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Evaluating The Current State Of Production Wastewater Quality Of Song Cong Garment Factory And Auxiliary Factory – TNG Investment And Trading Joint Stock Company, Song Cong City, Thai Nguyen Province, Vietnam

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ABSTRACT
Background*: The globalization trend has narrowed the geographical distance and the world market has unified. Viet Nam's textile and garment enterprises take advantage of this opportunity to learn from experience as well as absorb the world's technological and managerial levels. These businesses have contributed promoting the country, turning it into a nation with a dynamically developing economy and attracting plenty of foreign investors to Vietnam. TNG Investment and Trading Joint Stock Company was established in 1979 with 40 years of construction, development and growth. Up to now, TNG Investment and Trading Joint Stock Company has 15 factories with 314 sewing lines, 2 auxiliary factories for textile-related manufacturing activities. The company's products have been present in most of the world's major markets such as the US, Canada, and the EU. Although the environmental impact assessment records were fully guaranteed according to the approval decision when building factories under the company, there might be stages that did not really ensure the environmental safety in the production process. Therefore, it is necessary to evaluate the current state of the environment, especially the water environment to propose remedial solutions.*
Materials and Methods*: Methods of collecting documents and secondary data: Collecting documents and data on natural conditions, production process diagram, production situation of TNG Song Cong garment factory and Auxiliary factory; water quality, analysis data; production wastewater treatment situation; data collection place: TNG Song Cong garment factory and auxiliary factory; Information relating to the topic was collected through the field, books, articles, and the internet.*
Methods of field survey and analytical sampling: Production wastewater samples were taken and preserved according to current Vietnamese standards; Periodic sampling time: 18/11/2020; 18/2/2021; 16/8/2022.
Analytical method in the laboratory: Samples were preserved and analyzed at Thai Nguyen Environment and Natural Resources Monitoring Center; Analytical parameters followed international standards such as SMEWW and current Vietnamese regulations.
Method of processing data: Using tools such as Microsoft Word, Microsoft Excel to synthesize and process information.
Results*: It can be seen from the results of the production wastewater samples after going through the treatment system of TNG Song Cong garment factory and auxiliary factory that there were complicated and erratic changes in the indicators when analyzing, but all had very good results within the limits of QCVN 40:2011/BTNMT National technical regulation on industrial wastewater (column B). The quality of production wastewater through 3 years of monitoring showed that it met the regulations issued by Vietnam.*
Conclusion: *Wastewater quality shows that the water quality parameters were within the allowable limits of QCVN 40:2011/BTNMT. The factory has closely monitored the operation of wastewater collection and treatment works, without any problems in wastewater treatment and discharge. In addition, the factory's production wastewater flew into the general drainage system of the area for treatment rather than being discharged directly into the surrounding environment. Thereby, it is obvious that the factory has ensured good working environment conditions for employees in the factory as well as not letting the factory's production activities affect the surrounding environment.*
Abbreviations: *SMEWW: Standard Methods for the Examination of Water and Waste Water; QCVN: Vietnamese Technical Regulations; BOD_5: Biochemical Oxygen Demand; COD: Chemical Oxygen Demand; TSS: Total Suspended Solids; DO: Dissolved Oxygen; AOX: Adsorbable Organic Halides; PCB: Polychlorinated Biphenyls.*

***Key Word**: Evaluating, current status, water environment, wastewater quality, TNG Song Cong garment factory, auxiliary factory, Thai Nguyen province.*

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I. Introduction

Nowadays, people exploit the materials and energy necessary for living activities to survive and develop from the environment. The products produced by humans are derived from the forms of matter existing on the Earth and the space surrounding the Earth. Water, soil and air which exist in the environment are indispensable factors for life, existence and enhancement of humans and organisms [1]. However, along with the development of life, the growing process of urbanization, industrialization and agricultural intensification have had many detrimental effects on these resources. Humanity has been aware that if environmental issues are not fully and carefully considered in development policy, economic growth and industrialization at a certain speed will destroy the environment [2]. The environment is at an alarming state in developing countries, including Vietnam.

Regarding water pollution in rural areas and agricultural production areas, Vietnam currently has nearly 76% of the population living in rural areas where infrastructure is still outdated, most of the waste generated by human and livestock are untreated and washed away, leading to higher organic and microbial contamination of water. In agricultural production, due to the abuse of pesticides, water sources in rivers, lakes, canals and ditches are polluted, they have impacts on the water environment and people's health. [3].

