SADCWaterLab Newsletter

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SADCWaterLab Association

Introduction

The Southern African Development Community (SADC) Cooperation in Measurement Traceability (SADCMET) established the SADC Association of Water Testing Laboratories known as SADCWaterLab as a union of the water testing laboratories to carry out a water proficiency testing scheme and to facilitate collaboration among the participating laboratories. To date over 100 water testing laboratories from SADC and other African countries participate in the scheme which aims to ensure that the water used in the region is within acceptable chemical and microbiology limits and thus safe for human consumption. The Association was initiated in Dar es Salaam, Tanzania in November 2005 with the following objectives:

- To facilitate technical cooperation and collaboration amongst regional labs involved in water testing
- To provide an organized interface at the regional level between these labs and other SQAM structures involved in conformity assessment issues
- To develop and harmonize measurement, test and analytical methods
- To cooperate in capacity building
- To promote laboratory accreditation
- To organise PT schemes
- To promote system management and quality assurance in laboratories
- To identify areas of priority for development of technical cooperation in the areas of testing, measurement and analysis
- To establish a forum for exchange of information
- To cooperate on the training of staff
- To cooperate on the development and interpretation of test methods especially those relevant to regional technical regulations
- To cooperate between laboratories s and accreditation bodies on matters of common interest relating to accreditation
- To mobilise resources for laboratory improvement

SADCWaterLab membership is in two categories

- Ordinary members: Labs & Lab Associations in SADC countries involved in water testing and analyses
- Associate members: Labs and Lab Association in non-SADC countries involved in water testing and analyses
- Individuals and any organisations having an interest in water testing
- Membership fees (currently free)

SADCWaterLab Structure

- General Assembly consists of all members and meets once per year
- Project Management Committee (PMC) monitors the association's programmes
- The Chair and PMC members are nominated by the General Assembly every three years.
- Secretariat is hosted at the SADCMET

SADCWaterLab TRAINING OF TRAINERS PROGRAMME, 9 TO 13 AUGUST 2010, LIVINGSTONE ZAMBIA

With financial assistance from PTB, SADCWaterLab Association organized and conducted a “Training of Trainers on Quality Assurance in Analytical Chemistry” (ToT) held in Livingstone, Zambia under the frame-work of SADCMET with the aim to enable participants to conduct national workshops on this topic in their respective countries.

During the last years’ PT scheme and activities in SADCWaterLab it became clear that there is a strong need to offer workshops on quality assurance in analytical chemistry on a national basis in the participating SADC and EAC countries since the previous training activities in conjunction with the established Water PT scheme did only reach a very limited number of laboratories. So the idea came up to train two people from each country to enable them to conduct similar workshops and disseminate the knowledge and raise awareness of the importance of quality assurance amongst local laboratories in their countries.

Twenty eight participants from 14 countries were selected and participated in the one week course which was structured in two parts: the first two days training was given on presentation skills to give participants the skills and more confidence to present a topic in front of an audience and the second part, scheduled for three days, on the technical topics such as quality assurance, method validation, measurement uncertainty etc which were presented by the participants themselves. The general consensus from the participants was that this workshop was a huge success and would have a real impact on creating the awareness of the importance of quality assurance in the laboratories.

On their return to their countries, participants have started preparations for conducting such national workshops. Preliminary outcomes include two workshops that have already been organized and held in Kenya and Tanzania in November and December 2010 respectively. The national workshops are also supported by PTB which provides some funding assistance for the venue costs and other logistical arrangements. The ToT trainers are encouraged to organize these national workshops and approach PTB for some funding assistance.

In order to assist presenters, it was agreed to establish a database listing all the ToT trainers, so that a single trainer would not necessary be responsible for hosting a complete workshop. It was recommended that other experts from within the region who could also be used in these workshops be added to this database. The database will be made available on the SADCMET website on www.sadcmet.org

Prepared by Donald Masuku, SADCMET Regional Coordinator

SADCWaterLab - EVALUATION WORKSHOP

1 - 4 NOV 2010, WINDHOEK, NAMIBIA

With assistance from PTB, the SADCWaterLab Association runs the SADC Water PT Scheme since 2004, distributing samples once a year. Following compilation of the results, PTB then sponsors a workshop where results can be discussed and training on relevant subjects be provided.

In 2010 the evaluation workshop was held in Windhoek, Namibia from 1-4 November 2010 to evaluate the results of the 7th PT round for the Chemistry group and the 3rd PT round for the Microbiology group.

