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**Summary Report:  
Cleaner Production Training for Cleaner Production Promoters of the  
UNIDO/UNEP National Cleaner Production Centres**

Amsterdam, October 31 - November 4, 1994

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### 1. Introduction

In order to enable the establishment of the first batch of National Cleaner Production Centres (NCPC's), UNIDO invited representatives from the following organisations to participate in a study tour in Europe.

- Tanzania Industrial Research and Development Organisation (TIRDO): C. Migiro
- Environmental Forum of Zimbabwe (EFZ): L. Mombemuriwo and R. Guratena
- Chinese Research Academy for Environmental Sciences/National Environmental Protection Authority (CRAES/NEPA): D. Ning, C. Wenming and Y. Xiulung
- National Productivity Council of India: S. Chandak and P. Gupta
- Indonesian Environmental Management and Information Centre (IEMEC): T. Dharmawan, L. Iskandar and P. Widjanarko
- Instituto Mexicano de Investigaciones Tecnológicas (IMIT): J. Chavez and G. Cisniega
- Czech Cleaner Production Centre: V. Dobbes and M. Šrp
- Slovak Cleaner Production Centre: A. Brazej and M. Chodak
- Tunisian EP 3 Centre: H. Bali M'rad
- UNIDO: Energy and Environment Branch: I. Volodin
- University of Gerona: M. Martin

Part of the study tour consisted of a one week training course in Netherlands, organised by IVAM Environmental Research (University of Amsterdam) in co-operation with the Erasmus Centre for Environmental Sciences (Erasmus University of Rotterdam). The training was delivered by:

- Ir. R. van Berkel, Head, Dept. of Product and Process Studies, IVAM Environmental Research
- Ir. R. Boesten, Project Manager Waste Prevention, IVAM Environmental Research
- Prof. D. Huisingsh, Professor on Industrial Environmental Management at Erasmus Centre for Environmental Studies
- Drs. L. Baas, Senior Researcher Cleaner Production at Erasmus Centre for Environmental Studies.

In addition, specialist contributions have been provided by:

- Prof. L. Reijnders; Professor in Environmental Sciences at University of Amsterdam
- Drs. E. Lindeyer; Senior Researcher on Life Cycle Assessments at IVAM Environmental Research.

The training course has been designed in order to provide the participants with sufficient knowledge and skills to initiate Cleaner Production (CP) projects in their respective home countries. The training program therefore put great emphasis on the exchange of lessons learned in various CP projects between trainers and participants as well as among participants. The program is added to this summary report.

### 2. Highlights in the program

#### Monday morning

R. van Berkel welcomed the participants and introduced the program and the practical arrangements.

L. Reijnders spoke about global environmental problems and the possible role of CP in solving each of these problems. It was concluded that technology, both CP and End of Pipe, is needed to minimise resource depletion and pollution problems. However, technology changes won't be sufficient and have to be supported by decrease in population growth and changes in consumption patterns.

L. Baas spoke about policy initiatives in The Netherlands to promote CP in industry. He addressed the development of environmental legislation from single media to multi media and highlighted some changes in the type of policy instruments used, with current emphasis on for instance target group discussions and voluntary agreements. With a view to fostering the implementation of CP in industry, it is of utmost importance to build institutional capacity for delivering CP services to industry. In the Netherlands this has taken place via the establishment of centres of expertise, such as the Prevention Teams in the Provinces, at the Innovation Centres, at the BMD's and other intermediary organisations.

#### **Monday afternoon**

In the afternoon each of the candidate NCPC's presented itself.

Mr. Chavez introduced IMIT (Instituto Mexicano de Investigaciones Tecnológicas). IMIT started within the central bank of Mexico and works towards the industrialisation of Mexico. Since, Mexico has joined NAFTA, IMIT has changed its strategy and organisation. IMIT is currently owned by two banks and has seven priority programs (like environment, quality assurance, technology, agriculture, SME's, product development). The Mexican NCPC will be located in the Environmental Program but will work in close co-operation with various other programs, like the Quality Assurance and Technology Program. IMIT has gained experience in End of Pipe techniques over the last decade, but is willing to move to CP, building on its preliminary experiences in the sugar cane industry. The NCPC will initiate demonstration projects in Central Mexico (with 80 % of the pollution); the primary focus will be on agricultural industries, small scale enterprises and the export sectors.

