

C.5b.2-Diversity of Cu and Total Cr Metals in Surface Water and Sludge of Textile.pdf

By Risfidian Mohadi

Diversity of Cu and Total Cr Metals in Surface Water and Sludge of Textile Wastewater from Tuan Kentang Village Seberang Ulu I Sub District Palembang

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ABSTRACT

Nowadays, the production of rainbow fabric as a traditional fabric of Palembang city has been grown rapidly. Commonly, the waste water as the by-product of rainbow fabric production is discharged directly to domestic channels without any previous waste water treatment. This research was aimed to evaluate the presence of Cu and total Cr heavy metal in the area of rainbow fabric industrial center in Tuan Kentang Village, Seberang Ulu I Sub District, Palembang. The Cu and total Cr polluted in the collected wastewater sample was analyzed by using atomic adsorption spectrometry method with wet destruction technique. The results indicated that the area of Tuan Kentang villages is contributing metal contaminants distribution and accumulation to nature.

Keywords: Textile, waste water, heavy metal

1. INTRODUCTION

The growing interest of the community to develop and maintain the values of customs and traditions is reflected in the development of cloths and fashion trends based on rainbow fabric (*Kain Pelangi*) as the traditional fabric in all societies. This is further supported by the local government by declaring the area of Tuan Kentang Village District of Seberang Ulu I as the traditional fabric village and the center of rainbow fabric household industry, in the city of Palembang. The production volume of rainbow fabric is increasing from last year so that operational activity will increase. But the problem arises, the waste water that is a by-product of this activity is discharged directly to domestic channels without any previous waste water treatment. Dyestuffs are closely related to the content of metal contaminant ions and are the rest of the coloring process will be wasted and pollute the surrounding environment if not through the processing treatment (Sasongko & Tresna, 2010). The heavy metal content to be observed in this research is heavy metal ions of Cu and Cr Total. Although these two metals fall into the category of intermediate hazards in the long term, they can be carcinogenic (Vodyanitskii, 2016). The nature of heavy metal contamination that comes out of the human activity and into the environment can dissolve and accumulate in the sediment and will continue to grow as time passes and the natural events are occurring at that location (Wulan, Thamrin, & Amin, 2013). So

the spread of Cu and Cr total metal ions is feared will be at risk of contaminating the life of environmental biota and ultimately this contaminant will affect human health even in the long term and far from the central of the pollution source.

In order to evaluate the status of environmental conditions that actually occur in the location of research, this study was conducted to observe changes in conditions that occurred in industrial center of rainbow fabric in Tuan Kentang Village at Seberang Ulu I Subdistrict, Palembang for 4 months.

2. EXPERIMENTAL SECTION

The chemicals used in this research was reagent grade supplied from Merck including sulfuric acid and hydrochloric acid. The water used for Cu and Cr standard solution was double distilled water. The rainbow fabric wastewater as the wastewater sample was collected from the surface water and the sludge at the source of the waste liquid which is the wastewater of residual immersion and *kain pelangi* rinsing, domestic channels prior to disposal site, domestic channels along the flow of waste water discharges, swamp where the final estuary of sewerage flow. Subsequently, 5 (five) critical points as sampling points are observed from June to September 2017. The 5 (five) stations are show in table 1.

This research was conducted from June to September 2017. Sampling location was done in the residential area around the industrial center rainbow fabric in Tuan Kentang Village at Seberang Ulu I Subdistrict, Palembang. Analysis of heavy metal content of Cu and Cr using AAS (Atomic Absorption Spectrophotometer) conducted at the Laboratory Test of Various Commodities Baristand Industry Palembang. The Cu and total Cr analy-

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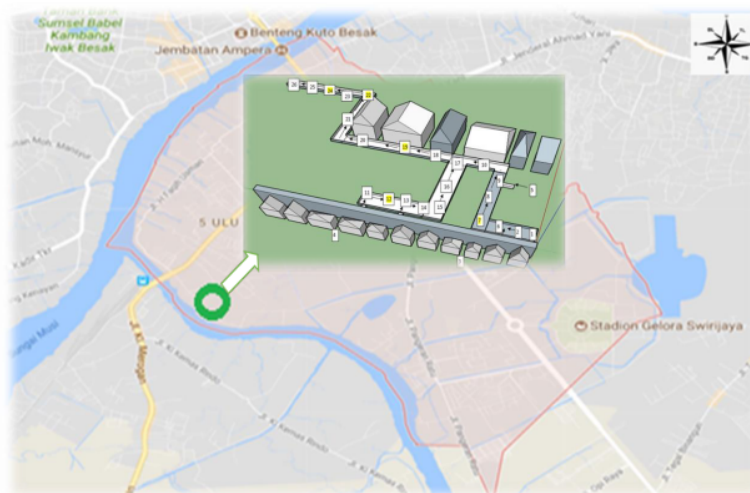


Figure 1. Map of research location on industrial center craft *Kain Pelangi* on Tuan Kentang Village at Seberang Ulu I Subdistrict, Palembang

