Kitakyushu Initiative for a Clean Environment: Successful and Transferable Practices

Ho Chi Minh (Vietnam): Promotion of Clean Production

Institute for Global Environmental Strategies[1]

Target Area: Clean Production in industry
Time Period:

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1. Achievements

Clean Production (CP) is an established program in many countries and regions for improving industrial productivity. In the case of Ho Chi Minh City (HCMC), CP measures were carried out with applying strategies to minimize the generation of wastes and emissions. The CP project of HCMC had an objective to demonstrate the potential economical and environmental benefits of CP, and capacity building to draw locally suitable strategies and assessment processes of CP measures. CP project was launched in 6 industries and significant achievements were made.

The following achievements were obtained from implementing CP measures: 66% reduction in wastewater discharge, 70% reduction in air emissions, 27% reduction in solid waste generation along with substantial conservation of materials and a reduction in use of toxic materials. Table 1 demonstrates the successes of the industries. Aside from environmental benefits, the pay back period for industries to recover investment in implementing CP measures was short and economic benefits were high. Table 2 shows such details by industry. Tables 3 and 4 show improvements by industry.

Table 1: Environmental impacts of CP measures

Industry	No. of CP Options	% Reduction in Environmental impacts		
		Wastewater (%)	Pollution load (%)	Gaseous emissions (%)
Thien Huong	24	66	35	30
Vissan	9	20	33	-
Xuan Duc	21	33	20	30
Linh Xuan	19	45	-	35
Phuoc Long	19	26	-	-
Thuan Thein	14	34	30	70
Total	106			
Percentage	42% (Total measures available)			

Table 2: Economic benefits of implementing CP measures

Industry	No. of CP options	Financial analysis		
		Investment US $	Savings US $	Pay back period
Thien Huong	24	62,000	633,700	< 2 months
Vissan	9	10,000	28,000	< 5 months
Xuan Duc	21	15,000	96,000	< 2 months
Linh Xuan	19	50,000	100,000	6 months
Phuoc Long	19	4,400	40,000	< 2 months
Thuan Thein	14	100,000	75,000	> 1.5 year
Total	106	241,400	972,700	< 4 months (average)

Table 3: Environmental benefits for food processing sector

Industry	Indicator	Before CP	After CP	Change %
Thien Huong Noodle Company	Fresh water consumption (m3/ton)	12.7	5.3	-58
	Furnace oil consumption (lit/ton)	165	138	-16
	Shortening oil (kg/ton of product)	185	160	-13
	COD load (kg/ton)	8.3	5.6	-32
	BOD load (kg/ton)	3.5	2.2	-37
	Green House Gases (ton/day)	0.51	0.42	-17
	Potable water consumption (m3/day)	1200	950	-20
Vissan Slaughter House	Furnace oil consumption MT/day	750	702	-6
	Electric consumption (KWhr/day)	17,600	14,628	-17
	Pollution load organic COD ton/day	3.34	2.30	-33
	Solid waste ton/day	15.8	11.72	-27
	Green House Gases ton/day	4.47	3.60	-19

Table 4: Environmental benefits for paper and pulp sector

Industry	Indicator	Before CP	After CP	Change %
Xuan Duc Paper Company	Water consumption (m3/ton)	130	85	-33
	Furnace oil consumption (lit/ton)	320	250	-21
	Electrical consumption (KWhr/T)	740	662	-10
	Rosin consumption (Kg/T)	10.8	8.8	-20
	Solid waste Kg/T	-	-	-20 (est.)
	Green House Gases (ton/day)	1.32	0.9	-20
Linh Xuan Paper Company	Water consumption (m3/ton)	250	140	-44
	Furnace oil consumption (lit/ton)	518	390	-33
	Electrical consumption (KWhr/T)	1,400	1,140	-18
	Bleaching chemical consumption (lit/T)	340	208	-39
	Organic pollution load (Kg/T)	-	-	-40 (est.)
	Green House Gases ton/day	2.65	1.86	-30

Table 5: Environmental benefits for textile processing sector

Industry	Indicator	Before CP	After CP	Change %
Phuoc Long Textile Company	Water consumption (m3/ton)	320	240	-25
	Furnace oil consumption (lit/ton)	1220	1090	-10
	Auxillary chemicals Kg (total)	391	330	-15
	Dyestuff (Kg/T)	6.2	4.3	-30
	Green House Gases (ton/day)	3.8	3.3	-13
Thuan Thien Bleaching and Dyeing Company	Water consumption (m3/ton)	104	70	-33
	Furnace oil consumption (lit/ton)	1590	435	-62
	Auxillary chemicals (Kg/t)	56	49	-14
	Green House Gases ton/day	5.67	2.09	-63

2. Processes and successful policies

The major motivation of HCMC for strong leadership in this area was due to the important role that industrial sector plays in its economy. HCMC approached UNIDO for assistance with its planned CP program and industries were selected to implement pilot projects. HCMC, with assistance from UNIDO, carried out feasibility studies and potential benefit assessments for selected industries. The technical know-how and financial assistance for program set-up and assessment of CP benefits for industries were provided by UNIDO and HCMC. Industries invested in implementing CP measures.

