



## **Report of the**

### **Regional Seminar of the ACWUA Task Force Energy Efficiency, Organised by IEA/ONEE, ACWUA and GIZ MENA WANT**

#### **Auditing for Energy Efficiency in Water Supply and Wastewater Utilities - Concepts and Applications -**

February 24 to 28, 2014, hosted by the IEA/ONEE in Rabat, Morocco

#### Program:

Strengthening the MENA Water Sector through Regional Networking and Training  
(MENA WANT)

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# Introduction

ACWUA, the Arab Countries Water Utilities' Association has founded an „Energy Task Force“ at the 6th Best Practice Conference in Algiers (December 2013). The task force wants among other work develop guidelines for energy audits/energy checks and energy analysis for water and wastewater utilities. International and German guidelines, manuals and standards as developed by DWA and DVGW will serve as a basis. As one of the first steps towards the development of the guidelines the task force has been proposing to the GIZ MENA WANT programme to organise a regional seminar to develop a common understanding and to share experiences from Germany:

## ***Auditing for Energy Efficiency in Water Supply and Wastewater Utilities – Concepts and applications -***

The present report gives a brief account of the seminar. It took place from the 24 to the 28 of February 2014 in Rabat, Morocco. The venue of the workshop was at the IEA training center of ONEE, the National Office for Water and Electricity.

There were 16 participants, most of them members of the ACWUA task force “Energy Efficiency”:

Algeria: 1  
Egypt: 3  
Jordan: 3 (including the program manager of ACWUA)  
Morocco: 3  
Palestine: 1  
Tunisia: 3  
Yemen: 2

## Day 1

The seminar started on time with the introduction and welcome by the organisers and the Chairperson of the ACWUA Task Force Energy Efficiency.

The moderator discussed the agenda with the participants (which was distributed beforehand); a short presentation of the participants and their motivation for the seminar followed. The participants filled out forms which were pinned to the wall and were accessible during the seminar.

Eng Matthias Stief of the Hamburg water and waste water utility “Hamburg Wasser” went with the participants through the energy efficiency topic, making his presentations lively with examples from Hamburg Wasser and other utilities in the region of Hamburg, where his utility is consulting. The participants had the opportunity to check and analyse the ideas presented in country groups with regard to their own context.

The main topics discussed during the day:

- The importance of a utility policy, which sets energy efficiency targets (wastewater has to save 15%)
- Always look at the lifecycle cost of equipment (i.e. investment cost and operational cost during lifetime) to compare investments – not only the initial purchasing cost. When replacing equipment, calculate the payback period.
- Collection of data is the entry to energy management. Use a step-wise approach as you will not be able to collect all the data you want at the beginning

- If you look at water supply, pumps are the biggest energy consumers, therefore optimization of pumps and motors (groups) may be the first action
- The step-wise approach is not only good for getting data, but as well for energy saving measures as a whole: look at the biggest consumers, than at the second biggest... and so on.
- Energy production has to be considered
  - With using hydraulic pressure where it is not used (pressure reducing valves, break pressure tanks,...)
  - With renewable energies like wind and solar energies
  - With producing heat or cooling from drinking water
- Performance indicators are a very good operation sharing tool
- When collecting data, be careful: often they are not reliable!

	Morocco + Algeria	Egypt	Tunisia	Yemen	Jordan/ Palestine
Concepts for equipment?	- Planning Dept. - Ministry (A)	Ministry of Housing & Utilities	- Technical departments of SONEDE - Departments of ONAS	PLANNING, PROJECT & INVESTMENT DEPARTMENT "SWSLC" "Sawa" "LWSCA" Aden	MWI (Ministry of Electricity Service Provider) (WAT, company)
Owner of equipment?	- ONEE - Dept. of Water Res. (A)	Through HCWW 25 Companies	- SONEDE - ONAS	Equipments belong to "SWSLC" "LWSCA" Sawa Aden	Service Provider (WAT & private comp)
Responsibility for processes & operation	- Asset Management (M) - Algerie Service des Eaux	HCWW O&M Sector	Technical departments of ONAS and SONEDE	TECHNICAL DEPARTMENT	Operation Dept at service provider
Funding of investment?	- Int. Banks, Donors, Govt - Ministry of F (A)	HCWW	The state and Customers	SWSLC Riguevante Sawa LWSCA Aden	Both Local & external Funding for Investment Local Funding for Operation
Conceptual planning?	- Directorate Technical → Outbound - Dept. of Water Res. (A)	HCWW Planning Sector	Technical departments of SONEDE and ONAS	Project & planning department preparing design & project doc - project approved by Tender Board - to the list of projects - Board director approval	Technical Affairs Dept in Water Authority (WAT)
Human Capacity Building?	Human Resource Dirct/ Dept. & IEA	HR	- Human resources - INORPI and ANPE	* Minister of urban & environment approval * High committee of Tenders approval * depends upon project size * by department utility	HR Department in WAT according to the Utility's needs in the projects
Process monitoring?	- Asset Management + Reg. Dirct - Rg. des Eaux (A)	Government	- Local Units	* Human resource department * Technical department & responsibility * Financial & economic depart	Technical Affairs Dept in WAT for Auditing & Monitoring processes PHU for Monitoring KPI
Standards / Tariffs	- Norms by interest. Committee of Wto Ministry for Water Basins				Governmental Body with Related Minister
Care for clients & the public?	Commercial Directorate Dept. of Communa (A)	Residential - Commercial - Institutions - etc Irrigation.	Local offices of SONEDE and ONAS	* All the people need water in Sanitation services.	Customer Services Dept. in WAT Needs, Services,