The PT providers for the scheme are NamWater from Namibia for the Chemistry PT and Uganda National Bureau of Standards for the Microbiology PT. Participants included laboratories from Namibia, Zimbabwe, Uganda, Botswana, Swaziland, Madagascar, Zambia, Malawi, Tanzania, Kenya, Mauritius, Ethiopia, Burundi, Rwanda, Seychelles, Lesotho, Ghana and Democratic Republic of Congo.

A record number of laboratories registered for each scheme, 70 for Chemistry and 33 for Microbiology which included laboratories from Burundi Rwanda, DR Congo and Ghana participating for the first time. Fifty-nine laboratories reported results in Chemistry while in Microbiology all laboratories reported results. Due to the large spread of results in Microbiology it was however not possible to come up with a consensus value. It was decided that the next microbiology PT round will have to be based on reference values and therefore a number of laboratories from Germany and Rand Water in South Africa will be approached to serve as expert laboratories to provide the required reference values.

In Chemistry, NMISA provides reference values to check the plausibility of the assigned values derived from the formulation of the samples. This has generally helped improve the results of many laboratories. However it remains a source of concern that the results of certain laboratories are consistently not satisfactory or getting worse. To facilitate the organization of the PT rounds Local Coordinators have been installed in each participating country. During the workshop, the Local Coordinators reported on their activities to promote the scheme at a national level.

Two PT leaflet designed by NMISA on “Benefits of participating in a PT scheme” and “How to ensure high quality analytical results” especially targeted to create awareness of the importance of the PT scheme among the decision makers are widely used. This has helped expand the PT scheme and in some sense is already reflected in the participants in this PT round, with laboratories from Ghana, Burundi, Rwanda and DR Congo also participating.

During the last day of the workshop training was provided to the participants on method validation using ISO/TR 13843: 2000 Water Quality – Guidance on validation of methods for the Microbiology group and on Uncertainty of Measurement for the Chemistry group.

The measurement uncertainty course gave a short overview of the statistics required during uncertainty estimation, followed by a quick overview of the GUM-approach and focussed on the approach recommended in the NORDTEST guide (TEC 537) which will also be incorporated into a new ISO standard for water laboratories (ISO 11352, due for publication in 2011). Feedback from participants was very positive, with statements generally indicating that laboratories would be able to go and implement the proposed approaches.

The SADCWaterLab Association had its General Assembly meeting during the workshop. This association is the responsible body for the PT scheme and an opportunity for collaboration and information exchange between its members.

One of the main decisions that was made during the General Assembly was regarding the sponsorship for participation at the Annual PT evaluation workshops. Delegates resolved that from 2012 participation at the Evaluation workshops for the Chemistry PT will no longer be fully sponsored.

Chemistry participants wanting to attend the evaluation workshops will be required to be assisted by their organizations to pay for their own air tickets and PTB will only cover the costs for accommodation and subsistence allowance. Microbiology participants will however still be fully sponsored.

Prepared by Donald Masuku, SADCMET Regional Coordinator

REPORT ON 7TH PT ROUND ON CHEMISTRY ANALYSIS

Introduction

This short report summarizes the outcome of the above mentioned evaluation workshop for the 7th PT round on Chemical Analyses.

It will be provided to all participants of the PT round to facilitate corrective actions and improvement in the laboratories. A detailed report will be published on http://www.sadmet.org.

Report of the local coordinators

To facilitate the organisation of the PT rounds and to reduce shipment costs local coordinators (LC) for each country have been installed. The list of local coordinators is available form www.sadcmet.org. During the workshop the local coordinators were requested to give a short report on their activities. The local coordinators reported on their activities to promote the PT scheme on a national level using national meetings and contacts via phone, fax, e-mail, letters and direct communication. The PT leaflet was widely used. It was reported that in many cases there was interest among the laboratory people, but nevertheless this was not followed by participation due to lack of awareness of the importance of PT among the decision makers. For this purpose following the last workshop in 2009 a leaflet was published by SADCWaterLab with the title "How to ensure high quality analytical results", especially targeted to decision makers. This leaflet is available from www.sadcmet.org. No customs problems were encountered this year.

Report of the PT provider

The PT round was provided by NamWater in the same way as in the years before, financially assisted by PTB Germany and directed by SADCWaterLab Association.

The 59 participating labs came from most of the SADC and EAC countries, participants from Burundi and DRC were present for the first time. Samples were prepared gravimetrically based on pure water by spiking with pure chemicals. So reference values with uncertainties could be calculated from the formulation process. Samples were distributed using DHL as courier.

