CHAPTER3

PROPOSED MEASURES FOR THE PROMOTION OF CLEANER PRODUCTION

CHAPTER 3 PROPOSED MEASURES FOR THE PROMOTION OF CLEANER PRODUCTION (CP) IN MALAYSIA

3.1 Summary

3.1.1 Review of Issues

Current issues mentioned in Sections 2.1, 2.2 and 2.3 are summarized as follows.

(i) Issues in enterprises in the Industrial Sector

- Limited awareness about CP and its advantages,
- Comparatively low priority of CP measures,
- Insufficient understanding and knowledge of present conditions of the factories,
- Lack of technically skilled human resources, and
- Lack of factory managers' confidence about CP benefits.

(ii) Issues Related to Policies

- Lack of implementing rules and/or provisions relating to CP or waste minimization practices, and
- Need for establishment of policy framework for CP promotion.

(iii) Issues Related to Incentives

- Complicated procedure for application of fiscal incentives specifically aimed at promoting CP,
- Complicated procedure for application of financing incentives specifically aimed at promoting CP,
- Need for strengthening technical incentives specifically aimed at promoting CP, and
- Lack of an award system for CP.

(iv) Other Issues

- Lack of information on consultancy services on CP,
- Need for improving access to information on existing CP technologies,
- Need for strengthening awareness campaigns on CP, and
- Need for capacity building of related organizations.

3.1.2 Summary of Proposed Measures

Barriers to the promotion of CP include many different factors as summarized in 3.1.1; therefore, CP cannot be promoted through a single measure.

Figure 3-1 shows how the issues, which factories are currently facing to, are to be incorporated into CP promotion strategy.

In this Study, measures for promotion of CP mainly in SMIs have been studied and are proposed on the following basis:

- It is expected that large industries can implement CP measures by themselves, and
- It is expected that large industries can comply with the environmental regulations through command-and-control.

Following are the set of measures proposed.

i) Development of National Strategy/Policy on CP

ii) Awareness Campaign, Networking and Dissemination of Information (Details are mentioned in 3.3)
   - Demonstration programme
   - Campaign on Benefit of CP and Incentives
   - Industrial Association and NGO
   - CP National Roundtable

iii) Access to CP Technology/Service (Details are mentioned in 3.4)
   - Training Programme for Corporate Manager, Engineer and Operator
   - CP Audit
   - Training Programme for CP Auditor
   - Certifying CP Auditor
   - Registration of CP Auditor
   - ESCO (Energy Service Company)

iv) Incentives (Details are mentioned in 3.5)
   - Improve SMI Access to Incentives
   - Promote CP Investments through MIDA Incentives
   - Improve Access to and the operation of the Existing Financing Schemes
   - Award System

v) Strengthening the Regulatory-policy Framework (Details are mentioned in 3.6)
   - Wider Application of Contravention Licenses
   - Self-environmental Auditing/monitoring
   - Self Disclosure
   - Energy Efficiency Regulation
   - Economic instruments

vi) Capacity Building (Details are mentioned in 3.8)

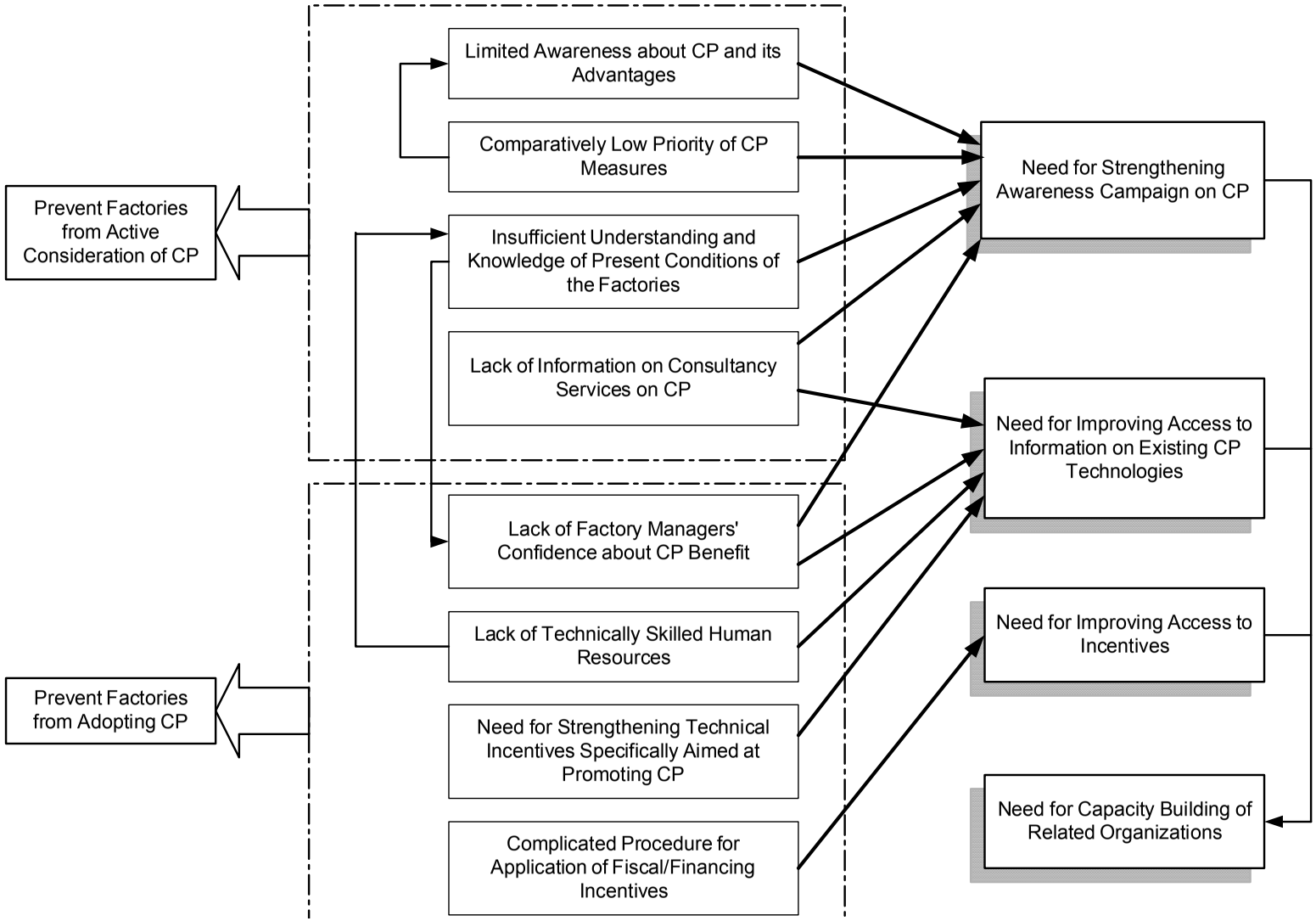

Figure 3-1 Relation between Issues of SMIs and CP Promotion Measures

3.2 Development of National Strategy/Policy

The national CP strategy or policy should be formulated to clarify the roadmap and responsibilities of related organisations to promote CP. A proposal of the National CP strategy is shown in ANNEX-4. The national CP strategy or policy should cover the following.

3.2.1 Basic Framework of CP Promotion Measures

It is desirable that the CP programme aiming at environmental preservation be based on a tripartite structure involving CP service providers that can provide SMIs with professional services on CP as shown in Figure 3-2, instead of a bipolar structure such as government vs. SMIs.

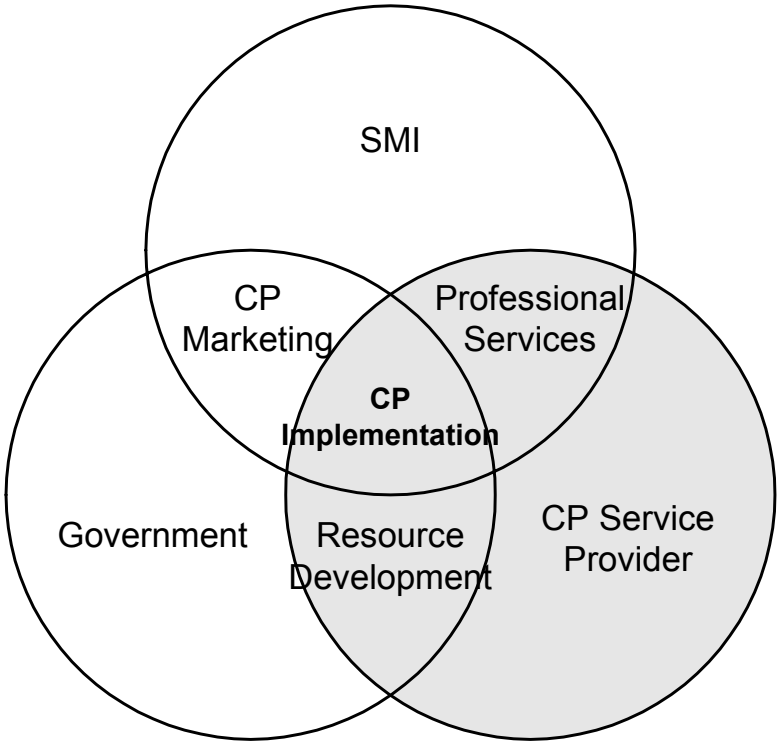

Figure 3-2 Desirable Structure for CP Promotion

The measures for the promotion of CP in SMIs are to be developed on the following ten basic issues.

(i) To promote CP in the manufacturing sector,

(ii) To enhance awareness of the importance of promoting CP among those who are associated with manufacturing and administration,

(iii) To clarify the role of organisations so that the responsibilities of the organisations may be clearly defined,

(iv) To organise an effective system of collecting and processing information of

manufacturing industries, SMIs in particular, so that the government may adequately promote CP,

(v) To identify and develop human resources, both in the public and private sectors, that will be needed to promote CP,

(vi) To prepare effective and easy access to incentives and finance in order to encourage SMIs to adopt CP,

(vii) To pursue inexpensive but effective strategies and methods in policy implementation,

(viii) To seek measures which the industries will accept and cooperate with willingly,

(ix) To facilitate introduction of technologies that promote CP, and

(x) To establish measures under which CP in the manufacturing sector can be effectively implemented.

The overall scheme of strategy/policy for CP promotion is shown in Figure 3-3.
Comprehensive methodologies should be worked out for the promotion of CP through:

(a) Regulatory policy framework on a long-term basis,

(b) Incentive measures on a short- or mid-term basis, and

(c) Measures for awareness raising, training, and information dissemination that call for activities on a short- term basis.

It should be noted that awareness raising as well as improvement in accesses to CP technologies/services calls for immediate attention, as they are connected to most issues.

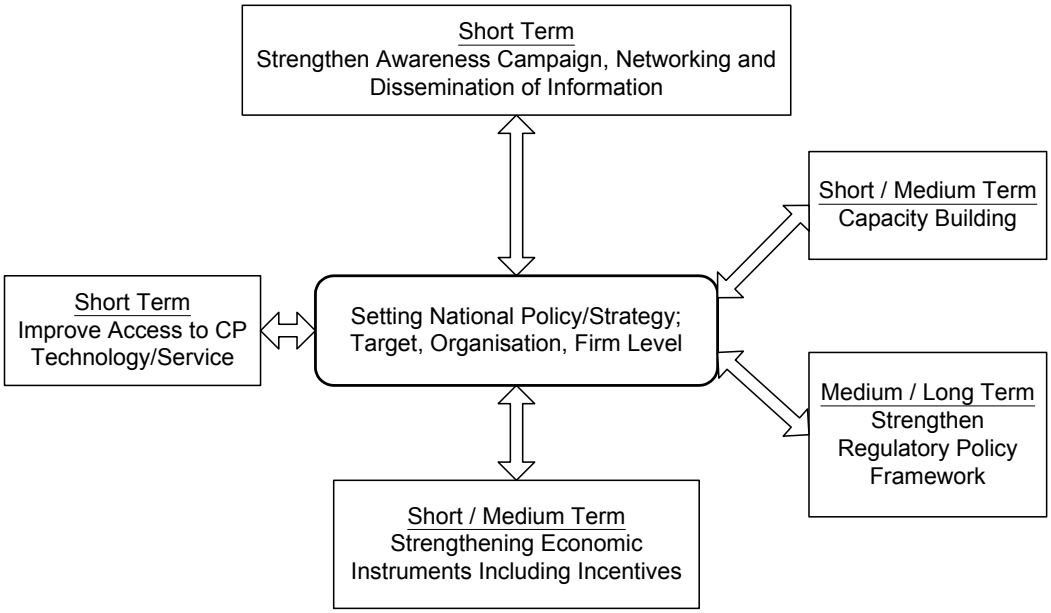

Figure 3-3 Concept of Strategy/ Policy for CP Promotion

3.2.2 Target or Benchmark

Sector based targets or benchmarks should be set up to provide industries with productivity improvement indices. Benchmarking is to be conducted based on industries' self-disclosure of basic data on the amount of input of raw materials and utilities, and output of products and waste. A concrete procedure for benchmarking is mentioned below:

(i) Prepare a questionnaire, which should include the following:
- Production amount,
- Number of employees,
- Amount of raw materials consumed,
- Amount of electric power, water, fuel, steam and other utility consumption. Water is to be subdivided by sources (city water, underground water, river water, recovered and recycled water and others), and by objectives (boiler, process, rinsing, cooling and others).
- The amount of wastewater discharged, solid and hazardous waste generated, and waste characteristics.

(ii) Distribute the questionnaire to individual factories periodically; i.e. annually,

(iii) Collect reports from individual factories in reply to the questionnaire,

(iv) Classify the reports by industrial sector,

(v) Calculate indices; e.g. unit consumption of raw materials and utilities, labor productivity, waste generation per production and the like,

(vi) Take the statistics of each index calculated and rank factories according to each index; i.e. good, average and inferior, and

(vii) Inform the factories, which cooperated to reply to the questionnaire, of the benchmarking results.

For example, typical indices in the electroplating industry are unit consumption of electricity (kWh/m^2-product), unit consumption of water (m^3/m^2-product), sludge amount (kg/m^2-product), reject rate (%), and so on.

The following is an example of such indices used in the electroplating industry in Japan.
- Rinsing water (fresh water + recycled water): 1 m^3/m^2-product
- Reject rate: 1-3%

As for the energy area, a remarkable reduction in unit consumption of energy was seen in industries in Japan after the first oil crisis in 1973. Tables 3-1 and 3-2 show unit energy consumption in the dyeing industry and the pulp and paper industry, respectively, in Japan.

Table 3-1 Unit Consumption of Energy in the Dyeing Industry in Japan

Unit: 1,000kl-oil equivalent/1,000m^2

	1973	1975	1977	1978	1979	1980	1985	1990	1995
Oil	0.216	0.209	0.201	0.194	0.188	0.163	0.125	0.133	0.144
(1973=100)	100	97	93	90	87	75	58	62	67
Electricity	0.038	0.040	0.044	0.045	0.047	0.044	0.046	0.052	0.064
(1973=100)	100	105	116	118	121	116	121	137	168
Total	0.254	0.249	0.245	0.239	0.234	0.207	0.171	0.185	0.208
(1973=100)	100	98	96	94	92	82	67	73	82

Source: MITI, Textile Statistics

Table 3-2 Unit Consumption of Energy in the Pulp and Paper Industry in Japan

Unit: 1,000kcal/ton

	1973	1975	1977	1978	1979	1980	1985	1990	1995
Total	5,948	6,129	5,440	5,392	5,321	4,834	3,874	3,461	3,497
(1973=100)	100	103	91	91	89	81	65	58	58

Source: Calculated based on data in "Handbook of Energy & Economic Statistics in Japan, 2000"

Activities for energy conservation in Japan were addressed to the reduction of oil consumption reflecting high oil prices after the oil crisis. Unit consumption of the sum of electricity and fuel in both of the industries showed steady decrease until early 1980s and leveled off afterwards due to completion of the first stage introduction of high energy efficiency equipment and reflecting relatively lowered oil prices. Thus indices or targets of energy conservation are influenced by the economic conditions as well as existing technologies that can be applied. As well, benchmarks should be set incorporating natural and economic conditions, available technologies, infrastructure and so on.

In conducting benchmarking, the following obstacles are considered and should be overcome:

- The benchmarking procedure is based on factories' voluntary reporting instead of compulsory application; therefore most factories may hesitate to reply to the questionnaire. Campaign for the benefit of benchmarking is necessary. In addition, it is advisable that an incentive be given to factories that cooperated to benchmarking; e.g. reply to the benchmarking questionnaire should be one of the qualification terms for CP awards if such awards are established.
- Most SMIs may not have data to fill out the questionnaire. Training for SMI managers on benchmarking is essential.

3.2.3 Organisational Structuring

In addition to those shown in Figure 3-3, the regulatory policy framework should be strengthened on a long-term basis so that CP promotion is effectively implemented and appropriate organisational structuring should be worked out.

It is proposed to set up a National Focal point as a main driving body and coordinating agency at the policy level. In addition, it is proposed that a National CP Centre be created at the operational level for promotion of CP.

The following sections describe proposed measures for the promotion of CP.

3.3 Awareness Campaign, Networking and Dissemination of Information

As stated in the Eighth Malaysia Plan, SIRIM is to intensify efforts to collect and disseminate information on CP to increase general environmental awareness in the industrial sector. In addition, it is desirable that other organisations continue efforts to raise corporate awareness about CP or waste minimisation.

3.3.1 Demonstration Programme

As one of the most effective measures that have an impact on corporate managers, a demonstration programme composed of a study tour to the demonstration model factory and a seminar to disseminate the results of the demonstration programme can play an effective role in an awareness campaign. A corporate manager will be most encouraged at a successful story in the same business that has adopted CP measures. The seminar could disseminate the following information gathered in a demonstration project:

- Incentives effectively applied in the project,
- CP options recommended by a CP consultant,
- CP measures implemented, and
- Benefits achieved by CP measures.

With completion of four demonstration cases in the SIRIM-JICA project, SIRIM has a total of ten demonstration projects supported by foreign donors in the showcase as of March 2002. It is suggested that a CP project be selected for demonstration in the case where the factory has taken full advantage of funding incentives; however, the factory owner's consent on the range of information release should be obtained in advance.

In addition, funding is necessary in order to implement more demonstration projects. A funding scheme for demonstration projects should be worked out including those created through international cooperation.

3.3.2 Campaign on Benefits of CP and Incentives

In order to raise corporate awareness about CP, which is generally limited, continuous efforts are needed by the various organisations concerned.

It is considerably effective to campaign on the benefits of good housekeeping practices as a cheap and fundamental basis for CP implementation. It should also be emphasised that losses in the production processes can be reduced to a certain extent through basic data collection and daily meticulous control of losses thus identified.

SMIDEC could provide information on incentives that should be available to assist SMIs with implementation of CP measures.

Continuous activities for information dissemination on CP are necessary to interest corporate managers in CP. Accordingly, it is preferable that the various organisations promoting CP make good use of various means; e.g. seminars and workshops, news letters on Cleaner Technology, exhibitions, CP information database, video records, and animated flow models, which are being adopted by SIRIM, TV broadcasting, journal publishing, and so on.

Funding for campaigns is also required and this could be made available through the budget managed by each relevant Ministry.