According to statistics of the Ministry of Fisheries, the total water surface area used for aquaculture of the whole country is 751.999 ha. Because of the massive aquaculture, lack of planning, and not following the technical process, it has caused many negative impacts on the water environment. Along with the excessive and improper use of chemicals in aquaculture, the residual food settles on the bottom of ponds, lakes, and rivers, the water environment is polluted with organic substances, causing the development of some pathogenic organisms and the appearance of some toxic algae; There are even signs of red tide appearing in some coastal areas of Vietnam [4].

The globalization trend has narrowed the geographical distance and the world market has unified. Vietnamese enterprises are increasingly integrating into the world economy and have matured in all aspects, actively participating in the general trend of global trade. Vietnam's textile and garment industry has made great progress. Textile and garment enterprises take advantage of this opportunity to learn from experience as well as absorb the world's technological and managerial levels. So they gradually apply and improve productivity, quality and strive to become enterprises of international stature. Thereby, businesses have contributed to promote the image of the country, turning it into a nation with a dynamically developing economy, attracting a lot of foreign investors to Vietnam. In the face of the country's strong innovation situation, Vietnamese garment enterprises have also taken steps to keep up with the world’s realities.

TNG Investment and Trading Joint Stock Company, formerly known as Bac Thai Garment Factory, was established in 1979. On August 28, 2007, the General Meeting of Shareholders consulted and voted in writing on the decision to change its name to TNG Investment and Trading Joint Stock Company. The company is the first Vietnamese enterprise to build a Fashion Design Center. The company is gradually creating "Made in TNG" products, serving domestic and export customers. Instead of simply outsourcing, the dream of making Vietnamese fashion products is gradually being realized by TNG. TNG is proud to be the leading enterprise in export turnover in the province with about 80 million USD per year. The company's products have been present in most of the world's major markets such as the US, Canada, and the EU. Besides, TNG is also a company with a business strategy to reach out to the world, in anticipation of the Trade Agreement, this enterprise has been preparing for itself modern auxiliary factories to proactively order, compete in price and productivity, and achieve the target of steady enhancement.

Although the environmental impact assessment records were fully guaranteed according to the approval decision when building factories under the company, there might be stages that did not really ensure environmental safety in the production process. Therefore, it is necessary to evaluate the current state of the environment, especially the water environment to propose remedial solutions [5]. From the above fact, the author conducted this research: "Evaluating the Current State of Production Wastewater Quality of Song Cong Garment Factory and Auxiliary Factory – TNG Investment and Trading Joint Stock Company, Song Cong City, Thai Nguyen Province, Vietnam".

II. Material And Methods

Study Design: Secondary data and general information collection; wastewater sampling and sample analysis; field survey

Study Location: TNG Song Cong Garment Factory and Auxiliary Factory – TNG Investment and Trading Joint Stock Company, Song Cong City, Thai Nguyen Province, Vietnam.

Study Duration: From January 2023 to May 2023.

Sample size: Samples of production wastewater.

Subjects & selection method: Current status of production wastewater environment of TNG Song Cong Garment Factory and Auxiliary Factory.

Procedure methodology: Samples were preserved and analyzed at Thai Nguyen Environment and Natural Resources Monitoring Center. Analytical indicators according to international standards such as SMEWW and current Vietnamese regulations. Summarizing collected data to compare with Vietnamese Standard: QCVN 40:2011/BTNMT to conclude the current status of wastewater quality of the Factory.

Statistical analysis: The data is processed and statistical on the computer by Excel and Word.

III. Result

The current state of water use, wastewater and wastewater treatment process

TNG Song Cong garment factory

At garment factories, water used to cool the air is collected in an underground storage tank with a capacity of 400 m^3 and used for circulation without being discharged into the environment. Washing wastewater is generated with an average actual flow of 100 m^3/day. Wastewater is treated at the wastewater treatment station before being discharged into the wastewater drainage system of the Industrial Zone. The factory's wastewater treatment station is built on an area of 300 m^2 (length x width = 15 x 20 m).