For the evaluation and assessment the reference value was used as assigned value. To calculate z-scores (the difference between the lab results and the assigned value divided by a standard deviation for proficiency assessment) the standard deviation of the data set (calculated with Algorithm A described in ISO 13528) was used whenever it was smaller than a limit agreed between the participants in the previous evaluation workshops. This limit can be regarded as a fitness-for-.purpose criterion.

The PT provider faced the following problems:

- Late confirmations from participants
- Registration forms were not sent to the provider – this caused communication problems
- Receipt of results by fax unclear
- Results faxed without lab name
- Different names used for E-mails or faxes than on registration forms
- Delayed reporting of results

Only 4 out of 11 laboratories from DRC reported results

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Results of the evaluation and assessment

Dr. Michael Koch, the consultant from Germany, explained the details of the evaluation and assessment. The most important facts are summarized here, for more detailed description please see the full report.

Sulphate

- Quite good agreement between means and ref.-values
- Standard deviations are still too high
- Too many labs with unsatisfactory results, but some are quite good
- High portion of outliers for the turbidimetric and the gravimetrical method – mistakes in executing the methods

Chloride

- Means are a bit too high compared to reference value
- Standard deviations are too high – no improvement
- More unsatisfactory results than ever before
- Only 2/3 of the labs have good results
- Problems with the endpoint detection in argentometric determination
- Obviously some problems with the spectrometric method

Fluoride

- Standard deviations are still very high, but not as extreme as in the last rounds
- About 45% of the values are not satisfactory
- Colorimetric values are not reliable (as in the last years!)
- Obviously some problems with ion selective electrode

Nitrate

- Some values obviously again were reported in wrong units (most probably 6 labs, at least 1 of them identical with 2009 and 2008)
- High number of outliers
- Standard deviations are still too high
- Harmonization of methods is urgently needed!!

Phosphate

- Some values were reported in wrong units, otherwise results would be quite good
- Standard deviation slightly improving

Calcium

- Mean values are close to reference values
- Standard deviations are still too high
- Still > 30% non-satisfactory results
- Mistakes in the application of analytical methods

Magnesium

- Mean values are around reference values
- Standard deviations are slightly better than last years, but still too high
- Almost 40% of the values are not satisfactory
- Titrimetric values are not reliable

Sodium
- Consensus means close to ref. values
- Slight improvement in the number of satisfactory results

Potassium
- Mean values are close to reference values
- Standard deviations are better again
- 1/3 of the results are non-satisfactory
- Problems with AAS

Iron
- Means are close to reference values
- Standard deviations are much lower
- Good improvement

Manganese
- Mean values are close to reference values
- Standard deviation are much better than last year
- More satisfactory values

Aluminium
- Small number of values
- Mean values are close to reference values
- Standard deviations are comparable to last year, but not really good

Lead
- Mean values are around reference values
- Standard deviations are similar to last year – too high
- Problems with AAS?

Copper
- Mean values are in quite good agreement with reference values
- Standard deviations are better than in previous year
- Percentage of non-satisfactory results is steadily going down

Zinc
- Perfect agreement between mean values and reference values
- Standard deviations are better again
- 20 % non-satisfactory results

Chromium
- Mean values are exactly as reference values
- Standard deviations are again below limit
- Percentage of non-satisfactory results went down again

Nickel
- Mean values are in good agreement with reference values
- Standard deviations are lower again

Arsenic
- Low number of values
- Good agreement between reference values and means
- Standard deviation like the years before

Cadmium

- Mean values are slightly lower than reference values
- Standard deviations are better again, but the percentage of non-satisfactory results is increasing
- Means are close to reference values
- Best standard deviation

All in all the results of the participating labs are better than last year. A closer examination of the development in the individual laboratories showed that some laboratories are continuously performing well, some are improving, but others constantly deliver bad quality without any change. In total it can be stated that:

- Again the PT Provider did a very good job
- The evaluation and assessment procedure is fit for the purpose
- The SADCWaterLab is a good possibility for the participants to compare with peers and with stated fitness-for-purpose criteria
- Overall the results of this PT round show an improvement for many labs, but the results of some laboratories continuously are not satisfactory or getting worse
- More emphasis should be put on corrective actions after unsatisfactory participation
- Some participating labs seem to be resistant against advice; in an accreditation procedure they will wake up
- There should be a discussion
  - How to proceed with recommendation of suitable methods?
  - How to help laboratories to proper apply these methods?
  - How to convince the “resistant” labs that participating in PTs without corrective actions is waste of money and resources

The gaps that prevent labs from proper application of the methods should be identified. Discussion about parameters, concentrations, standard deviation limits and missing networking within SADCWaterLab.

