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Northwestern Switzerland

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Final activity report 2005

FHNW Activities to Consult the Central American Cleaner Production Centers

Incl. missions 10/2005

Due to a merger the former name of the reference centre "Fachhochschule beider Basel (FHBB)" has changed on 1/1/2006 into "Fachhochschule Nordwestschweiz (FHNW), Hochschule für Life Sciences, Institut für Ecopreneurship".

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Northwestern Switzerland

Final activity report 2005

FHNW Activities to Consult the Central American Cleaner Production Centers

Incl. missions 10/2005

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Muttenz, January 2006

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1 Goals

According to contract 2004/060 and the terms of reference the overall goal of the support activities for the NCPC in Central America (Costa Rica, Guatemala, El Salvador) is as follows: to provide services to enhance cleaner production and environmentally sound technology transfer, multilateral environmental agreements implementation and management activities.

During the reporting period following specific goals could be defined:

- defining and implementing national CP awareness raising strategies;
- providing training on CP and CP related issues;
- organizing and assisting CP in-plant-assessments;
- developing and implementing projects within multilateral environmental agreements
- promoting CP technology investments and transfer of EST

2 Summary

The present report reflects the activities of the second phase of the support for the national cleaner production centres in El Salvador, Costa Rica and Guatemala according to contract No. 2004/060 with UNIDO. In the current report the activities of FHNW (former FHBB) of the last three months period from October to December 2005 are listed.

From 11 October until 21 October 2005 Mr. Christian Buser (FHNW) conducted a mission to the NCPC Guatemala in order to train the local cleaner production consultants of the NCPC and BID-project as well as from companies in CP and food processing.

FHNW organised and funded an expert mission from 11 until 21 October 2005 to the NCPC Guatemala. The two experts supported the training of consultants in food industry with their specific know-how in dairy industry.

FHNW prepared, organised and funded a mission to the NCPC Costa Rica, El Salvador, Guatemala and Nicaragua on quality management ISO 9'001 conducted by Mr. Peter Schönenberger from 13 until 22 October 2005. This mission was carried out as a follow-up of ongoing activities regarding the implementation of ISO 9'001 at the NCPC. The main goal was to identify any deviations in the process descriptions from the requirements of ISO 9'001 and to define the next steps until certification.

Technical support was provided to the NCPC on following issues:

- CDM-Follow-up
- Closing-the-loop project at Foremost SA, El Salvador
- Follow-up on multilateral environmental agreements: POP and PCB
- Technology transfer at Cerveceria Centroamericana SA, Guatemala
- Provision of specific know-how on water conditioning and cleaning

Furthermore FHNW commented the evaluation of the NCPC done by seco (Mr. Jürg Grütter) with own statements on behalf of UNIDO.

3 Duties to be performed and results achieved

Activities under the above mentioned goals (for details see contract 2004/060, annex D) are further described below and a summary on activities carried out is provided including the results being achieved during the reporting period (October 05 – December 05). Moreover comments are given regarding the lessons learnt during the contract phase (February 04 – December 05) and possible follow-up activities.

For more detailed information reference shall be made to the 3-monthly activity reports and the respective mission reports elaborated by the staff of the University of Applied Sciences Northwestern Switzerland (former FHBB) or external experts and provided to UNIDO over the past 22 months.

3.1 NCPC management

3.1.1 Quality Management-mission

From 13 until 22 October 2005 Mr. Peter Schönenberger, Quality Management expert of SAQQualicon Ltd. Switzerland, carried out a mission to all NCPC in Central America including Nicaragua. FHNW organised and funded the mission and also supported UNIDO in preparation of the contract for the activities in Nicaragua. The mission was conducted to follow-up with the tasks assigned during the QM-training in May 2005. The NCPC were requested to finalize the QM process descriptions and appended documents until the end of the year. Therefore the mission had following specific goals:

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- To find out if the already elaborated QM-System is implemented effectively
- Monitoring of previous implementation efforts
- To evaluate if the requirements of the ISO 9001:2000 are fulfilled (deviations)
- To show further necessities to meet requirements of ISO 9001:2000
- To define the next steps and final requirements to get the certification of ISO 9001:2000
- Realization of the examinations for EOQ Quality Systems Manager

The visits at each NCPC lasted two days. As this time was rather short the centres were requested to send the process documents to the expert beforehand for review. However, this happened not with all NCPC and additional effort during the mission was needed.

About 65% to 75% of the planned ISO 9'001 project descriptions and appended documents drafted by the NCPC were available before and during the mission and reviewed by the expert. In order to increase the efficiency the evaluation of the current status of the QM-system was carried out as audit with the relevant checklists at each NCPC. During the workshops deviations from the project target were recorded and listed together with each NCPC. The results were rated with marks:

1 = conformance, 2 = observation (minor nonconformity for which the relevant corrective action will be verified in the next audit), 3 = major nonconformity (re-audit or submission of new documentation by a defined date necessary).

In addition open questions regarding the following topics were discussed with the QM-responsible of each centre:

- Quality Management in general
  - General requirements
  - Documentation requirements
- Management responsibility
  - Management commitment
  - Customer focus
  - Quality Policy
  - Planning
  - Responsibility, authority and communication
  - Management review
- Resource management
  - Provision of resources
  - Human resources
  - Infrastructure

- Work environment

- Service realization
  - Planning of product realization
  - Customer-related processes
  - Design and development
  - Purchasing
  - Product and service provision
  - Control of monitoring and measuring devices
- Measurement, analysis and improvement
  - General
  - Monitoring and measurement
  - Control of nonconforming product
  - Analysis of data
  - Improvement

The QM-expert together with FHNW prepared tests on quality management for the QM-managers of each centre. This test was offered to them in order to get the certificate as European Quality System Manager (EOQ). This official test shows the degree of target achievement concerning ISO 9'001:2000 and was conducted with every responsible at each centre. The test was supplemented by an oral exam that was also carried out by the expert and a specific part which required the finalization of the draft process documents at each NCPC. All participants passed the test and will receive the official certificate of the European Organization of Quality.

