

# THE STATUS AND ENVIRONMENTAL PROBLEMS OF TEXTILE INDUSTRY IN VIETNAM

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## **Abstract**

The textile industry in Vietnam has seen as a sharp industry with production achieved from 14-15% total of industrial production of the Nation. Besides, the advantages from the rapid growth of textile sector, environmental problems concerning discharges of wastewater, emission air, noise and waste solid are actually problems to be solved for the industry. End-of-pipe technology has used as tools for sustainable development of industry activities during the past years. However, the build, operation and maintenance cost of the waste treatment system are to be increased production costs. That why many enterprises don't willing to treat waste in competition of market. At present, cleaner production has become one of useful measure to reduce load of the waste and have been recognized as a desirable mean, both environmental and economically in protecting environment for the recent years. However, cleaner production can not solved environmental problems all. Here, the paper is present the status, environmental problems of textile industry and environmental protect solutions have been carried out for textile industry in Vietnam. How to build a model of integrated approach combining both cleaner production and end-of-pipe treatment for pollution prevention in the textile industry in Vietnam is still a question.

## **I. INTRODUCTION**

Textile industry has attained great successes in recent years. Production of the textile sector increased from 51,200 tons to 75,000 tons from 1996 to 2000, export turnover increase every year (achieved 1.7 billions USD in 1999, 1.9 billions USD in 2000 and 2.1 billions USD in 2001). Textile industry exported 2752 billions USD in 2001. This is created work for 1,600,000 labours (approximate 25% of the industrial labour force). However, it has some advantages and disadvantages. The advantages are increased production processes, products, and employment through expansion industry sectors as well as step by step to improve life condition of inhabitant. The disadvantages are serious environmental pollution and scarce resource causing turbulent development of the industry. Regarding to report of Ministry of Light Industry (1999), almost all machine and technology of textile industry have become underdeveloped with 90% machine used above 30 years, resulting in increase raw material, water, and energy consumption.

The textile industry releases highly polluted and very alkali or acidity wastewater and the dyes often contain toxic substances such as chlorine, chromium, alkaline compounds, zinc and copper. Accumulated several dyes and some of their N-substituted aromatic biotransformation products to surface, river and underground lead to harmful effects on human by transport through the food chain that it have been caused adverse impacts on the health public. The compliance with environmental regulations of textile factories is often targeted to avoid problem with environmental official of local authority. In order to economic development and pollution problems are not contradictory concepts. There are things we can do to reform the situation by researching feasibility solutions to prevent pollution in textile industry. In this way, the survey status of textile industry are carried out to study the measure of combination of both cleaner production approach and end-of-pipe technology to achieve sustainable development in the coming years.

## **II. THE STATUS AND ENVIRONMENTAL PROBLEMS OF TEXTILE INDUSTRY VIETNAM**

### **2.1 Basic characteristics of Textile industry in Vietnam**

According to survey of textile and garment association in December 2001, Vietnam has about 1031 of textile and garment businesses and thousands of small scales textile enterprises. These distribute and develop on entire territory Vietnam and concentrate into three areas: North, Middle and South area in which:

- Nationalized business: 231units
- Un-nationalized business: 449units
- Business with 100% foreign investment: 351units

### **Distribution of textile industry in Vietnam**

Large textile and garment businesses have mainly concentrated in three areas:

- The North area is concentrated in Ha Noi and some neighboring provinces. Hanoi have 104 businesses and 9 foreign investment businesses, Hai Phong have 30 businesses, Nam Dinh with 25 businesses and Thai Binh with 28 businesses.
- The Middle area has 58 businesses (49 Vietnamese businesses and 9 foreign investment businesses). These have distributed scattered Nghe An (9businesses), Quang Nam-Da Nang City (9 businesses), Khanh Hoa (8 businesses), Hue (6 businesses).
- The South area has 688 businesses with 385 nationalized businesses and foreign investment businesses, mainly distributing in Hochiminh with 329 businesses, Dong Nai with 53 businesses, Binh Duong with 50, Long An with 21 businesses and Can Tho with 7 businesses.

