the groups' attention and all participants worked hard together to come up with a solution they would need to present to the rest of the participants on the last morning of the course.

Each group also spent time in the laboratory going through the tests required to pattern approve water meters in a test rig. This was a very comprehensive demonstration and generated lots of questions from the participants. Doing this in small groups made this a very successful activity.

The quality of the slides presented and the level of interaction amongst participants was very pleasing. All appeared to be engaged and were working through problems and questions asking appropriate questions when required. Dinner was served at the Nilai Springs Hotel. After dinner participants were taken to a nearby shopping Mall.

Day 3 The bus collected us at 9 am to head off to the Delta Perdana Sdn Bhd water meter factory. The General Manager Mr Sofian Selleh met us when we arrived. We were shown how this manufacturer assembles and verifies water meters that are then installed by water authorities. Again, the participants were keen to know everything possible and took lots of photos. We traveled to a local restaurant for lunch and then returned to the hotel.

After lunch we returned to the hotel where the participants shared their action plans which are displayed in Annex 4. They were also asked to complete their feedback using survey monkey. They then worked together in the groups polishing off their presentations for Friday morning. The farewell dinner was held at the Nilai Springs hotel and attended by Dr Osman Zakaria.

Day 4 Dr Rahman presented a solution to explain how to calculate the Minimum test quantity of water required for your particular test rig. He agreed to upload these new slides to the Google Drive. This was followed by Hafidzi discussing the results gathered by the participants during the practical session at NMIM. Then it was the turn of the 3 groups to present their solution explaining how they would pattern approve the meter they were given on Wednesday.

At the end of the session Marian discussed the evaluation results. Most comments were very positive and generally participants felt the training had been very useful. The overall score out of 5 for the training was 4.52. The trainers need to be congratulated for such a great result.

All the training materials and group presentations are stored on the APLMF website.

4. Highlights/ Lessons Learned

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The objectives of the course were met as most participants now feel they are in a better position to support the work of implementing water meter regulation in their economies. In future we need to be more specific regarding the criteria required for participants to attend this type of technical course as we had some participants who had no technical background. This may be difficult as it's not always easy to determine what the minimum requirement for a participant. However, some level of technical expertise related to the topic is an important prerequisite. For this course we had participants with a range of experience in implementing OIML R 49, some who are already implementing to some degree and a smaller number who are fully implementing OIML R49. For the most part they were the right target audience for this course.

The feedback from the participants showed they were very satisfied with the logistics and the group work. What they found most useful was the practical sessions and the visit to the factory. They also enjoyed the discussion and the calculations.

Areas for improvement were few but it was mentioned that trainers need to speak more slowly, and they also need to check in with participants to ensure they are following. Something more than asking: are there any questions? They would have liked more time overall for the training course and more time for the practical sessions. They felt they were a bit rushed. They also commented on the materials not being available 1 week before the course.

The participants were all very keen and engaged during the course – see photographs in Annex 5. Their presentations on Friday were of a very high standard and showed they had worked well within their groups and were capable of preparing a structured presentation within a short period of time. By working within their groups, they had the opportunity to share ideas and to make new friendships. This will allow them to be able to interact in future through email and hopefully they can contact each other to ask further questions and share experiences.

While most of the participants were suitable for this training course the MEDEA Coordination Committee and trainers need to consider how to develop stricter criteria to differentiate, between participants when checking their eligibility and suitability for a particular course.

5. Next Steps/ Follow-up

Participants will return to their economies and implement their action plans. The APLMF Secretariat will follow up after 6 months to find out what progress they have made.

Malaysia now has a training program for water meters so they should advertise this program and deliver it as a regional resource.



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Annex 1: Course Programme

Tuesday 15 October 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) | APLMF and Host |
| 09:40 – 10:00 | Introduction | APLMF and Host |
| 10:00 – 10:30 | Overview of the course Economy reports - explains how water meters are tested & verified Group photo taking | Marian Haire All trainees |
| 10:30 – 11:00 | Coffee Break | |
| 11:00 – 12:30 | <ul style="list-style-type: none"> • Course outline • History of Water Meters • Types and uses of Water Meters • Selection and installation of Water Meters • Calibration of Water Meters | Dr Abdul Rahman |
| 12:30 – 14:00 | Lunch break | |
| 14:00 – 15:30 | Pattern approval and verification of Water Meters OIML R49 - 1 and International Standards | Dr Abdul Rahman |
| 15:30 – 16:00 | Coffee break | |
| 16:00 – 17:00 | OIML R49 - 2 & 3 | Dr Abdul Rahman |
| 18:00 – 20:00 | Welcome dinner hosted by MEDEA | |