Together with the centres the expert defined the next steps until certification and listed that in a "To-Do-List" (see annex 1) for reference.

It has been experienced that between the two missions of the expert to the region (May and October 2005) some important activities were not carried out by the responsible people at the NCPC and had to be taken over by FHNW. Especially the collection and distribution of process descriptions and appended documents was not done by the NCPC Costa Rica although it was agreed on that during the training in May 2005. Therefore all documents had to be handled by FHNW which generated a lot of additional work.

All further details about the mission and the specific findings at each NCPC are listed in the mission report 10/2005 of the expert Mr. Peter Schönenberger in Enclosure 2.

3.1.2 Certification ISO 9'001:2000

FHNW was actively looking for a certification body that could carry out the ISO 9'001:2000 certifications at the four NCPC in Central America. Meetings were hold and finally SwissTS/TÜV was selected for this task. A proposal was requested and handed over to FHNW (see annex 5). This organisation is represented in Central America (Mexico) that could take over the surveillance audits after the certification. That way the overall cost for the certification can be kept low. FHNW recommends to conduct the certification with Swiss auditors because of following reasons:

- The Mexican auditors are unknown as well as their certification style. It is known from experience with ISO 14'001, there might be different views from different auditors. It would be possible that the Mexicans let the NCPC fail in order to have another audit to be done afterwards (there are examples in CA). It is always possible to find deficiencies within the process descriptions.

- The QM-expert and the Swiss certification auditor already know each other as they have worked together in the past. Therefore the certification body knows about the quality of the consultancy done by the expert. The auditor would never overreact during the certification process only because some details have not been fullfilled by the NCPC. Of course the auditor has not been persuaded but explained about the centres and their structure.

- The Swiss certification auditor will hand over the surveillance task to the Mexicans during his mission. This will allow him to explain what is really important for the NCPC as far as ISO 9'001 is concerned in order to help them keeping the certificate.

- In Europe another certification course is followed although the procedure is the same. It is not obvious at the moment that the Mexicans follow the same course.

- The Mexicans and the Swiss work for the same company (TÜV). With the combined activities, certification by Swiss and surveillance by Mexicans, we can achieve a low overall cost with the smallest risk of failure. The price for the certification is very low considering the cost for ISO-certification in industry.

3.2 Training

At the beginning of 2005 FHNW together with the NCPC Guatemala elaborated a modular training scheme for Cleaner Production consultants supported by the Interamerican Development Bank (BID). Several modules have been carried out with assistance and contribution of FHNW e.g. training in ISO 14'001 and Energy Efficiency. In order to supplement the training sequence Mr. Christian Buser (FHNW) carried out another mission to Guatemala from 11 until 21 October 2005. This mission was accompanied by two food experts, Ms. Florence Clerc and Mr. Paul Hunziker from the Swiss College of Agriculture and Leplan Ltd. respectively.

The BID-project did foresee for the year 2005 the training of twelve instructors (train-the-trainers programme) which will be trainers for CP-consultants and company representatives who have to realize in-plant-assessments (IPA) in the next two years.

The training program for these BID instructors and the company representatives includes 10 modules of classroom training and in parallel the practical conduction of an IPA in the 12 companies assigned to the project.

The training listed in this report represented the module 5 with the aim to instruct the participants about "Cleaner Technologies in the Food Sector". It lasted two days as classroom training and aimed mainly at specific theoretical inputs on Best Available Techniques and experiences made in Europe in the dairy industry. Apart from sector specific topics also important aspects regarding food-safety and hygiene, cleaning and HACCP (Hazard Analysis Critical Control Point) in the food sector were covered. In specific following topics were presented:

- *Dairy technologies in small/medium scale production sites (milk, ice cream and cheese* production) – state of the art techniques and experience made in Europe
- Water preparation, handling and water saving potentials, Effluent handling and treatment systems
- Energy aspects in dairies
- Important aspects about product and raw material storage
- Cleaning processes, CIP-systems
- Disinfection and hygiene – principals of reducing risks
- Implementation of Quality Assurance- and HACCP systems

During the first training day totally 30 participants of which 18 persons from Industries, 11 national consultants and the BID-coordinator Mr. César Vallejo Bolaños participated. During the second training day a total of 36 participants of which 22 representatives of companies and 14 national consultants attended.

In addition to the training the experts also conducted seven company visits at plants which also take part in the BID-project. Following companies were visited:

- Las Margaritas SA
- Inprolacsa
- La Cuna de Queso
- Industria Rick's SA
- SULA
- Tostaduria de Café Sol
- Distibuidora de Alimentos Montesol SA

The experts conducted an extensive walk through the companies auditing all the production processes and the storage area. For some of the companies the national consultants have already generated CP options to optimize the situation. The experts discussed mutually these options together with the company representatives. Furthermore they contributed with additional suggestions on Good Manufacturing Practices (GMP), technology and HACCP issues. For every company a short report was elaborated and a follow-up list developed.

It is expected that the NCPC together with the local consultants and the company staff will continue with the IPA. FHNW offered to check some of the reports according to the defined guidelines for IPA-reporting.

For further details about the training and company visits please refer to the Mission report 10/2005 of Mr. Christian Buser, Ms. Florence Clerc and Mr. Paul Hunziker in Enclosure 1.

3.3 Technical assistance at plant level / EST

In order to accelerate the implementation of EST at plant level and to foster technology transfer respectively FHNW again followed-up with certain company assessments. In specific following companies and NCPC were involved:

Foremost SA, El Salvador

For the production of ice-cream out of whey this company was presented a reverse osmosis plant in spring 2005 (mission J. Walder in May 2005). Furthermore to check the feasibility of whey processing, trials in Switzerland on laboratory equipment are important. FHNW again discussed this issue with the NCPC and the dairy lab in Switzerland to get the company's commitment and afterwards the appropriate raw material. As the management has changed at Foremost SA in the meantime, the NCPC has to present and convince the responsible again. This has to be done as soon as possible otherwise this opportunity for technology transfer that could be part of UNIDO's closing-the-loop project will probably be taken over by private consultancies.