### **Machine and Technology**

Textile industry is the oldest industry in Vietnam. In development process, the investment in several stages was conducted in multiform machine and technology of textile industry. Some factories have still employed machine from 60, 70 decade, even there is machines whose were produced from 1930-1940.

The survey shows that almost all small scales enterprises employed underdeveloped machine and technology. In recent years, large factories scales are invested from government to innovate machine and technology in order to raise quality of product. Also in the period private companies have invested new machine and technology to change quality and production.

### **The production status of textile industry in Vietnam**

The textile Vietnam play one importance role in economic of country, using 25 % labor force, contribution of 31% GDP of processing industry and 14,8% export turn over. The stage from 1996 to 2000 is stable developed stage of textile Vietnam. Result to carry out business and production show that average raise of textile industry was 11,7%.

### **The market and export status**

The textile industry only meet the demand 30% domestic market, remain part is imported from Trung Quoc and Thai Lan...However, from 1998 until now textile industry have took back the domestic market and a lot of commercial firms such as Viet Tien, Number 10, Ha Noi textile, Thanh Cong, Thai Tuan, Hue, Nha Trang companies are fond of customers. Vietnam have 80% rural resident with low income, to meet the demand of good correspond to income, custom, and life level of people are responsibility of textile industry and it also one of impulses development of textile industry.

### **Export market**

Textile product of Vietnam have been export to 174 countries in the world while the most is United State (976 billions USD), Japan (490 billions USD, Taiwan (233 billions USD), Korea (93 billions USD), United Kingdom (more 75 billions USD and France (more 70 billions USD).

**Table 1: export turn over and important export market of textile Vietnam from 1996 to 2002**  
(Unit: billion USD)

	1996	1997	1998	1999	2000	2001	2002
Export							
- Garment	897,0	1050,0	1055,0	1360,0	1475,0	1519,0	
- Yarn	35,0	40,0	41,0	52,0	57,0	65,0	
- Fiber	23,0	27,0	27,0	35,0	50,0	87,0	
- Other	195,0	232,0	228,0	300,0	310,0	290,0	
Market							
- Japan	248,0	225,0	321,0	417,0	620,0	588,0	490,0
- EU	225,0	410,0	521,0	555,0	609,0	599,0	552,0
- USA	9,1	12,0	26,0	34,0	49,5	46,6	976,0
- Other	668,0	602,0	483,0	387,3	613,0	730,0	734,0

*Source: General Corporation of Textile Vietnam, 2002*

To meet the domestic and export demand, textile industry has proposed concrete production, export turnover and develop investment norm such as:

- To raise export turnover from 2 billions USD to 4 billions USD in 2005 and 8 billions USD in 2010.
- To expand production, attracting labor with 4 billions of work, and 450,000 labor for developing cotton plant and grow worm.
- To raise domestic production from 25% to 50% in 2005 and 75-80% in 2010.
- To invest 10 textile industrial zone (Hung Yen, Thai Binh, Thanh Hoa, Dong Nai, Binh Duong, Long An, Can Tho, Ha Nam, Khanh Hoa, Tay Nguyen).

## **2.2 The status of environmental pollution of textile industry**

### **2.2.1 Air pollution**

All textile factories often use the boiler in production process. Generated waste is contained particles and SO<sub>2</sub>, CO, NO<sub>2</sub>. Demand of fuel of 20 textile companies in 2001 is given in table 2. The survey result of 2 factories in Ha Noi and 5 factories in Hochiminh show that almost concentration of particles at the survey factories exceeds the allowed maximum Vietnamese standard from 2 to 3 times, other parameters meet the standard. Besides, the temperature treatment process and finish process are generated volatile solvents as followings:

- Chlorine vapor generate from bleaching process using NaClO solution
- NO<sub>2</sub> generated as using generative dyes (indigosol). This is toxic air and it can causes inflammation of respire for working labor in workshop.
- Vapor of petroleum which is used in pigment
- Vapor of formalin and acid acetate
- Sulfur vapor
- Dust of cotton.