3.3.3 Industrial Associations and NGO

Industrial associations can play a leading role in networking and disseminating CP information; e.g. the SMI Association of Malaysia is willing to disseminate information about CP as well as to obtain feedback on SMIs' need for CP.

Through a network established by industrial associations, corporate managers can obtain technological information about similar businesses. On a mid-term basis, it is recommended that industrial associations spread information to their members on benchmarks for productivity or unit consumption of raw materials or utilities.

In order to make full use of the function of industrial associations with regard to CP information dissemination, it is advisable that materials on CP case studies, incentives, and/or sector-based benchmarks be prepared and distributed through the respective networks.

Activities by NGOs are playing increasingly important roles for networking engineers in

the industrial sector or consulting business as represented by the Cleaner Production Interest Group (CPIG) of ENSEARCH, which is functioning through tea talks on CP related topics and site visits. NGOs should enhance their networking activities especially through including industries.

It is proposed that SIRIM consider collaborating with NGOs in disseminating CP information through seminars/workshops; thus it is expected that more resources in the area of CP will become available.

3.3.4 CP National Round Table

As one of the most effective occasions that appeal to wider people, establishing a CP National Round Table, which was first organised in Malaysia by ENSEARCH in 1998, should be studied.

It is proposed that the Draft Final Report on the Study be presented at a CP National Round Table.

3.4 Access to CP Technology/Services

It is desired that various measures be implemented to provide industries with improved access to CP technology and services.

3.4.1 Training

A range of training programmes should be developed addressing industries, CP auditors, and/or financing organisations.

(1) Training for Industries

(i) Training Programme for Corporate Managers

In order to remove the large barrier in promoting CP among corporate managers, who tend to be sceptical about introducing CP measures, training programmes for corporate managers should aim at convincing them of the benefits of CP. With this in mind, it is preferable that the training programmes be focused on the presentation of successful demonstration projects, which can be appropriately provided by SIRIM.

(a) Training Organisation: SIRIM, NPC or NGOs
(b) Targeted Audience: Corporate Managers
(c) Training Period: A total of one day
(d) Training Items:

- Presentation of successful demonstration projects,
- Environmental management system,
- Incentives applicable to the adoption of CP, and
- Document based production control or ISO 9000 and 14000

(e) Targeted Level to Attain: To be convinced of the benefits of CP

(ii) Training Programme for Engineers

As key personnel in production activities, engineers are expected to do the following, although most SMIs may not be able to employ engineers:

- Have a clear understanding and knowledge of production processes;
- Establish the factory's own technology by combining the hands-on experiences of operators,
- Identify existing problematic issues,
- Work out and implement measures to solve the issues,
- Improve production management through a shorter management cycle, and
- Transfer technology to juniors.

Skills to carry out those measures mentioned above could not be acquired through a single training course but would require long-term working experiences; thus a training programme for engineers should focus on basic technology related to productivity improvement.

(a) Training Organisation: SIRIM, NPC or NGOs
(b) Targeted Audience: Engineers working at factories
(c) Training Period: A total of 3 days
(d) Training Items:
- Concept of CP,
- Concept of unit consumption and material balance,
- Benchmarking,
- Standardisation procedures, and
- Leadership role in QCC or small group activities.

(e) Targeted Level to Attain: To be qualified as the environmental manager

(iii) Training Programme for Operators

Operators working at industrial sites play important roles in productivity improvement activities by collecting basic data; thus it is recommended that training programmes for operators be developed accordingly. It is recommended that in-house programmes be conducted for all the operators in an industry by request, and public programmes for those selected.

(a) Training Organisation: SIRIM, NPC or NGOs
(b) Targeted Audience: Operators
(c) Training Period: A total of one day
(d) Training Items:
- Concept of CP,
- Good house keeping, e.g. 5S movement as a cost-effective CP measure, and
- Significance of basic data collection based on the concept of unit consumption.

(e) Targeted Level to Attain: Understanding on housekeeping and significance of basic data

(2) Training Programme for CP Auditor

Most SMIs need consultancy services for CP based on factory audits to work out improvement measures through CP.

On the other hand, no known registered CP auditors or consultants exist in Malaysia presently, although there are many consultants on environmental management and pollution control technologies. SIRIM is substantially a government supported agency that has conducted CP audits; thus it is proposed that a training programme be developed to develop CP auditors as follows:

(a) Training Organisation: SIRIM
(b) Targeted Audience: Engineers willing to function as CP auditor
(c) Training Period: A total of 10 days
(d) Training Items:
- Environmental laws and regulations,
- Incentives for CP,
- Concept of CP and end-of-pipe technology,
- Case studies on successful CP projects,
- CP audit procedure,
- Points for audit, and
- Reporting.

(e) Targeted Level to Attain: To be capable of conducting general CP audit.

(3) Training Programme for Financing Organisations

In case financing organisations do not possess sufficient knowledge on CP, it is possible that financial application proposals may not be accepted for unreasonable grounds. In order for financing organisations to select appropriate CP projects and reject inadequate projects, it is necessary to provide them with CP training.

(a) Training Organisation: SMIDEC in collaboration with MIDA
(b) Targeted Audience: Bank officers
(c) Training Period: One day
(d) Training Items:
- Concept and benefits of CP, and
- Typical CP investments.

(e) Targeted Level to Attain: Basic understanding of CP necessary to judge and select sound CP projects.

3.4.2 CP Audit

Environmental audits mainly address wastes from a factory or compliance to the regulations, and therefore does not necessarily require specific knowledge of the targeted process. On the other hand, CP audits address the production process, its operation and efficiency, with the aim to improve productivity.

Incentives for CP audit such as incentives available under the existing SMIDEC matching grant scheme for factory auditing should be prepared and disseminated

(1) CP Audit Services

Factory managers and staff may obtain general ideas on CP through seminars, booklets, the internet, etc. However, general ideas do not necessarily lead to immediate decisions to introduce CP measures to a factory, because the factory cannot generally work out improvement measures by CP due to the following issues.

(a) Insufficient grasp of the existing conditions which therefore hide real problematic issues,
(b) The factory lacks knowledge for solving problematic issues, and
(c) Finally, the factory manager is sceptical about the benefits of CP in his own factory.

There is no better way to convince factory managers of the benefit of CP measures than through realistic recommendations based on an actual audit carried out on the factory. As the first step of considering CP, factories may contact a single window agency, which can furnish the factories with CP audit services that are cheap or practically free of charge.
A technologically competent team in which SIRIM should take a leading part as stated in the Eighth Malaysia Plan should conduct CP audits.

Through a CP audit, a factory would be able to obtain the following outputs from the audit

team based on the recognition of existing conditions:

(i) Identification of existing problematic issues;
(ii) Improvement measure options; and
(iii) Recommendations based on feasibility study.

It should be emphasised that it is important to get an exact grasp of present factory conditions based on basic information and data on the production process. Where such information and data are not sufficiently collected as is often the case with SMIs, the CP audit itself should initiate this by requesting the factory to start collecting basic data.

It should be emphasised again that, by actually grasping the present conditions of the factory, the factory might discover existing issues, which were previously hidden, and thus take measures to improve production control activities without a large investment.

In order to meet the industry's requirement for CP audit, the capacity of its audit teams should be increased by:

i) Increasing the capacity of SIRIM itself;
ii) Organizing private sector's consultants; and
iii) Utilising certified environment auditor or energy auditor.

(2) Accrediting CP Auditor

In order to foster competent CP auditors or consultants, it is proposed that a system for accrediting CP auditors be created. The CP auditor certificate should be given to those who satisfy the following criteria:

- Pre-qualified graduates of the CP auditor-training course mentioned above or engineers with sufficient years of experiences in industrial sites, and
- Those who have passed an examination for CP auditor qualification including undergoing a practical exercise at a model factory.

As presently there are very few experienced engineers available in the private sector, it is desirable to create a graded certification system according to the following qualification:

CP Auditor Grade A: qualified to conduct a complete package of audits containing recommendations on CP options. Since CP measures differ depending on targeted industrial sector, this grade will be given to specific industrial fields; e.g. metal finishing, electroplating, textile, and so on.

CP Auditor Grade B: qualified to conduct factory audits on general issues related to productivity improvement or waste minimisation.

It is proposed that SIRIM be entitled to issue CP auditor accreditation mentioned above.

(3) Registration of CP Auditor

In order to cope with an increasing number of requirements for CP audits, it is necessary to mobilise a large number of CP auditors.

It is suggested that a system of registering CP auditors be set up aiming at providing industries with high quality consultancy services in CP promotion. Qualified engineers with CP auditor certificates as mentioned in (2) can be registered with SIRIM.

SIRIM can mobilise registered CP auditors for conducting CP audits on a case-by-case basis in order to supplement its own staff resources, especially, in the case where a specific process expert is needed

3.4.3 ESCO (Energy Service Company)

Over the long-term, it is preferable that CP consultancy services be promoted to become stand-alone businesses. Energy Service Companies (ESCOs) give a pioneering example. ESCOs undertake comprehensive services from energy audits to final implementation of a project for energy conservation and takes fees based on the benefits achieved. The ESCO system is functioning in Japan, particularly in the commercial sector.

As energy conservation is an important element of CP, it is expected that ESCOs be made use of for the promotion of CP in cases where the targeted factory has a clear goal for energy conservation. For that purpose, SMIDEC and SIRIM should recognise ESCOs as an integrated part of the CP- related technical service system.

3.5 Incentives

3.5.1 Improve SMIs Access to SMIDEC Incentives

Many SMIs simply lack knowledge and/or awareness of incentives for CP investment. The ITAF, which is a grant scheme for consultancy services for promotion and rehabilitation of SMIs as described in 2.3.1 (2) and is applicable to CP promotion, is an example. Among ITAFs, ITAF2 meets Cp promotion. In addition, it is observed that the application forms to apply for incentives are slightly complicated for them. It tends to require long period for evaluating proposals. The measures to improve SMIs access to incentives for CP investment include promotion of incentive awareness campaigns through SMIDEC, MIDA, industrial associations, and financing firms using pamphlets, brochures and posters. These can be presented on occasions of environmental protection campaigns such as seminars, exhibitions and through the mass media.

It is highly recommended that SMIDEC specify the inclusion of CP audits and investment into ITAF matching grants schemes. In addition, SMIDEC can also prepare brochures on the incentives of grant schemes applicable to CP promotion.

3.5.2 Promote CP Investment by MIDA Incentives

It is important to make existing direct and indirect tax incentives more effective, as opposed to creating new incentives. The fiscal incentives offered by MIDA that favor CP promotion are described in 2.3.

(i) Promotion of access to MIDA incentives

The following are recommendations for SMIs to access MIDA incentives for CP promotion.

(a) Strengthen administrative capabilities through the following measures.

- MIDA together with SMIDEC should prepare a brochure on fiscal incentives for CP for inclusion into basic information booklets.
- Application forms for incentives for CP should be reviewed, studied and simplified where possible.
- The officials concerned should be trained to assist SMIs in completing these forms.
- The officials concerned should be trained to assist SMIs in obtaining fiscal incentives for CP investments.

(ii) Clarify the applicability of existing incentives to invest in CP

In order for fiscal incentives to attract investors, the enforcement of existing environmental regulations, and registration system for taxes should be strengthened.

(iii) Inclusion of water project to MIDA incentives

In CP, the reduction of water consumption is an important issue. Therefore, MIDA incentives should be applicable to the investment which affects the reduction or reuse of water. In addition, it should be specified in the brochures that MIDA incentives are applicable to the project related to the reduction or reuse of water.

3.5.3 Improve SMIs access to Bank Financing and Operation of the Existing Loan Schemes

It is important for CP investors to ensure easy and adequate access to institutional finances as opposed to creating new financing schemes. Bottlenecks in financing SMIs

investments, including those for CP, are observed in the operation of existing loan schemes. The following are recommendations to promote CP investment by improving SMIs access to bank financing and improve the operation of the existing loan schemes:

(i) Provide adequate consultation for access to bank financing and help for SMIs in presenting their investment proposals to banks.

SMIs proposals are often inadequate for banker evaluation due to lack of information and accurate accounting documents from SMIs. Poor presentation is often observed. Under these circumstances bankers tend to refuse financing. Closer consultation between both parties will increase the chance for bank approval in case of preparation of precise proposals.

(ii) Easy access to finance schemes for SMIs investment among various schemes

Various kinds of financing schemes are available for SMIs investment. Eligibility details for financing CP should be better studied.

(iii) Raise bank credit officers' awareness of CP

Bank officers are not familiar with CP investment due to its small capital investment and the inclusion of various technical aspects. It is recommended that bank officers be invited to CP seminars in order to increase their awareness on the benefits of CP investment. In addition, when CP seminars are held, bank officers should be invited as lecturers for presenting their viewpoint on financing.

(iv) Support banks evaluation of CP projects properly

Bank officers who are in charge of evaluating the creditability of proposals submitted are well trained; however they are not familiar with CP investment. They thus could outsource specialists with CP knowledge to assist them in evaluating the technical feasibility of the CP investment. Support from DOE and SIRIM on technical evaluation will enhance bankers' evaluation of CP investment.

3.5.4 Award System

To increase business interest in CP, awards could be given to individual engineers groups of employees or entities, which have achieved excellent results in promoting CP. It is considered necessary for government to publicly commend enterprises or individuals that have achieved excellent results in CP and that have made constant efforts in implementing CP. Candidates for awards could also include manufacturers who have developed and used highly effective CP equipment during the year. This system will greatly boost the morale of people who have engaged in CP implementation.

3.6 Strengthen the Regulatory-policy Framework

3.6.1 Wider Application of Contravention License

A contravention license is a license to pollute beyond the limits permitted by the provisions of the EQA. Contravention licenses are issued when there is an absence of technology to dispose waste efficiently and an effluent-related fee is charged for the license.

As SMIs especially need time to make their process comply with effluent standards, application of contravention licenses is a good method for industry to pay attention to process improvement; i.e. CP rather than end-of-pipe approach as a quick solution. The wider application of contravention licenses is thus useful to promote CP especially for SMIs.

3.6.2 Environmental Audit and Environmental Manager

(1) Environmental Audit

Environmental audits may be required and the results of audits should be submitted as described in EQA Section 33A. DOE enforcement officers visit factories to obtain samples of the discharges and emissions, to analyze for compliance and to pursue operations effectiveness. This activity needs much manpower and budget to monitor a large number of SMIs. To reduce these requirements, environmental audits should be introduced aiming at more efficient enforcement and compliance to the law.

The following outlines the steps necessary to develop self-environmental audit/monitoring procedures.

(i) As a first step, environmental audit regulations should be developed. In parallel with the preparation of regulations, guidelines should be developed.
(ii) Specific regulatory requirements for auditing should be established.
(iii) Training should be carried out aiming at capacity building for environmental audit for industry.
(iv) After carrying out environmental audits, audit reports are submitted to DOE. For the purpose of carrying out audits, qualified personnel are appointed.
(v) Qualified personnel who are capable of carrying out environmental audits are to be listed. It is important to ensure appropriate training and experience for regulatory enforcement.

(2) Environmental Manager System

For the promotion of CP, the establishment of a factory environmental manager system is recommended. This system aims at helping the designated factories to recognise their production, material and utility consumption, and waste; to analyze their material and utility consumption and waste process-by-process; and to understand the causes of fluctuations in material and utility consumption, and waste generation. As a result, this will lead them to take effective measures to avoid and reduce waste generation.

It is important for a factory to have a designated environmental manager and to enable these managers to play a key role in promoting CP. The environmental manager is expected to fulfill the following roles.

(i) To investigate potential reduction of material and utility consumption and waste generation in the company and to examine the causes of the inefficiencies, and

(ii) To investigate complaints by the owner or management relating to the efficient use of equipment;

A system of designating environmental and CP-managed entities and environmental managers will greatly contribute to nationwide CP promotion.

An environmental and CP managed factory should therefore appoint an environmental manager. In order to maintain the quality of the environmental manager system, a qualification system for the environmental manager is important.

(a) System for qualification of environmental manager

Introduction of a qualification system for environmental managers will be needed in order to expedite deployment of necessary managers at every environmental and CP-managed entity.

- Environmental Manager Certificate:

It is worth discussing the establishment of short-term approved courses to provide training on environmental management subjects to personnel to be assigned by the plants, and/or a system where the authority issues authorisation to the training organisations to arrange these courses. The body that is responsible for the promotion of CP should be able to issue certificates at the end of the said courses. In order to expedite deployment of environmental managers, it would be advisable to introduce a state-approved or authorised qualification system for environmental managers, such as the giving of certificates to graduates of specific technology courses, and engineers/practitioners with a

certain minimum number of years of experience in promotion of environmental issues. At the early stages of establishment of the system, certificates could be given without examination, aiming at extension and upgrading of the certification system. However, examinations are recommended to certify candidates and to upgrade managers technically and administratively.

(b) Organising Environmental Managers

In order to maintain and improve the quality of environmental managers, it is recommended to organise them, provide them with updated technical information on CP and train them in cleaner technology training courses. Qualified environmental managers should be registered. At an organisational level, it is possible to provide them with information obtained by CP audits and information from foreign sources on CP and to give specialised technical education. This group of environmental managers also can perform as auditors or consultants.

3.6.3 Energy Efficiency Regulation

Mandatory regulations for the electricity efficiency were drafted and they propose10% reduction in power consumption. CP includes the concept of efficient use of energy. As a first step in aiming at efficient use of energy, it is highly recommended to gazette the regulations. The regulations were drafted under the Electricity Supply Act and prepared to comprehensively promote the rational use of electricity and resources in order to ensure their effective use and meet goals of economic and social development. As mentioned above, the regulations should be gazetted as soon as possible and contents of the draft should be modified as the original draft was prepared 6 years ago and was not enacted. The draft consists of energy managed entities system, qualification system for energy managers and officers, energy auditing, monitoring, reporting system for electricity control and recording, and standards for electrical appliances with a labeling system and for products using electricity. Judging from current situation, the most important step to proceed is to gazette the draft and enact as written below (1).

The regulations cover mainly electricity as stated. Accordingly, to further promote the efficient use of energy, the scope of regulations should be expanded to include not only electricity, but also other energy sources. Furthermore, regulations will ideally cover other sectors such as the residential and transportation sectors. Standards and guidelines for promotion of energy efficiency should be prepared when the regulations changes to cover electricity as well as fuels.

(1) Early gazettement of regulations

It is strongly recommended that the Government expresses its commitment to the promotion of energy efficiency, and for it to formulate regulations on which its various measures are to be based. A draft of the regulations has been prepared and is expected to be gazetted in 2002.

(2) Expansion of scope of regulations to regulate fuels

The prepared regulations are mainly for electricity. It is recommended to expand the scope of the regulations not only for electricity, but also for other fuels when revision is required for the purpose of further energy-savings.

(3) Preparation of standards and guidelines for promotion of energy efficiency

It is strongly recommended that standards and guidelines be prepared, in the areas shown below.

Standards for auditing are desperately needed. The items for standards for the industrial sector are:

(i) Rationalisation of fuel combustion system,
(ii) Rationalisation of heating, cooling and heat transfer system,
(iii) Prevention of heat loss due to radiation and transmission,
(iv) Recovery and utilisation of waste heat,
(v) Rationalisation of systems to convert heat into motive power,
(vi) Prevention of electric power loss due to resistance and other factors, and
(vii) Rationalisation of systems to convert electricity into motive power, heat, etc.