Wastewater from the washing factory flows through the channel, the bar screen, and the wastewater channel into the conditioning tank. At the conditioning tank, the air is supplied from the air compressor to help the wastewater to be uniform in composition. The tank is supplied with air thanks to the aeration disc system located on the bottom of the tank to create agitation flow and maintain the aerobic condition in the tank. Wastewater from the conditioning tank flows to the reactor (flocculation tank). In this tank, poly aluminum chloride (PAC) (20g/m^3 of wastewater) is added to create floc. Next, the water is taken to the primary sedimentation tank, the suspended solids in the wastewater and the large flocs generated from the flocculation tank will be settled to the bottom, reducing the solid load for the following treatment stages.

In the wastewater treatment module (aerobic biological treatment device - aerotank), the decomposition of substances in the wastewater occurs when this water comes into contact with the sludge under continuous aeration conditions. The water is brought to the secondary sedimentation tank after aerobic biological treatment in the module. The clear water above is discharged to the common sewer system of the Industrial Zone, and the sludge below is pumped to the sludge storage tank. The sludge is stored in the tank for about 10 days, the clear water above is returned to the conditioning tank, and the sludge part is sucked by the tank truck, which is rented by the factory, for hygienic burial. The treated water meets QCVN 40:2011/BTNMT column B and flows into the centralized wastewater treatment system of Song Cong I Industrial Zone.

Auxiliary factory

According to the actual production of the printing workshop operating at the factory, the water flow for this workshop (in the process of washing the printing molds, the hands and feet of workers) is 2 m^3. However, when the operation reaches the designed capacity, the amount of water supplied to the printing workshop is 8 m^3. Thus, the amount of wastewater generated at the maximum time is about 8 m^3/day. Pollution components mainly contain heavy metals such as Pb, Cu, Zn, and color intensity... This water is collected and treated up to regulations before being discharged into the centralized wastewater collection and treatment system of Song Cong I Industrial Zone for further treatment.

Wastewater from the printing workshop is pre-treated to separate garbage and flows to the collection-conditioning tank of the wastewater treatment station. The conditioning tank balances the flow and concentration of pollutants present in the wastewater. Then the wastewater is pumped to the coagulation compartment of the physico-chemical treatment tank and mixed with the coagulant chemicals, which are loaded from the chemical tank through the metering pump, to form large-sized particles. Wastewater continues to be

directed to the flocculation compartment and anionic polymer will be added to stimulate the formation of larger flocs. Wastewater from the flocculation compartment will be led through the lamella clarifier to separate the flocs from the wastewater.

In the lamella clarifier, the settled solids and heavy metals in the wastewater will be settled by gravity method. The sludge settled at the bottom of the secondary settling tank is periodically discharged into the sludge storage tank. The water after settling will automatically flow to the intermediate tank for higher oxidation. At the AOPs high-level oxidation compartment, the wastewater is aerated with ozone mixed with H_2O_2 chemicals, and iron alum is added from the chemical tank through a metering pump to generate hydroxyl radicals (OH*) to decompose organic matter with a stable structure. Wastewater continues to automatically flow to the coagulation-flocculation compartment.

The sediment will be deposited by gravity and compressed down, the clear water above will flow into the intermediate tank, and the sludge will flow to the sludge tank. Wastewater from the intermediate tank is supplied by 02 suction pumps to the sand and activated carbon filter to isolate residues and organic residues left after the treatment process. The water used to wash the filter is returned to the conditioning tank, and the sludge from the clarifiers is brought to the sludge storage tank. Periodically, the sludge is collected and treated by a competent unit in accordance with regulations. The treated water meets QCVN 40:2011/BTNMT (column B) and flows into the centralized wastewater treatment system of Song Cong I Industrial Zone.

Evaluating the production wastewater quality

Wastewater status by year

Year 2020

Wastewater at the workshop was collected and treated to meet the regulations at the factory's wastewater treatment system before being discharged into the receiving source. Analytical samples were taken at the source discharged into the wastewater collection system of Song Cong I Industrial Zone. The analysis data of production wastewater quality in 2020, sampled on November 18, 2020 is presented in Table 1.