Wednesday 16 October Venue: Nilai Springs Hotel and NMIM

| Time | Details | Presenter |
|--------------|---|-------------------|
| 9:00 – 10:30 | Test procedures for Pattern Approval and the Verification of Water Meters <ul style="list-style-type: none"> • Sample of Water Meters by group | Mohd Noor/Hafidzi |

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|---------------|--|-------------------|
| | <ul style="list-style-type: none"> • Sample of Test Sheet | |
| 10:30 – 11:00 | Coffee Break | |
| 11:00 – 12:30 | *Demonstration data process (3 groups) | Mohd Noor/Hafidzi |
| 12:30 – 14:00 | Lunch + shuttle 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 Question and Answer session | All trainers |

**Demonstration: Accuracy Test performed by each group Demonstration of continuous and non-continuous performed by trainer*

Thursday 17 October Venue: Water Meter Factory visit

| Time | Details | Presenter |
|---------------|---|------------------------------|
| 9:00 – 9:30 | Bus to Water Meter Facility | All trainees |
| 9:30 – 12:30 | Visit to Water Meter Factory to view their facilities | All trainees |
| 12:30 – 14:00 | Lunch | |
| 14:00 – 15:30 | Action plans and feedback | Marian Haire All trainees |
| 15:30 – 16:00 | Coffee Break | |
| 16:00 – 17:00 | Trainees answer test questions and prepare group presentation for Friday am | All trainees |
| 18:00 – 20:00 | Outdoor Dinner - Nilai Spring Hotel | All trainees |

Friday 18 October Venue: Nilai Springs Hotel

| Time | Details | Presenter |
|---------------|----------------------------|--------------|
| 9:00 – 10:30 | Presentation by each group | All trainees |
| 10:30 – 11:00 | Coffee Break | |

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| 11:00 – 12:30 | Closing ceremony with bestowal of the certificates | All trainees |
| 12:30 – 14:00 | Lunch | |

Annex 2: List of Participants

| Pos | Title | Name | Economy | Institution |
|-----|-------|-------------------------------|-----------------|--|
| 1 | Mr | Tshewang Dhendup | Bhutan | Bhutan Standards Bureau |
| 2 | Mrs | Radhika Sanyasi | Bhutan | Bhutan Standards Bureau |
| 3 | Mr. | Kong Sok | Cambodia | National Metrology Center, Ministry of Industry and Handicraft |
| 4 | Mr. | Phirun Sorn | Cambodia | National Metrology Center, Ministry of Industry and Handicraft |
| 5 | Mr. | Longbo Ma | China, P.R. | Zhejiang Institute of Metrology |
| 6 | Ms | Chia Yi Chiang | Chinese-Taipei | Bureau of Standards, Metrology and Inspection |
| 7 | Mr | Yung-Ming Yang | Chinese-Taipei | Bureau of Standards, Metrology and Inspection |
| 8 | Mr | Purwanto Nugroho | Indonesia | Directorate of Metrology |
| 9 | Mr | Taufiqurrahman Kaenong | Indonesia | Directorate of Metrology |
| 10 | Mrs | Mamere Tekitau | Kiribati | Ministry of Commerce Industry and Cooperative |
| 11 | Mrs | Oerenga Takaria | Kiribati | Ministry of Commerce Industry and Cooperative |
| 12 | Mr. | Bounkone Yonglorxiong | Laos P.D.R. | Ministry of Science and Technology |
| 13 | Mr. | Seesomphone Yoysaykham | Laos P.D.R. | Ministry of Science and Technology |
| 14 | Mr. | Muhammad Afifuddin Ahmad Zaki | Malaysia | NMIM, SIRIM |
| 15 | Mr. | Mohd Faridzul Mohd Arif | Malaysia | NMIM, SIRIM |
| 16 | Mr | Gantulga Banzragch | Mongolia | Mongolian Agency for Standard and Metrology |
| 17 | Mrs | Bolortuya Batsukh | Mongolia | Mongolian Agency for Standard and Metrology |
| 18 | Mr | Jose Marco Latosa | Philippines | Industrial Technology Development Institute |
| 19 | Mr. | Humphrey Ricky Tautai | Solomon Islands | Trade and Measurement Unit |
| 20 | Mr. | John Wesley Dokama | Solomon Islands | Trade and Measurement Unit |