The figure shows a result of the working groups on different responsibilities and data from the utilities present.

## Day 2

Energy management was focussing on wastewater at the second day. The following topics were prominently discussed:

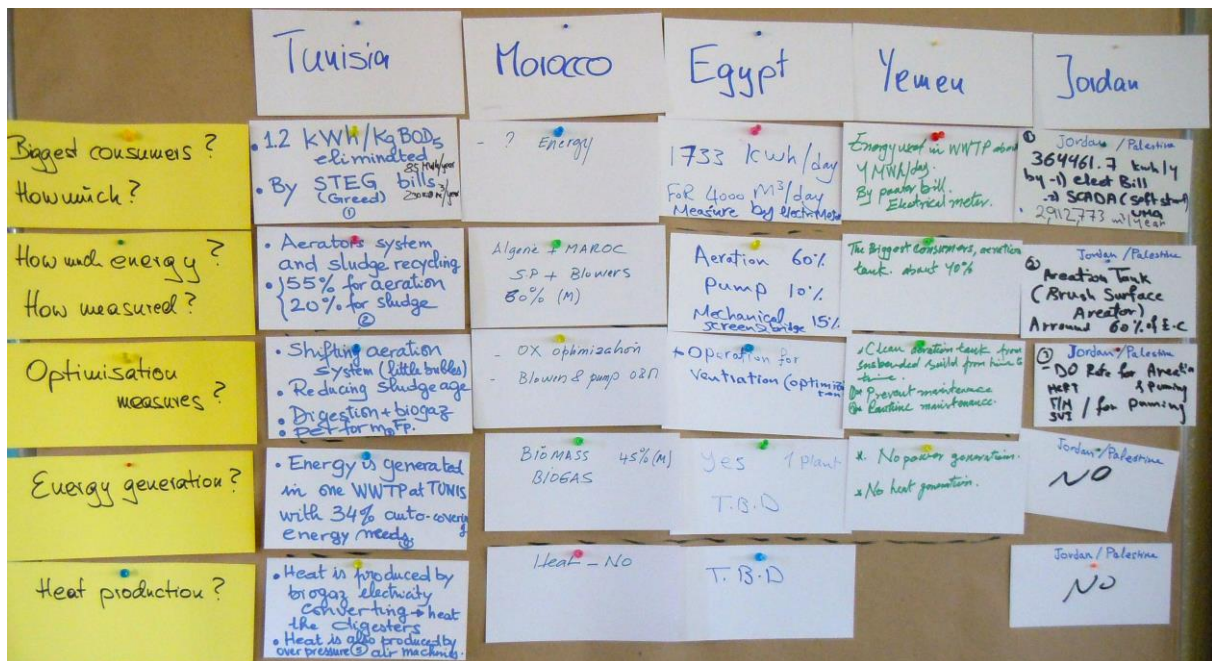
- The difference of surface aeration and pressure aeration, especially with regard to energy use. Surface aerators – though robust and long living – are replaced gradually by pressure aeration because of its lower energy use.
- Mechanical pre-treatment is important and can save energy in the following stages
- Reducing the sludge age within the system is another fact to save energy consumption of the plant
- The energy check as used at Hamburg Wasser is very similar to the preliminary audit of the energy audit as used in Tunisia and Morocco
- The step following the energy check at Hamburg Wasser is the energy analysis, which is similar to the general audit (“audit approfondi”) in the energy audit
- Mr. Stief was of the opinion – based on his experience, that 20% energy can be saved in every wastewater plant
- Different pump sizes working in parallel can often be an alternative to using frequency converters with pumps.

A short survey on wastewater pump operation problems was giving these results:

- Yemen
  - the main wastewater pumping station is not working because of lack of funds; therefore the wastewater is discharged untreated into the sea, “ the bill is paid by nature”
- Egypt:
  - frequent cleaning of pumps is necessary
  - pumps are often operated at different from the design flow rates
- Jordan
  - As an indicator, the energy consumption per cum is used
  - Computerised maintenance system helps to keep pump downtimes to a minimum
  - The staff is certified for O&M practices
- Tunisia
  - Suspended solids damage the system and therefore the pump stations require frequent cleaning; when the pump is blocked, the cos phi is going down which can lead to high electricity charges
  - Air in pumps causes cavitation
  - Odour is a serious problems as citizens around the pump stations complain
- Morocco
  - Maintenance is outsourced; the contract management is therefore key to a good performance

General findings:

- A reporting system is important
  - For planning new plants and the rehabilitation of old ones
  - As it should have direct influence in daily work
- The good design of systems can avoid many problems



The figure shows the energy situation in the wastewater utilities present and optimisation potential

## Day 3

The day was reserved for an excursion to the drinking water system of the Atlantic coast (Casablanca – Rabat), which belongs to the regional directorate of the Atlantic coast within ONEE.