Table 1. Results of periodic production wastewater environmental monitoring in 2020

Params	Unit	Results		QCVN 40:2011/BTNMT (Col B)
		TNG garment factory	Auxiliary factory	
pH	-	6.2	6.2	**5.5-9.0**
*Flow	m^3/hour	3.5	3.5	**-**
*Color Intensity	Pt/Co	29	29	**150**
*Temperature	^oC	27	x	**40**
BOD_5	mg/l	24.3	14.3	**50**
COD	mg/l	63.2	33.2	**150**
TSS	mg/l	45.5	35.5	**100**
As	mg/l	0.0014	0.0014	**0.1**
Cd	mg/l	<0.0005	<0.0005	**0.1**
Pb	mg/l	<0.0005	<0.0005	**0.5**
Total Chromium	mg/l	0.0217	0.0217	**-**
*Cr(III)	mg/l	<0.03	<0.03	**1**
*Cr(VI)	mg/l	<0.01	<0.01	**0.1**
Co	mg/l	0.001	0.001	**-**
Cu	mg/l	0.005	0.005	**2**
Hg	mg/l	<0.0005	<0.0005	**0.01**
Ni	mg/l	0.0048	0.0048	**0.5**
Sb	mg/l	0.0052	0.0052	**-**
Zn	mg/l	0.03	0.03	**3**
Fe	mg/l	0.43	1.43	**5**
*S^{2-}	mg/l	<0.1	x	**0.5**
*CN^-	mg/l	<0.01	x	**0.1**
*NH_4^+-N	mg/l	3.8	x	**10**
*Total Nitrogen	mg/l	15.8	x	**40**
Total Phosphorus	mg/l	2.6	x	**6**
*Phenol	mg/l	<0.01	x	**0.5**

*Residual chlorine	mg/l	<0.15	x	**2**
*Grease	mg/l	<0.3	<0.3	**10**
*Coliform	MPN/100ml	<3	<3	**5000**
**AOX	µg/l	0.26	0.26	**-**
DO	mg/l	4.1	4.1	**-**

(Source: analyzing at Thai Nguyen Environment and Natural Resources Monitoring Center, 2020)

Note:

- The value after the "<" sign represents the quantitative limit of the method;

- Sign (-) means not specified;

- Sign (x) means no value;

*- Parameters marked with * are unrecognized criteria according to ISO 17025:2017;*

- QCVN 40:2011/BTNMT: National technical regulation on industrial wastewater quality. Column B specifies the C value of pollution parameters in textile wastewater when discharged into water sources not used for domestic water supply purposes.

From the analysis data of production wastewater samples in Table 1, it is shown that all parameters give results below the threshold of QCVN 40:2011/BTNMT (column B). Thus, the production wastewater of the factory and auxiliary factory in 2020 was safe for the environment.

Year 2021

The analysis data of production wastewater quality in 2021, sampled on February 18, 2021 is presented in Table 2.

Table 2. Results of periodic production wastewater environmental monitoring in 2021

Params	**Unit**	**Results**		**QCVN 40:2011/BTNMT (Col B)**
		TNG garment factory	**Auxiliary factory**	
pH	-	6.3	6.3	**5.5-9.0**
*Flow	m^3/hour	3.5	3.5	**-**
*Color Intensity	Pt/Co	27	27	**150**
*Temperature	^oC	27	22.8	**40**
BOD_5	mg/l	15.9	15.9	**50**
COD	mg/l	36.56	36.56	**150**
TSS	mg/l	47.9	47.9	**100**
As	mg/l	0.0058	0.0058	**0.1**
Cd	mg/l	<0.0005	<0.0005	**0.1**
Pb	mg/l	0.0013	0.0013	**0.5**
Total Chromium	mg/l	0.0131	0.0131	**-**
*Cr(III)	mg/l	<0.03	x	**1**
*Cr(VI)	mg/l	<0.01	x	**0.1**
Co	mg/l	0.0007	0.001	**-**
Cu	mg/l	0.0078	0.005	**2**
Hg	mg/l	0.0007	0.0007	**0.01**
Ni	mg/l	0.0017	0.0017	**0.5**
Sb	mg/l	0.0041	0.0041	**-**
Zn	mg/l	0.025	0.025	**3**
Fe	mg/l	<0.3	<0.3	**5**
*S^{2-}	mg/l	<0.1	x	**0.5**
*CN^-	mg/l	<0.01	x	**0.1**
*NH_4^+-N	mg/l	3.34	x	**10**
*Total Nitrogen	mg/l	15.7	x	**40**
Total Phosphorus	mg/l	<0.3	x	**6**
*Phenol	mg/l	<0.001	x	**0.5**
F^-	mg/l	<0.08	x	**10**
Cl^-	mg/l	113	x	**1000**
*Residual chlorine	mg/l	<0.15	x	**2**
*Grease	mg/l	<0.3	<0.3	**10**