To evaluate pollution level of textile industry, status of air environmental pollution of 20 textile symbolic companies is present in table 3.

**Table 2: Demand of fuel of 20 textile companies in 2001**

No.	Name of company	FO (ton/year)	Coal (ton/year)
1	Dong Xuan stockinet	151	1329
2	Mua Dong wool weave	-	535500
3	19/5 weave	365	-
4	Minh Khai weave	-	4500
5	Ha Noi sewing thread factory	-	770
6	8-3 weave	1000	14468
7	Ha Noi textile –garment	2373	-
8	Industrial Weave	-	1500
9	Phuoc Long Weave	3191 100 (DO)	-
10	Phong Phu Weave	8508	-
11	Dong Nam weave	-	-
12	Dong Phuong weave	1352	-
13	Thanh Cong weave	5014	-
14	Thang Loi textile-garment	3810 179,384 (DO)	-
15	Dong A weave	1726,8	-
16	Nam Ding weave	2222	16460
17	Ha Dong wool factory	900	-
18	Ha Dong weave	-	900
19	Vinh Phu weave	-	4700
20	Nha Trang weave	2812	-
	<b>Total</b>	<b>33.704,184</b>	<b>580127</b>

Source: Vietnam Cleaner Production Center, 2002

**Table 3: air environmental quality at production areas (boiler, weave, workshop, bleach and dye workshop) of 19 textile companies**

No.	Name of company	NO <sub>x</sub> (mg/m <sup>3</sup> )	SO <sub>2</sub> (mg/m <sup>3</sup> )	CO <sub>2</sub> (mg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	Particle (mg/m <sup>3</sup> )	T °c
Vietnamese Standard TCVN (5942- 1995 ), class B		0,4	0,5		40	0,3	-
01	Dong Xuan stockinet	0,86 - 2	1,34 – 6,1	0,07 – 0,09	6 - 11		
02	Mua Dong wool weave	27 – 73 ppm	210 – 608 ppm	12,6 – 15,2%	908 – 5930 ppm		140 - 190
03	19/5 weave	0,04 – 0,05	0,05 – 0,06		0,8 – 0,9	0,9 – 1,5	29,1 – 3,2
04	Minh Khai weave		0,03 ppm	1,3 ppm		100	26 – 33,7
05	Ha Noi sewing thread factory	0,034 ppm	315,7 ppm	512 ppm			
06	8-3 weave	0,017 – 0,084	0,04 – 0,35		0,015 – 0,47	0,41 – 6,12	
07	Ha Noi textile –garment	221 ppm	1212 ppm		6 ppm		
08	Industrial Weave	0,011 – 0,15	0,21		2,4	0,37 – 0,51	
09	Phuoc Long Weave	0,01 – 0,064	0,1 – 0,41			0,11 – 0,34	
10	Phong Phu Weave	0,022 – 0,031	0,34	0,017 – 0,072	0,15 – 0,28	0,7 – 1,5	
11	Dong Nam weave	563,3	770,6	0,05 %			
12	Dong Phuong weave	0,053 – 0,082	0,169 – 0,396		3,2 – 3,6		
13	Thanh Cong weave	0,052 – 0,061	0,068 – 0,072	11,8%	3,2 – 3,8		269
14	Thang Loi textile-garment	0,069	0,119	0,051	4,4	45,9	
15	Dong A weave	362	1175				
16	Ha Dong wool factory	0,015 – 0,018	0,8		4,0	4,6	
17	Ha Dong weave	0,007	0,068	0,032		0,83 – 1,63	
18	Vinh Phu weave		0,21 – 0,3			0,28	
19	Nha Trang weave	107 ppm	2280 ppm	27			
Average		76,78	237,0		313,86	17,699	