Mr. Mumburiwo and Guratena introduced the Environmental Forum of Zimbabwe (EFZ). EFZ is an industry initiative, with limited institutional resources, willing to host the Zimbabwe NCPC. The past experience in Zimbabwe is limited to the development of environmental legislation, with little - if any - implementation efforts; to a large extent the legislation is just copied from the UK (hazardous substances, water pollution, air pollution). The challenge for the NCPC will be to start a dialogue between private industry and government on industry and environment. Information dissemination via pamphlets, news bulletins, seminars and technology demonstrations will play a central role in the NCPC activities. In addition, networking will be essential, both among various sectors in Zimbabwe and internationally (at regional as well as global level).

Mr. Migiro from TIRDO (Tanzania Industrial Research and Development Organisation) emphasised the strong drive towards privatisation and the low capacity utilisation (20 to 30 % in public enterprises and 50 to 60 % in private enterprises) in Tanzanian industry. He believes that CP can benefit from this strong, national privatisation policy, since it forces industries to improve efficiency to which CP can contribute. TIRDO operates within the Ministry of Industry and Trade. Tanzania currently gains CP experience in a DANIDA funded CP demonstration project (CEPITA: Cleaner Environmental Production In Tanzania). CEPITA is managed by the National Environmental Management Council (part of the Ministry of Natural Resources, Tourism and Environment). The work plan for the NCPC, puts emphasis on information dissemination and management and the development of new CP demonstration projects.

Mr. Dharmawam introduced the Indonesian Environmental Management and Information Centre, which aims at fostering environmental management in Indonesian industries through information dissemination. There are close links with the chambers of commerce. The Indonesian government has approved a development plan for

1994 - 1998, stipulating among others 660 billion US dollar investments. The draft action program for the NCPC encompasses the development of an information system, training and awareness raising campaigns, technical assistance to industry and development of incentives (eco-labelling, annual industrial awards, soft loans, import duty exceptions etc). The following industry sectors will receive priority: leather tanning, food & beverages (tapioca, shrimp, meat processing, sugar cane), textile, metal finishing, printing and lead acid industries.

Mr. Chandak introduced the Environmental Division of the National Productivity Council. It works on different approaches; media-based (air pollution, water treatment, hazardous waste), trust sector based (small scale industries) and issue based approach (CP, waste minimisation, energy conservation). Although, NPC has already gained experience in CP (for instance via the DESIRE project), there is still a need for an Indian NCPC, because of the size of the country, the number of SME's (over 2.5 million), the need for CP demonstration projects and sectorial manuals and the need for developing CP experts, disseminating CP concepts and changing industrial and environmental policies. Among the expected outputs of the NCPC are above all demonstration and training projects. Industrial sectors for such demonstration projects will be chosen on the probability of success, expected cost-effectiveness of CP opportunities, pollution intensity, management commitment, status of the industry association (with a view to dissemination of the results) and capacity of NCPC. The development of training programs will be based on the assessment of actual training needs among governments, consultants and industries.

Mr. Duan Ning explained how China gained experience in CP via the establishment of discharge factors and best operating practices (benchmarking study for 25 industrial activities) and via implementation of the WorldBank/UNEP Cleaner Production Project. As part of this project, Chinese experts are trained and CP assessments do take place in some 30 companies in various industrial sectors. It is envisioned to establish the NCPC at the Chinese Research Academy for Environmental Sciences (subsidiary of the National Environmental Protection Authority). The NCPC will network via CP centres at the various Ministries of Industry (first one at the Ministry of Chemical Industry is already established) and at provincial and regional authorities.

The discussion among the centres and with trainers and representatives of the Dutch Ministry of the Environment focused on the action programs. Although it is necessary to develop comprehensive action programs on the long term, it was felt that given the resource availability for the centres, the activities should be focused on a few key activities. To be effective on the longer term, in the first years great emphasis should be given to the development of a number "excellent" case studies, showing both the environmental, technical and economic advantages of CP.