Apart from the CP technical process, various supporting activities were carried out by HCMC, which are described below.

Partnership: Partnership between HCMC, participating industry and UNIDO

Practical demonstrating potential benefits: Scientific assessments on the potential benefits were major driving forces for industries to carry out CP measures. Before that, industries were not aware of the potential benefits and short pay back period. Confidence on the part of the industries was created. In such assessment, the active role of industries was encouraged and technical assessment know how was provided to collaborators from industries.

Collaborating rather than enforcing: In most cases, cities rely too much on regulation and enforcement mechanisms without providing sufficient support to the problematic sector. HCMC adopted a multi-step approach in which both a regulatory and collaborative approach was simultaneously applied.

Institutional capacity enhancement: During CP implementation, the technical capacity of factory supervisors as well as of local government was enhanced. On site training and demonstrations were carried out and the need for foreign experts were greatly reduced.

Formulation of local CP guidelines: A planned approach was employed with the adaptations of CP process to local circumstances. The methodology consists of six steps and eighteen tasks that were used to implement CP systematically in all six-demonstration factories.

Considerations to barriers: Identification of barriers experienced by the stakeholders was achieved by gathering feedback and opinions of involved workers and management staff on a participatory basis. This helped to eliminate many of the attitudinal, organizational, market, technology, economic, and governmental barriers.

CP measures are a well-established procedure and therefore, details of CP measures are not given in this paper. However, the approaches used in HCMC were:

- Good housekeeping: systems to prevent leakage and spillage through preventive maintenance schedules and routine equipment inspections. Proper working instructions, supervision and regular training of workforce
- Input material change: substitution of input materials by eco-friendly, non or less toxic and renewable materials, preferably having long service time
- Better process control: modification of working procedures, machine operating instructions and process record-keeping in order to achieve higher efficiency and lower waste and emission rates
- Equipment modification: modification of existing production equipment and utilities in order to minimize waste and emissions during production
- Technology change: replacement of technology, processing sequence and or synthesis pathway
- Onsite recovery and reuse: reuse of waste materials in the same process or for other applications within the factory
- Production of useful by-products: transformation of waste materials into a product that can be recycled or reused
- Product modification: modification of product characteristics to minimize environmental impacts

3. Lesson learned and future

The major lessons learned as part of the CP project were:

Commitment: Commitment at all levels in an organization was seen as vital to the success of CP programs. This expressed commitment was most effective when it was clearly communicated by management to all levels. Commitment was evident in all 6 CP demonstration companies at all levels and as a result, remarkable behavioral change was observed along with enthusiasm for the project.

Openness and ownership: During the course of the project, it was observed that the groups that were the most successful were those that engaged in frequent open discussions, and whose attitudes were not resistant to change. In addition, those teams that sought the involvement of many employees were also more successful as workers at all levels felt some degree of ownership over the project and the outcomes.

CP Championship: In all the demonstration companies, the teams involved in the project nominated a "CP Champion" who became the focal point for the whole CP program. That person also assumed responsibility for communication, data collection and compilation, organization of meetings and facilitation of the implementation program. The CP Champion in

most teams was highly enthusiastic and served to motivate the team and push the program forward.

Planned approach: By employing a deliberate and planned approach, the six companies were successful in implementing 42% of all identified CP measures in less than a year. This time period is highly efficient given the typically sluggish approach to organizational and procedural change that usually prevails. The long-term sustainability of the change towards CP remains to be seen.

Starting with simple measures: In the project, it was useful to start with CP options that were easy to implement, required low investment and had quick pay back periods. It was thus possible to get the approval of management and the motivation of employees by demonstrating early economic and environmental improvements without too much resource investment. In the project, 2/3 of CP measures identified were analyzed to be low cost and more than 80% had a payback period of less than a year.

4. Replicability

The potential for replicating the present approach to Cleaner Production in other cities either domestically or internationally is promising. This project employed a strategic, deliberate step-by-step approach to planning, assessment, implementation and evaluation in relation to CP in the industrial sector of HCMC. This methodology can easily be transferred to other countries, cities and/or business sectors for identifying areas in which environmental and economic improvements can be made in production processes. CP is an established technique with detail guidelines and processes, however, adaptation to all standard CP techniques is needed based on local situation.