Source: Vietnam Cleaner production center, 2002

## 2.2.2 Wastewater

Textile production is one of the most pollution industries. Concerning elements of the textile sector are that it consumes a large volume of water, energy, dyes, textile auxiliary agents and chemicals. Production processing generated a lot of pollutants such as wastewater, waste heat, solid waste, exhaust gas from dryers, gas emissions from boiler plant in which wastewater is a problem facing textile sector. Water norm per each ton product is 150-400m<sup>3</sup>, according to statistic, textile industry annual discharge to environment from 24-30 millions of m<sup>3</sup> wastewater while only 10% wastewater is treated and remain is discharged directly to body water. The wastewater treatment method is often employed that coagulation, aerobic method or combine both coagulation and aerobic. Wastewater can take place at almost any step of the textile production from preparation of the fiber through finishing of fabric. Quantity and toxicity of wastewater are depended on the types of production processing, dyes used, type of equipment, ect. According to document of VINATEX (Vietnam textile Industry), chemical norm and auxiliary per ton product are 200-1,000kg and amount of dyestuff per ton product is 20-80 kg. Textile industry was employed 3,504,890 tons of dyes and 27,483tons of other chemical in 2001. With use efficiency is 70-80%, remain (20-30%) is discharged to environment. Diagram of diagram of textile production processes is present in figure 1. Each production process of textile industry and waste generated are described as following:

**Desizing process:** in order that subsequent dyeing and finishing materials can be absorbed as evenly as possible, all sizing materials must be removed from fabric completely and uniformly. These materials are removed either hot water or enzymes, depending on the sizing materials that were used. The most commonly used sizing materials are starches or polyvinyl alcohol, fats and wax. So pollutants go into wastewater are remain starches (polyvinyl), wax, fat.

**Scouring process:** scouring process removes waxes and destroys vegetable residues in raw materials. Alkali chemical is used to saponify the fats on the fibers. The soap that is formed then serves to emulsify the remaining waxes and washing away any dirt or other impurities. Waste can be take place in scouring process including: sodium hydroxide, waxes, greases, surfactants, chelating agents, sodium silicate, fibrous matter, processing oil, acid acetate, phosphates.

**Bleaching process:** fabrics can require bleaching or whitening to prepare them for dyeing or printing or to product a clear white fabric. Bleaches are chemical substances that oxidise coloured compounds, removing colour. Most generated pollutants from bleaching were hypochlorite, chlorine, caustic soda, acids, hydrogen peroxide, sodium silicate.

**Mercerizing process:** in mercerizing step, fabrics are immersed under tension in a strong solution of alkali substance for short, controlled the period of time, then it is washed off and any excess alkali is neutralised. Caustic soda is main pollutant in this process.

**Dyeing process:** colour can apply to fabric at any one of four steps in its processing. Colour can be manufactured fibers before the fibers is extruded, or dyes can be applied to fibers, to yarn, or to constructed fabrics or finishing product. In these processes various dyes, auxiliaries, chemicals, soap will be ending in wastewater.

**Printing process:** by pressing the decorated surface against fabric this process is known as printing. Generated pollutants from printing consist of colours, thickeners and auxiliary.

**Finishing process:** in order to preserve textile products, finishing process are carried out to prevent impact of ambient condition in product. Starch, resin and some auxiliaries are usually in this process and remain of them will be end in wastewater.