Regarding the parameters it was decided that no other parameters are to be added. The PT provider was asked to check whether the anion sample is suitable to be used also for measuring of total dissolved solids (TDS).

There were lots of discussions for the change of concentration levels. Up to now the concentration for some parameters are much higher than the WHO limits for drinking water. Finally it was decided that the at least for one sample the concentrations should be lowered to match the WHO limits since these values are used for assessing suitability of drinking water.

The standard deviation limits for some parameters up to now are very high. It was discussed whether these limits are really fit for the purpose. for the judgement of drinking water. After some discussions it was decided to use in future:

- in principle 10% for all parameters
- but 20% for the more challenging heavy metal samples (lowest concentration) 25% for Aluminium

It was also discussed why the networking did not really work within SADCWaterLab. No satisfying answer could be found since the website and contact addresses are available. It was proposed to also put the ranges of tests for each lab on the website.

Report prepared by Dr. Michael Koch (Chemistry PT Consultant)

REPORT ON 3RD MICROBIOLOGY PT ROUND

Introduction

This report summarizes the topics and discussions of the evaluation workshop for the 3rd microbiological PT round held in Windhoek, Namibia. It is meant to inform all interested laboratories and help with corrective actions. A more detailed report will be published on http://www.SADCMET.org.

Workshop

All participants and the German experts were welcomed by Namwater representative Dr. Shivute (CEO) the SADCMET regional coordinator Mr. Masuku the PTB representative Ms Wunderlich and SADC WaterLab Association Chair Mrs. Mwambo. Afterwards the workshop split into two groups chemistry and microbiology to evaluate the respective PT schemes. 16 participants representing laboratories from 14 different countries participated in this evaluation workshop of the 3rd Microbiology Proficiency Testing round.

Report of the PT provider UNBS

Mrs Jacqueline Kwesiga from Uganda Bureau of Standards (UNBS) described trial runs and several packaging simulations that were conducted in preparation for the 3rd PT. DHL was used as a courier as previously. With 33 laboratories participating in the 2010 PT a major increase in participants was achieved although some difficulties with email-communication were encountered. These were mainly due to unsatisfactory performance of hardware and server-provider. This has been addressed by UNBS by switching to a different provider. Samples were dispatched on the announced date and mostly received within a few workdays. Unfortunately some of the samples were frozen when arriving at the participating laboratories. This might be due to the very cold temperatures the ice bricks had been stored at before use in packaging. The packaging will have to be further improved. The only packages held up in customs were the ones to Mauritius. 9 out of 33 samples reached their destination within the optimum 2 day period and 12 samples showed temperatures in the desired range at reception.

Evaluation of the PT

General aspects: Analysis of the reported data revealed that only 17 of 33 laboratories (52 %) managed to start analysis of the PT samples at the day of reception. In one case analysis was even delayed for 6 days. The PT samples contain live organisms and therefore have limited stability. Hence it is crucial to start analysis right away. As the PT samples were announced well in advance and there is only once a year a chance to participate in this performance testing the lack of suitable arrangements for analysis is not easy to comprehend.

Unfortunately the participants' results did not show a consensus value that could be used as assigned value to judge the reported results by statistical means. Next to reaching a number of approximately 30 participants in order to have a sound basis for statistical evaluation it is necessary to come up with a trustworthy assigned value.

> *It was decided that the laboratory of the scientific consultant NLGA (Germany) and at least one or two more laboratories should receive samples and be dealt with as expert laboratories. These data will be compared to the UNBS Quality control data. The consensus value of these expert laboratories will then be used for statistical evaluation of performance according to ISO 13528.*

Methods: All participants had been asked to give detailed information on the methods used for analysis of the PT samples with their results. Sometimes some ISO standard was cited but the method described did not match the ISO standard.

> *If changes are made in medium used e.g. due to availability problems or other things changed the method stated can only be "modeled after ISO…" or a similar description. The method has then to be validated at laboratory level.*

Participants compared within small working groups the methods for E. coli/Coliforms used in different laboratories for PT analysis. Microbiological analysis of water samples is greatly operationally defined. E.g. methods for detection and enumeration of total coliforms use anything from lactose fermentation (gas and acid production from lactose) to enzyme activity (ß-galactosidase) to describe this group. It is not surprising that this leads to a very different set of species detected by various methods. Use of many different methods as used by the participants of the PT complicates and in the worst case prevents comparison of results within the PT scheme but also comparison of results from regular analysis in routine laboratory work.
This problem was discussed in detail and a working group installed to come up with a recommendation on standardized methods best suitable for analysis of potable water in the SADC and EAC region.
The recommendation is published on the SADCMET website and in this newsletter.