Various guidelines with quantitative targets for the promotion of energy efficiency should be prepared for the following:

(i) Fuel combustion system,
(ii) Heating, cooling and heat transfer,
(iii) Radiation and transmission,
(iv) Recovery and utilisation of waste heat,
(v) Converting heat into motive power,
(vi) Electric power loss, and
(vii) Converting electricity into motive power.

(4) Wider application of regulations to other sector

It is also recommended that the regulations be applied to other sectors such as residential and transportation.

3.6.4 Economic Instruments

Economic instruments are part of the environmental regulatory system. They act to reduce effluents and make the act of discharging pollution more costly offering an effective approach to environmental protection. The areas for which economic instruments can be applied include water pollution, water supply, air pollution, solid waste and scheduled waste. Among them water related economic instruments are considered to be appropriate for CP promotion to the industrial sector. In Malaysia the charging of palm oil and natural rubber effluent fees have been practiced. In addition, palm oil and rubber research cases have also been introduced.

(1) EPU study on Economic Approaches to Sustainable Development (2000-2003)

The mid-term review of the Seventh Malaysia Plan (MTR-7MP), the National Economic Recovery Plan (NERP) had indicated that the government was considering the adoption of economic instruments in environmental management. Both these documents were published in 1999. The Eighth Malaysia Plan (8MP) has indicated that efforts will be channeled at promoting economic instruments in addressing environmental and natural resource issues.

With the assistance of the Danish government, through the DANCED programme, the EPU embarked on a three-year project to develop demonstration projects using economic approaches to achieve sustainable development. That project started in the second half of year 2000 and is due to run through till mid-2003.

The approach undertaken by the project team was to carry out a scoping exercise, which identified possible projects, short-listed them on the basis of certain criteria,[1] and then with a smaller, more manageable, number, conducted pilot projects to examine the implications for wider policy actions.

A steering committee was formed with the EPU as the chair. The members of the steering committee were the major ministries, and in many cases, included the agencies where the demonstration projects were undertaken. Other major ministries were also represented, such as Ministry of Finance, and Ministry of Housing and Local Government. The steering committee provided coordination, guidance and direction for the project. For daily implementation, workgroups were formed to carry out all the work of the demonstration projects.

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1 For example, institutional responsiveness to project, applicability of known instruments, complexity of economic-social and institutional context, etc.

A scoping exercise was undertaken. This took the form of a workshop held to identify potential interest amongst the major government agencies. It was organised by the EPU, the implementing agency. During the workshop, potential participants indicated their interest. This was followed up by a prioritisation according to needs of the EPU and the project sponsors. A short list of projects was made, and visits were made to the prospective organisations to gauge their interest, level of complexity of problems, institutional preparedness and the fit between these projects and their institutional plans. Several demonstration projects that show the usefulness of economic approaches in solving several environmental problems were identified in this process.

The demonstration projects that started early January 2001 are in various stages. The objectives of the projects are:

– to demonstrate the usefulness of economic instruments
– how to transform a carefully planned and designed proposal to introduce an economic approach into official government policy.

The demonstration projects are:

i) To improve the safe and proper use of pesticides

The issue in this project was the government's view that pesticide usage is excessive, and needs to be controlled. A cess or charge on pesticides is being considered, and the current duties, charges, taxes, and fees are reviewed. A rapid assessment survey was carried out to assess the consumption, production, and distribution of pesticides in various agricultural industries. This project is being carried out with the lead agency in the Pesticides Board, i.e. the regulator of pesticide industry in Malaysia. This project on the safe and proper use of pesticides and the next project on deposit-refund system for pesticide containers were essentially combined as one project during the investigation or study phase.

ii) A deposit refund system for pesticide containers

A deposit refund system for pesticide containers is being considered to ensure that used pesticides, which are hazardous and toxic, are collected and disposed of in an acceptable manner and not diverted to non-intended use. For instance, there were reported cases of pesticide containers being used as storage for water. A demonstration project is currently being carried out in Cameron Highlands. The working group has prepared a paper on options for a deposit-and-refund system. Discussions are underway to finalise on a specific proposal. Once again the Pesticides Board is the implementing agency.

iii) Management of lubricant waste oil

This project would address the environmental problems of lubricant waste oil as well as oil which is not properly collected or disposed resulting in soil, surface and ground water pollution. A rapid assessment survey was carried out throughout the country to assess the import, export, generation and collection of lubricant waste oil. An option paper is being prepared for the design and financing of an incentive system for collection, transport and disposal of non-usable waste oil. The implementing agency is the Department of Environment, DOE.

iv) Local waste management and recycling project for Tioman Island (November 2001-October 2002).

The TOR has been prepared and approved. The objective is to consider how economic instruments can be used to provide incentives for enhancing the functioning of the solid waste collection and treatment system. A paper on the current situation, recommendations on the design of economic incentives, legal and institutional recommendations, and Social Impact assessment are part of the project. Working group meetings, study trips for head villages, a study tour to Denmark, and workshops to increase acceptance by major stakeholders are being carried out. The implementing agency is the Tioman Development Authority (TDA).

v) The collection and treatment of used tyres in Sarawak (November 2001-March 2002).

The proposal for this project has been developed. The objective is to consider how economic instruments can be used to improve the collection and treatment system for used (post-consumed) tyres, including feasibility study of a tyre recycling facility. A feasibility study to determine the economic and financial viability of implementing a tyre collection and treatment system in Kuching is part of this project. An assessment of the implications for a system to be set up in Peninsular Malaysia would also be carried out. The implementing agency is the Kuching Municipality.

The demonstration projects on pesticides, pesticide containers and lubricant waste oil are expected to be completed by mid-2002.

With the experience gained from these projects, the EPU will be able to formulate policies that aim to use economic instruments or economic approaches in environmental management and move towards sustainable development. Each of the demonstration projects has valuable lessons in terms of their execution. So far, the lessons learnt have been that economic instruments must co-exist with the “right” institutional context. There is much institutional rigidity, either in the laws or organisational set-up that could pose important barriers for implementation. And there is also a market that operates in ways

that sometimes undermines the good effort of government.

(2) Green Procurement

The government as well as private enterprises could implement green procurement. Such a policy will help stimulate suppliers and manufacturers to move towards more environmentally friendly products and services. Currently, government consumption is estimated to be 26% of total consumption. A green procurement policy could very greatly stimulate overall consumption patterns in the country.

(3) Others

(i) Environment Fund

Though an Environmental Fund is not presently in place, activation of such a fund would be useful to promote CP in the future. Provisions for setting up the fund is already stated in Sections 36B to 36 E of EQA. Hurdles to the creation of an Environmental Fund are,

(a) Consensus among Governmental organisations has not been reached,
(b) An organisation to manage the fund has not been appointed,
(c) Monetary sources are not clear, and
(d) The application of the fund is not defined.

(ii) Emission Trading for BOD

To get the 'market' to manage the environment is a strategy for reducing pollution and the idea of tradable pollution instruments now in practice in the US could be strategy for the future. It is noted that the transaction cost is high to develop, monitor and certify the amount of emission and to prepare the market for its implementation.

3.6.5 Solid Waste Management Act

The proposed Solid Waste Management Act should incorporate provisions for promoting waste recycling practices. The Act should serve as a guideline for those involved in waste management and provide encouragement for the public to minimise waste generation. With the implementation of this Act, some incentives can be incorporated for the public to recycle usable wastes.

(1) Independent and separate activity of related parties to promote recycling

The following activities to support recycling should be implemented by every related party in cooperation with one another.

- Matching between waste generator and user,
- Coordination and arrangement among government sectors and private sectors,

- Redesignate solid waste as scheduled waste and vice versa,
- Appropriate cost and profit allocation among related parties in carrying out the activities, and
- Observation of each participating party to carry out their responsibilities.

(2) Targets and Objectives

In order to monitor recycling progress and to sustain activities it is necessary to set concrete target values for recycling rates in each participating body and for each kind of industrial wastes. Targets should not be set at levels too difficult or too easy to achieve so that the participating bodies are both challenged and encouraged.

Denmark's target for waste recycling in the action plan was set to increase 15% from 35% in 1985 to 50% in the 1990s. The target has since been achieved.

3.6.6 Environmentally Hazardous Substance

EQA, prescribes which environmentally hazardous substances are required to be reduced, recycled, recovered or regulated. Such prescribed products shall contain a minimum percentage of recycled substances and include declaration of their recycled constituents, method of manufacture and disposal. In this regard EQA specifies rules on the use, design and application of the label in connection with the sale of the substance or product which claims to be environmentally friendly.

EQA also has provisions on deposit and rebate schemes in connection with the disposal of products that are considered environmentally unfriendly and/ or cause adverse effects on the environment. Accordingly, the government will be able to control any hazardous material/ substance so that it is properly handled and disposed of, thus further reinforcing the need to promote CP and recycling practices

3.6.7 Voluntary Approach

(1) Environment Management System

Introduction of the ISO 14000 Series is expected to bring enhancement of environment management and production control, while possibly providing financial benefits and boosting international competitiveness. However, certification needs cost and manpower.

(2) Publishing Environmental Performance Data/Environment Performance Evaluation (EPE)

Making public the company's environmental commitment and performance data provides transparency on the company's activities. Corporate environmental reports that are

published on a regular basis by some big companies, not only serve to inform the general public but also provide the possibility of benchmarking on environmental improvement. Establishing websites is another popular option to disseminate information.

(3) Voluntary Agreements

This is a tested measure for Malaysia where the government enters into negotiations or agreements with associations or firms to reduce or prevent pollution or to reduce waste in production processes and/or products. This approach gives the stakeholders a chance to be involved in a national solution that ensures that environmental costs are not excessive while benefits to society are ensured. The authorities set up the framework and targets and negotiate with industry, and then they are free to choose how to attain these targets or pay the penalty for not doing so. The agreement is voluntary at the beginning, but becomes mandatory when the regulations kick in. In other instances, these could be based on the principles of producer product liability and if the industry does not comply with the agreement, the targets can be converted into commands through legislation. This is one suitable approach that could be taken, as the DOE has had a similar experience with the palm oil and rubber industries in the 1980s.

3.7 Role of Related Organisations

In view of the roles of the existing organisations, it is proposed that SMIDEC more clearly consolidate their CP promotion activities as well as SMIs development, and act as a window or liaison on incentives for CP promotion.

Table 3-3 shows the role of each organisation in CP promotion and implementation.

Table 3-3 (1) Role of Organization Related to CP Promotion (1)

◎: Main body ○: Cooperative body Time Frame S: Short-term M: Mid-term L: Long-term

Measures for CP Promotion	Related Activities	EPU	MOSTE	SIRIM	DOE	MITI	MIDA	SMIDEC	NPC	MECM	Energy Commission	Energy Centre	CP Consultant	Industries	Ind Associations	NGOs	Banker	Time Frame
National Strategy/policy	(1) Formulate a National Strategy/policy	◎	◎		○													S
	(2) Set up Benchmarks		◎	○	○	○												S/M
Awareness Campaign, Networking and Dissemination of Information	(1) Demonstration Programmes	◎		◎				◎					○	○				S/M
	(2) Campaign on CP Benefit and Incentives			◎	○			○							○	○		S
	(3) Networking			◎											◎	◎		S
	(4) CP National Roundtable			◎												○		S
Access to Technology/Services	(1) Training			◎			○	◎	◎					◎	◎	◎		S/M
	(2) CP Audit			◎				◎					◎					S/M
	(3) ESCO			○				○				◎						S/M

Table 3-3 (2) Role of Organization Related to CP Promotion (2)

◎: Main body ○: Cooperative body Time Frame S: Short-term M: Mid-term L: Long-term

Measures for CP Promotion	Related Activities	EPU	MOSTE	SIRIM	DOE	MITI	MIDA	SMIDEC	NPC	MECM	Energy Commission	M Energy Centre	CP Consultants	Industries	Ind Associations	NGOs	Bankers	Time Frame
Incentives	(1) Improve SMIs Access to SMIDEC Incentives			○				◎							○			S/M
	(2) Promote CP Investment by MIDA Incentives						◎	◎							○			M
	(3) Improve SMIs Access to Bank Financing and Operation of the Existing Loan Schemes							◎							○		○	M
	(4) Award System		◎		○													S/M
Strengthen Regulatory-policy Framework	(1) Wider Application of Contravention License		◎		◎													S/M
	(2) Environmental Audit and Environmental Manager	○	○	○	◎								○	◎				S/M
	(3) Energy Efficiency Regulation										◎	◎		◎				S/M
	(4) Economic Instruments	◎	◎		○													M/L
	(5) Solid Waste Management Act		◎		◎													S/M
	(6) Environmentally Hazardous Substance		◎		◎													M/L
	(7) Voluntary Approach		◎	○	◎													M/L

3.8 Capacity Building

It is necessary to increase the capacity of the leading organisations for CP promotion.

3.8.1 SIRIM

As proposed in 3.4, SIRIM has a direct and leading role in the promotion of CP in the industrial sector, particularly in SMIs. Accordingly, SIRIM should have appropriate capacity to carry out CP audit services, to provide training for CP auditors and industries, to provide information services on CP technologies and to carry out demonstration programmes.

(1) National CP Centre

As discussed, CP promotion requires integrated measures including awareness raising, training, information dissemination, consultancy and advisory services, regulatory measures and/or incentives, and several organisations are playing important roles.

In order to facilitate efficient and effective implementation of such integrated measures and to provide industries in general and SMIs in particular with easy access to various services related to CP, it is proposed that the National CP Centre be established. In view of the role of SIRIM stipulated in the Eighth Malaysia Plan, SIRIM should play the central part of the National CP Centre by strengthening its Cleaner Technology Extension Service (CTES) and Cleaner Technology Information Service (CTIS) as well as obtaining participation of SMIDEC, MOSTE, DOE, industrial associations and NGOs.

It is expected that the Centre function as a single contact point on CP for industries and all relevant organisations.

(2) Expertise

Expertise required in CP related technical services are classified into two categories as follows:

(a) CP audit skills regarding general items that do not go into details of individual processes, and
(b) Specialised skills to audit a production process and work out measures specific to the process.

It is recommended that:

- SIRIM develop expertise (a) mentioned above, because (b) requires long term practical experiences in a specific process field,
- As for expertise (b), SIRIM could outsource CP auditors through CP auditor

registration system or international cooperation.

Through CP demonstration projects with DANCED and JICA, SIRIM has developed expertise (a) to provide SMIs with assistance services for the adoption of CP. It is also expected that such expertise be developed on the job through CP audits, consultancy services and demonstration projects.

On a short- or mid-term basis, it is proposed that SIRIM increase its staff number by five in order to enable it to carry out CP related technical services at 50-100 factories per annum.

3.8.2 MOSTE/DOE

As the primary authority for implementation and enforcement of the EQA and its regulations, DOE plays a major role in industrial pollution control through effective enforcement as well as advising industries, particularly SMIs, in the adoption of CP. DOE should build an adequate capacity and it is expected that the Environment Institute of Malaysia (EMAS), which started in August 2001, facilitate the development of the capacity of DOE as well as the individual enterprises.

(1) Strengthening Enforcement Capacity

For the purpose of strengthening the enforcement capacity of DOE officers in environmental auditing, it is advisable that guidance manuals be prepared describing procedures for the following:

- Notification to industries,
- Frequency of environmental auditing and monitoring,
- Follow-up compliance inspection and monitoring, and
- Reporting on findings and corrective actions.

(2) Pollution Prevention Partnership (P3) Committee

In order to enhance dialogue between the government and the private sector, it is advisable to establish a Pollution Prevention Partnership Committee represented by MOSTE, DOE and other related governmental organisations, SIRIM, industrial associations, and other stakeholders. It is expected that the committee will facilitate exchanging opinions and information among the members on environmental regulations, institutions and/or incentives and CP promotional strategies.

3.8.3 SMIDEC

As proposed in 3.5, SMIDEC should play an important role as a contact point for SMIs on various incentives and should have appropriate capacity. In view of the current limited

manpower at SMIDEC, it is proposed that training of SMIDEC officials be conducted in order to facilitate a more thorough understanding that CP is a target of the incentives operated by SMIDEC and other financial institutions. The following should be considered for SMIDEC:

(i) Define fiscal, financial and technical incentives to SMIs available for the adoption of CP,
(ii) Define the roles and responsibilities of SMIDEC staff, and
(iii) Introduce periodic training programmes for the staff to be effective in CP promotion through various incentives; the programmes are to include a minimal knowledge on CP technology.

3.8.4 Industrial Associations and NGO

As industrial associations can function more effectively than the government in collecting and disseminating data and information to and from industries, it is proposed that the linkages between the government and industrial associations be strengthened.

In particular, industrial associations can collaborate with MOSTE, SIRIM, MITI and DOE in setting up benchmarks, which require the following:

- Collection of basic data from member companies; and
- Compilation and statistical analysis of collected data.

In order to enhance CP related technical services, it is strongly recommended that sufficient numbers of CP auditors be made available; therefore, the CP auditor registration system should function as it is intended. SIRIM should also strengthen its linkages with NGOs, which can mobilise the additional engineering resources required.

CHAPTER 4

ACTION PLAN

CHAPTER 4 ACTION PLAN FOR PROMOTION OF CP

4.1 Objectives

Various measures for Cleaner Production (CP) promotion were proposed in the previous Chapter based on the following cognition of CP:

- CP as a win-win approach provides enterprises with improved business foundation as well as reduction of the environmental pollution burden;
- Thus the development is consistent with the environmental protection through CP;
- It is possible to motivate enterprises to introduce environmental management systems through the reduction of production costs by CP providing improvement measures with a minimum investment;
- Therefore CP is an enterprise friendly measure.

In this Chapter, action plans are proposed aiming at promotion of CP strongly supported by government thus encouraging efforts by the private sector.

The objectives of presenting action plans are to:

- Present material that will contribute to assisting the Malaysian side in formulating a CP promotion programme,
- Highlight important measures,
- Clarify which agencies should take actions, and
- Clarify targeted time-frame for each action.

4.2 Principle of Preparing Action Plans

Action plans were prepared by:

(a) Selecting measures from measures proposed in the previous Chapter based on the following criteria:
   - Select important items for formulating a CP programme,
   - Select items that need action on a short and/or mid-term basis, and
   - Eliminate items deemed low priority by the Malaysian side during the course of the Study.

(b) Clarifying organisations responsible for each action element, and

(c) Adding targeted time frame.

Table 4-1 shows the relationship between measures proposed in the previous Chapter and action plans selected.