Cerveceria Centroamericana SA, Guatemala

FHNW presented a proposal for a new yeast drying equipment in spring 2005 to the company (mission J. Walder May 2005). With this technology a big part of waste yeast could be stored and sold to alternative clients generating an additional profit. However, up to this moment the company was reluctant to decide upon this investment. As the NCPC Guatemala had other priorities during the reporting period FHNW directly communicated with the company's representative and asked again for a follow-up. As a result the company is considering the technology when the NCPC will assist them in finding potential customers for the yeast (pet food producers, farmers etc.). It is very important now to push this initiative in order to finally implement new profitable technology at a company with financing opportunities. This would also lead to the first case study on technology transfer for the centre in Guatemala.

Water conditioning and bottle washing

On behalf of the NCPC Guatemala FHNW was looking for appropriate technology for water conditioning. At a soft drinks company in Guatemala (ABASA Coca-Cola) problems with lime occurred and FHNW was asked for alternatives to chemical water conditioning. Magnetic water descaling is a possibility that has already been implemented successfully in industry (see annex 2).

Furthermore the washing of bottles at a brewery (Cerveceria Centroamericana) and the soft drinks producer (ABASA) was identified for optimization during in-plant-assessments of the NCPC Guatemala. FHNW looked into that problem and suggested means to reduce the water consumption. A short research report on hygienic requirements, legal framework, water benchmarks and supplier information was elaborated and handed over to the NCPC Guatemala.

3.4 Multilateral Environmental Agreements

3.4.1 Persistent Organic Pollutants (POP)

As a follow-up of the mission on PCB-management carried out by an FHNW funded expert (Mr. Urs Wagner) in summer 2005 the NCPC Guatemala elaborated a proposal for training activities on that topic in Guatemala. FHNW assisted the NCPC to finalize that proposal which was eventually handed in at the Swiss embassy in Guatemala for approval and funding.

Furthermore the future POP-activities on PCB of the NCPC in Guatemala mainly depend on the participation of the centre in the national steering committee. FHNW together with the expert contacted several times the responsible person at the ministry of environment in Guatemala in order to underline the importance of having the NCPC in that committee. Finally the centre was accepted and invited for the first two meetings where it could present its training services. Further expert support that is needed to fulfil this task will be defined by FHNW for 2006.

3.4.2 CDM-Projects

FHNW evaluated the situation at the NCPC after the training on CDM hold by the expert Mr. Jürg Grütter in August 2005. It has been experienced that the industries selected by the centres were either to small for a reasonable Project Identification Note / PDD or there is no existing baseline study /methodology. Jürg Grütter gave the NCPC several pieces of advice and they are looking for other alternatives at the moment.

FHNW looked for own possibilities to assist the centres in promoting CDM-projects. As the country of Liechtenstein has an existing partnership with Costa Rica first negotiations took place with the environmental responsible. In fact the government of Liechtenstein is interesting in supporting a CDM-project in Costa Rica especially in the agricultural sector. FHNW investigated about opportunities for a biogas plant at cattle farms and contacted also the NCPC Costa Rica and GTZ Germany as this organization has already been active in this field during the last years. It seems that a project in this sector makes sense considering existing initiatives of the NCPC and existing baseline studies.

As a result FHNW elaborated a proposal for a CDM-project on behalf of the state of Liechtenstein with a finance volume of 500'000 CHF. With this initiative Liechtenstein could cover 10% of its CO_2-reduction obligation. Furthermore as the head of Liechtenstein's government will visit Costa Rica's government in March 2006 FHNW suggested to put the topic on the agenda and to also invite the NCPC for a side meeting.

4 The last year of the contract phase: lessons learnt and outlook

As announced in 2004 FHNW has focused in the year 2005 mainly on tasks that help the NCPC in Central America to consolidate their function and to find new financing sources. In total 17 missions were conducted to the Central American region for that purpose in 2005. At the end of this year some remaining funds from UNIDO/seco are available for the centres, however, these cover only part of the cost. The evaluation of seco (done by Mr. Jürg Grütter) has shown in 2005 that the NCPC in Costa Rica and Guatemala have a reasonable share of self-financing and will most probably continue operation after phasing-out of the project. FHNW has substantially helped them to find new services and to build sufficient capacity. The LCA initiative in Costa Rica for instance has lead to a service hub which will attract new clients and open new funding possibilities for the centre. Another issue are the multilateral environmental agreements. This is an area where the NCPC can sharpen their profile and improve credibility. That is why FHNW insisted on having proper training on CDM during summer 2005 and awareness raising seminars as well as technical training on PCB management in Guatemala. The NCPC have now enough experience in these fields to carry on and extend the offers to new clients.

Other areas where FHNW supported the centres among others are ISO 14'001, corporate social responsibility (subcontracted), energy efficiency and nutrient balancing in farming. These are topics that need more effort to be included in the existing service portfolio of the centres. However, with a reasonable assignment of time to these subjects the responsible at the centres can further develop the topic and connect that know-how with conventional CP-services.

As FHNW experienced obvious deficiencies in the management of internal processes at the NCPC it proposed to develop a quality management system according to ISO 9'001:2000. First experience with such a system already exists at the NCPC in Vietnam. With the training initiative the centres could develop and improve processes and their descriptions and assign responsibilities to the correct persons. Furthermore the archiving, making available and continuous improvement of process and appended documents should now easily be possible. In addition the reproducibility of processes has much improved due to the QM-system. However, it is very important that the NCPC management is backing this initiative and that a proper management review of the system is going to take place at the beginning of 2006. Only when there is commitment from the management the system can help the centre to realize processes more efficiently. It is foreseen to help the NCPC getting the certificate in ISO 9'001:2000 in April 2006. For that reason FHNW together with the QM expert will review the documented system and adjust where necessary. The achievement of the certification will doubtlessly lead to a better image and facilitate the acquisition of new clients.

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With remaining funds FHNW will again support the NCPC in selected areas in the year 2006. These will be defined together with the centres and UNIDO. The main goal of these activities will again be the consolidation of existing excellency and modest extension of services in e.g. Food Safety Management (HACCP) or CDM.