*Coliform	MPN/100ml	1100	1100	**5000**
**AOX	µg/l	<1	<1	-
**Total PCB	µg/l	<0.1	x	**0.01**
DO	mg/l	4.3	4.3	-

(Source: analyzing at Thai Nguyen Environment and Natural Resources Monitoring Center, 2021)

Note:

- The value after the "<" sign represents the quantitative limit of the method;

- Sign (-) means not specified;

- Sign (x) means no value;

*- Parameters marked with * are unrecognized criteria according to ISO 17025:2017;*

-QCVN 40:2011/BTNMT: National technical regulation on industrial wastewater quality. Column B specifies the C value of pollution parameters in textile wastewater when discharged into water sources not used for domestic water supply purposes.

From the analysis data of production wastewater samples in Table 2, it is shown that all parameters give results below the threshold of QCVN 40:2011/BTNMT (column B). Thus, the production wastewater of the factory and auxiliary factories in 2021 was safe for the environment.

Year 2022

The analysis data of production wastewater quality in 2022, sampled on August 16, 2022 is presented in Table 3.

Table 3. Results of periodic production wastewater environmental monitoring in 2022

Params	**Unit**	**Results**		**QCVN 40:2011/BTNMT (Col B)**
		TNG garment factory	**Auxiliary factory**	
pH	-	6.5	6.4	**5.5-9.0**
* Flow	m^3/hour	3.5	3.5	-
* Color Intensity	Pt/Co	48	16.6	**150**
* Temperature	^oC	28.7	29.8	**40**
BOD_5	mg/l	7.1	18.2	**50**
COD	mg/l	<15	27.5	**150**
TSS	mg/l	4.3	13.9	**100**
As	mg/l	0.0018	0.0025	**0.1**
Cd	mg/l	<0.0005	<0.0005	**0.1**
Pb	mg/l	0.00014	<0.0005	**0.5**
Total Chromium	mg/l	0.0005	<0.0005	-
*Cr(III)	mg/l	<0.03	x	**1**
*Cr(VI)	mg/l	<0.01	<0.01	**0.1**
Co	mg/l	<0.0005	<0.0005	-
Cu	mg/l	0.0018	0.0022	**2**
Hg	mg/l	0.0005	<0.0005	**0.01**
Ni	mg/l	0.0006	0.0008	**0.5**
Sb	mg/l	<0.0005	0.0005	-
Zn	mg/l	<0.01	0.025	**3**
Fe	mg/l	<0.3	<0.3	**5**
$*S^{2-}$	mg/l	<0.1	x	**0.5**
$*CN^-$	mg/l	<0.01	x	**0.1**
$*NH_4^+$-N	mg/l	1.7	x	**10**
*Total Nitrogen	mg/l	3.9	x	**40**
Total Phosphorus	mg/l	0.4	x	**6**
*Phenol	mg/l	<0.01	x	**0.5**
F^-	mg/l	0.17	x	**10**
Cl^-	mg/l	113	x	**1000**
*Residual chlorine	mg/l	<0.15	x	**2**
*Grease	mg/l	<0.3	<0.3	**10**
*Coliform	MPN/100ml	<3	1200	**5000**

**AOX	µg/l	<1	<1	-
**Total PCB	µg/l	<0.001	x	**0.01**
DO	mg/l	4.7	3.0	-

(Source: analyzing at Thai Nguyen Environment and Natural Resources Monitoring Center, 2022)

Note:

- The value after the "<" sign represents the quantitative limit of the method;

- Sign (-) means not specified;

- Sign (x) means no value;

*- Parameters marked with * are unrecognized criteria according to ISO 17025:2017;*

- QCVN 40:2011/BTNMT: National technical regulation on industrial wastewater quality. Column B specifies the C value of pollution parameters in textile wastewater when discharged into water sources not used for domestic water supply purposes.

From the analysis data of production wastewater samples in Table 3, it is shown that all parameters give results below the threshold of QCVN 40:2011/BTNMT (column B). Thus, the production wastewater of the factory and auxiliary factories in 2022 was safe for the environment.