**Dry process:** water will be separated product with centrifuge machine or temperature treatment.

Characteristics of textile wastewater of each production process of textile industry are described in table 4

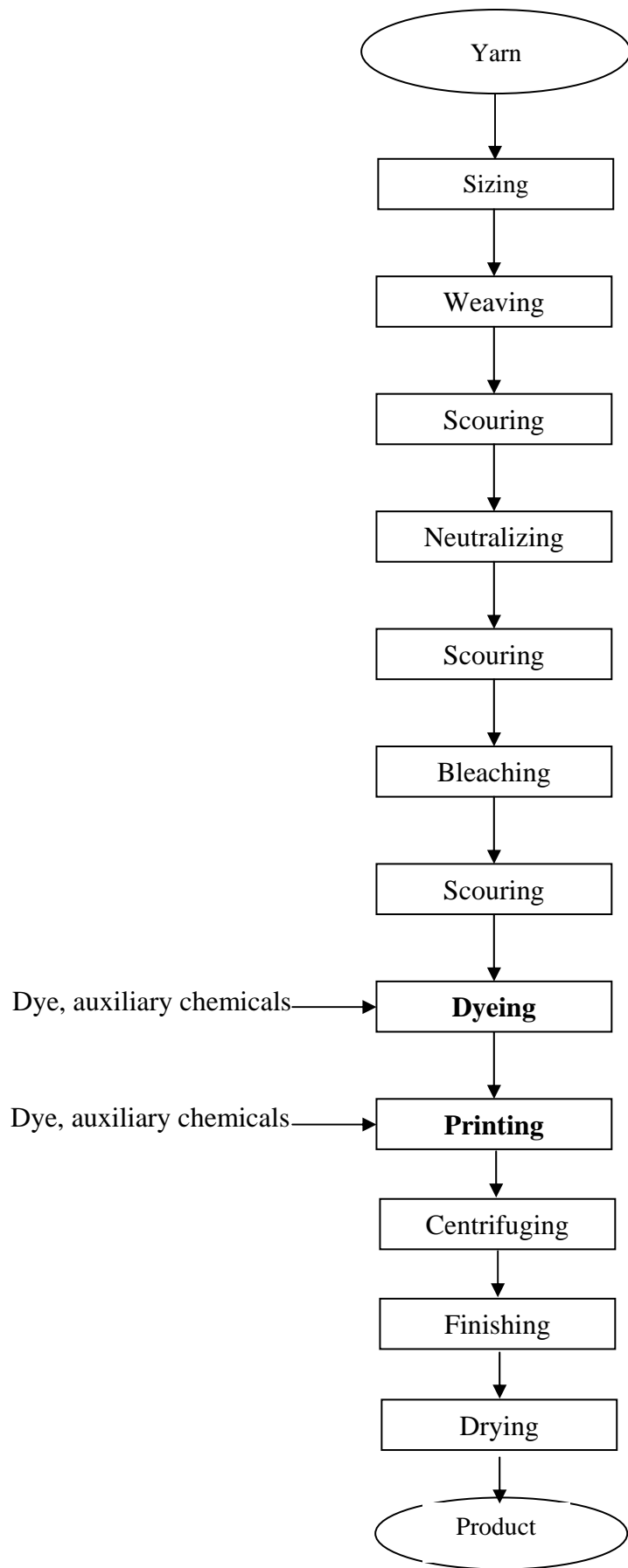
**Table 4: Characteristics of the textile wastewater of each production process**

No.	Parameters	Unit	Production process		
			Fiber	Dyeing & finishing	Garment
1	Temperature	<sup>0</sup> C	24.7	35.5	30.3
2	PH	-	7.3	8.9	7.5
3	Conductivity	μS/cm	290	370	270
4	Turbidity	NTU	2.8	13.5	10.8
5	Oil and grease	mg/l	0.04	0.02	0.02
6	BOD <sub>5</sub>	mg/l	16.5	522	40.7
7	COD	mg/l	21.5	665	55
8	DO	mg/l	2.4	4.2	1.7
9	Suspended solid	mg/l	6	17	12
10	Total nitrogen	mg/l	19.1	9.2	7.9
11	Total phosphorous	mg/l	4.5	7.5	1.2
12	Residual Chlorine	mg/l	Trace	Trace	13.5
13	Sulphate	mg/l	98	91	63
14	Cyanide	mg/l	0.02	Trace	0.02

The results show that the dyeing process has higher concentration of COD and BOD<sub>5</sub> higher than other process and exceed the Vietnamese standard, class B from 6.6 to 10.2 times. Raw material, fuel and auxiliary norm of textile industry per ton product is listed in table 5.