As FHNW (FHBB) has been the reference centre for the three Central American NCPCs during the last six years some valuable insights into the set-up of the centres, their management and the CP-programme could be gained. It is planned to do a review of the entire support phase after the final activities in 2006.

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Annex 1 "To do – list" QM until Certification (April 2006)

This "to do- list" corresponds with the project plan and the defined process owners

To do	Responsibility	Deadline
Definition of individual model, strategy, objectives. Planning of necessary time resources to fulfil the objectives of the project	Each project leader together with the top management within the corresponding center	15th June 2005
Draft of process description	Each process owners (name is defined in the process architecture, figure 3) In a first step the following processes will be drafted by P. Schönenberger: 1100 Strategic planning 1300 Marketing 1500 Continuous Improvement 3300 Documentation	15th July 2005
Collecting of the drafts of process description	Carlos Perera (CNP+L) Costa Rica	25th July 2005
Distributing of the drafts of process description (to each centre and P. Schönenberger)	Carlos Perera (CNP+L) Costa Rica	30th July 2005
Finishing the process description individual (related to the centre),	Each process owner	15th August 2005
Creating of a draft of the management review	Each project leader together with the top management within the corresponding centre	15th September 2005
Creating of an internal training plan for the employees		15th September 2005
Creating of an internal training plan for the employees		15th September 2005

Preparation of the Examination regarding EOQ certification (Quality Systems Manager)	Participants of the training	30th September 2005
Creating of the appended documents (each centre on its own)	Each process owner	20th September 2005
Finishing and completing the Quality-Management Documentation (by considering the suggestions and nonconformities of the external audit, 2nd mission from SAQ-Qualicon AG, October 05)	Each process owner	30th November 2005
Creating of an internal training plan for each employee – realization of this training until end of January	Project-leader / each process owner	31st December 2005
Going "live" with the Management-System. Release of the whole documentation of the Management-System by the director of the NCPC.	Each project leader together with the top management within the corresponding center	1st January 2006
Creating of the management review. All defined and available key indicator figures have to be included		28th February 2006
External certification-audit	Every employee	25th April 06

Annex 2 Magnetic water descaling

CP-technical report

Magnetic water descaling

Principle

(source: analytical systems GmbH) Magnets will be applied for descaling water. The lime remains in dissolved condition and can't deposit in pipes.
Permanent magnets are working on optimal level with a water flow rate of 2 m/sec. With a flow rate below or above the permanent magnet is loosing the efficiency. For the application in industrial activities permanent magnet application is not useful.

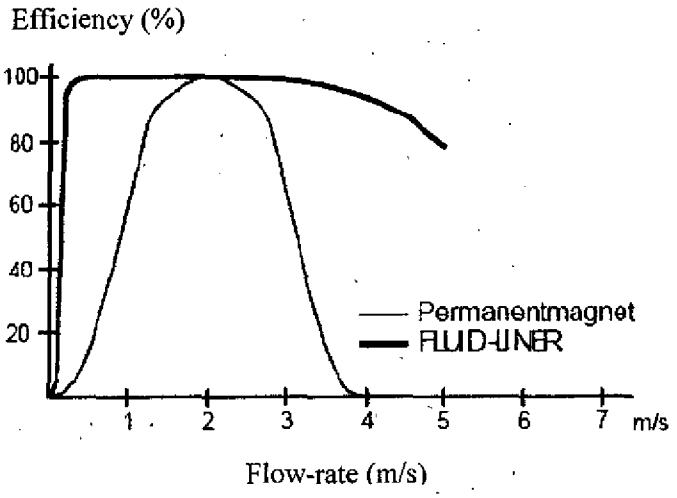

Figure: comparison of permanent magnet and fluid liner (electric magnet)

With electric magnets the induction frequency can be adjusted to the water flow rate. An efficient descaling will be achieved as well with different water flow rates. Electric magnets can be applied on all type of pipes, doesn't matter from which material it is.

Examples for the application are the food industry, brewery, sugar refinery, etc.

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Web: **www.analytical.de**

Products:

- The type calc.tech is deliverable for flow rates from 300 m^3/ year to 250 m^3/ h for different diameter and length of pipes.

Author: Dirk Hengevoss

Date: 1.9.2005

Annex 3 Bottle washing – research report

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CP-research report

Bottle Washing

Hygienic requirements

To guarantee a sufficient level of hygienic for bottled beverage and beers bottle washing requires certain standards. It depends on what should be bottled. Beer for instant needs a higher level of hygienic the Coke due the easier generation of bacteria's in beer.
Following is described the procedure for bottle washing according the Canadian code of hygienic (*Source: Code of Hygienic Practice for Commercial Prepackaged, and Non-Prepackaged Water. CFIS(Ccanada), 2003)*

(...) 5.1.4 Cleaning of Multi-Use and Returnable Bottles
If multi-use containers are refilled bottlers should:
a) inspect, wash and sanitize the container prior to filling so as to remove any extraneous materials, chemical or microbiological contaminants;
b) develop a program for the maintenance and operation of the bottle washing and sanitation unit (manufacturers' instructions may provide a source of the necessary information);
Rationale:
Returnable bottles pose a challenge for product safety and require additional controls than single use packaging materials.
c) inspect returnable bottles to detect damage and contamination including suspicious odours, oily appearances and foreign objects in order to cull these bottles for separate handling or rejection;
d) invert the bottles and wash both the internal and external surfaces using an effective cleaning agent within the concentration, contact time and temperature range recommended by the manufacturer's
specifications;
e) ensure that the operation includes monitoring, documenting, routine maintenance and regular cleaning of equipment;
f) after washing the bottles, they should be rinsed free of the washing agent and sanitized using an effective sanitizer within the recommended concentration, contact time and temperature range
according to the manufacturer's specifications; and
g) ensure that chemical agents, if used, are compatible with packaging materials such that chemicals do not leach into or otherwise contaminate the water.
5.1.5 Cleaning of Single-Use Bottles
The bottler should:

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a) ensure that all single-use bottles are free of extraneous materials and contaminants prior to filling; or
b) clean all containers, if they are not ensured free from contamination, by inverting and rinsing them with an effective sanitizing solution; and
c) ensure that chemical agents, if used, are compatible with packaging materials such that chemicals do not leach into or otherwise contaminate the water.