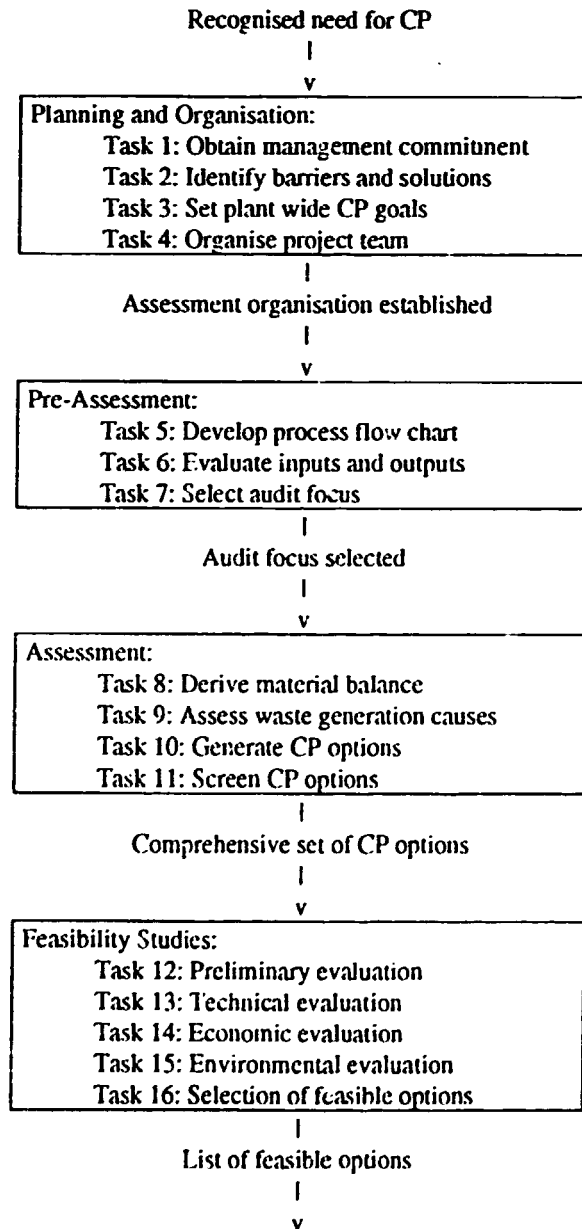
#### Monday evening

Ms. Bali M'rad spoke about the EP 3 centre in Tunisia, which has been established in 1993. In the first year, 12 company audits in 7 industrial sectors have been executed by USA experts in co-operation with local consultants. Dissemination of these results is about to take off. In addition the link has been established with the international EP 3 information clearinghouse. The most important lesson learned is that it is not enough to create the supply of CP services (via an EP 3 centre); a lot of attention still needs to be given to creating the demand for CP services (by developing appropriate industrial and environmental policies).

Mr. Dobbles spoke about the Czech CP centre. Various CP demonstration projects have proven the potential for CP and shown that CP faces a lot of barriers (such as End Of Pipe thinking, transitional state of the industry, poorly developed management systems etc). The challenge for the CP centre is to develop appropriate schemes that can ensure the ongoing implementation of CP even after finalisation of the external assistance to the company.

**Tuesday**

The entire day was devoted to a practical training on the systematic working method for a CP assessment. For the purpose of this training a modified version of the PREPARE approach has been used. Figure 1 contains the flow sheet of the CP working method used in the training. After the initial introduction to the overall framework the participants worked in small groups on the 'peanut factory' in order to practice the sequence source inventory, cause assessment and option generation. The overall impression by the participants was that it works; via these logical steps, one will be able to generate CP options for each process considered.



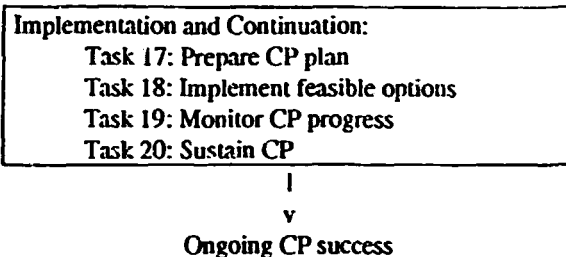


Figure 1: Flow sheet of the working method used in the training.

Next, a more detailed introduction was given to each of the tasks. These - theoretical - introductions were organised according to the five main phases. After each phase, the working groups worked on a real plant exercise to practice - part of - the tasks for the respective phase of the CP assessment. An agro-based pulp and paper mill and a chemical plant were taken as examples in these evolving exercises. The results of the group work has been briefly discussed.