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|----|-----|--|-----------|--|
| 21 | Mr | Hewa Lunuwilage Indika Siri Sampath | Sri Lanka | National Measurement Laboratory |
| 22 | Mr | Vinayagamoorthy Vickneswaran | Sri Lanka | National Measurement Laboratory |
| 23 | Ms | Wipawee Namagorn | Thailand | Bureau of Weights and Measures |
| 24 | Mr. | Issara Rattanawai | Thailand | Bureau of Weights and Measures |
| 25 | Mr. | Ngoc Hai Nguyen | Vietnam | Vietnam Metrology Institute |
| 26 | Mr | Tien Dan Nguyen | Vietnam | Directorate for Standards, Metrology and Quality |

Annex 3: Summary of Economy Reports

| Summary of Economy reports 15–18 October 2019 at NMIM, S | | | | | | | |
|--|--|--|---|----------------------|---------------|--|---|
| Economy | Law | Who does verify | Verification period | MPEs | Type approval | Integrity | OIML R49 Implemented |
| Bhutan | No | Inspectors | Not yet implemented | Not yet | No | ? | Not implemented yet – Need to implement in the future. |
| Cambodia | Yes | Inspectors | 7 years | *see below | No | ? | Fully implemented |
| China | Yes | 3rd party | 6 year(s) | ±2% | Yes | | Fully implemented |
| Indonesia | Yes | Inspectors | 5 years | ±2% | Yes | | Partially implemented |
| Kiribati | Yes | Inspectors | Nil year(s) | Nil | No | ? | Not implemented yet |
| Laos | No | Inspectors | | | No | ? | Partially Implemented |
| Malaysia | Yes | 3rd party | 7 year(s) | ±2% & ±5% | Yes | | Fully implemented |
| Mongolia | Yes | Inspectors | 6 years | ±(2/5)% | | | Partially implemented |
| Philippines | No regulation. | None | Some water districts and water utility concessionaires recalibrate every 5 years. | ±5% and ±2% | No | The concessionaires calibrate meters before installation. They use Certificate of Approval from other developed economies. | Partially Implemented - Some of the water districts and water utility concessionaire only follow the MPE stated in ISO 4064. Other requirements are not being followed. |
| Solomon Islands | No metrological control of water meter in the regulation. Legislation allows the Minister to make regulations. | 3 rd party Industry | Most equipment is 1 year. Water meters 10 years is fine. | none. | No // Yes | Solomon Water (State Owned Enterprises – SOE) carry out the approval of water meters. | Water Meters are imported and tested by Solomon Water. Need capacity building or trainings and review of the current legislation – Weights & Measures Act. |
| Sri Lanka | Yes | Not implemented (Water Board installs meter nobody inspects) | N/A | N/A | No | As the NML we have authority to do pattern approval, but not yet implemented. | Not implemented yet |
| Taiwan | Yes | Inspectors | 8 years | ±2% | Yes | | Partially implemented |
| Thailand | Yes | Inspectors 3rd | Only verified before use or | MPEs follow OIML R49 | No | | Partially implemented. |

| | | party, Industry | trading. No verification periods | (R49-1:2013) | | | |
|---------|-----|----------------------|----------------------------------|--------------------|-----|--|---|
| Vietnam | Yes | Inspector s // Other | 3-5 years // 3 years | (1,3) % or (2,5) % | Yes | | Partially implemented// Fully Implemented |

*Cambodia reply to MPE's: **Accuracy class 1** temperature: 0.1 °C ~ 30 °C, MPE: when (Q2 ≤ Q ≤ Q4)±1%, when (Q1 ≤ Q ≤ Q2)±3% temperature: ≥30 °C, MPE: when (Q2 ≤ Q ≤ Q4)±2%, when (Q1 ≤ Q ≤ Q2)±3% **when Q3 ≥100 m3/h Accuracy class 2** temperature: 0.1 °C ~ 30 °C, MPE: when (Q2 ≤ Q ≤ Q4)±2%, when (Q1 ≤ Q ≤ Q2)±5% temperature: ≥30 °C, MPE: when (Q2 ≤ Q ≤ Q4)±3%, when (Q1 ≤ Q ≤ Q2)±5% **when Q3 ≤100 m3/h**