Legal Framework

COUNCIL DIRECTIVE 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

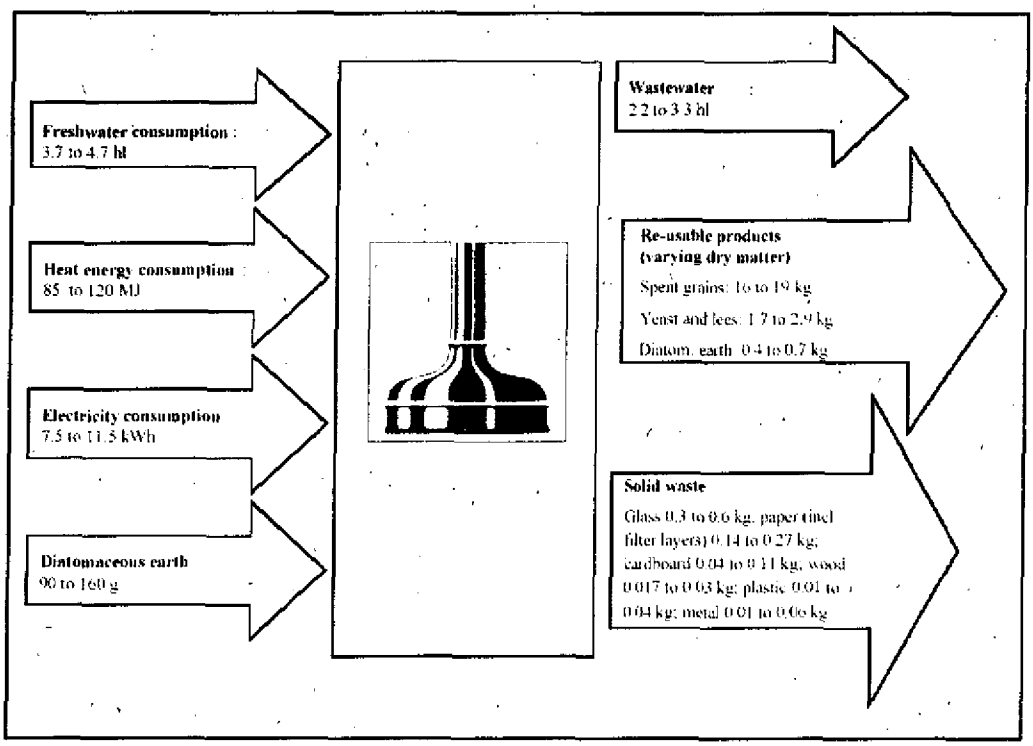
Article 1 Objective
This Directive concerns the quality of water intended for human consumption.
(...)
Article 2 Definitions
For the purposes of this Directive:
(...)
1. 'water intended for human consumption' shall mean:
(b) all water used in any food-production undertaking for the manufacture, processing, preservation or marketing of products or substances intended for human consumption unless the competent national authorities are satisfied that the quality of the water cannot affect the wholesomeness of the foodstuff in its finished form; (...)

Benchmarks

The following benchmarks should give an overview on water consumption and waste water production in the beer and beverage industry:

Department	Specific waste water volume (m^3/hl beer sold)			
	Measured*		Literature	
	from	to	from	to
Brewing house/cold storage	0.024	0.063	0.010 0.008	0.114 0.050
Fermentation cellar	0.005	0.021	0.0012	0.070
Storage cellar	0.005	0.013	0.0014	0.030
Filtering cellar	0.019	0.059	0.0070	0.090
Bottling cellar	0.036	0.068	0.070	0.280
Cask cellar	0.008	0.037	0.0053	0.067
Miscellaneous	0.020	0.204	-	-
Total process	**0.32**	**0.51**	**0.25**	**0.6**
* Measurements by Heidemann, Rosenwinkel and Seyfried (1990 - 1992)				

Figure: Wastewater production in different brewery processes (Source: Draft reference document on best available techniques in the food drink and milk industry. EC,2003)



Input and output figures of large German breweries (capacity over 1 million hl beer) per hl sold beer (Source: Draft reference document on best available techniques in the food drink and milk industry. EC,2003)

Type of waste water	BOD_5 (mg/l)	SS (mg/l)	pH
Soft drinks			
Lemon drinks	42000	56860	2.95
Cola	60000 - 80000	114900	2.4
Cola	79500	122000	2.5
Juices			
Tomato	25000	66860	4.1
Pineapple	65000	138950	3.15
Orange	200000	-	2.5
Lemon	170000	-	2.4

Figure: Characteristics of wastewater from different soft drinks and juice productions (Source: Draft reference document on best available techniques in the food drink and milk industry. EC,2003)

Water to beer ratio	4 - 10 hl water/hl beer.
Wastewater to beer ratio	1.3 – 1.8 hl/hl less than water to beer ratio
COD	0.8 – 2.5 kg COD/hl beer
Suspended solids	0.2 - 0.4 kg SS/hl beer
COD / BOD	1.5 - 1.7
Nitrogen	30 - 100 g/m^3 wastewater
Phosphor	30 - 100 g/m^3 wastewater
Heavy metal concentration	Very low

Figure: Characteristics of Brewery Wastewater
(Source: Guidance Note for establishing BAT in the brewing industry. CBMC, 2002)

Case study: Reducing water consumption in bottle washing

(Source: Draft reference document on best available techniques in the food drink and milk industry. EC,2003)

The water consumption per bottle cleaned was cut from 530 ml to 264 ml in the example plant.

Energy and water consumption of bottle washers

(source: Flaschenreinigungsmaschine.?,?)

Consumption figures are the base for the comparability of different bottle washers. Figures of interest are heat, electricity and water consumption.