It started with an introduction on the system itself and its energy consumption and other performance indicators.

We visited

- the Sidi Med Ben Abdallah dam (1 billion cum), the tower (water intake and the pre-chlorination station)
- the raw water pumping station with 4,4 and 2,2 MW pumps pumping to the treatment plant
- the remote sensing system and the control room and
- the Bouregreg treatment plant (Degremont clarifiers & rapid sand filters) and
- the newly installed sludge thickening plant.

## Day 4

The day started with the presentation of the rapid survey on auditing for energy efficiency in water utilities of the ACWUA members in Egypt, Tunisia and Morocco. It became clear that different members of ACWUA are at different levels of energy efficiency work in their utilities and the corresponding experience with it.

An overview of activities of the task force for the next 2 years as well as the related milestones were determined and discussed with Dr. Thomas Petermann.

Important in this context:

- Agreements have to be signed for permanent membership in the task force
- A pool of people will have to be trained to guide Energy Efficiency checks/analysis

The afternoon and the following day were mainly dedicated to energy management as described in ISO 50.001 by Prof. Dr. Lieback of GutCert Berlin.

A clarification of the terms used was very helpful:

\* Energy Check (in style of DWA):

“Assessment of the energetic inventory of components, installations or whole infrastructures in relation to key performance indicators (KPI)”

\* Energy analysis/review (in style of ISO 50001 and DWA):

“Detailed survey and evaluation of the past and present energy consumption, assessing the significant areas of use to prioritize optimisation measures including considerations of cost efficiency”

\* Energy Audit (by EN 16247):

“Systematic inspection and analysis of energy use and energy consumption of a site, building, system or organisation with the objective of identifying energy flows and the potential for energy efficiency improvements and reporting them”

\* Audit (3.17 - ISO Annex SL part of HLS, ISO 9001, ISO 14001 etc.)

“Systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled”

The energy check is the first approach into energy management. Important are

- checklists
- checks e.g. on pumps with the pump audit as done e.g. by Grundfos and other pump companies
- the knowledge to invest in high electric efficiency (to replace old electric motors that run more than 50% of the time may pay off in less than 2 years)

# Day 5

Energy management in a broader context of the utility was discussed:

- The organisation must have an energy policy
- Anchor energy management in the organisation
- Document the communication structure of an energy team and the processes (simple tables were shown of how to do this)
- Raising awareness of staff and clients was an important point.

Group work on this point was done with the following questions:

- 2 important ideas for public awareness in the context of your utility!
- Are there/can you name energy consultants in your country to support you?

The table below shows the results:



The use of external consultants was discussed at length. One of the conclusions:

- Know (well) what you want to do -> only then can you take a consultant!

A summary of how to start an energy management system in your organisation:

- you need an energy officer in the organisation who then develops a team (people of all departments related to energy, who give part of their time)
- get status data (and historical data which are available)
- do a first assessment, set goals, targets and derive measures.

The day and the seminar ended with a discussion on the Terms of Reference (Task force members will contribute) for the development of ACWUA guidelines on energy management.

Participants mentioned in a brief evaluation of the most important learning of the week as follows:

- Energy efficiency is an effort for all employees of a utility
- An EnMS will have to be employed in our organisation: it has to be a common effort of all of us
- Analyses to achieve environmental efficiency should be part of energy efficiency
- I am now aware of how important energy efficiency is and how we can control our energy consumption
- Now is the time to apply energy efficiently; we hope that our manager is supporting us
- I got the idea of the meaning of auditing – now I know what is an EnMS; I want to begin
- It was good to meet other experts from Arab countries
- Thank you for the good experience on energy management
- I can differentiate now between the terms energy audit, energy check,....
- The parameters for saving energy in wastewater were new for me; an EnMS has to be established in our company!
- There must be a real will for energy management; all staff have to be involved in it; we need a responsible person for energy
- Energy efficiency is a source of energy; we need a lot of energy to reduce energy! Get top management involved; the human factor is very important
- This is the real start of the EE-TF; I am happy with this start; it gave us the opportunity to speak the same EE language; we got a precise definition of auditing, of EnMS, energy check and energy analysis.
- We have water stress in all the Arab countries gathered here; as well we have energy stress; we need to develop more and more energy consuming water resources (desalination, deep ground water pumping,...); therefore we have no other choice than to do energy management. EnMS according to ISO 50.001 is a good start.

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