Annex 4: Summary of Action Plans

| Summary of Action Plans | | |
|---|--|---|
| MEDEA 2: Course on Pattern Approval & Verification of Water Meters 15-18 October 2019, Sepang | | |
| Economy | Participants | Action Plan |
| Bhutan | Mr Tshewang Dhendup Mrs Radhika Sanyasi | Survey high density areas of country to see how present. Establish a metrology lab |
| Cambodia | Mr Kong Sok Mr Phirun Sorn | Train 19 colleagues Develop an action plan to recertify the laboratory |
| China PR | Mr Longbo Ma | Train 50 persons about Pattern Approval based on Train provincial staff on verification of water meters Apply OIML R 49 and seek 3rd party accreditation |
| Chinese Taipei | Mrs Chia Yi Chiang Mr Yung-Ming Yang | Share information with 15 colleagues Make a recommendation to improve regulations Improve equipment in the laboratory to allow test meters |
| Indonesia | Mr Purwanto Nugroho Mr Taufiqurrahman Kaenong | Propose budget to obtain water chiller to perform testing and water overload test Upgrade test rig Pass information on to colleagues |
| Kiribati | Mrs Mamere Tekitau Mrs Oerenga Takaria | Share information with public utility Assess the legislation to see how they can include regulations Recommend Malaysia as a supplier of reliable water meters |
| Laos PDR | Mr Bounkone Yonglorxiong Mr Seesomphone Yoysaykham | Share knowledge with other officers Review knowledge of OIML R 49 Prepare regulation for control of water meters Establish water meter test lab Train officers in the provinces |
| Malaysia | Mr Muhammad Afifuddin Ahmad Zaki Mr Mohd Faridzul Mohd Arif | Upgrade test rig so they can test electronic/hitec |

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|-----------------|--|---|
| Mongolia | Mr Gantulga Banzragch Mrs Bolortuya Batsukh | Share information with colleagues Deliver training to 20 local area branches Update the national standards |
| Philippines | Mr Joe Marco Latosa | Develop a training module for verification officers Share this module with others on the course Deliver training to colleagues and 3rd party verifiers Deliver training to 3rd party officers who verify weights |
| Solomon Islands | Mr Humphrey Ricky Tautai Mr John Wesley Dokama | Deliver 1-day training to colleagues Meet with the water authority board Review Weights and Measures Act to see how current regulations |
| Sri Lanka | Mr Hewa Lunuwilage Indika Siri Sampath Mr Vinayagamoorthy Vickneswaran | Train 25 legal metrology officers on OIML R49 Review legislation to see how accuracy of water meters Modify current facilities to improve the test rig |
| Thailand | Ms Wipawee Namagorn Mr Issara Rattanawai | Share knowledge with colleagues Establish a Pattern Approval test rig |
| Vietnam | Mr Ngoc Hai Nguyen, Mr Tien Dan Nguyen | Review current regulations Share information with colleagues Review and update technical documents used to |

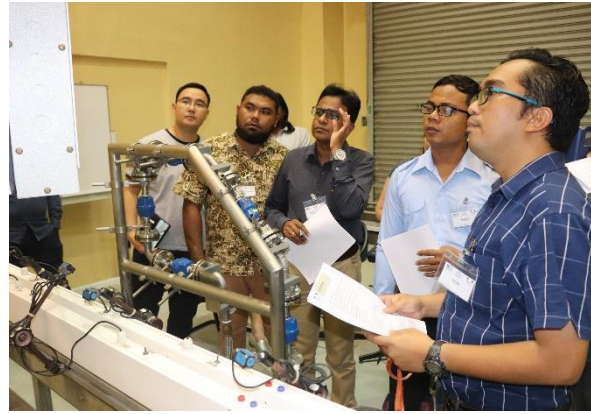


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Annex 5 Photographs



Opening ceremony: Marian Haire and Dr Osman Zakaria



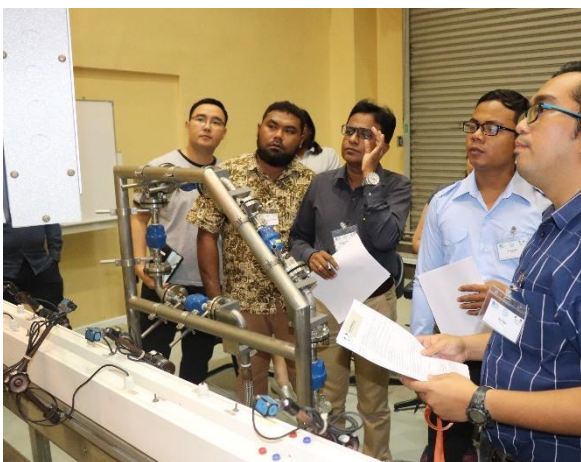
During the practical at NMIM



During practical at NMIM



Assembling meters at the factory



During practical at NMIM





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Talk at factory



Group presentation



Group photo at factory visit