Table 4-1 Relationships between Proposed Measures and Action Plans

Proposed Measures	Importance	Urgency	Priority in Malaysia	Selected Action Plan Element
National Strategy/policy				
(1) Formulate national policy/strategy	High	High	High	Element-1
(2) Target or benchmark	High	High	Mid.	Element-2
Awareness Campaign, Networking and Dissemination of Information				
(1) Demonstration projects	High	High	High	Element-3
(2) Campaign on CP benefit and incentives	High	High	High	Element-1
(3) Networking	High	Mid.	Mid.	Element-4
(4) CP National Roundtable	Mid.	Low	Mid.	
Access to Technology/Services				
(1) Training	High	Mid.	High	Element-5
(2) CP Audit	High	High	High	Element-6
(3) ESCO	Mid.	Mid.	Mid.	Element-13
Incentives				
(1) SMIDEC incentives	High	Mid.	Mid.	Element-7
(2) MIDA incentives	High	Mid.	Mid.	Element-8
(3) Bank financing	Mid.	Mid.	Mid.	Element-9
(4) Award system	Mid.	Mid.	Mid.	Element-10
Strengthen Regulatory-policy Framework				
(1) Contravention license	Mid.	Low	Low	
(2) Environmental audit and Environmental Manager	High Mid.	Mid.	Mid.	Element-11 Element-12
(3) Energy efficiency regulation	High	High	High	Element-13
(4) Economic instruments	High	Low	Low	
(5) Solid Waste Management Act	High	Mid.	Mid.	Element-14
(6) Environmentally hazardous substance	Mid.	Low	Low.	
(7) Voluntary approach	Mid.	Low	Mid.	
Capacity Building	High	High	High	Element-15

4.3 Action Plan and Each Element

4.3.1 Action Plan

Timetable of the Action Plan is illustrated in Figure 4-1.

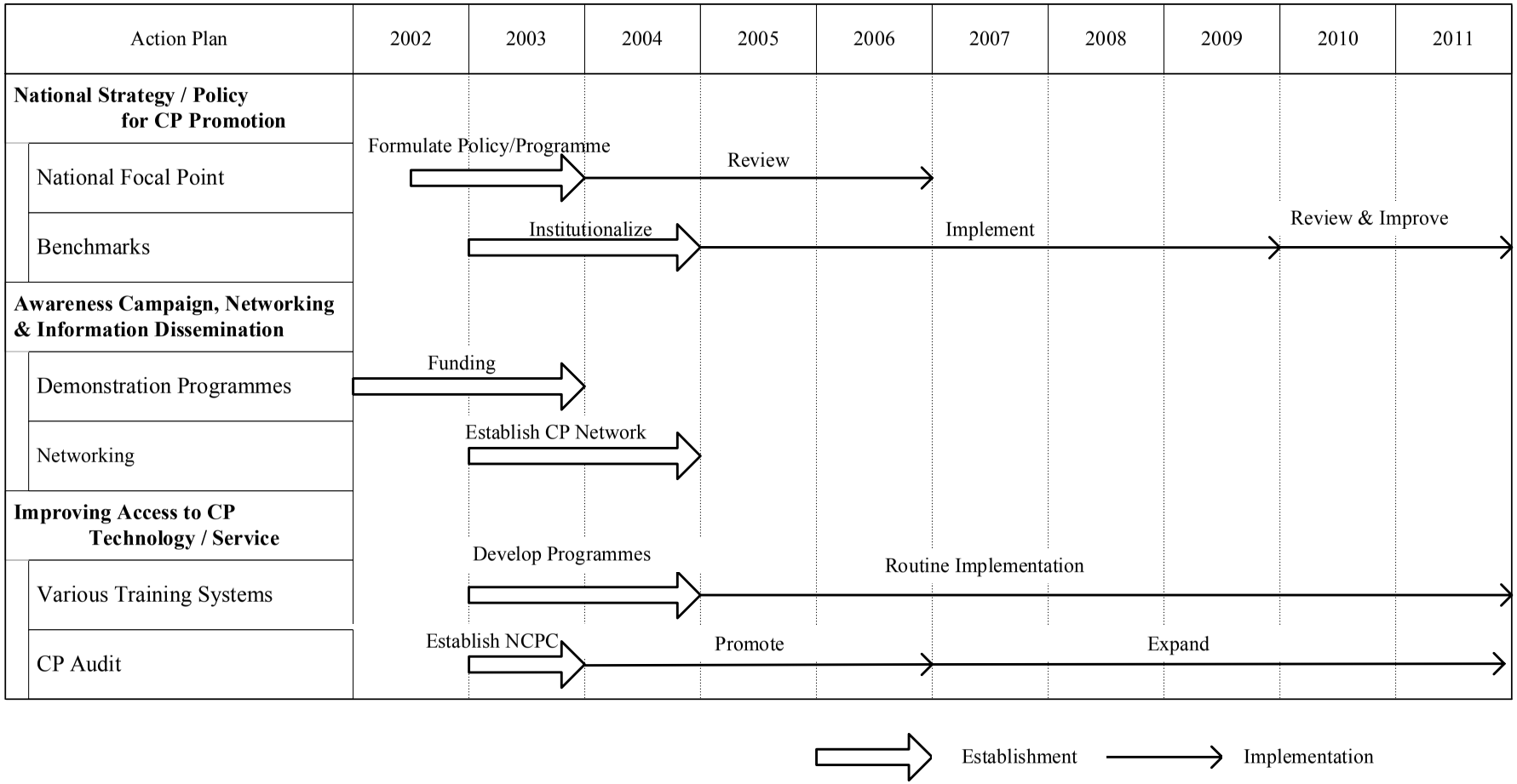


Figure 4-1 (1) Action Plan for CP Promotion

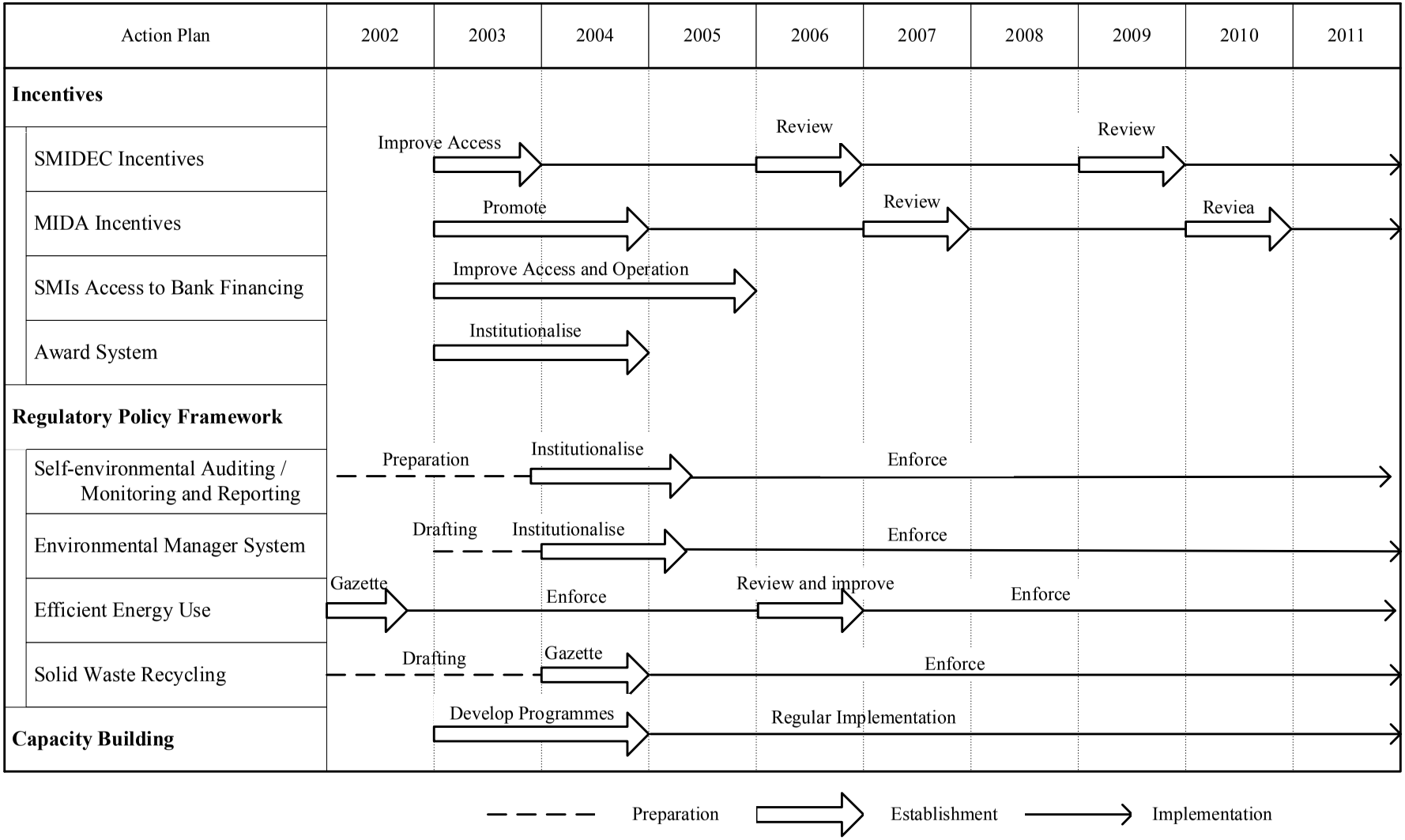


Figure 4-1 (2) Action Plan for CP Promotion

4.3.2 Action Plan Elements

(1) Plan for National Strategy/Policy

(a) Element-1: Formulate a National Strategy/Policy

Objective:

To clarify the roadmap and responsibilities for related organisations to promote CP, and
To promote CP in an integrated manner.

Plan:

- Formulate a national policy/strategy including the following:
  - The Strategy at Policy and Institutional Level
  - Mechanisms and Measures for implementing CP
  - Institutional set-up; e.g.

    The national focal point to drive the implementation of CP programmes, and
    The National CP Centre (NCPC) to act as a key advisory centre as well as an information clearing house.
- Incorporate the policy/strategy into the Mid-term Review of the Eighth Malaysia Plan.

Responsible Organisation:

EPU takes initiative.

(b) Element-2: Set up Benchmarks

Objective:

To provide industries with productivity improvement indices, and
To provide benchmarks as indicators of the National Strategy/Policy

Plan:

The following steps are to be pursued:

- Develop regulations for self-monitoring and reporting systems as described in the Element-11,
- Conduct training for industries on the self-monitoring and reporting system,
- Collect basic data through the reporting system. Such basic data should cover the amount of input of raw materials and utilities, and output of products and waste.
- Classify the collected data by industrial sector.
- Calculate indices, for example:

  Unit consumption of raw materials,
  Unit consumption of utilities such as electric power (kWh/product), water

(m3/product), steam (t/product), fuel (l/product) etc.,

Waste generation per product such as wastewater (m3/product), solid waste (kg/product) etc.

- Take the statistics of each index calculated and rank factories according to each index; i.e. good, average and inferior, and compile as benchmarks.
- Prepare an annual industrial statistics report to make the benchmarks public.

The following are examples of indices in Japan.

[Industrial water recovery ratio (%)]

Whole manufacturing industry:	78
Food industry:	34
Pulp & paper industry:	46

[Indices in the electroplating sector]

Rinsing water (fresh +recycled water): 1 m^3/m^2-product

Reject rate: 1-3%

[Unit energy consumption]

Dyeing industry:	240 kl/m^2 in 1970s
	175 kl/m^2 in 1980s
Pulp & paper industry:	6.0×10^6 kcal/t in 1970s
	3.5×10^6 kcal/t in 1990s

These figures are not directly applicable to Malaysia because indices should reflect regional factors such as infrastructure, natural and economic conditions, viability etc.

Responsible Organisation:

- MOSTE is responsible for institutionalizing regulations for the self-monitoring and reporting system,
- DOE is to collect basic data based on the self-monitoring and reporting regulations,
- DOE and MITI are jointly to arrange benchmarks in collaboration with SIRIM.
- FMM and/or Industrial Associations' cooperation is desirable for the implementation of benchmarking.

Remarks:

- It is expected that industries can make clear targets for productivity improvement.
- By collecting basic data, corporate managers can have a better understanding of the conditions and problematic issues in the production systems; accordingly it is expected that the level of production management in industries will rise.

(2) Plan for Awareness Campaign, Networking and Dissemination of Information

(a) Element-3: Step up CP Demonstration Programmes

Objective:

To raise corporate managers' awareness about CP.

Plan:

- Prepare a new funding scheme for demonstration projects,
- Campaign for the CP audit scheme, which is described in Element-6, and conduct CP audits,
- Campaign for the CP demonstration project scheme,
- Select model factories among the targeted factories for CP audits and implement CP measures at selected model factories, and
- Conduct demonstration activities including information dissemination on effective CP measures implemented and benefits achieved by CP measures, and project assessments.

EPU and MOSTE are to work out a new funding scheme for demonstration projects, SIRIM and DOE are to campaign for the CP audit and demonstration project scheme, and SIRIM in collaboration with CP consultants is to conduct CP audits and demonstrations.

Responsible Organisation:

SIRIM

Relevant Organisations: EPU, MOSTE, DOE, CP Consultants

(b) Element-4: Enhance CP Networking

Objective:

To enhance the efficiency of awareness raising and information dissemination on CP.

Plan:

- Establish a forum on a regular or non-regular basis where industries can freely discuss with relevant agencies matters related to CP such as but not limited to:
- Incentives available for CP adoption,
- Technologies and management method effective for productivity improvement including "good housekeeping",
- Prepare and distribute materials on CP case studies, incentives and sector-based benchmarks through industrial associations, and

- Establish a Pollution Prevention Partnership (P3) Committee comprised of MOSTE, DOE, other related governmental organisations, SIRIM, industrial associations, and other stakeholders. The P3 Committee is to facilitate the exchange of opinions and information among the members on environmental regulations, institutions, incentives and/or CP related topics.

Responsible Organisation:
SIRIM and DOE, Industrial associations and NGOs
SIRIM or the NCPC in case it is founded should establish a network with industrial associations and NGOs, and
DOE is responsible for establishing the P3 Committee.

(3) Plan for Improving Access to Technology/Services

(a) Element-5: Provide Various Training Systems

Objective:
To raise the level of technical knowledge on environmental protection and CP, and
To improve the service level of consulting businesses and/or financing businesses.

Plan:
- Develop a consistent system of training programmes on CP as follows:
  - Training programme for corporate managers,
  - Training programme for engineers,
  - Training programme for operators,
  - Training programmes for CP auditors, and
  - Training programmes for financing organisation.
- Conduct training.

Responsible Organisation:
Planning/Coordination: SIRIM
Implementation: SIRIM, EMAS, SMIDEC, NPC, Industrial Associations, NGOs
SIRIM is responsible for the training programmes for industries and CP auditors,
EMAS, NPC and NGOs are to participate in developing and conducting training programmes for industries,
SMIDEC is responsible for co-organising the training programmes for financing organisations.

(b) Element-6: Promote CP Audits

Objective:

To facilitate corporate managers' better understanding of CP benefits.

Plan:

- Define a single contact point to provide CP audit information,
- Market CP audit services,
- Campaign for the benefit of CP and CP audits, the function of NCPC as a single contact point for CP, and SMIDEC factory auditing incentives,
- Institutionalize CP auditor accreditation and registration systems,
- Campaign for the CP auditor accreditation and registration systems,
- Conduct a state examination for CP auditors,
- Accredit CP auditors based on state examinations,
- Register accredited CP auditors, and
- Mobilize registered CP auditors in CP audits on a case-by-case basis.

Responsible Organisation:

Planning/Coordination: SIRIM, MOSTE

Implementation: SIRIM, DOE, SMIDEC, CP Consultants

Before establishing the NCPC,

SMIDEC is responsible for campaign for CP audit incentives, and

SIRIM is to take a leading role in CP audits.

After establishment, the NCPC should function as a single contact point for CP.

MOSTE is to institutionalize CP auditor accreditation and registration systems.

DOE and SIRIM are to campaign for the systems.

DOE is responsible to accredit and register CP auditors based on state examinations.

Remarks:

Factories can:

Recognize existing problematic issues in production processes and realize the benefits of CP, and

Be encouraged to implement CP measures.

(4) Plan for Improving Incentives

(a) Element-7: SMIDEC Incentives

Objective:

To improve SMIs access to SMIDEC incentives to use a grant scheme for consultancy services for promotion of CP.

Plan:

- Improve SMIs access to ITAF and Factory Audits, which is a grant scheme for consultancy services. This scheme is available to use CP promotion,
- Clarify adoptability of existing incentives to CP investment,
- Prepare a brochure solely for CP promotion as annex information to existing ITAF brochures and Factory Audits, if requested.
- Evaluate proposals quickly and shorten the procedure to provide incentives,
- Assist SMIs in completing these forms by consulting with SMI applicants,
- Train officers to support SMIs,
- Advertise SMIDEC incentives actively for SMIs using CP brochures which are applicable to CP investments at seminars, work shops, etc., and
- Create co-work scheme with industry associations and NGOs for SMIDEC incentive awareness campaigns.

Related Organisation:

Responsible Organisation:

Responsible organisation: SMIDEC

Acting organisation

SMIDEC improves SMIs' access to incentives, extends incentives through campaigns and seminars and provides advisory services.

Remarks:

Concept of CP includes the advantage of production cost reduction. Grant scheme is applied to CP at initial stage of CP promotion.

(b) Element-8: MIDA Incentives

Objective:

To make existing direct and indirect tax incentives more effective for CP investment, as opposed to creating new incentives.

Plan:

- Clarify adoptability of existing incentives to CP investment,
- Promote inter-government coordination activities to allocate budgets for preparation of MIDA incentives for CP promotion among MITI, EPU, MOSTE, etc.
- Include clear description of tax incentives for environmental and CP investments in existing brochures,
- Prepare easy access for SMIs to MIDA and assist SMIs in completing procedures and forms to apply for tax incentives by MIDA staff through face-to-face discussion, and
- Train officers to support SMIs.

Related Organisation:

Responsible Organisation:

MIDA

Acting organisation

MIDA can provide easy access to their incentives and can promote application for CP.

Remarks:

The classification of CP investments as investments to increase productivity and to protect the environment is generally difficult. Alternatively, it is better to include the categories for investment in productivity and environmental improvement as Tax incentives for CP.

Accordingly, a decrease in the burden of CP promotion and investment can be expected.

Easy access to MIDA is important as SMIs make application for MIDA incentives.

If the taxes are not effectively collected, these incentives will not be effective.

Enterprises generally have the tendency to avoid contact with tax authorities.

(c) Element-9 Plan: SMIs Access to Bank Financing

Objective:

To improve SMIs' access to bank finance and to improve operation of existing finance schemes for CP investors to ensure easy and adequate financing.

Plan:

- Provide adequate consultation for access to bank finance,
- Help SMIs with presentation of their investment proposals to banks,
- Provide easy access to variety of finance schemes available for SMIs investment,
- Increase bank credit officers' awareness of CP,
- Help banks better evaluate CP projects,
- Train bankers for strengthening recognition of environmental issues, and
- Increase opportunities of financing campaigns for CP investment by holding CP seminars, workshops, round tables, etc.

Related Organisation:

Responsible Organisation:
Financing institutions

Remarks:

Hurdles in the financing of SMI investments including those for CP are observed. Consulting services to assist in the financing of CP will be greatly appreciated, especially by SMIs.

(d) Element-10: Award for CP Promotion

Objective:

To create an award for CP promotion to increase business interest in CP

Plan

- Introduce the award for CP after installation of NCPC,
- Give awards to individual engineers, groups of employees or entities in order to increase business interest in CP,
- Have Government endorse the award to make it prestigious
- Give the winner of the award a plaque, certificate, and the entitlement to use an

award logo for publicity, and
- Commend enterprises, offices, groups, which achieve remarkable promotion of CP, by well-known measures.