The overall impression of this assessment training was positive. The major constraint was time, one day proved to be too short to fully elaborate the questions in the working groups and to properly evaluate the results of the working sessions in the plenary session.

In the evening session, Mr. Chandak presented the DESIRE CP manual and Mr. Ning the Chinese CP manual. Emphasis was given to the development process of the manuals, the scope and the organised approach. Although, more or less the same background material has been used by the two editorial teams, the final versions of the manuals are completely different. The need for the development of localised CP working methods was stressed. After localisation, one might expect differences in the scope for CP (giving rise to different CP prevention techniques) as well as in the procedure (proposed steps in the assessment), for instance with regard to the way obviously-feasible options are handled.

### Wednesday

A study tour was made to Rotterdam. At Erasmus University, first an introduction was given to the Stimular initiative. This started as a research project on CP opportunities and constraints in SME's in selected industrial sectors in the Rotterdam Area, and evolved into a Foundation fostering the implementation of CP in SME's, through training, information dissemination and technical assistance. The technical assistance given per company is relatively limited; approximately 10 advisory days per company.

Next the participants visited some companies that have received technical assistance from Stimular. These were:

- Van Trigt Straaltechniek; a container blasting and painting shop
- Machinefabriek Schut; a machining job shop
- Kaspenberg Printing Shop: an off set printing job shop
- Sanders Printing Shop: an off set printing job shop

The participants were divided in two groups, which allowed each of them to visit one of the metal working and one of the printing shops.

In the evening a rapporteur session was held in order to exchange the impressions from the company visits. It was concluded that in all companies, environmental legislation as well as rising costs for waste disposal and waste water discharges played an important role.

Stimular has contributed to the development and implementation of some CP options at the metal working



plants, respectively for blasting grid (at Van Trigt) and for coolants (at Machinefabriek Schut). However, it was felt that by far not all CP opportunities had been fully explored.

For the printing shops, Stimular has also proposed a number of CP options, especially for changes of printing inks and cleaning solvent. These are however not yet implemented.

Overall, the picture emerged that only limited parts of the systematic CP working method had been applied in each of these companies. The most remarkable gaps in the working method were:

- no real 'project team' established (the Stimular consultants basically co-operated with the director);
- no ownership of the CP options and results at the company;
- no baseline established (only overall loss balances established and no detailed material balances);
- focus limited to opportunities for technology optimisation and input changes.

#### Thursday

A study tour was made to the province of Overijssel. On the way to the province, a poultry slaughtering and processing plant (Jansens Pluimvleeslacterij) was visited, while on the way back a furniture manufacturer (Bovrie kasten en keukenfabriek) was visited. Both plants participated in sectorial CP demonstration projects - financed by the provinces of Overijssel and Gelderland - in which they received about 10 working days of assistance from CP consultants. At both companies, a short introduction was given by management representatives. Next, a tour was made around the facilities, which gave the participants the opportunity to raise issues for discussion.

At the province a short introduction was given to the activities of the Prevention Team. This team takes the lead in planning and organising sectorial CP demonstration projects and in trying to involve local governments (municipalities) and intermediary organisations (such as industry associations and innovation centres) in CP. Involvement of the regional or national industry association is a necessary pre-condition for sectorial demonstration projects. In each sectorial project some 3 to 10 companies get CP support from CP consultants or sector experts. After finalisation of the plant audits, dissemination of the results takes off during a sectorial CP seminar/workshop.

#### Friday

First a rapporteur session was held in order to evaluate the impressions from the two company visits on Thursday. Once again the participants felt that only part of the CP working method had been applied at each of the companies. At the poultry slaughtering and processing house, the focus was limited to water conservation and waste water minimisation. It was felt that opportunities with regard to processing of by-products had not seriously been addressed during the CP audit. The plant could hardly remember the changes made, which illustrated the lack of ownership over the project results. Apparently only housekeeping related options had been implemented, while some technology optimisation options are still under consideration by the plant management.

At the furniture factory the impression was that the management was only interested in innovations, both with regard to manufacturing techniques and with regard to products. Waste minimisation or CP seems to have occurred as a positive spin off from the installation of new, advanced technologies, instead of being properly integrated in the preparation of these investments.