**Table 5: Raw material, fuel and auxiliary norm of textile industry per ton product**

No.	Material & fuel	Unit	Norm	BAT norm
1	Dyestuff	kg	20-40	
2	Chemical & auxiliary	kg	200-1000	100-600
3	Supply water	m <sup>3</sup>	150-400	80-120
4	Energy (FO or DO)	kg	300-1800	120-180
5	Electricity	Kwh	350-1500	30-50
6	Dye reuse ratio	%	5-15	1.5



**Figure 1: diagram of textile production processes**



## Status of environmental pollution at 20 textile factories

Wastewater can generate at almost any step of the textile production. Quantity and toxicity of wastewater depend on the types of production processing, dyes and chemical used, type of equipment, ect. Demand of chemical and dye of the textile companies and characteristic and flow rate of 20 textile factories were referenced in table 6 and 7.

**Table 6: Demand of chemical and dye of 18 textile companies in 2001**

No.	Name of company	Chemical (ton/year)	Dye (ton/year)
1	Dong Xuan stockinet	278.667	0.171
2	Mua Dong wool weave	5.1	0.474
3	Minh Khai weave	287.8	1.2
4	Ha Noi sewing thread factory	112	7.5
5	8-3 weave	701.5	20-54
6	Ha Noi textile –garment	1222	38.77
7	Industrial Weave	80.6	-
8	Phuoc Long Weave	400.257	94.605
9	Phong Phu Weave	866.74	45.032
10	Dong Phuong weave	106.61	0.531
11	Thanh Cong weave	6768.4	-
12	Thang Loi textile-garment	738.023	49.286
13	Dong A weave	151.46	11.076
14	Nam Ding weave	1774.9	26.38
15	Ha Dong wool factory	222.4	-
16	Ha Dong weave	37	-
17	Vinh Phu weave	211.5	-
18	Nha Trang weave	445.4	8.3
	Total	<b>14410.357</b>	<b>320.325</b>

**Table 7: Characteristic and flow rate of 20 textile companies**

No.	Name of company	Flow rate m <sup>3</sup> /day	Parameter				
			pH	COD	BOD <sub>5</sub>	SS	Colour
1	Dong Xuan stockinet	730	9.0	529	281	-	520
2	Mua Dong wool weave	36	7.3-8.3	172-265	-	7-26	119-417
3	19/5 weave	120	9.05	311	-	56	5960
4	Minh Khai weave	600	11.2	271-533	287	40	7
5	Ha Noi sewing thread factory	480	10.9-11.4	105-183	-	27-80	8-40
6	8-3 weave	4500	7.4-10.5	104-148	70-90	25-41	67-217
7	Ha Noi textile – garment	1200	8.8-10.8	279-722	175-400	175-400	23-50
8	Industrial Weave	36	8.0	67		55	68
9	Phuoc Long Weave	800	6.3	186-246	80-89	17-98	-
10	Phong Phu Weave	3200	11.8	301-339	150-170	11-35	202-196
11	Dong Nam Weave	3200	10.6	129	60	1605	264
12	Dong Phuong weave	600	10.9	980	431	640	4250

No.	Name of company	Flow rate m <sup>3</sup> /day	Parameter				
13	Thanh Cong weave	9000	12	1584	500	100	5500
14	Thang Loi textile-garment	2400	10.7	1750	407	-	-
15	Dong A weave	2000	9.7	2200	450	648	-
16	Nam Ding weave	8300	10.9	340-360	260-280	178	-
17	Ha Dong wool factory	400	6.3-10.2	487-632	140-240	11-19	145-310
18	Ha Dong weave	300	12.1-12.3	916-1001	220-240	65-320	3126-23195
19	Vinh Phu weave	580	7.7	317	22.5	1348	-
20	Nha Trang weave	1200	-	57	50	-	-

Source: *Health Textile –garment, Institute of science & environmental technology, Center for monitoring industrial environment, Program of disseminate the information to community, own company.*

Results were demonstrated that the wastewater of textile industry has high concentration of COD and BOD<sub>5</sub> and very alkali. According to survey document, wastewater of almost all companies is directly discharged to sewer or river without any treatment. Some company had the wastewater treatment system but treatment efficiency was very low.