Related Organisation

DOE under collaboration of industrial associations will preside over the award.

Remarks

Improvement in the moral stance of enterprises that promote CP is expected. Additionally, interest in CP will be increased among other enterprises. Award will be highly appreciated by SMIs and will boost the morale of people who have engaged in CP implementation.

(5) Plan for Strengthening Regulatory Policy Framework

(a) Element-11: Self-Environmental Auditing/Monitoring and Reporting System

Objective

To introduce and promote self-environmental auditing/monitoring and reporting by industry to Government; initiative will strengthen environmental enforcement and compliance. Adopting this system will result in reduction of pollutant load and enforcement efforts by DOE.

Plan:

- Activate and modify the EQA 33A. to apply to industries,
- Prepare regulations to promote environmental auditing/monitoring and reporting,
- Develop criteria and guidance for auditing and monitoring,
- Formulate audit regulations and guidelines,
- Classify specific requirements for auditing/monitoring and reporting,
- Provide training for auditing/monitoring and reporting,
- Establish periodical reporting system of monitoring data from industries to DOE,
- Compile and evaluate the data by DOE,
- Prepare procedure for announcements of concern, and announcements of violation of regulations with the aim to promote adoption of CP,
- Organize an environmental manager system to support self-environmental auditing/monitoring and reporting,

- Qualify personnel, and
- Prepare announcements of concerning.

Related Organisation:

Responsible Organisation:

Governmental organisation:	DOE
Implementation:	Industries
Support:	Environmental Consultants

Acting Organisation

DOE to manage the institutionalisation of self-auditing/monitoring and reporting. DOE to prepare guidelines of audit/monitoring and reporting. Audits are conducted by each industry. Environmental consultants shall be required in cases where industries lack capability for audit/monitoring and reporting.

Remarks:

DOE visits factories to obtain samples of discharges and emissions to analyze for compliance. This activity will require much manpower and budget to monitor a large number of SMIs. Introduction of self-auditing and monitoring will reduce Government cost; however, it is heavy burden for SMIs.

Enterprises may resist self-auditing/monitoring and reporting if the system will includes disclosure to the public.

(b) Element-12: Environmental Manager System

Objective:

To introduce an environmental manager system in factories to establish responsibility for environmental concerns. System will also assist with the promotion of CP.

Plan:

- Introduce an environmental manager system to large-scale industries at initial stage, which enforces industries to appoint an environmental manager.
- Educate and train managers and concerned personnel,
- Create and environmental manager certificate and qualification examination, and
- Organize an environmental managers association.

Environmental managers shall be responsible for environmental audits, monitoring and reporting.

Related Organisation:

Responsible Organisation:

Managing organisation: DOE
Implementation: DOE

Acting Organisation

DOE manages creation of the system. DOE also supports education and training of consultants to become environmental managers. Environmental managers support self-environmental auditing/monitoring as well as reporting. Environmental consultants support enterprises and the managers, if required.

Remarks:

The success of the system will depend on the manager's competence. It sometimes becomes formal and increases the costs of both government and private sides. It will be necessary to give public qualification to managers after their ability is carefully confirmed; if their ability cannot be confirmed qualification should not be not confided.

(c) Element-13: Efficient Energy Use

Objective:

To promote efficient use of energy through improvement of equipment, facilities, and plant operational technology. Introduction and development of energy efficient equipment.

Plan:

First, it will be essential to gazette the draft of regulations in 2002. Each energy saving activity should be undertaken based on the designated regulations. Following are plans for promotion of energy efficient use.

- Gazette regulations on energy efficient use,
- Enact regulations – auditing, and reporting system should be included
- Establish energy manager system for factories and buildings,
- Formulate standards on efficient energy use,
- Prepare guidelines on efficient energy use,
- Arrange incentives for promotion of efficient energy use,
- Educate and train personnel concerned in efficient energy use, and

- Start energy audits.

Related Organisation:

Responsible Organisations:

Policy: MECM

Regulations: Energy Commission

Implementation: PTM, ESCO, Consultants of Energy saving

Acting Organisations:

Policies for energy efficient use are planned by MECM, the Energy Commission manages enforcement of regulations and the energy manager system. The Energy Commission and PTM prepare standards and guidelines. Incentives are MIDA's responsibility, and banks and SMIDEC carry out financing. It is recommended that energy audits be conducted by PTM, ESCO and other consultants. Enhancement of capabilities of personnel and activation of energy efficient use activities are basically conducted by PTM, ESCO and related consultants.

Remarks:

The responsibilities and actions should be based on law and regulations. Legal responsibility and authority become clear after enactment of law and regulations.

(d) Element-14: Promote Solid Waste Recycling

Objective:

To promote solid waste recycling to decrease the load of incinerators and landfill sites leading to environmental preservation, as a supplementary measure of CP.

Plan:

- Include efficient recycling in the draft of the Solid Waste Act
- Promote voluntary activities and enforce compulsory requirements for solid waste recycling,
- Establish a waste database currently undertaken by MHLG,
- Set a clear target, and
- Clarify independent and separate activities of related parties

  Matching between waste generators and users

  Coordination among government sectors and private sectors

Change designation from solid waste to scheduled waste or vice versa
Assistance to participating parties to conduct responsibilities

Related Organisation:

Policy: Ministry of Environment (DOE)

Regulations: MHLG and State Governments

Implementation: Industries, households, local authorities, local communities and traders are involved in the promotion of industrial waste recycling.

Remarks:

Responsibilities of Each Related Party

Parties	Responsibilities	
Industries	Design	Design of easily recyclable products
	Process	Utilisation of less harmful and recyclable materials Utilisation of own and other enterprises' recycled by-products Ensuring the proper management and maintenance of facilities Improving recycling technologies Introduction of recycling equipment Environmental sound waste treatment
	Products	Labeling for separate disposal for easier collection and sorting
	Marketing	Cultivation of new markets for recycled products Waste exchange between enterprises
Households	Disposal	Segregated discharge of industrial product wastes (Car batteries / Glass / Paper / Magazine / Newspaper)
	Recyclable products	Utilisation of rechargeable batteries Avoiding unnecessary product purchase Exchange of goods with other households
	Cooperation	With local communities
Local Authorities Communities	Collection	Segregated collection of industrial product wastes Collection of recyclable waste from households Collection of recyclable waste form commercial sectors
	Campaign	Recycling activities
	Cooperation	With traders, vendors, industries and households
Traders Vendors	Segregated collection of industrial product wastes Systematic management of collected waste for promoting recycling Cooperation with other traders and vendors Promotion of exchange recyclable industrial waste	

(6) Plan for Capacity Building

(a) Element-15 Capacity Building of Concerned Organisation

Objective

To increase the capacity of related organisations,

Plan

- Activate the NCPC,
- Establish a CP training centre in the NCPC,
- Make use of UNEP programmes.
- The centre is to organize and monitor capacity building programmes:
    (i) EMAS programmes for DOE officers,
    (ii) Capacity building programmes for SIRIM,
    (iii) Capacity building programmes for SMIDEC, and
- Implement the CP auditor registration system mentioned in Element-6.

Responsible Organisation

Planning/Coordination: SIRIM

Cooperation: DOE

Participation: SMIDEC

CHAPTER 5

OVERVIEW OF FACTORY AUDIT AND DEMONSTRATION PROJECT

CHAPTER 5 OVERVIEW OF FACTORY AUDIT AND DEMONSTRATION PROJECT

5.1 Overview of Factory Audit

5.1.1 Factory Audit

Factory audits in the Study were conducted in two phases -- Phase I and Phase II. The Phase I Factory Audit was planned and conducted for the purpose of selecting model factories and the Phase II Factory Audit was conducted for the purpose of preparing basic design data of CP introduction for the selected model factories.

(1) Phase I Factory Audit

Phase I Factory Audit was divided into two factory audits -- the first factory audit and the second factory audit. The first factory audit was conducted in December 2000 and in January 2001, when SIRIM and the Study Team surveyed the following twenty representative companies in the targeted industrial sub-sectors.

a. Metal Finishing and Electroplating Sub-sector
   (i) Metal Polishing Industries Sdn. Bhd.
   (ii) Perusahaan TGB Sdn. Bhd.
   (iii) E-Coat Snd. Bhd.
   (iv) Aceloy Sdn. Bhd.
   (v) Malaysian Electroplating Technology (M) Sdn. Bhd.
   (vi) Chemobright Industries Sdn. Bhd

b. Food and Beverage Sub-sector
   (i) Winner Food Industries Sdn. Bhd.
   (ii) Awra Food Processing Sdn. Bhd.
   (iii) Cocoaland Industry Sdn. Bhd.
   (iv) Universal Nutri-Beverage Sdn. Bhd.
   (v) Vit Makanan (KL) Sdn. Bhd.

c. Pulp and Paper Sub-sector
   (i) Telic Paper Sdn. Bhd.
   (ii) Lekok Paper Mill (M) Sdn. Bhd.
   (iii) Versatile Paper Boxes Sdn. Bhd.

d. Textile Sub-sector
    (i) South Asia Textiles (M) Sdn. Bhd.
    (ii) Berjaya Knitex Sdn. Bhd.
    (iii) Sykt Perusahaan Finetex Sdn. Bhd.
    (iv) Sykt Koon Fuat Industries Sdn. Bhd.
    (v) M.K.K. Industries Sdn. Bhd.
    (vi) Samtex Industries Sdn. Bhd.

After the first factory audit, Tables 5-2, 5-3, 5-4 "Adjudication Table for Model Factory Selection" were prepared for respective sub-sectors, and the following candidates were short listed through discussions between SIRIM and the Study Team.

a. Metal Finishing and Electroplating Sub-sector
    - Metal Polishing Industries Sdn. Bhd.
    - Perusahaan TGB Sdn. Bhd.
    - Chemobright Industries Sdn. Bhd
b. Food and Beverage Sub-sector
    - Winner Food Industries Sdn. Bhd.
    - Cocoaland Industry Sdn. Bhd.
c. Textile Sub-sector
    - South Asia Textiles (M) Sdn. Bhd.
    - Samtex Industries Sdn. Bhd.

In the Pulp and Paper Sub-sector, candidates were not selected because less improvement was expected than in other sub-sectors as described in section 5.2.5 "Selection of Model Factory in Pulp & Paper Sub-sector".

The second factory audit was conducted in February 2001, when SIRIM and the Study Team surveyed seven candidate companies described before in more detail. Finally, the following four factories were selected as model factories:

a. Metal Finishing and Electroplating Sub-sector
    - Metal Polishing Industries Sdn. Bhd.
    - Perusahaan TGB Sdn. Bhd.
b. Food and Beverage Sub-sector
    - Winner Food Industries Sdn. Bhd.

c. Textile Sub-sector
    - South Asia Textile (M) Sdn. Bhd.

(2) Phase II Factory Audit

Phase II Factory Audit was conducted in March 2002, when SIRIM and the Study Team carried out a detailed survey in the model factories of the following based on the results of Phase I Factory Audit and conceptual design of CP introduction.

a. Operation status (operating load, main materials and products, utilities consumption and its supply conditions),
b. Overall and detailed material and energy balance,
c. Design data and documents of the existing production and wastewater treatment facility (capacity, layout of equipment, dimension of main equipment, heat insulation conditions etc.),
d. Sampling of water (raw water, process water, wastewater), and
e. Financial condition.

Based on these data, tendering documents were prepared as described in Chapter 7, section 7.1 “Preparation of Tendering Document”.

5.1.2 Present Status

The outline of each factory surveyed is described in each relevant chapter and the present status on environmental matter and CP options are summarised below.

(1) Observation of Pollution Control Condition

Present status on the observation of pollution control conditions is as follows.

a. Metal Finishing and Electroplating Sub-sector

- Four electroplating factories are using toxic chromic acid and three factories of them are located in an electroplating park that is facilitated with a centralised wastewater treatment plant. Consequently the factories do not have their own wastewater treatment. They are discharging wastewater separating it into acidic, alkaline, chromium and cyanide wastewater.
- One electroplating factory is located in another industrial park which is not facilitated with a centralised wastewater treatment plant; therefore. the wastewater containing toxic chromium hexavalent is discharged without any treatment.

- Two anodizing factories are using no toxic chemicals. One of them discharges wastewater after coagulating and filtering SS, and the other discharges wastewater after controlling pH value only.
- As to exhaust gas, two electroplating factories installed exhaust ducts and scrubbers. One anodizing factory installed an exhaust system without a scrubber, and the other anodizing factory installed an exhaust duct and a scrubber for chemical polishing exhaust gas.

b. Food and Beverage Sub-sector

- None of the five factories have a wastewater treatment facility. However, due to the exception rule for water pollution control, which does not regulate wastewater under 60 m^3/day or 6 kg BOD/day, three of these factories are not covered by the regulations.
- Four factories are using diesel oil and one factory is using sawdust as fuel for boilers. The maximum capacity of the boilers is 5.6 t/h and they emit only a small amount of exhaust gas, estimated at 6,000 m^3/h; therefore they are also not covered by the regulations.

c. Textile Sub-sector

- All factories have wastewater treatment facilities. Accordingly, they cleared most of the Malaysian effluent standard-B (Sewage and Industrial Effluents for Standard B), except the COD value.
- All factories use heavy oil or natural gas as fuel for boilers. The SO_2 and NO_x concentration in boiler exhaust gas of six factories have cleared the Malaysian regulatory standard, judged to be through good operational management and the utilisation of less sulfur and less nitrogen fuel.

(2) Waste Disposal, Treatment and Recycling

Present status on waste disposal, treatment and recycling is as follows:

a. Metal Finishing and Electroplating Sub-sector

- In five factories except one anodizing factory, the sludge accumulated at the bottom of wastewater pits is consigned to Kualiti Alam Sdn. Bhd. for final treatment.
- Wastewater is not recycled at all.

b. Food and Beverage Sub-sector

- Most wastes generated from packing materials for products, raw materials and sub

materials are small in amount and not harmful, and they are re-used in the factories, returned to original suppliers, or disposed of in the factories.

- In some cases, garbage is mixed into wastewater and discharged. It is not a serious problem at present, but it will become a problem in future when the regulations become more stringent.

c. Textile Sub-sector

- The sludge accumulated at the bottom of wastewater pits is consigned to Kualiti Alam Sdn. Bhd. for final treatment. The sludge discharged from dyeing house contains small or no amounts of hazardous substances such as heavy metals.
- South Asia Textiles (M) Sdn. Bhd. currently recycles treated wastewater to use for its washing process at the recycling rate of 30%.

(3) CP Options in each Sub-sector

Measures for improvement by Cleaner Production (CP) are classified in each sub-sector as follows:

a. Metal Finishing and Electroplating Sub-sector

(i) Prevention of water and air pollution,
(ii) Reduction of energy saving, and
(iii) Improvement of productivity.

b. Food and Beverage Sub-sector

(i) Improvement of production process,
(ii) Reduction of energy and utility consumption, and
(iii) Prevention of water and air pollution.

c. Textile Sub-sector

(i) Heat recovery,
(ii) Reduction of electricity consumption, and
(iii) Improvement of wastewater.

5.2 Selection of Model Factories

5.2.1 Procedure for Selection of Model Factories

In order to select model factories from representative factories concerned, Table 5-1 "Adjudication Table for Model Factory Selection" was used at first.

Table 5-1 Adjudication Table for Model Factory Selection

Sub-sector:

Adjudication Items	Allocation of Points	Factory Audited					
1. Expected Improvement							
(1) Reduction of Environmental Impact	25						
1) Quality of Waste Water	10						
2) Quantity of Waste Water	10						
3) Quantity of Industrial Waste	5						
(2) Energy Saving	15						
(3) Improvement of Productivity	15						
(4) Replication for Other Factories	15						
(5) Compliance with regulation (current)	30						
Subtotal-1 (A)	100						
2. Possibility of Improvement							
1) Improvement Cost	10						
(within Budgetary Limitation)							
2) Introduction of Equipment	10						
3) Equipment Procurement in Malaysia	10						
4) Compliance with regulation (future)	20						
Subtotal-2 (B)	50						
Total	150						
3. Willingness of the Factory							
1) Present Production Management	10						
2) Demonstration & Seminar	25						
3) Acceptance of Visitors	25						
4) Provision of Installation Equipment	10						
5) Bearing Ability for Operation	20						
& Maintenance of Equipment							
6) Improvement of Production	10						
Management							
Total (C)	100						
Grand Total ((A) x (B) x (C))/100	5,000						

In the table, adjudication items are divided into the following three categories:

(A) Expected Improvement,

(B) Possibility of Improvement, and

(C) Willingness of the Factory.

Each category is subdivided in more detailed items and some supposed adjudication points are allocated to them. After adjudicating the factory's conditions and inputting proper figures into each item, the sum for each category is calculated as subtotal of (A), (B) and (C), and final adjudication point is calculated as follows:

Grand Total = (A) x (B) x (C) / 100

The larger the calculated grand total value, the greater the possibility to introduce CP equipment. Therefore, after adjudicating and inputting the proper figures into each item for all the factories, the factory that has the highest grand total value in the table will be selected as the candidate of a model factory.

In the table, "Expected Improvement" is treated as a negative factor. Therefore, a bigger figure shall be input for the factory which its environmental impact is bigger.

In addition to the adjudication by "Adjudication Table for Model Factory Selection", it is necessary to consider the following criteria for the selection of a model factory for the promotion of CP technology in Malaysia:

a. The factory is willing to demonstrate CP technologies and allows visitors to see them,
b. Cost for the equipment for the demonstration project in the factory will not exceed budgetary limits,
c. The factory can provide facilities for installation of equipment,
The factory can bear costs necessary for the operation and maintenance of the equipment,
e. The equipment for the demonstration project in the factory can be procured in Malaysia,
f. The CP technology that will be demonstrated in the factory is replicable in other factories,
g. The factory makes a commitment to improve production management through CP,
h. The process of modification or improvement at the factory is preferred over introducing new facility,
i. The factory has an extract assessment of the present unit consumption, and
j. Equipment at the factory is appropriately maintained at the present time.

Through the first factory audit, some model factories were selected as candidates for three sub-sectors respectively based on the adjudication results utilising the "Adjudication Table for Model Company Selection" and the criteria mentioned above. However, the final selection of model factories was concluded after the re-audits in the second factory audit.

5.2.2 Selection of Model Factories in Metal Finishing and Electroplating Sub-sector

For the selection of a model factory, a comparative study was carried out as shown in Table 5-2. Metal Polishing Industries Sdn. Bhd., E-Coat Sdn. Bhd. and Aceloy Sdn. Bhd. are located in a plating park of Shah Alam, and a wastewater treatment centre was built in the park. Therefore, the three factories were enthusiastic to decrease the amount of wastewater sent to the centre in order to reduce the fee to be paid for wastewater treatment. This system leads electroplating factories to approaches to CP that differ from stand-alone factories. The production amount of Malaysian Electroplating Technology (M) Sdn. Bhd. seemed to be very small. Two anodizing factories had some criteria to be improved, and effects to other plants might be larger. SIRIM and the Study Team proposed that Persahaan TGB Sdn. Bhd. and Chemobright Industries Sdn. Bhd. be given higher priority in the selection of a model factory.