Next, D. Huisingsh introduced a variety of CP training and educational materials, from different training institutes around the world. This session was followed by the 'fun factory'; the interactive CP training exercise based on a mock industrial process.

The afternoon was spent on topical sessions - held in parallel - for more detailed discussions between participants and trainers on specific topics. The following topics were covered:

1. *Developing Corporate Environmental Policies*: Don Huisingsh used cards with industrial environmental problems which had to be prioritised by the session participants, which provoked discussion. Such exercise can be used among top management representatives in order to set corporate environmental priorities.
2. *Barriers and Incentives for CP*: Leo Baas spoke about the barriers encountered in Dutch CP demonstration projects and ways to overcome these. A distinction was made between barriers occurring before the start of the company audit, during the company audit and after the company audit (while trying to set up ongoing CP programs).
3. *CP Opportunities in Textile Dyeing & Printing*: René van Berkel spoke about generally applicable CP opportunities in textile dyeing and printing. The results from demonstration projects in The Netherlands and China were discussed. Additionally, attention was given to the efforts from Dutch retailers trying to initiate partnerships for environmentally-improved clothes with their suppliers.



4. *Life Cycle Assessments*: Erwin Lindeyer introduced the framework for LCA's of products and highlighted some of the strong and weak points of this methodology. This provoked a lot of discussion on the impact of LCA's on international trade.
5. *Improving CP Training Skills*: Don Huisingsh spoke about various approaches for enhancing creativity in training programs and in co-operative project work with plant level CP assessment teams.
6. *Beyond CP Demonstration Projects*: Leo Baas facilitated this discussion which paid attention to various ways of disseminating the results of CP demonstration projects and of ways to foster ongoing CP activities in companies participating as demonstration units.
7. *CP Indicators*: René van Berkel spoke about the preliminary results and experiences of a Dutch project for the development of bench marking tools for CP. An attempt is made to clarify the conceptual misunderstandings regarding CP indicators. The proposed indicators for foundries and metal finishing companies were presented. In the discussion it was concluded that CP indicators could be an interesting tool for exchange of CP experiences between NCPC's in different parts of the world.

Next Igor Volodin facilitated an evaluation session (the evaluation remarks are elaborated in section 3 of this summary report). R. van Berkel finally acknowledged the co-operative spirit during the training program and closed the official training program

### 3. Evaluation

During the evaluation, the participants highlighted the following good points:

- *Comprehensiveness of the proposed working method*: the training in the assessment methodology was exceptionally complete and well planned, giving sufficient opportunity for the explanation of the theory, for brainstorming by the participants on the real plant, evolving exercises and reflections on the practical applications in a number of companies. The methodology explained during the assessment training seems to be well developed and proven.
- *Interactive sessions*: the interaction among the participants and with the trainers and representatives from the Dutch Ministry of the Environment was highly appreciated. The Monday afternoon session was useful as it contributed to the preparation of the action programs for each NCPC as well as to networking among the NCPC's.
- *Concise, brief coverage of a spectrum of CP related topics*, such as corporate environmental programs, CP indicators, LCA's, planning and management of CP demonstration projects, etc.
- *Exceptional CP commitment of the trainers and the perfectly prepared training kit.*

In addition, the following weak points were highlighted, which could be improved in similar training activities in the future.

- *Planning was too tight*; in order to allow for proper reflection on the materials presented, some more time for reflection was needed, especially for working on the CP assessment training (real plant exercises).
- *Difference between assessment theory and practice in the visited companies was too big*. The selection of companies to be visited could have been improved in order to show different levels of application of the CP working method. In addition it could have been nice to prepare fact sheets for each of the companies, summarising the before, and after, CP waste generation and economic data.
- *Poor coverage of environmental legislation and the development of CP policies in The Netherlands.*

The trainers appreciated the commitment and working spirit of the participants. It was a pleasure to experience the enthusiasm of the aspirant Cleaner Production Promoters. The trainers regard the interactive sessions on the draft action programs, the evolving plant exercises and the rapporteur sessions on the company visits as the most successful parts of the training program since these provided a forum for two way critical reflection between trainers and participants and as such proved the growing CP skills among the aspirant CP Promoters.