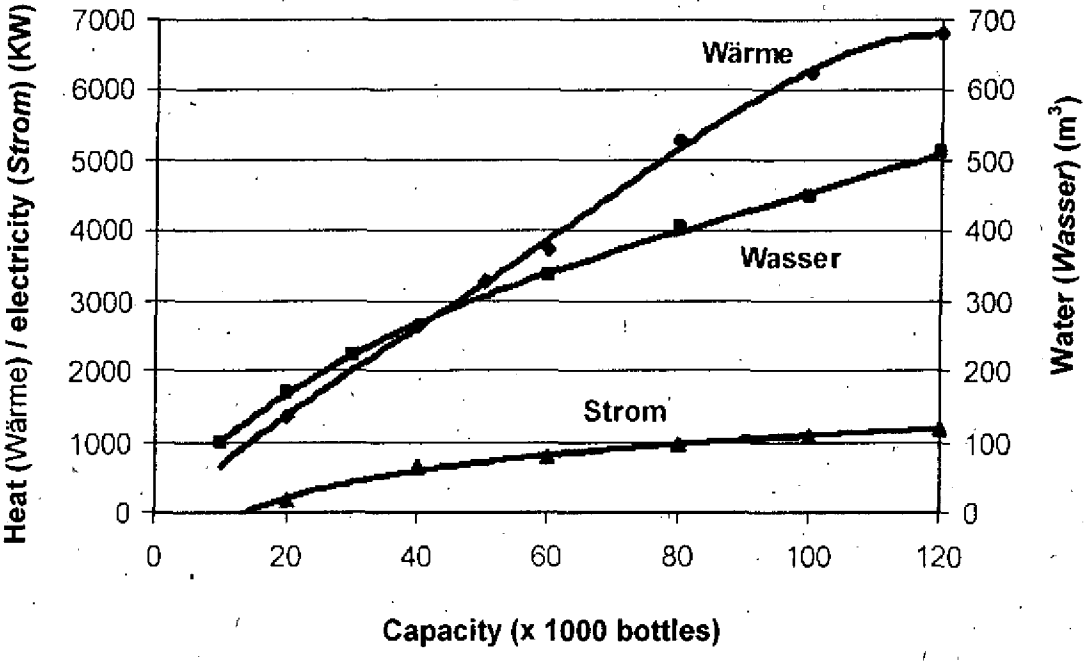


Figure: specific consumption figures of a bottle washer

- The heat consumption is between 25-60 KJ/ Bottle and depends on the technical and operational condition of the facility. With the isolation of the bottle washer 15-18% of the heat can be saved.
- The electricity consumption is between 2.5-10 KJ/Bottle and depends on the technical and operational condition of the facility.
- The water consumption is between 150-400 ml/Bottle

Operational parameters

To achieve the hygienic requirements following operational parameters for bottle washers are mentioned in the literature (source: Flaschenreinigungsmaschine.?,?):

- Temperature of lye bath: 80-83°C (glass bottles)
- Temperature of lye bath: 55-58°C (plastics bottles)
- Action time for a lye bath: 6-7 min
- Lye: NaOH, KOH, 1.5 – 2%
- Other additive: 0.1- 0.5%
- Injection pressure: 2 – 2.5 bar

Evaluation of bottle washers

Contacted supplier : Krones AG, Schweiz, Kapellenweg 5, CH - 5632 Buttwil

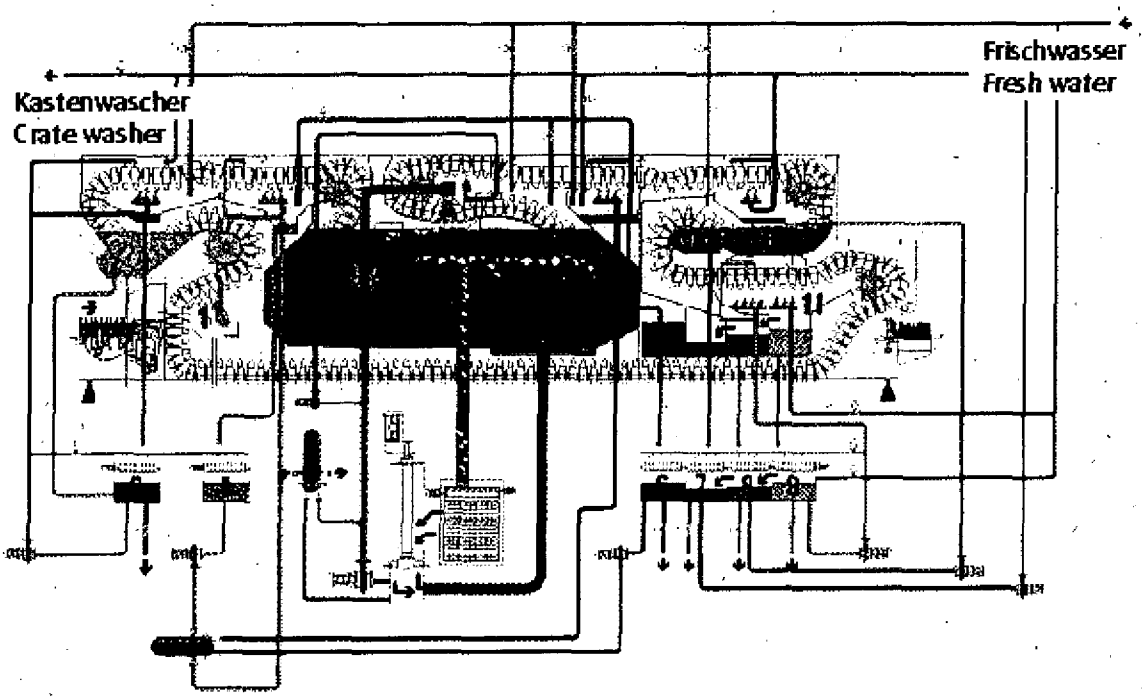
Tel +41 56 675 50 40, **www.krones.com**

Person: Mr. Christian Blaser, **chris.blaser@krones.ch,**

To estimate the costs for a new bottle washing machine following data's are required