Re-audits were conducted for the three companies, Persahaan TGB Sdn. Bhd., Chemobright Industries Sdn. Bhd. and Metal Polishing Industries Sdn. Bhd. After the re-audits, the following two companies were selected as model factories.

(1) Metal Polishing Industries Sdn. Bhd.

Total construction cost and the total benefit were estimated at approximately RM326,000 and about RM93,000 respectively. Additional benefit was expected to final product quality improvement. This enables the factory to win customers' confidence.

(2) Perusahaan TGB Sdn. Bhd.

Total construction cost and the total benefit were estimated at approximately RM265,000 and about RM96,000 respectively. Additional benefit was also expected to final product quality improvement. In terms of environmental protection, it was expected that wastewater could be reduced by 15%.

Table 5-2 Adjudication Table for Model Factory Selection

Sub-sector: Metal Finishing and Electroplating

Adjudication Items	Allocation of Points	Metal Polishing Industries	E-Coat	Aceloy	Malaysian Electroplating Trchnology	Persahaan TGB	Chemobright Industries
1. Expected Improvement							
(1) Reduction of Environmental Impact	25	12	12	12	15	23	18
1) Quality of Waste Water	10	5	5	5	10	8	7
2) Quantity of Waste Water	10	5	5	5	2	10	7
3) Quantity of Industrial Waste	5	2	2	2	3	5	4
(2) Energy Saving	15	5	5	5	3	7	8
(3) Improvement of Productivity	15	5	5	5	10	10	8
(4) Replication for Other Factories	15	5	5	5	7	10	10
(5) Compliance with regulation (current)	30	5	5	5	15	15	18
Subtotal-1 (A)	100	32	32	32	50	65	62
2. Possibility of Improvement							
1) Improvement Cost (within Bagetary Limitation)	10	7	5	5	8	8	7
2) Introduction of Equipment	10	7	5	5	7	8	8
3) Equipment Procurement in Malaysia	10	8	8	8	8	8	8
4) Compliance with regulation (future)	20	10	10	10	10	10	10
Subtotal-2 (B)	50	32	28	28	33	34	33
Total	150	64	60	60	83	99	95
3. Willingness of the Factory							
1) Present Production Management	10	10	3	2	8	10	8
2) Demonstration & Seminar	25	20	5	7	12	12	10
3) Acceptance of Visitors	25	20	15	5	20	15	15
4) Provision of Installation Equipment	10	8	8	8	8	8	4
5) Bearing Ability for Operation & Meinatenance of Equipment	20	18	5	10	10	14	10
6) Improvement of Production Management	10	8	4	5	6	8	7
Total (C)	100	84	40	37	64	67	54
Grand Total ((A) x (B) x (C))/100	5,000	860	358	332	1,056	1,481	1,105

5.2.3 Selection of Model Factory in Food and Beverage Sub-sector

For the selection of a model factory, a comparative study was carried out as shown in Table 5-3. The management of all factories visited had favorable thoughts for CP and activities. Both Awra Food Processing Sdn. Bhd. and Vit Makanan (KL) Sdn. Bhd. are new factories and have installed the latest equipment and machines with a well-studied system. So they had almost no need to introduce CP. However, Awra Food Processing Sdn. Bhd. was singled out by DOE for wastewater discharge. They were discussing with a consultant company and therefore SIRIM and the Study Team could only offer its own suggestions on the matter. The remaining three factories, Cocoaland Industry Sdn. Bhd., Winner Food Industries Sdn. Bhd. and Universal NutriBeverage Sdn. Bhd. have their own potential areas for improvement respectively and they are as follows.

(1) Cocoaland Industry Sdn. Bhd.

The vacuum system in the candy process uses much water with once-through flow.

(2) Winner Food Industries Sdn. Bhd.

The noodle cooling and rice washing system uses much water with once-through flow.

(3) Universal NutriBeverage Sdn. Bhd.

The system of sugar melting uses much steam with once through flow.

Though each item requires more detailed study, with regards to engineering and the selection of suitable equipment and machines, each factory has the possibility of introducing CP equipment. Therefore, SIRIM and the Study Team proposed that Cocoaland Industry Sdn. Bhd. and Winner Food Sdn. Bhd. be given high marks and priority for selection as model factories. After the re-audits, Winner Food Industries Sdn. Bhd. was selected as a model factory. Total construction cost was estimated at approximately RM272,000 and the following benefits were anticipated through the introduction of CP equipment.

a. Reduction of city water consumption by replacing city water for boiler feed water with well water,
b. Improvement of product quality, and
c. Reduction of wastewater discharge.

This will bring a remarkable reduction in the investment cost required for the construction of a wastewater treatment system, which will be essential in the near future

because the amount of water consumption and discharge will be restricted in the future. In addition, water price was also an important factor in selecting Winner Food Industries Sdn. Bhd. as a model factory because the price of both city water and well water could rise or be newly charged.

Table 5-3 Adjudication Table for Model Factory Selection

Sub-sector: Food and Beverage

Adjudication Items	Allocation of Points	Awra Food Industries	Cocoaland Industries	Winner Food Industries	Universal Nutri-Beverage	Vit Makanan
1. Expected Improvement						
(1) Reduction of Environmental Impact	25	2	20	20	0	0
1) Quality of Waste Water	10	2	10	10	0	0
2) Quantity of Waste Water	10	0	10	10	0	0
3) Quantity of Industrial Waste	5	0	0	0	0	0
(2) Energy Saving	15	0	12	0	10	5
(3) Improvement of Productivity	15	0	10	10	5	0
(4) Replication for Other Factories	15	10	10	5	10	5
(5) Compliance with regulation (current)	30	15	0	0	5	20
Sub-total-1 (A)	100	27	52	35	25	30
2. Possibility of Improvement						
1) Improvement Cost (within Budgetary Limitation)	10	2	10	10	10	10
2) Introduction of Equipment	10	2	10	10	2	10
3) Equipment Procurement in Malaysia	10	10	10	8	5	10
4) Compliance with regulation (future)	20	10	8	15	0	10
Sub-total-2 (B)	50	24	38	43	17	40
Total	150	51	90	78	42	70
3. Willingness of the Factory						
1) Present Production Management	10	10	10	10	10	10
2) Demonstration & Seminar	25	25	25	10	25	25
3) Acceptance of Visitors	25	25	25	25	25	15
4) Provision of Installation Equipment	10	10	10	10	10	10
5) Bearing Ability for Operation & maintenance	20	20	20	20	20	20
6) Improvement of Production management	10	10	10	10	10	10
Total (C)	100	100	100	85	100	90
Grand Total ((A) x (B) x (c))/100	5,000	648				

5.2.4 Selection of Model Factory in Textile Sub-sector

For the selection of a model factory, a comparative study was carried out as shown in Table 5-4 and its outline is summarised as follows.

(1) Based on the overall view for the reduction of environmental impact and the concern over the quality of wastewater, Sykt Persahaan Finetex Sdn. Bhd. and South Asia Textiles (M) Sdn. Bhd. had emerged as the best in comparison to other factories. Nonetheless, the quantity of wastewater was not better for Sykt Persahaan Finetex Sdn. Bhd. compared with South Asia Textiles (M) Sdn. Bhd.

(2) On the other hand, Sykt Persahaan Finetex Sdn. Bhd. was very concerned about energy saving - over CP. These can be referred to Table 5-4.

(3) Basically, almost all the factories were looking forward to improvement in productivity. A project for introducing new technology equipment was underway in M.K.K. Industries Sdn. Bhd.; the project could also reduce water consumption by introducing dyeing machines with low liquid ratio.

(4) South Asia Textiles (M) Sdn. Bhd., Sykt Persahaan Finetex Sdn. Bhd. and Sykt Koon Fuat Industries Sdn. Bhd. were willing to invest in the operation and maintenance of the equipment. Whereas, South Asia Textiles (M) Sdn. Bhd. and Sykt Persahaan Finetex Sdn. Bhd. were looking for the improvement in production management.

(5) With regards to energy saving and reduction of water consumption, all six factories have nearly the same system for heating (dyeing & drying) and cooling (washing) operations. Some factories are not recovering steam condensate while other companies do. Sykt Persahaan Finetex Sdn. Bhd. had some advantages in this regard because the factory's facility had been constructed with proper piping arrangements that would be easy to remodel. In addition, the factory was willing to remodel the piping arrangement. Therefore, Sykt Persahaan Finetex Sdn. Bhd. was also selected as one of the model factories in the textile sub-sector.

(6) About South Asia Textiles (M) Sdn. Bhd. and Sykt Persahaan Finetex Sdn. Bhd., the company representatives showed more concern for the future of the environment than representatives of other companies. Besides, their factory area was well suited for the installation of CP equipment.

Table 5-4 Adjudication Table for Model Factory Selection

Sub-sector: Textile

Adjudication Items	Allocation of Points	Samtex	Sykt Koon	Berijaya	South Asia	Finetex	MKK
1. Expected Improvement							
(1) Reduction of Environmental Impact	25	20	13	13	5	13	25
1) Quality of Waste Water	10	8	5	5	2	5	10
2) Quantity of Waste Water	10	8	5	5	2	5	10
3) Quantity of Industrial Waste	5	4	3	3	1	3	5
(2) Energy Saving	15	10	5	5	5	5	10
(3) Improvement of Productivity	15	8	5	5	5	5	3
(4) Replication for Other Factories	15	13	10	10	5	10	14
(5) Compliance with regulation (current)	30	15	10	15	0	10	20
Subtotal-1 (A)	100	66	43	48	20	43	72
2. Possibility of Improvement							
1) Improvement Cost (within Bagetary Limitation)	10	2	2	2	2	2	2
2) Introduction of Equipment	10	2	2	2	2	2	2
3) Equipment Procurement in Malaysia	10	10	10	10	10	10	10
4) Compliance with regulation (future)	20	10	10	10	20	15	10
Subtotal-2 (B)	50	24	24	24	34	29	24
Total	150	90	67	72	54	72	96
3. Willingness of the Factory							
1) Present Production Management	10	8	10	10	10	10	10
2) Demonstration & Seminar	25	23	22	20	25	25	20
3) Acceptance of Visitors	25	25	25	25	25	25	25
4) Provision of Installation Equipment	10	10	10	10	10	10	5
5) Bearing Ability for Operation & Meinatenance of Equipment	20	5	20	10	20	20	15
6) Improvement of Production Management	10	5	5	5	10	10	10
Total (C)	100	76	92	80	100	100	85
Grand Total ((A) x (B) x (C))/100	5,000	1,204	949	922	680	1,247	1,469

At the re-audit stage, the following points were considered and South Asia Textiles (M) Sdn. Bhd. was selected as a model factory:

a. Wastewater treatment is a common subject for dyeing houses, and recycling is the ultimate wastewater treatment method. If a recycling method is established, the technology will be applicable to other companies,
b. City water price has been raised and will increase in the future,
c. Although it is not a big problem at present to buy city water and to discharge wastewater to the river or sewer, the amount of buying and discharging will possibly be regulated by the government in future, and
d. South Asia Textiles (M) Sdn. Bhd. is eager to increase the water recycling ratio and also to solve the present problematic issues by CP implementation compared with others.

Total construction cost was estimated at RM272,000 roughly and the running cost would be RM0.5/m^3 at the maximum case, while the city water price was RM2.24/m^3.

5.2.5 Selection of Model Factory in Pulp & Paper Sub-sector

Table 5-5 shows an adjudication table for model factory selection. The outline of the selection of the model company in this sub-sector is as follows:

(1) Telic Paper Sdn. Bhd.

The factory was operating its original oven dryers and they did not like to receive visitors. Therefore this company was excluded from the selection of a model company.

(2) Lekok Paper Sdn. Bhd.

It was necessary to do a more detailed study on a strict control method of recycle water quality.

(3) Versatile Paper Boxes Sdn. Bhd.

It was also necessary to do a more detailed study on the treatment of ink washing water and wastewater treatment system.

Finally, no factory was selected as a model factory, because not much area for improvement was expected for this sub-sector compared with the other sub-sectors.

Table 5-5 Adjudication Table for Model Factory Selection

Sub-sector: Pulp and Paper

Adjudication Items	Allocation of Points	Telic paper	Lekok Paper	Versatile Paper Boxes
1. Expected Improvement				
(1) Reduction of Environmental Impact	25	4	13	13
1) Quality of Waste Water	10	2	5	8
2) Quantity of Waste Water	10	1	5	3
3) Quantity of Industrial Waste	5	1	3	2
(2) Energy Saving	15	5	3	1
(3) Improvement of Productivity	15	5	5	5
(4) Replication for Other Factories	15	1	5	10
(5) Compliance with regulation (current)	30	10	10	5
Sub-total-1 (A)	100	25	36	34
2. Possibility of Improvement				
1) Improvement Cost (within Budgetary Limitation)	10	3	8	8
2) Introduction of Equipment	10	6	5	7
3) Equipment Procurement in Malaysia	10	10	10	10
4) Compliance with regulation (future)	20	10	10	10
Sub-total-2 (B)	50	29	33	35
Total	150	54	69	69
3. Willingness of the Factory				
1) Present Production Management	10	8	5	8
2) Demonstration & Seminar	25	15	10	15
3) Acceptance of Visitors	25	5	20	20
4) Provision of Installation Equipment	10	5	5	5
5) Bearing Ability for Operation & maintenance	20	15	10	15
6) Improvement of Production management	10	8	5	8
Total (C)	100	56	55	71
Grand Total ((A) x (B) x (c))/100	5,000	406	653	845

5.3 Outline of Demonstration Project

5.3.1 Metal Polishing Industries Sdn. Bhd.

(1) CP Measures

The following five CP measures were implemented.

(a) Installation of a pressure controller for city water inlet (CP1)

The city water inlet pressure increases during midnight and decreases during daytime. This pressure controller controls the outlet pressure and helps to keep a stable flow rate at all times.

(b) Installation of area flow meters (CP2)

This is to install area flow meters for five rinsing tanks in addition to CP1. The operators could control the water flow rate adequately all the times using these area flow meters.

(c) Installation of a diaphragm pump (CP3)

This is to install a diaphragm pump for the purpose of transferring over-flow rinse water from tank No.7 to No.4 for reuse.

(d) Installation of a filtering unit (CP4)

This is to install a filtering unit for the bright chromium tank in order to maintain a desirable suspended solid concentration in the tank.

(e) Installation of an ion exchanger system (CP5)

This is to install an ion exchanger system. This system can make full recovery of rinse water after bright chromium plating, and can help to improve the final products quality.

(2) CP Investment

The total investment for the CP introduction resulted in RM216,000 as shown in Table 5-6.

Table 5-6 Investment for CP Measures

No.	Item	Quantity	Amount (RM)
CP1	Installation of a pressure controller for city water inlet	1 set	5,000
CP2	Installation of area flow meters	5 sets	10,000
CP3	Installation of diaphragm pump	1 set	9,000
CP4	Installation of a filtering unit	1 set	87,000
CP5	Installation of an ion exchanger system	1 set	105,000
Total			216,000

(3) Performance Confirmation

(a) Impurity ion concentration in rinse

After the introduction of CP5, the concentration of Cr^{6+}, for example, in rinse water was decreased from 4-5 mg/litre to 0.05 mg/litre.

(b) Electric conductivity value in rinse water

The water in rinsing tanks has become very clear and transparent, and its electric conductivity value reduced from 1,000 μS/cm to 20μS/cm.

(4) Reduction of Production Cost and Increased Running Cost

After the introduction of CP, wastewater treatment fee, city water and electricity consumption and labour cost were reduced. Consequently production cost was reduced by RM12,029 per month though some amount of running cost increased as follows:

(a)	Reduced wastewater treatment fee	+RM1,996/month
(b)	Reduced city water consumption	+RM234/month
(c)	Reduced electricity consumption	+RM19/month
(d)	Reduced labour cost	+RM4,400/month
(e)	Increased productivity	+RM6,350/month
	Sub-total	+RM12,999/month
(f)	Increased running cost	- RM970/month
	Total	**+RM12,029/month**

5.3.2 Perusahaan TGB Sdn. Bhd.

(1) CP Measures

The following six CP measures were implemented.

(a) Rearrangement of wiring between rectifiers and tanks (CP1)

Connection of bus bars and anode stands and cathodes are rearranged adequately for

lowering the electrolysis voltage.

(b) Installation of newly designed anode stands (CP2), and

(c) Replacement of anode beam sets (CP3)

By installation of new anode stands on both sides of each anodizing tank in addition to the rearrangement of wiring, uniformity in film thickness and shortening of anodizing time can be expected.

(d) Refreshment of cathodes (CP4)

The allocation of anodes and cathodes in the anodizing tanks are corrected.

(e) Improvement of rinsing facility (CP5)

This measure consists of the following 4 measures:

i. Installation of a shower system

To prevent contamination of anode beams, a shower system is installed at the second rinsing tank after anodizing.

ii. Installation of over-flow gutters beside rinsing tanks

Over-flow gutters and water supply pipes at the bottom are installed for all the eight rinsing tanks so that water will flow from the bottom to the surface.

iii. Installation of water supply piping for rinsing tanks

A water-supply pipe is led into the bottom of each rinsing tank. Accordingly water will flow from the bottom to the surface.

iv. Installation of air agitation pipes in rinsing tanks

To increase rinsing efficiency, air agitation piping at the bottom is installed for all the rinsing tanks.

(f) Introduction of a counter-current system (CP6)

The water used in the third rinsing is sent to the second rinsing tank in order to reduce water consumption.

(2) CP Investment

The total investment for CP introduction was RM400,000 as shown in Table 5-7.

Table 5-7 Investment for CP Measures

No.	Item	quantity	Amount (RM)
CP1	Rearrangement of wiring between rectifiers and tanks	1 set	94,100
CP2	Installation of newly designed anode stands	1 set	14,500
CP3	Replacement of anode beam sets	18 sets	151,000
CP4	Refreshment of cathodes	1 set	123,300
CP5	Improvement of rinsing facilities	1 set	13,100
CP6	Introduction of counter-current system	1 set	4,000
	Total		400,000

(3) Performance Confirmation

(a) Reduction of anodizing voltage (CP1,CP2,CP3,CP4)

Before CP introduction, the voltages at the rectifier and inside the anodizing tank were around 17 volts. After CP introduction, the both voltages were around 11 volts. This means that electricity consumption for anodizing was reduced by 35%.

(b) Film thickness distribution (CP1,CP2,CP3,CP4)

The thickness dispersion in one section is significantly reduced by CP introduction. Assuming that the film thickness difference in a section reduces from 35% to 10% of maximum thickness, electricity required for anodizing was also reduced by 18.5%. It means that anodizing time can be reduced by 18.5%, where productivity also increased by 18.5%.

(4) Reduction of Production Cost and Increased Running Cost

After the introduction of CP, electricity and water consumption and labour cost were reduced without increasing running cost. Consequently production cost was reduced by RM314,200 per year as follows:

(a)	Reduced electricity consumption	RM105,600/year
(b)	Reduced city water consumption	RM6,600/year
(c)	Increased productivity	RM174,000/year
(d)	Decreased labour cost	RM28,000/year
	Total	**RM314,200/year**

5.3.3 Winner Food Industries Sdn. Bhd.

(1) CP Measures

The following three CP measures were implemented.