Training on method validation

Method validation was discussed using **ISO/TR 13843:2000 Water quality - Guidance on validation of microbiological methods**. The necessity to clearly define the purpose/scope of the method to be validated was stressed. Regulatory limits have to be taken into account as well as the matrix the method is supposed to be used with. For example a method for drinking water analysis of E. coli with a limit of 0 in 100 ml is not fit for purpose as long as a sample volume of less than 100 ml is used. After defining the purpose very clearly a basic description of target organisms and the method can be written. Experimental data has to be gathered from pure culture experiments as well as from natural samples. Numbers for sensitivity, selectivity, specificity, efficacy, rate of false positives and false negatives have to be calculated. Uncertainty of counts and the robustness of the method at the limits have to be checked. For quantitative methods it is also important to know the linearity range. To saves a lot of work compared to a full scale method validation it is recommended to use an established standard (e.g. ISO) because this only has to be verified which adds to the benefit of comparability.

> *A method described in an established standard only has to be verified to prove that it works in the hand of the user according to its characteristic values (establishes that the method performs to its specifications).*

Training on measurement uncertainty

The topic of measurement uncertainty was shortly addressed during the workshop. Unfortunately there is no gold standard for calculating measurement uncertainty for microbiological methods. A few approaches were shortly introduced: the Top-down approach (GUM/EURACHEM/CITAC) and the Bottom-up approach (VAM/NORDTEST) used in chemistry. Moreover there is the ISO CD 29201 as a standard under development that deals will the question of MU in microbiology. This ISO describes two ways the step-by step (GUM) and the global approach. The workshop ended with a visit at Namwater laboratories.

Conclusions

- There is a strong need to improve the methods used for analysis in the PT.
- Evaluation of the PT gave valuable leads for improvement to all laboratories even though a statistical evaluation of the PT was not possible.
- Evaluation for the next PT will have to be based on an assigned value. Therefore NLGA and other laboratories in Germany will be approached to serve as expert laboratories. At least one laboratory from the southern African region should be recruited as expert laboratory as well.
- Participants of the workshop felt it important to recommend and use comparable methods for the analysis of E. coli and Total coliforms in potable water that are fit for purpose.
- The PT provider UNBS did a good job in sample preparation but still there is need for improvement on the logistics.
- After detailed discussions of the total plate count methods in the workshop 2009 this workshop focused on the methods of E. coli/Coliform detection.
- Quite a few participants need to adjust their methods to the standards cited or validate their used method which would be much more laborious.
- The workshop was filled with lively discussions and left enough room for networking and sharing experiences.

Prepared by Dr. rer. nat. Katrin Luden (Microbiology PT Consultant)

RECOMMENDATION OF TEST METHODS FOR DETECTION AND ENUMERATION OF COLIFORMS AND E.COLI IN DRINKING WATER

Background

A meeting to evaluate the outcome of the 3rd Microbiology Proficiency Testing (PT) scheme for drinking water was held on the 1st to 4th November, 2010 in Windhoek, Namibia. It was observed that there were large variations in the results obtained by the participating laboratories. These variations were thought to be attributable to the various test methods used in the PT scheme. This made it difficult to compare and perform statistical analysis. It is against this background that participants in the PT evaluation workshop came up with the following recommendation:

Recommendation

Participants recommended that internationally accepted test methods applicable to drinking water be used. The following test methods were recommended:

ISO 9308 – 1: 2000

Colilert - 18

Note: some participating laboratories use ISO 9308-2, since this method is most suitable for samples where high bacterial counts are expected, *i.e.* waste water, using this method for drinking water may not be applicable.

Participants acknowledge that there may be challenges in adopting the recommended methods due to the unavailability of resources at the participating laboratories. However, the benefits of using these recommended methods are long term and outweigh the challenges

Benefits of using the recommended methods

- Reducing technical barriers to trade;
- Assist new laboratories to correctly select appropriate methods for analysis of drinking water
- Facilitate the provision of technical collaboration and comparability of results among the SADC Water Laboratory Association members

Feedback

Members are encouraged to direct any feedback and/or suggestions to the SADCMET secretariat at dmasuku@nmisa.org, Private bag X34, Lynnwood Ridge, Pretoria, South Africa.

Prepared by the working group on Test Methods