Cleaner Production - a Cost-Effective Tool for Industrial Wastewater Management (1)

Dr. Tran Van NHAN: Hanoi University of Technology (Vietnam)

↑SCA LOGO'

Introduction

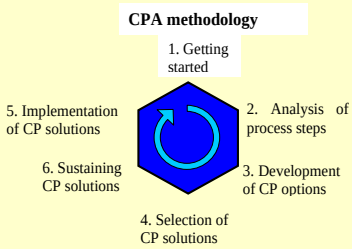
Cleaner production (CP) has been known as an approach to improve production efficiency and reduce risks to the human and the environment.

Textile industry has been a very important sector of Vietnamese economy since the past four decades. An average production growth rate of about 10.7% per year has been achieved [1]. However, textile is an industrial sector which uses a huge amount of water and produced a considerable amount of wastewater with high pollution load.

A CP demonstration program was carried out in 12 textile dying companies during 1999-2003 by Viet Nam Cleaner Production Center in order to show the potential reduction of waste in general and wastewater in special as well as financial benefits from CP.

Cleaner Production Assessment at Textile-Dyeing Industries- Methodology

A cleaner production assessment (CPA) was carried out for each participating company. The root of a cleaner production assessment (CPA) is to determine where wastes/losses is generated, why they are produced and how to eliminate them. The foundation of the CP assessment used is a systematic methodology that consists of 6 steps. Chart 1 presents the methodology of CPA.



During the analysis of production processes, material balances are conducted to quantify waste/material losses. The cause analysis task is carried out to answer the question "why material losses and why so much of waste/loss generated". The cause analysis is done systematically which help to determine direct as well as hidden causes of waste streams. This is done by evaluation of factors including house keeping, input materials, process control, equipment design, technology which may affect to waste streams.

The development of the CP options is done based on the identified causes. The generated CP options are then categorized. No and low-cost options are implemented as soon as the options identified. The high-cost options should be studied further on technical, economical and environmental feasibility aspects.

Results and Discussion

During the demonstration program, benchmarks of material, and water consumptions of textile companies were surveyed. These values were varies from industry to industry. Table 1 presents water and chemical consumptions of the participating companies and those of companies in Europe. From the table 1, it can be seen that the benchmarks of the participating companies were in a large range. This depended on the status of management as well as technology of each company. The water consumption benchmark of Vietnamese companies which has high water consumption (600m3/ton of product) were almost double in comparison with that of European companies (380m3/ton of product) while dyestuff and chemicals benchmark were about the same rage.

Material	Unit (per ton of product)	Viet Nam	Europe
Dyestuff	kg	5-80	5-80
Auxiliaries	kg	200-1000	92-1032
Water	m3	130-600	144-380

There are many reasons leading to high water consumption of Vietnamese companies. It has included poor management of companies, low and subsided cost of supplied water and low wastewater fee and high rate of re-dyeing.

The 12 participating industries had produced 489 CP options during the demonstration program. Of which 30% of generated CP options were implemented during the demonstration. These options were categorized as the chart 2.

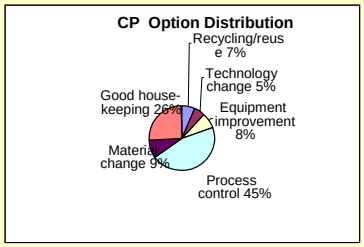
As can be seen in the chart 2, most of the generated options are belong to the Process Control and Good House-keeping categories. The reason for that was those are no or low cost options. It did not cost much the participating industries to implement those options.

With only implementation of 30% of CP options, it brought to the 12 industries a saving of 11 billion VND (705,000USD) annually from a investment of 2 billion VND(128,000USD). This came from saving of water, chemicals, energy as well as reducing re-dying rate.

Cleaner Production - a Cost-Effective Tool for Industrial Wastewater Management (2)

Dr. Tran Van NHAN: Hanoi University of Technology (Vietnam)

Chart 2 – CP Option Distribution



Results related to water consumption reduction as well as pollution load decreasing.
In term of wastewater and pollution load, a significant reduction was achieved. Recycling/reuse cooling water, cut off some production processes are usually Thank to decrease of water consumption (at a highest case of 50%), volume of wastewater also decreased. Pollution load of the wastewater was dropped due to reduction of used dye stuff and chemicals amount. This achieved of 33% in the best case. Besides this, pollution load and toxicity of wastewater also was declined because of using another type pollution load and toxicity of wastewater also was declined because of using another type chemical which less toxic in the production process. The table 2 below indicates the results of the demonstration:

Table 2- Reduction rate of water and chemical consumption

Item	Reduction rate (%)
Water	5 - 50
Dyestuff	2 - 33
Auxiliary	3.5 - 32

Chart 3- Environmental Improvement from CP implementation

From the diagram, it can be recognized that BOD dropped almost 45% in the best case. This was the result of implementation of CP option that replaced the starch used in sizing process by enzymatic agents. The decrease of COD was mainly due to dyestuff and auxiliary consumption. A significant reduction of used amount of dye stuff and chemicals was obtained annually (45 tons of dye stuff, 380 tons of chemicals). In some cases, the toxicity of the wastewater reduced because of using more environmental friendly dyestuff and chemicals.
The following CP measures mainly contributed to reduction of wastewater volume pollution load:

- good house-keeping,
- process control/process modification (shorten production processes, improve pre-treatment quality of grey fabric, optimize
- material change (replace dyeing, sizing chemicals)

Conclusions

From the results of the program, it can be seen that CP is not only help industries to reduce wastewater both in term of volume and pollution load but also save money. Therefore, it is concluded that CP is a cost effective tool in wastewater management to industries in general and to wet textile ones in special.
This tool is suitable for all scales of the industries.

Acknowledgements

We would like to express our sincere thanks to SECO, UNIDO as well as to international experts and industries which participated in the our US/VIE/96/063 project for their supports and dedicated participation.

References

1/ VietNam National Textile Garment Corporation VINATEX (1997*) VietNam Textile - Garment Industry the Present and Future*, Center for Science and Technology HoChiMinh City.
2/ Viet Nam Cleaner Production Center, (2004) *Brief Results of capacity improvement and in-plant demonstration***,** 2nd National Cleaner Production Roundtable- HoChiMinh City

3/ Viet Nam Cleaner Production Center (2002), (2003) *Annual Reports*, Hanoi.