(a) Reform of rice washing system (CP1)

A new rice washing machine is installed for the reduction of rice washing water. Before CP introduction, the process required about 8-10 times as much water as rice for rice washing, which can be reduced to 4-5 times of rice.

(b) Reform of noodle cooling system (CP2)

Fresh water is sprayed onto noodles directly at the front where existing cooling baths are to be modified. Then, warmed water in the baths is recycled and sprayed onto noodles at the rear.

(c) Improvement of well water (CP3)

To decrease city water usage as much as possible, a chlorine dosing unit for sanitary treatment and a water softening unit for boiler feed water are added to the existing well water system

(2) CP Investment

The total investment for the CP introduction resulted in RM270,000 as shown in Table 5-8.

Table 5-8 Investment for CP Measures

No.	Item	Quantity	Amount (RM)
CP1	Reform of rice washing system	1 set	166,000
CP2	Reform of noodle cooling system	1 set	15,000
CP3	Improvement of well water	1 set	89,000
Total			270,000

(3) Performance Confirmation

(a) Rice washing machine

The model factory operates the rice washing process once a day for around one hour treating 1.0-1.2 ton rice. Before CP introduction, it took 60 minutes for washing 1,000 kg rice using 13-15 m^3 water. After CP introduction, it takes 30-40 minutes for washing 1,000 kg rice by using 4 m^3 water. Therefore, both reduction of laborious work time and decrease of water consumption were attained.

(b) Noodle cooling

The water consumption is almost same or a little lower than the system before CP introduction. However, temperature lowered by around 5℃ and the quality of noodles

was improved.

(c) Well water improvement

Residual chlorine concentration through NaClO dosing was under 0.1 ppm after passing through an activated carbon filter. Bacillus count is ND (No Detected); therefore the treated well water can be good enough for use in food production. Total hardness is under 1 ppm as $CaCO_3$, which had no problem for boiler feed water use.

(4) Reduction of Production Cost and Increased Running Cost

The actual annual running cost saving was RM11,369 per year. However, the rice washing machine is not used fully because of the low production rate compared with the machine's designed capacity due to shortened operation time. Therefore, in the case where 10 times production rate is realised, which is enough to use the machine, both raw water and wastewater profitability increase.

5.3.4 South Asia Textiles (M) Sdn. Bhd.

(1) CP Measures

The following CP measure was implemented.

(a) Increase of treated wastewater recycling ratio

The factory had been considering reusing treated wastewater in the washing process, and after several trial operations, the recycling ratio of the treated wastewater had increased to 30%. However, further increase of recycling was constrained by the presence of high iron ion in the treated water. Through laboratory scale tests, it was concluded that a coagulation method could reduce the iron ion concentration from more than 5.0 mg/l to 0.1-0.05 mg/l.

(2) CP Investment

The total investment cost resulted in RM305,000 as shown in Table 5-9.

Table 5-9 Investment Cost for New Plant

No.	Item	Quantity	Amount (RM)
	Wastewater treatment plant	1 set	305,000
Total			305,000

(3) Performance Confirmation

The operating condition for reducing iron ion content was confirmed.

(a) Reduction of iron ion content in the treated wastewater

Fe^{3+} and total iron ion concentration was higher than the target value during the test operation because pH value of treating water in the coagulation tank was higher and there was some amount of iron rust in the filter. After controlling pH value and cleaning of the filter, iron ion content was reduced to less than 0.1 mg/liter.

(b) Reduction of residual chlorine content in the treated wastewater

A small amount of residual chlorine remained in the treated wastewater. It came from a higher injection rate of NaClO and deterioration of activated carbon filter. After reduction of NaClO injection rate and installation of a new activated carbon filter by the model factory, no residual chlorine in the treated wastewater.

(c) Elimination of smell in the treated wastewater

The treated water smelled of something because the wastewater was not aerated sufficiently and bacterium was propagated in the treated wastewater storage tank. After normal operation of the aeration tank at higher water level, smell was eliminated.

(4) Reduction of Production Cost and Increased Running Cost

Necessary running cost mainly for chemicals was RM0.283/m^3-feed water. Using this running cost, total expected cost saving was calculated at the recycling ratio of 70% as follows:

a. Reduction of consumption of city water: 72,000m^3/year
b. Reduction of purchasing amount of city water: RM110,000/year
c. Reduction of effluent amount of wastewater: 72,000m^3/year

5.4 Evaluation of CP Measures

5.4.1 CP Measures for Model Factories and Investment

For each model factory, CP measures were selected and executed. Those CP measures and investment are summarised in Table 5-10.

Table 5-10 CP Measures and Investment

Model Factory	CP Measures and Investment
Metal Polishing Industries Sdn. Bhd.	CP1 Installation of a pressure controller for city water inlet CP2 Installation of 5 area flow meters for city water line CP3 Installation of a diaphragm pump CP4 Installation of a filtering unit CP5 Installation of an ion exchanger system **Investment: RM216,000**
Perusahaan TGB Sdn. Bhd.	CP1 Wiring between rectifier and tanks CP2 Installation new designed anode stands CP3 Replacement of anode beam sets CP4 Refreshing cathodes CP5 Improvement of rinsing facilities CP6 Installation of counter-current system **Investment: RM400,000**
Winner Food Industries Sdn. Bhd.	CP1 Reform of rice washing system CP2 Reform of noodle cooling system CP3 Improvement of well water **Investment: RM270,000**
South Asia Textiles (M) Sdn. Bhd	CP1 Increase of treated wastewater recycling ratio **Investment: RM305,000**
	Total Investment RM1,191,402

5.4.2 Purpose of Evaluating Profitability of CP Measures

CP measures are introduced to factories for not only decreasing industrial pollution but also making profits through lower energy consumption, reducing wastewater discharge and increasing productivity. The companies can recover their CP investments by these profits and can reinvest that money in other CP measures. From these points of view, factories need to evaluate profitability of CP investment when they want to invest for the introduction of CP.

In this case, it was carried out to check the profitability of CP measures in the model factories when they reach a steady level of operation. When CP measures are applied to other factories, it is important for the factories to know the profitability of CP investment.

5.4.3 Method of Evaluating Profitability

The two general methods to evaluate profitability are explained below.

(1) Return on Investment (ROI) Method:

This method is used to evaluate the profitability based on the ratio of return on the investment. A main ROI method is Internal Rate of Return (IRR) method (or Discounted Cash Flow - DCF method) that calculates the discount rate to let the accumulated present value of the annual net cash flow equal to the investment. This method is usually used to evaluate big and long-term projects.

(2) Pay Out Time (POT) Method:

This method is used to evaluate the profitability based on the period needed to recover the investment. POT is calculated as the period required to recover the investment through the accumulated annual cash flow earned by the project. POT method is generally used to evaluate small rationalising investments such as saving manpower or saving energy, and small capacity expansion investments.

It is considered that POT method should be applied to evaluate CP measures because they involve relatively small equipment. However, it is better to apply IRR method at the same time as mentioned later

5.4.4 Necessary Data used for Evaluation

The form used in calculation is shown in Table 5-11 and the data used to calculate the profitability are explained below.

Table 5-11 Example for Calculation

Year	0	1	2	3	4	5	6	7	8	9	10
1) Investment											
2) Cost saving											
3) Increased operating cost											
4) Interest											
5) Income tax											
6) Net cash flow											
7) Depreciation											
8) Loan balance											

Here, each item is explained as follows:

(a) Investment:

Investment expenditure such as installation of new equipment or modification of existing equipment

(b) Cost saving:

Reduction of operating costs such as raw materials, energy, operators, waste,

city water, increased profit by productivity increase and other cost saving by operation of installed equipment

(c) Increased operating cost:

Increased operating costs such as energy, manpower, maintenance and other costs by operation of installed equipment

(d) Interest:

Money: All money required for CP investment is borrowed from the bank.

Interest rate: 6% (4% in food industry: Political low interest is applied to food industry in Malaysia.)

(e) Income tax:

30 % of taxable income

(f) Net cash flow:

Cost saving less investment less increased operating cost less interest less income tax

(g) Taxable income:

Cost saving less increased operating cost less interest less depreciation

(h) Depreciation:

Initial depreciation: 20%, Annual depreciation: 8%

So, depreciation in the first year is 28%.

5.4.5 IRR Method

IRR method is shown below where "r" is answer to be calculated.

$$\text{Investment} = \frac{\text{Cash flow of } 1^{st} \text{ year}}{(1+r)} + \frac{\text{Cash flow of } 2^{nd} \text{ year}}{(1+r)^2} + \cdots + \frac{\text{Cash flow of } n^{th} \text{ year}}{(1+r)^n}$$

Here,

r: Discount rate which lets the accumulated present value of cash flow except investment equal to the investment. This rate shows the yield on the investment in the calculated period.

n: 10 in these calculations.

5.4.6 POT method

POT is the period calculated by subtracting the cash flow of each year from the investment until the investment is equal to zero.

5.4.7 Calculated POT & IRR Value and their Evaluation

Investment, saved cost, increased cost, calculated POT and IRR values are shown in Table 5-12. From Table 5-12, the evaluations for each model factory are summarised as follows.

(1) Metal Polishing Industries Sdn. Bhd.

a. The group of CP1 to CP3 made very good profitability; although the investment cost was smaller without any additional operation cost and the annual cost saving was not much.
b. The profitability of CP4 was a little insufficient because POT is 5.8 years. However, CP4 should be considered as one part of CP5.
c. CP5 showed a very good profitability, where POT was 1.4 years. In addition, the factory's productivity was increased by 5% through the improvement of working environment by CP5. It was thought that CP5 could be applied to other factories because CP5 was effective not only in productivity but also in improvement of working environment.
d. In total, POT was 2.1 years and IRR was 51%. Therefore, it was judged that total CP introduction was a good investment.

Table 5-12 POT and IRR Values for Model Factories

Model Factory	Investment	Saved cost	Increased cost	POT	IRR
	RM/y	RM/y	RM/y	Year	%
(1) Metal Polishing Industries Sdn. Bhd.					
a. CP1 to CP3	24,000	24,000	0	1.3	-
b. CP4	87,000	21,000	1,000	5.8	-
c. CP5	105,000	110,000	10,000	1.4	-
d. Total	216,000	155,000	11,000	2.1	51
(2) Perusahaan TGB Sdn. Bhd.					
a. CP1	94,00	92,000	0	1.4	-
b. CP2	14,000	92,000	0	0.2	-
c. CP3	151,000	77,000	0	2.7	-
d. CP4	123,000	46,000	0	3.6	-
e. CP5	13,100	3,600	0	2.0	-
f. CP6	4,000	600	0	2.5	-
g. Total	400,000	312,000	0	1.7	60
(3) Winner Food Industries Sdn. Bhd.					
a. CP1	166,000	5,000	-	10<	-
b. CP2	15,000	-	-	-	-
c. CP3	89,000	12,000	6,000	10<	
d. Total	270,00	17,000	6,000	10<	Negative
(4) South Asia Textiles (M) Sdn. Bhd.					
a. Recycle Ratio: 50%	305,000	81,000	51,000	10<	2
b. Recycle Ratio: 60%	305,000	121,000	51,000	5.8	16
c. Recycle Ratio: 70%	305,000	161,000	51,000	3.7	27
d. Recycle Ratio: 80%	305,000	202,000	51,000	2.7	38

(2) Perusahaan TGB Sdn. Bhd.

a. CP1 showed very good profitability because POT was 1.4 years and the reduction of electricity consumption and the increase of productivity by CP1 were very large. Furthermore, CP1 did not require any additional cost through the introduction of the equipment.

b. POT of CP2 was 0.2 years, so profitability was also very good. It made the same amount of cost saving as CP1 in the same way, though the investment was smaller than CP1.

c. The investment for CP3 was the largest but its cost saving was smaller than CP1 and CP2 because of less efficiency in electricity consumption reduction and the productivity increase. Therefore POT was 2.7 years -- longer than CP1, but profitability was good.

d. Profitability of CP4 was sufficient although the investment was the second largest; however, cost saving was smaller than CP1, CP2 and CP3. Therefore,

POT was 3.6 years.

e. As there were many facilities that could be improved, especially in electric facilities, CP measures were very efficient in improving electric facilities and POT of the total of CP1,CP2, CP3 and CP4 was 1.4 years. It was considered that these measures could be successfully applicable to other factories in the same situation as the model factory.

f. The saved costs for CP5 and CP6 smaller, but POT of CP5 was 3.7 years and POT of CP6 was 2.7 years. Therefore, it was thought that profitability of these investments was sufficient. It should be added that CP5 was effective improving product quality, and there was a reduction in complaints from customers.

g. The total investment in the model factory had a very good profitability where POT was 1.7 years and IRR was 60 %. This means that any factory in the same situation as the model factory can recover their investment within 2 years if the factory borrows all required money from a bank. And any CP can be recommended separately to factories because each CP has a good profitability.

(3) Winner Food Industries Sdn. Bhd.

a. CP1 reduced the rice washing water to one tenth compare to the consumption of water before installation. However, CP1 equipment was rather expensive and the reduction of city water is not much because there is only one operation a day. Therefore, POT was over 10 years and this made the profitability of this investment not favorable. It was thought that if the production of noodles would increase and more washing be needed in the future, CP1 could cope with the situation. From this point of view, it is said that CP1 has good potential.

b. CP2 reduced the water consumption and improved the noodle quality by cooling rapidly. But almost no monetary merit came from this CP introduction because the factory was already using well water. However, CP2 will decrease the future investment for wastewater treatment facility because CP2 has reduced the amount of wastewater discharge.

c. The profitability of CP3 was over 10 years and was not good. The factory had almost completely switched from using city water to using well water. It can be concluded that CP3 will be attractive to other factory which already has a well and is using as much city water or more than the model factory.

d. The overall benefits of CP1, CP2 and CP3 did not give a good profitability, where POT was over 10 years and the company could recover only one third of the investment in 10 years at 4 % interest. However, It is thought that this type of rice washing machine is very effective for the companies that have larger production

capacity than the model factory and need to install new wastewater treatment facilities. Moreover, these measures will be profitable to small companies like the model factory when the government strengthens regulations on wastewater discharge in the future.

(4) South Asia Textiles (M) Sdn. Bhd.

As of March 2002, the recycling ratio was increased. Therefore, only trial calculations for the profitability, POT and IRR, were made and their evaluation was as follows.

a. If the recycling ratio reaches 70%, this investment can be judged as sufficient, because POT is 3.7 years.
b. When the recycling ratio reaches 60%, POT becomes 5.8 years, which is considered as insufficient in profitability.
c. Therefore, it is expected that the factory increase the recycling ratio to 70% at least.
d. Through operation of the new wastewater treatment, the model factory can reduce city water consumption and wastewater discharge to the utmost limit. It is thought that the model factory would become a real model factory in the textile industry in Malaysia from view points of water consumption and wastewater discharge.

CHAPTER 6

DISSEMINATION OF CP INFORMATION

CHAPTER 6 DISSEMINATION OF CP INFORMATION

6.1 Seminars on CP

In order to disseminate CP information, SIRIM together with the study team organised seminars in course of the study.

6.1.1 Water Conservation Seminars

In view of a pressed issue of water resources that is stimulated by the recent rise in city water prices, three seminars on water conservation were held in three cities:

(1) Seminar in Shah Alam

The seminar was held on 12 July 2001 at Grand BlueWave Hotel Shah Alam. After a welcoming address by Mr. Toshio Hida, Resident Representative JICA Malaysia, the seminar was opened by Dr. Mohd. Arrifin Hj. Aton, President/Chief Executive of SIRIM . A total of 75 participated in the seminar.

Based on various experiences in effective utilisation of water in Japan, presentations were given by Dr. Wada and Mr. Kaneko covering basic and advanced technologies for water conservation, and case studies in Japan. Mr. Lu Sim Hoay, Environmental and Energy Technology Centre (EETC), SIRIM, concluded the seminar by giving a brief presentation titled CP cost saving options for efficient water utilisation.

(2) Seminar in Johor Bahru

The seminar was held on 16 July 2001 at The Puteri Pan Pacific Hotel Johor Bahru with 44 participants.

(3) Seminar in Penang

The seminar was held on 19 July 2001 chaired by Mr. Lu Sim Hoay, SIRIM Berhad, at Hotel Equatorial Peneng with 54 participants.

6.1.2 Industrial Sector Specific Seminars

Two seminars were held addressing industrial sector specific topics.

(1) Seminar on CP in the Textile Industry

This seminar was held on 6 September 2001 at the Katerina Hotel, Batu Pahat. After the introduction of the SIRIM-JICA project by Mr. Lu Sim Hoay, who chaired the seminar, Messrs. Hayakashi and Morimoto of the JICA study team gave presentations. The

presentations covered CP measures in water utilisation, dyestuff utilisation, and productivity improvement. A total of 28 participated in the seminar.

(2) Seminar on CP in the Electroplating Industry

For the purpose of presenting CP experience in the metal finishing industry in Japan, SIRIM and the study team held this seminar on 6 November 2001 at Condorde Hotel Shah Alam. Chaired by Dr. Yeoh Bee Ghin, General Manager, EETC, SIRIM , Messrs. Hirayama and Kanematsu of the JICA study team gave presentations that covered CP measures for improvement of rinsing efficiency, film thickness control, cost saving, measures for valuables recovery, and waste waterless plating applied to still zinc plating. A total of 40 participated in the seminar.

6.1.3 CP Demonstration Project Seminars

As important activities of CP demonstration projects, seminars were held to present the achievements of the projects as follows.

(1) Demonstration Seminar in the Textile Sub-sector

This seminar was held on 25 June 2002 at Classic Hotel, Muar to introduce the demonstration project at South Asia Textiles (M) Sd. Bhd. Chaired by Dr. Yeoh Bee Ghin, SIRIM, the study team, the model factory and the CP equipment supplier made presentations from respective viewpoints. Especially, Mr. Teo K. F., the Factory Manager of the model factory gave a detailed presentation on the water system and profitability of the CP measure introduced and actively explained the benefit of CP.

After the seminar, site visit tour was conduced at the model factory.

A total of 31 outside audiences participated in the seminar.

(2) Demonstration Seminar in the Metal Finishing and Electroplating Sub-sector

This seminar was held on 27 June 2002 at Concorde Hotel Shah Alam to introduce the demonstration projects at Metal Polishing Industries Sdn. Bhd. and Persahaan TGB Sdn. Bhd. After a welcoming address by Mr. Toshio Hida, Resident Representative JICA Malaysia, the seminar was opened by Dr. Mohd. Arrifin Hj. Aton, President/Chief Executive of SIRIM.

After the introduction of demonstration projects by the study team, Ms. Suzanne L. P. Foo, Managing Director of Metal Polishing Industries Sdn. Bhd. and Mr. Cheah G. T., General manager of Persahaan TGB Sdn. Bhd. made presentations on respective CP demonstration project and emphasized the benefit and importance of CP practice. Presentations from suppliers viewpoint followed.

After the seminar, site visits were conducted at both the model factories.

A total of 46 outside audiences participated in the seminar.

(3) Demonstration Seminar in the Food Sub-sector

This seminar was held on 28 June 2002 at Concorde Hotel Shah Alam to introduce the demonstration project at Winner Food Industries Sdn. Bhd. Chaired by Dr. Yeoh Bee Ghin, SIRIM, the study team, the model factory and the CP equipment supplier made presentations from respective viewpoints. Especially, Mr. Chin Y. G., General Manager of Winner Food Industries Sdn. Bhd. actively supported the achievement of CP measures implemented. A total of 29 outside audiences participated in the seminar.