- Weight, diameter, lengths and opening of each type of bottle
- Maximum and minimum size of the bottles
- bottles per hour (for a bottle size)
- Time in the suds
- Double or one end machine
- What types of products shall be bottled

The price for a bottle washing depends as well on additional features like isolation, heat exchanger, disinfection features. The various models of bottle washers can be found on:
http://www.krones.com/krones/en/104_366_ENG_krones_group.htm



1 Residual draining
2 Pre-soak
3 Pre-jetting
4 Recovery
5 Main caustic
6 Post-caustic
7 Warm water 1
8 Warm water 2
9 Cold water
10 Submerge bath, warm water 2
11 Fresh water

Figure : Sample of an double-end design, Lavatec KD...3,6

Fazit / conclusions / recommendations

According the COUNCIL DIRECTIVE 98/83/EC of 3. November 1998 on the quality of water intended for human consumption only drinking water is allowed for bottle washing. Mr. Blaser from Krones AG added that only the last step for bottle washing requires drinking water quality. That means for preliminary steps light contaminated water from other processes can be used.

Consumption figures of water between 150-400 ml/Bottle for bottle washers are achievable. Beside water consumption the option to save heat should been investigated.

For a cost estimation of a new bottle washer some basic data's are required, mentioned above. The costs are between 2'000'000 CHF and 3'000'000 CHF.

Author: Dirk Hengevoss

Date: *1.9.2005*

Annex 4 Missions and study tours conducted during the project period 2/2004-12/2005

Mission	Date	Duration	Place	Experts	Topics
6/03	8.06. – 19.06.03	11 days	ES, CR	Thomas Bürki	N.B.: this mission was budgeted and paid within 2004 as support contract FHBB in 2003 was pending Training seminars on energy efficiency for consultants Matchmaking between NCPC and industrial clients Practical measurements with NCPC consultants in industry
2/04	6.02.04	1 day	Vienna	Jürg Walder	Meeting on new project phase for the NCPC CA with P. Schwager Discussion of Workplan FHBB 2004.
4/04	14.04. – 26.04.04	12 days	GT ES CR	Jürg Walder	Discussion and final adjustment of FHBB's work plan according to the needs of the NCPC Interview and selection of NCPC director in El Salvador Definition of in-plant monitoring and benchmarking Quality assurance of in-plant-assessments Outlining the opportunities of QMS for the NCPC Outlining the opportunities of waste management especially in the plastics sector Taking up of technical needs of companies for home-based investigation
5/04	3.05.-14.05.02	10 days	Muttenz	Heinz Leuenberger, Jürg Walder, Maurice Jutz, Antje Langbein, Christof Jeiziner, >10 external experts	Sector specific CP training in Switzerland for NCPC staff on textile wet processing Know-how transfer regarding BAT and CP-methods Technology transfer: technology evaluation, project pre-condition Experience exchange among participants
6/04	14.06.-22.06.04	8 days	Berne	Christian Buser, Markus Schumacher, Maurice Jutz, 9 external experts	Overview of practices in milk producing farms Methods for whey utilization Matchmaking between NCPC and Swiss farmers authorities, technology providers, research institutes Business plan elaboration for dairy products with NCPC and CAMAGRO

Mission	Date	Duration	Place	Experts	Topics
6/04	7.06. – 11.06.04	5 days	Interlaken	Thomas Heim, Heinz Leuenberger, Jürg Walder, Christian Buser	Annual CP-meeting with all Swiss reference centres, UNIDO, UNEP and NCPCs
6/04	14. 06.04	1 day	St. Gallen	Jürg Walder	PET-study tour: Overview PET-recycling Switzerland Overview plastics recycling RE-LOG Three site visits (sorting and recycling plants of MIGROS)
7/04	23.07. – 28.07.04	4 days	CR	Urs Wagner	PCB-training: Awareness raising Teaching PCB-properties Remediation possibilities and inventories PCB management and field exercises
7/04	19.07. – 30.07.04	10 days	CR	Heinz Leuenberger, Markus Wolf, external experts	Training on hazardous materials and waste for government and industry Support under this contract: preparation of course documentation and part of logistics
9/04	6.09. – 14.09.04	8 days	GT ES	Christian Buser	Evaluation of on-going works and needs at the NCPC Introduction of time collect software at NCPC Discussion on formats for reporting Elaboration of modular training program
10/04	3.10. – 10.10.04	8 days	CR	Jürg Walder, Ernst Reinhardt	Eco-drive: Awareness raising at public and private organizations Matchmaking between the national cleaner production center, ministries and private sector Capacity building for NCPC-staff in Eco-drive methodology and implementation concept elaboration
11/04	1.11. – 9.11.04	8 days	CR	Fredy Dinkel	LCA training for NCPC staff of CR and ES: Continuation with LCA training incl. social and economic data with NCPC staff and some selected companies Learning about software tools to enable an efficient application of the method

Mission	Date	Duration	Place	Experts	Topics
2/05	30.1.05-20.2.05	21 days	GT, ES, CR	Jürg Walder	Planning mission (workplans) Technical assistance at company level Organisation of tranings (printing industry)
2/05	14.2.-19.2.05	5 days	CR	Kurt Münger	Training for graphics industry Audits of printing shops Printing manual elaboration
2/05	10.2.05-19.2.05	9 days	GT	Christian Buser	Elaboration of modular CP-training concept Training on CP for BID-consultants
2/2005	7.2.05/16.2./17.2.05	3 days	CR	Dieter Mutz	Selection of partners for solid waste programme Matchmaking with GTZ and NCPC Costa Rica
4/2005	18.4.-3.5.05	23 days	CR	Fredy Dinkel	Training in Life Cycle Assessment (LCA), participation in LCA-conference Building up of LCA hub at NCPC Costa Rica
5/05	2.5.-12.5.05	10 days	CR	Clemens Lang	Training of CSR-responsible at NCPC, Awareness raising on CSR Company visits for CSR assessments
5/05	22.5.-5.6.05	14 days	GT, ES	Jürg Walder	Follow-up on technology transfer projects Further planning with NCPC Assistance in nutrient balancing workshop
5/05	23.5.-27.5.05	5 days	GT	Peter Schönenberger	Training on quality management ISO 9'001:2000 First assistance in project descriptions
5/05	29.5.-8.6.05	11 days	ES	Hugo Cecchini	Training on nutrient balancing for NCPC staff Audits at pig farms, visits at MAG and MARN
7/05	24.7.-31.7.05	7 days	GT	Urs Wagner	Awareness raising on PCB inventory Elaboration of national action plans Field visits