Progress of production wastewater status at TNG Song Cong garment factory

Table 4. Progress of the production wastewater quality in 3 years of TNG Song Cong garment factory

Params	Unit	2020	2021	2022	QCVN40:2011/BTNMT (Col B)
pH	-	6.2	6.3	6.5	**5.5-9.0**
* Flow	m^3/hour	3.5	3.5	3.5	**-**
* Color Intensity	Pt/Co	29	27	48	**150**
* Temperature	^oC	27	27	28.7	**40**
BOD_5	mg/l	24.3	15.9	7.1	**50**
COD	mg/l	63.2	36.56	<15	**150**
TSS	mg/l	45.5	47.9	4.3	**100**
As	mg/l	0.0014	0.0058	0.0018	**0.1**
Cd	mg/l	<0.0005	<0.0005	<0.0005	**0.1**
Pb	mg/l	<0.0005	0.0013	0.00014	**0.5**
Total Chromium	mg/l	0.0217	0.0131	0.0005	**-**
*Cr(III)	mg/l	<0.03	<0.03	<0.03	**1**
*Cr(VI)	mg/l	<0.01	<0.01	<0.01	**0.1**
Co	mg/l	0.001	0.0007	<0.0005	**-**
Cu	mg/l	0.005	0.0078	0.0018	**2**
Hg	mg/l	<0.0005	0.0007	0.0005	**0.01**
Ni	mg/l	0.0048	0.0017	0.0006	**0.5**
Sb	mg/l	0.0052	0.0041	<0.0005	**-**
Zn	mg/l	0.03	0.025	<0.01	**3**
Fe	mg/l	0.43	<0.3	<0.3	**5**
*S^{2-}	mg/l	<0.1	<0.1	<0.1	**0.5**
*CN^-	mg/l	<0.01	<0.01	<0.01	**0.1**
*NH_4^+-N	mg/l	3.8	3.34	1.7	**10**
*Total Nitrogen	mg/l	15.8	15.7	3.9	**40**
Total Phosphorus	mg/l	2.6	<0.3	0.4	**6**
*Phenol	mg/l	<0.01	<0.001	<0.01	**0.5**
F^-	mg/l	x	<0.08	0.17	**10**
Cl^-	mg/l	x	113	113	**1000**
*Residual chlorine	mg/l	<0.15	<0.15	<0.15	**2**
*Grease	mg/l	<0.3	<0.3	<0.3	**10**
*Coliform	MPN/100ml	<3	1100	<3	**5000**
**AOX	µg/l	0.26	<1	<1	**-**
**Total PCB	µg/l	x	<0.1	<0.001	**0.01**
DO	mg/l	4.1	4.3	4.7	**-**

As described in Table 4 above, all analytical parameters were within the allowable limits of QCVN 40:2011/BTNMT (column B). In which, the parameters of heavy metals (Fe, As, Cd, Cu...) were very low, containing only a very small amount compared to the allowable level.

However, the typical parameters of the output wastewater sample during the 3 monitoring periods of the TNG Song Cong garment factory treatment system also fluctuated, specifically: pH was lower than the upper limit of the allowable level and tended to be stable, ranging from 6 to 6.5; The color intensity in the 2020 and 2021 monitoring periods were quite similar at 28 Pt/Co, although it increased to approximately 50 Pt/Co in 2022, but it was still 3 times lower than the limit of QCVN 40:2011/BTNMT column B; The temperature of the waste stream is maintained at equilibrium; the BOD and COD values in water samples were highest in 2020 with 24.3 mg/l and 63.2 mg/l, but there was a gradual decrease over time in the next 2 years; TSS value had complex fluctuations, while the data of the first 2 years was around 45-50 mg/l, it was only a relatively small concentration (4.3 mg/l) in 2022; The grease content was very low and almost negligible with the data in all 3 monitoring periods being < 0.3 mg/l.