### 2.2.3 Solid waste

Generated solid waste from operation of textile includes coal residues, dust of cotton, fabric residues, waste accessories, packing wood, paper, metal and plastic. Solid water is separate at source to reuse or recover. In which, coal residues occupied about 35%, dust of cotton, fabric residues is about 20%. Waste accessories, packing and oil residues are 22%.

## VI. Status of environmental management

Almost all business carried out the environmental impact assessment report or registration form for meet Vietnamese Standard. However, they can't compliance with environmental regulations that were mentioned in report. Their wastewater is often discharged directly to municipal sewerage, canal or river. Waste air is released into the atmosphere without any treatment. The company usually not have environmental cadre.

### The environmental pressure

Businesses are almost not been pressured about environment (25%). Pressure of authority and surrounding resident is occupied 30-40%. Although some enterprises have been built water treatment facility which only operating as environmental office of local authority has checked because the fee of operation and maintenance are added in products or operation of system is not efficiency.

### Environmental legislation

Environmental policy in Vietnam is characterized by a command-and-control system based on regulations and standards. The Law on Environmental Protection of 1994 is the key environmental policy instrument. For instance, in HCMC, the Department of Resource and Environment is the local environmental organization. The Environmental Management Division of Department of Resource and Environment is responsible for environmental monitoring, Environmental Impact Assessment (EIA) of investment projects, registration form for meet Vietnamese Standard and programs on minimization of industrial pollution.

In order to reduce industrial wastes, the People's Council of Nation issue a regulation in which mentioned that industrial waste must be treated to meet national environmental standards and all production units must introduce waste treatment by the year 2000." (Ministry of Science & Technology, 1999).

### **Vietnamese Standard for discharging wastewater**

Ministry of Science and Environment is responsible for issue discharge standards of industrial wastewater and ordered to local governments to implement these regulations. Depending to receiving waters, the discharging standards are changed to adapt with each region.

**Table 8. Discharging standards of industrial wastewater**

Parameter	Unit	Maximum allowed value (TCVN 5945-1995)		
		Discharge to potential supply source	Discharge to streams using transport, irrigation and cultivate	Discharge to sewer
Temperature	<sup>0</sup> C	40	40	45
PH	-	6-9	5.5-9	5-9
BOD <sub>5</sub>	mg/l	20	50	100
COD	mg/l	50	100	400
Suspended solid (SS)	mg/l	50	100	200
Grease and fat	mg/l	Not detection	1	5

Industrial effluents of textile sector in city are usually disposed of directly into a public sewerage, according to above applying conditions, local government only require the pre-treatment step.

### **V. Cleaner production**

To October 2002, there are eight textile companies have participated in cleaner production program. These have proposed 243 solutions, while 64 solutions were carried out, 87 solutions are carrying out and remain solutions were not suit for finance condition of companies. The solutions were classified as followings:

#### **Options for cleaner production in textile sector**

<b>Cleaner production</b>	
Good housekeeping	Better operation: <ul style="list-style-type: none"> <li>- Optimizing the process</li> <li>- Regular maintenance of taps water</li> <li>- Installing automatic for control water supply</li> <li>- Reduce consume of supply water</li> <li>- Monitoring and record keeping of material, chemical</li> <li>- Improvement of skill</li> </ul>
Input material changes	<ul style="list-style-type: none"> <li>- Replace hydrochloride by hydrogen peroxide</li> <li>- Replace starch by carbonxymethyl cellulose or polyvinyl alcohol 1% to decrease COD concentration in effluent.</li> <li>- Replace acetate by inorganic salt as ammonium sulfate or chloride</li> <li>- Using enzym in desizing process to reduce</li> </ul>

	concentration of COD - Replace emulsion petroleum in pigment by synthesis paste in printing process.
Technology change	- Using equipment with low rate of water and dye
On site reuse	- Reuse starch, sodium hydroxide, grease and fat, soap from scouring and bleaching - Reuse cooling water - - Collect and reuse waste in production process
Off-site: useful Byproduct	- Waste is become the raw material for other industry

According to Gupta (director of Center for Cleaner Production of An Do), cleaner production seems to be a promising approach for the textile industry. Application of cleaner production can reduce production expenses about 100USD per ton product. With small adjust, businesses can save from 50-80USD per ton product and significant reduce pollutant loading rate as well as improve work condition.

### **Economic benefits**

Although, there was only carried out 26% of cleaner production solutions, almost all companies have gained satisfactory results for both environmental and economically in protecting environment for the recent years. According to estimated program, each company can saved 744,000USD per year. The economic benefits are due to reduce out put material (chemical, fuel, electricity and supply water) and reduce re-treatment ratio.

### **Environmental benefits**

Cleaner production is not only help the company to reduce production fee, but also it contribute environmental protect.

The consume of raw and working material annually reduce such as:

- Supply water : 1,037,000m<sup>3</sup>
- FO : 1,910 tons
- Electricity : 530,000 kwh
- Chemical and dye : 1,178 kg

### **Other benefits**

Cleaner production program is not only help companies save money and environmental protect, but also it is changed attitude of worker to production process.

### **Experience lessons**

- Some experience lessons were draw for carrying out cleaner production in textile industry as followings:
- If company is applied cleaner production, they can gain the large benefits for both economic and environment. Besides, the production quality is also improved and to opening an opportunity to increase capacity.
  - Cleaner Production program is improved safety and health of labor due to improve work condition.
  - Applying cleaner production at each company is not the same. Each company will propose a lot of present production improve solutions and production condition to suit condition of each company
  - Cleaner production only is carried out successful as it is supported by the board of manager
  - Lack of encouraged and help polices of government.
  - Effect law is not enough power.

## VI. Conclusion

“To speed up the developing strategy of Textile industry Vietnam to 2010” will create textile industry many opportunity to expand production and keep up quality of products. Besides, the advantages from the growth of textile sector, environmental problems concerning discharges of wastewater, emission air, noise and waste solid are actually problems to be solved for the textile industry as significant amount of used chemical, dye, water and energy.

End –of- pipe technology has used as solution for minimize environmental pollution. However, the fee of waste treatment system is to be added product costs and treated wastewater usually does not meet Vietnamese standard. The build wastewater treatment system is often targeted in order to avoid problem with environmental official of local authority. So their wastewater is often discharged directly to municipal sewerage, and canal and waste air is released into the atmosphere without any treatment. These are several causes of extreme environmental deterioration. At present, cleaner production has applied as one of useful measure to reduce load of the waste and have been recognized as a desirable mean, both environmental and economically in protecting environment in Vietnam for the recent years. The organic pollution load decrease about 15-40%, flow of wastewater decrease 5%. However, cleaner production is still not yet widely applied in textile industry (eight factories) the there are many reason as followings:

- Cleaner production only is carried out successful as it is supported by the board of manager
- Business have not recognized themselves responsible for environmental protect as well as purpose and mean of cleaner production
- Lack of coordinate organization among the members.
- Lack of encouraged and help polices of government.
- Effect of law is not enough power.

In order to sustainable development, to build model for the application of an integrated approach combining both cleaner production approach and end-of-pipe treatment for pollution prevention in textile industry is purpose of the study. Besides, pollution problems, technology, management, social and economic aspects also being included.

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