Mission	Date	Duration	Place	Experts	Topics
7/05	1.7-13.7.05	13 days	GT, ES	Carsten Wemhöner	Training on energy efficiency for NCPC staff Company visits and practical exercises
8/05	22.-24.8.05	3 days	GT	Dieter Mutz	Participation in CPLatin Net workshop
8/05	22.-24.8.05	3 days	GT	Jürg Grütter	Training on CDM for NCPC staff Training on investment cost calculation
9/05	20.9.- 28.9.05	8 days	GT, ES	Christian Grabski	Training on ISO 14'001 for NCPC staff, BID-consultants and University students
9/05	29.8.05- 9.9.05	10 days	CH	Jürg Walder et al	Training on Food and Beverage production in Switzerland for NCPC consultants
10/05	11.10.- 21.10.05	10 days	GT	Christian Buser Florence Clerc Paul Hunziker	Training on cleaner production and food technology GMP, HACCP Company audits and recommendations
10/05	13.10.- 22.10.05	9 days	GT, ES, CR, NI	Peter Schönenberger	Follow-up training at each NCPC on QM ISO 9'001:2000 implementation Test on quality management for QM-responsible Evaluation of process documentation

J. Walder, Institute for Ecopreneurship

Annex 5 Proposal for ISO 9'001:2000 certification of the NCPC in Central America

swissTS

Bid/Contract

05-419

For the certification of the management system according to

ISO 9001:2000

of

National Cleaner Production Centres (NCPC)

Guatemala, Costa Rica, El Salvador und Nicaragua

Lead Auditor Heinrich A. Bieler
Swiss TS
Certification Body
Richtistrasse 15
CH-8304 Wallisellen
t +41 1 877 62 31
f +41 1 877 62 32
m +41 76 578 15 60
e heinrich.bieler@swissts.ch

Wallisellen, November 02, 2005

1. Subject and basics

The references of the procedure of certification of the management system of TÜV America are:

- Allgemeinen Bedingungen für die Zertifizierung von Managementsystemen
- Allgemeinen Geschäftsbedingungen der Swiss TS.

The basic references of this offer are

- Your contact to Mr. Heinrich A. Bieler
- Locations: Guatemala
  Costa Rica
  El Salvador
  Nicaragua
- The certification audit will be performed by a team with one auditor from Swiss TS in Switzerland and one auditor from TÜV América de México.
  The surveillance audits will be performed by an auditor from TÜV América de México.
- NACE Code: K 74.8
- The certification audit is scheduled for spring 2006

2. Service of Swiss TS-certification

This bid is valid under the assumption that no major changes of the organisation and the services are happening between now and the audits.

2.1 Cost of a certification-cycle

Organisation and preparation	**USD**	**425.--**
Review of System Documentation	**USD**	**1'330.--**
Certification audits		
Audits on site 1 day with 2 auditors in Guatemala 1 day with 2 auditors in Costa Rica 1 day with 2 auditors in El Salvador 1 day with 2 auditors in Nicaragua	**USD**	**10'640.--**
Audit analysis and report	**USD**	**1'995.--**
Certificates		
Registration fee and issue of 5 certificates A4, English for each location	**USD**	**1'200.--**
Surveillance audits		
1st year of surveillance 6 hours with 1 auditor in each of the 4 locations audit analysis and report	**USD**	**3'600.--**
2nd year of surveillance 6 hours with 1 auditor in each of the 4 locations audit analysis and report	**USD**	**3'600.--**
Certification audit	**USD**	**15'590.--**
Surveillance audits	**USD**	**7'200.--**
Total cost for three years	**USD**	**22'790.--**

2.2 Cost of a re-certification-cycle

Organisation and review of System Documentation	**USD**	**1'330.--**
Re-Certification audits		
Audits on site 6 hours with 2 auditors in Guatemala 6 hours with 2 auditors in Costa Rica 6 hours with 2 auditors in El Salvador 6 hours with 2 auditors in Nicaragua	**USD**	**7'980.--**
Audit analysis and report	**USD**	**1'755.--**
Certificates		
Registration fee and issue of 5 certificates A4, english for each location	**USD**	**1'200.--**
Surveillance audits		
1st year of surveillance 6 hours with 1 auditor in each of the 4 locations audit analysis and report	**USD**	**3'600.--**
2nd year of surveillance 6 hours with 1 auditor in each of the 4 locations audit analysis and report	**USD**	**3'600.--**
Re-certification audit	**USD**	**11'725.--**
Surveillance audits	**USD**	**7'200.--**
Total cost for the following three years	**USD**	**18'925.--**

2.2 Other costs

Travel time on a time and material basis Chargeable travel time is limited to 8 hours maximum each way per trip between Swiss TS and TUV America and between TUV America locations.	USD 100. -- / h
Flight costs (economy class)	will be charged on a time and material basis
Per diem (incl. accomodation, meals and local transportation)	USD 125.--
Additional certificates (5 units / language)	USD 150.--
Printing of organisation logo on the certificate	USD 150.--
Post audit (when necessary)	1,200.-- USD/day plus expenses

3. Validity of bid and contract

This bid is valid 6 month. By the signature of the two parties the offer becomes value of a contract.

The contract is valid for three years. It will be postponed for further three years if it is not cancelled by written matter within 6 weeks before the end of calendar year from by the two parties.

For the organisation
Fachhochschule beider Basel FHBB
Institut für Umwelttechnik
St. Jakobs-Strasse 84
CH-4132 Muttenz/Schweiz

Muttenz, Date: .....

.....
(Valid signature)

Swiss TS Technical Services AG

Wallisellen, November 02, 2005

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Heinrich A. Bieler