After the seminar, site visit was conducted at the model factory.

6.1.4 Workshop and Roundtable on CP Action Plan

(1) Workshop on Cleaner Production Strategic Action Plan

In order to develop a Malaysian Action Plan for CP Promotion, SIRIM organised a workshop on Cleaner Production Strategic Action Plan, which was held on 30 May 2002 at Grand BlueWave Hotel Shah Alam.

After introductory remarks by Mr. Freddie Cho, Director, Regional Economics and Environment Section, EPU, the study team gave a presentation on draft action plan for CP promotion that was to be proposed in this study. 42 participants were then broken up into the following 4 groups to discuss the CP action plan based on the plan proposed by the study team:

Group 1: Policy and Regulations
Group 2: Financial and Incentives
Group 3: Technology and Information Dissemination
Group 4: Training and Capacity Building

Afterwards each facilitator presented the active discussion results representing respective group.

Based on the Action Plan proposed by the study team and the outcome of the workshop, SIRIM developed the National Strategic Action Plan on Cleaner production, which was submitted to EPU in August 2002.

(2) National CP Roundtable

As a concluding event of this study the National CP Roundtable was held on 27 August 2002 at Pan Pacific Glenmarie Resort Shah Alam.

After a welcoming address by Mr. Toshio Hida, Resident Representative JICA Malaysia and the opening address by Dr. Mohd. Arrifin Hj. Aton, President/Chief Executive of SIRIM, the following presentations were given:

1) Success stories of CP in the Asia-Pacific Region: Mr. Y. Yamada, Special Advisor to the Secretary General, APO
2) European Experience in the Promotion of Cleaner Production: Mr. K. Lauritsen, NIRAS Consulting
3) Japanese Experience in Clener Production: Mr. S. Aoki, JICA study team
4) Introduction of the proposed National Strategic Action Plan on Cleaner Production: Dr. B. G. Yeoh, SIRIM

Roundtable discussion by all the participants followed.
With this Roundtable as a momentum, it is expected that various appropriate measures be taken to effectively promote Cleaner Production in Malaysia.

6.2 CP Information Database

6.2.1 Plan for Database Development

An original plan of the Study was to develop a new information database incorporating the results of demonstration projects and the study team prepared a conceptual model for the database to be developed. In the course of the Study, however, the development the database system was viewed to be too costly considering the data consists of four case studies which will become out-of-date in a short period.

As an alternative option, the study team surveyed a fee database which should provide detailed information on numbers of CP case studies. However, a database on CD-ROM from UNEP, which was the only fee database the study team could find, was basically the same as one that could be accessed through the Internet.

It was concluded that SIRIM will create in its homepage links to CP case studies on the internet.

6.2.2 Plan for Link to Outside Database

The study team worked out a way to add to the current SIRIM web site, links to CP information sites. The purpose of links is to enable outside users to easily browse CP information, which is located on several different web sites.

(1) Website for CP Case Studies

After reviewing information obtained from various CP web-sites, the following web sites were selected as link targets. They cover CP case study information in manufacturing industries such as food, pulp & paper, textile, and metal-finishing as well as general information on CP.

(a) UNEP, Metal finishing industry:
http://www.emcentre.com/unepweb/tec_case/metal_28/house/casename.shtml
(b) UNEP, Food processing industry:
http://www.emcentre.com/unepweb/tec_case/food_15/house/casename.shtml
(c) UNEP, Pulp & paper industry:
http://www.emcentre.com/unepweb/tec_case/paper_21/house/casename.shtml
(d) UNEP, Textile industry:
http://www.emcentre.com/unepweb/tec_case/textile_17/house/casename.shtml
(e) GEC, Japan, General:
http://nett21.unep.or.jp/GECweb/asp-bin/en_DataResult.asp
(f) Australia's Environet, General:
http://www.environment.gov.au/environet/eecp/industry.html
(g) USAID, EP3, General:
http://es.epa.gov/ep3/ep3.html

(2) Method for Updating Links

Three alternative methods were studied for creating and updating a link page in the SIRIM web site:

i. Option-1: Create a CP link index page to the current SIRIM web site;
ii. Option-2: Semi-manually create and update a detailed CP link page in the current SIRIM web site; and
iii. Option-3: Automatically update a detailed CP link page in the current SIRIM web site.

In view of cost and manpower required for the creation and maintenance of links, Option-1 was selected. Following is a brief explanation of each method:

(i) Option-1: Simple Method

The concept of Option-1 is shown in Figure 6.1.

The links in (A) are directly referred to those in UNEP and/or others. Each of them is a link page like the one at right, which is just the same as in the original site.
This new page can be written in HTML in the following steps:

(a) Decide categories in the cover page; e.g. Food Industry (UNEP), and so on;
(b) Browse the internet to get the summary link from each target site; e.g. UNEP site; and

(c) Write a HTML source file which covers all of links got in step (b).

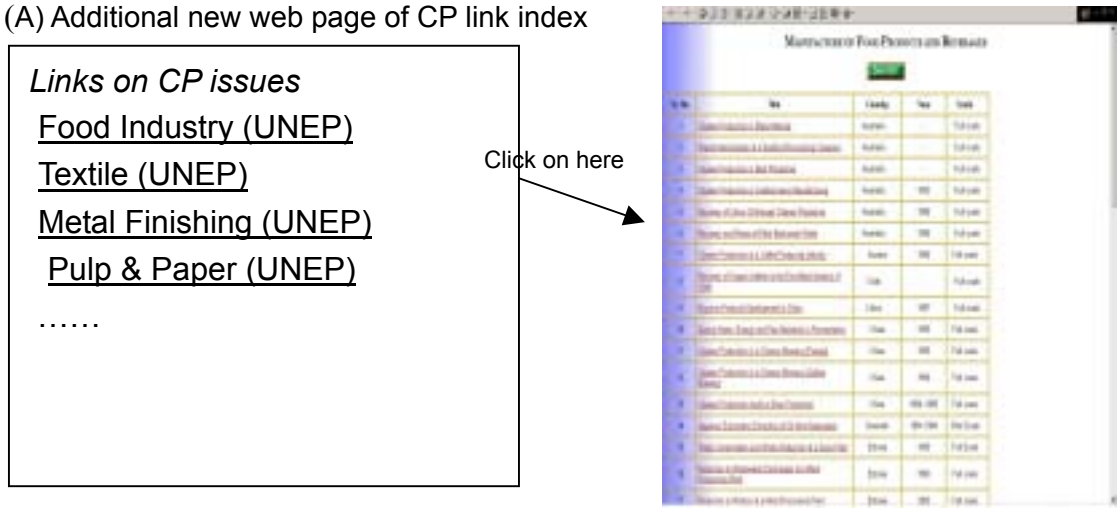


Figure 6-1 Concept of Simple Method for Linking to CP Web-site

(ii) Option-2: Semi-manually Update the CP Web Link Index Page

This method provides outside users with a detailed index of individual CP case studies by creating one more page to include some direct link, collected from the target sites such as the UNEP site as shown in Figure 6-2.

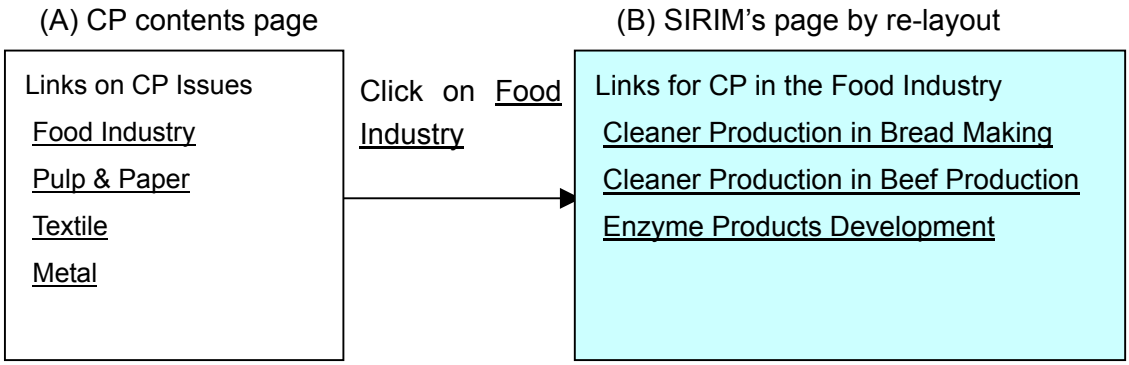


Figure 6-2 Concept of Option-2

The links in (B) are directly referred to those in web sites, such as UNEP. They simply have been laid out again and have changed in appearance from the SIRIM page. Updates will be required in case changes in the link name and URL occur in the original pages. Generally, updates will require the operation shown in Figure 6-3.

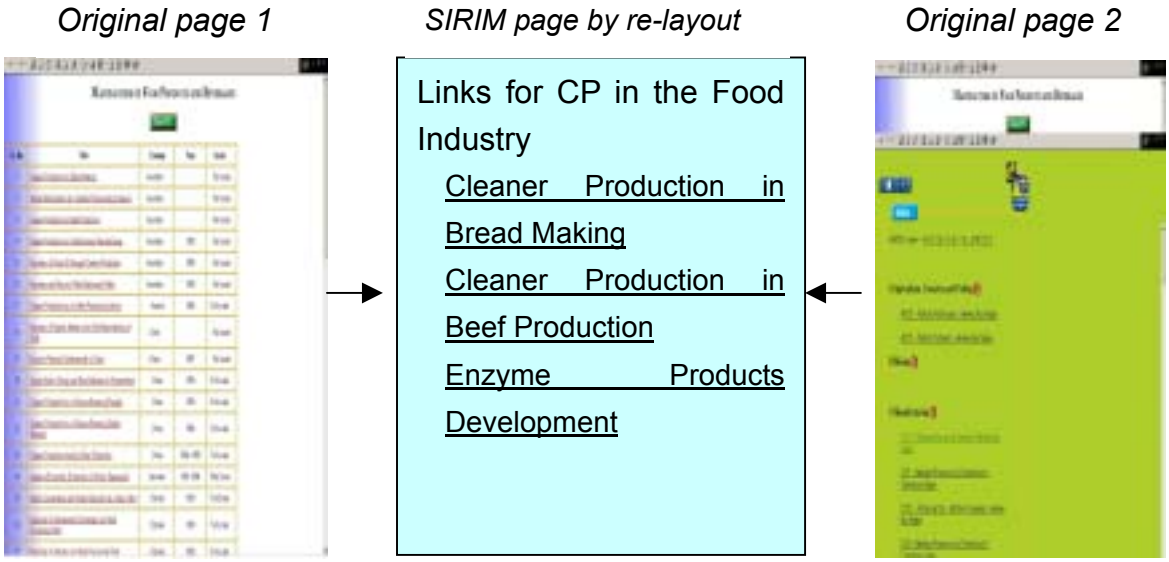


Figure 6-3 Update Operation of SIRIM Index Page

By developing a software program, it is possible to update the CP Web link page semi-automatically. Figure 6-4 shows an outline of this method.

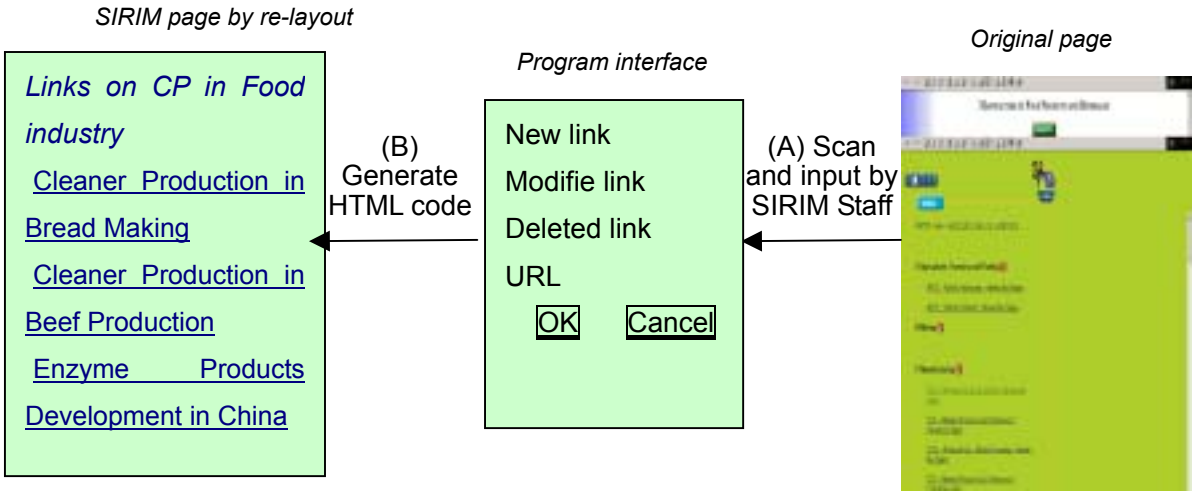


Figure 6-4 Semiautomatic Update Operation of SIRIM Index Page

The implementation of this method requires development of a software programme using JAVA, Visual C or Visual Basic to accomplish the step (B) in Figure 6-4. Staff scan target sites and input into the programme and then the programme generates HTML code and then writes it directly into the existing direct link page.

It is estimated that this method will require a total of 1.5 man-months to develop the required software programme.

(iii) Option-3: Automatically Programmed Updating of the CP Web Link Page

This method automates the step of scanning an original page utilising a software programme coded with JAVA, Visual C, or Visual Basic. The program analyses several original pages, picks out changes in them, and rewrites the HTML codes reflecting the changes, addition or deletion of link names and URLs into the SIRIM web page. There has to be a restriction on the number of original pages, also some pages with very specific layouts may not be analyzed. Therefore, implementation of this method depends on the format of the original pages.

It is estimated that this method will require a total of 3 man-months to develop the software programme.

(3) Implementation of CP Link Creation

In view of manpower required for the creation and maintenance of CP links, Option-1, the simplest method, was selected. Reflecting discussions with the IT Department of SIRIM, CP links are to be added to the existing SIRIM link page as well as to the EETC homepage.

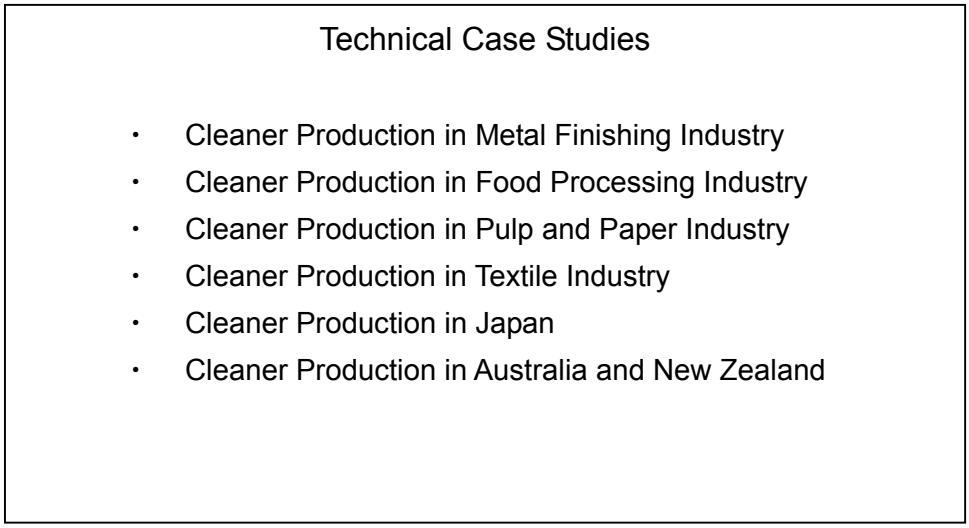
To provide a convenient way for creating links in the SIRIM web site, the study team wrote a required software programme, which was handed over to SIRIM.

Links will appear in the SIRIM web page is as follows:

Title in the SIRIM Web-page: Links for Cleaner Production Case Studies

Titles in the CP Link page

The following image will be shown in the CP link page.



6.3 Newsletter

A newsletter, to be published in March 2002, will present the following:

- Introduction of SIRIM-JICA project for the Study,
- Outline of the Seminars held in the SIRIM-JICA project, and
- Important points in electroplating process.

6.4 Display Panels of Demonstration Projects

A set of display panels was fabricated for each CP demonstration project. Panels are to be used for:

- Showcase display at the SIRIM showroom;
- Display at the demonstration model factories;
- Display at exhibitions;
- SIRIM Corporate Marketing use
- Other.

6.5 Computer Animated Display

For the purpose of providing a visual explanation of CP systems at the demonstration model factories, computer animation displays were developed. The development of the display was subcontracted to Frames Production Sdn. Bhd.
Since an animation display can run on a notebook computer, it can be a convenient tool, easy to carry to targeted factories.

6.6 Animated Flow Models

Animated flow models, which present realistic images and functions of CP equipment in the demonstration projects, were fabricated as follows:

(a) A water system in a noodle manufacturing factory
(The system in Winner Food Industries Sdn. Bhd.)

(b) A water treatment system for recycling and reuse of wastewater in a dyeing factory (The system in South Asia Textiles (M) Sdn. Bhd.)

The animated models are to be utilised for the following purposes:

- Display in the SIRIM showroom; and
- Display at exhibition sites.

6.7 Video Record

In order to keep records of the introduction process of CP equipment to the demonstration factories, video records were produced.

The study team carried out video shooting at the demonstration factories and the editing of video records was subcontracted to Frames Production Sdn. Bhd. Computer animated displays mentioned in 14.5 were inserted in each demonstration project part.

Records on VHS tapes with PAL format as well as CD-ROM will be utilised for visual presentations at seminars, workshops, and/or on the occasion of marketing. VHS tapes with NTSC format were produced for the presentation in Japan.

Cleaner Production Demonstration Project Launching Seminar

Textile Industry
25 June 2002
Classic Hotel, Muar

Opening Address by Dr. Yeoh Bee Ghin, SIRIM Berhad

Industry's View Point by Mr. Teo Kiong Fui, South Asia Textiles (M) Sdn. Bhd.

Supplier's View Point by Mr. Tan Wah Keong, Aquakimia Sdn. Bhd.

Cleaner Production Demonstration Project Launching Seminar

Metal Finishing Industry
27 June 2002
Concorde Hotel Shah Alam

Welcoming Address by Mr. Toshio Hida Resident Representative, JICA Malaysia

Opening Address by Dato' Dr. Mohd. Ariffin Aton,
President/Chief Executive, SIRIM Berhad

Industries' View Point

Ms. Suzanne L. P. Foo
Metal Polishing Industries Sdn. Bhd.

Mr. Cheah Geak Tek
Persahaan TGB Sdn. Bhd.

Active Discussion

Cleaner Production Demonstration Project Launching Seminar

Food Industry
28 June 2002
Concorde Hotel Shah Alam

Welcoming Address by Dr. Yeoh Bee Ghin, SIRIM Berhad

Industry's View Point by Mr. Chin Yim Gem, Winner Food Industries Sdn. Bhd.

Display of Posters and Animated Flow Models for
Cleaner Production Demonstration Projects