Progress of production wastewater status at the Auxiliary factory

Table 5. Progress of the production wastewater quality in 3 years of Auxiliary factory

Params	Unit	2020	2021	2022	QCVN40:2011/BTNMT (Col B)
pH	-	6.2	6.3	6.4	**5.5-9.0**
* Flow	m^3/hour	3.5	3.5	3.5	**-**
* Color Intensity	Pt/Co	29	27	16.6	**150**
* Temperature	^oC	x	22.8	29.8	**40**
BOD_5	mg/l	14.3	15.9	18.2	**50**
COD	mg/l	33.2	36.56	27.5	**150**
TSS	mg/l	35.5	47.9	13.9	**100**
As	mg/l	0.0014	0.0058	0.0025	**0.1**
Cd	mg/l	<0.0005	<0.0005	<0.0005	**0.1**
Pb	mg/l	<0.0005	0.0013	<0.0005	**0.5**
Total Chromium	mg/l	0.0217	0.0131	<0.0005	**-**
*Cr(III)	mg/l	<0.03	x	x	**1**
*Cr(VI)	mg/l	<0.01	x	<0.01	**0.1**
Co	mg/l	0.001	0.001	<0.0005	**-**
Cu	mg/l	0.005	0.005	0.0022	**2**
Hg	mg/l	<0.0005	0.0007	<0.0005	**0.01**
Ni	mg/l	0.0048	0.0017	0.0008	**0.5**
Sb	mg/l	0.0052	0.0041	0.0005	**-**
Zn	mg/l	0.03	0.025	0.025	**3**
Fe	mg/l	1.43	<0.3	<0.3	**5**
*Grease	mg/l	<0.3	<0.3	<0.3	**10**
*Coliform	MPN/100ml	<3	1100	1200	**5000**
**AOX	µg/l	0.26	<1	<1	**-**
DO	mg/l	4.1	4.3	3.0	**-**

The progress of production wastewater quality in 3 years of TNG Song Cong Auxiliary factory in Table 5 shows that all analytical parameters were within the allowable limits of QCVN 40:2011/BTNMT (column B). In which, the parameters of heavy metals (Fe, As, Cd, Cu...) were very low, containing only a very small amount compared to the allowed level.

However, the typical parameters of the wastewater sample in the three monitoring periods of the treatment system of the TNG Song Cong auxiliary factory had different developments: pH was lower than the upper limit of the allowable level and tended to be stable, ranging from 6 to 6.5; The color intensity in the 2020 and 2021 monitoring periods was quite similar at 28 Pt/Co, but in 2022 it dropped to 16.6 Pt/Co; As for the temperature of the waste stream, although there was no data for 2020, that of 2 years later showed that the temperature was still maintained below the allowable limit; BOD value tended to be stable and range from 14 to 18 mg/l; COD value in the water sample had fluctuated during the 3 years of observation but was still at a relatively low level compared to the threshold of QCVN 40:2011/BTNMT (column B); TSS had strong fluctuations with a slight increase in 2021 to approximately 50 mg/l and a sharp decrease to about 14 mg/l in

2022. However, all of them did not exceed QCVN 40:2011/BTNMT (column B); The grease content was very low and almost insignificant with the data in all 3 monitoring periods being < 0.3 mg/l.

IV. Discussion

Production wastewater was collected through a system of wastewater collection and storage facilities, then strictly treated at the Wastewater Treatment Station. Wastewater quality showed that the water quality parameters were within the allowable limits. The factory closely supervised the operation of wastewater collection and treatment works, without any problems in wastewater treatment and discharge. It can be seen from the results of the production wastewater samples that after going through the treatment system of TNG Song Cong garment factory and Auxiliary factory, there were generally complicated and erratic changes in indicators when analyzing and commenting, but all had very good results within the limits of column B QCVN 40:2011/BTNMT. Thus, the factory's production wastewater met the safety requirements when discharged into the environment outside the plant.

V. Conclusion

Through surveying the current status and basing on the basis of analysis and assessment of water pollution control at Song Cong TNG garment factory and Auxiliary factory, the following conclusions can be drawn: Basically, the issue of environmental protection has been cared, especially the problem of wastewater generated in the progress of production and daily life. The factory had a relatively well-functioning wastewater treatment system, wastewater was collected through a system of wastewater collection and storage systems, then strictly treated at the wastewater treatment system. Wastewater quality showed that the water quality parameters were within the allowable limits of QCVN 40:2011/BTNMT.

The factory has closely monitored the operation of wastewater collection and treatment works, without any problems in wastewater treatment and discharge. In addition, the factory's wastewater flew into the general drainage system of the area for treatment rather than being discharged directly into the surrounding environment. Thereby, it can be seen that the factory has ensured good working environment conditions for employees in the factory as well as not letting the factory's production activities affect the surrounding environment. The wastewater quality of the factory and auxiliary factory has been controlled very well, it is advisable to continue with the plans established to maintain control and prepare for incident response.

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