Table 1. Observed Critical Points Table

Sampling Point	Position	Titik Koordinat	
		X	Y
1	A current	3°1'5,35"	- 104°45' 22,4"
2	B current	3°1'5,23"	- 104°45'22,79"
3	End of AB current	3°1'5,63"	- 104°45'22,96"
4	Filling under craftsman house and not flowing	3°1'5,48"	- 104°45'23,69"
5	Swamp	3°1'5,31"	- 104°45'23,95"

sis on sludge using aqua regia destruction on Hotplate at 180°C until the solution almost dry. Then the sludge dried at 60°C and it weighed as much as 2 grams for further treatment. After that sample destructed with 30 mL aqua regia (HNO₃ : HCl, 1 : 3), the result than cooled. After cooled, the sample was diluted with 100 mL distilled water. The sample solution then measured with atomic adsorption spectrometer (AAS) Shimadzu AA-7000 type 324 at 323,7 nm in order to determine the Cu and Cr content.

The research method used in this study used descriptive analysis with quantitative analysis approach to water and sludge conditions in domestic channels at 5 stations with 4 different weather conditions. In each station, field testing is also done to see the condition of the location at the time of sampling. Environmental quality parameters measured in the field include temperature, pH, turbidity, TSS (Total Suspended Solid), TDS (Total Dissolve Solid) and COD (Chemical Oxygen Demand). The research design that will be carried out include:

- 1) Study of literature related to research topic;
- 2) Field observation;

- 3) Determine the location of research;
- 4) Determining objects and sampling points;
- 5) Primary and secondary data collection (moisture and rainfall);
- 6) Interview and data analysis;
- 7) Calculation and comparison of data of total Cr metal cation concentration in textile wastewater and the determination of metal cation contamination status based on South Sumatera Governor Regulation No 8 the year 2012 on the quality standard of liquid waste for industrial, hotel, hospital, domestic and coal mining activities; Regulation of the Minister of Environment of the Republic of Indonesia No 5 the year 2014 on Wastewater Quality Standard; the quality standard of sludge (sediment) base on ANZECC ISQG-Low 2010
- 8) Calculation and comparison of data of Cu metal cation concentration and textile wastewater field data on the surface water with the classification of IV class quality water based on South Sumatera Governor Regulation No 16 the year 2005 on Water Allocation and River Water Quality Standard; the quality standard of sludge (sediment) base on ANZECC ISQG-Low 2010

3. RESULTS AND DISCUSSION

This observation result shows that the concentration of ions Cu and Total Cr as below :

The research result show that average of concentration Cu in surface water is still under 0,2 mg/L although there are some data shows that upper than 0,2 mg/L such as in swamp area shows 0,2383 mg/L. It means that the location on under the craftsman house and swamp are the deepest depth than other area and upper from quality standard of South Sumatera Governor Regulation No 16 the year 2005 on Water Allocation and River Water Quality Standard that Cu concentration on surface water is 0,2 mg/L.

According to Sujantoko and Natakusumah (2003), the water depth is shallow if it smaller compare to width then there is only insignificant layer formed. Because of it, if there is a quick current of water the layer taken along to the deepest depth area with it and will accumulate there. It Shows in sampling point 4 that

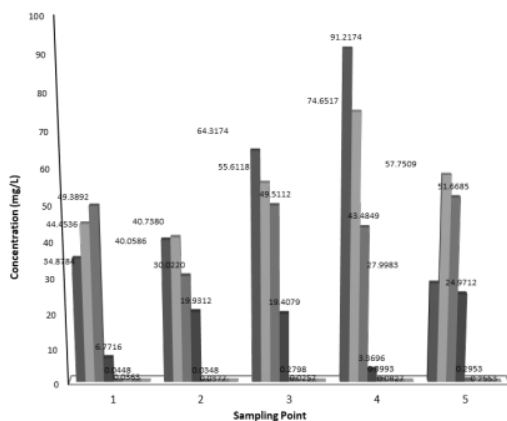


Figure 2. Cu Concentration in Sludge and Surface Water on June – September 2017

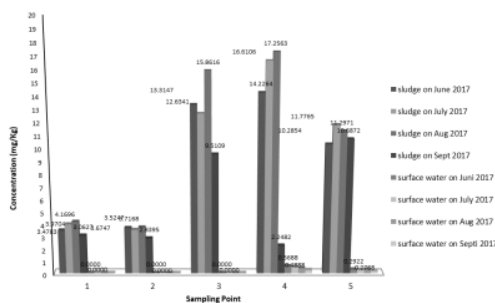


Figure 3. Total Cr Concentration in Sludge and Surface Water on June – September 2017

the highest Cu concentration on sludge is 91,2174 mg/L that it is upper from the quality standard of sludge (sediment) base on ANZECC ISQG-Low 2010 that Cu concentration is maximum 65 mg/kg.

In same case, Figure 3. Shows that the Cr concentration on surface water and sludge has increase in sampling point 4 and 5. The highest Cr concentration on sludge is 17,2563 mg/L and on surface water is 0,4888 mg/L. Both is still under the quality standar of South Sumatera Governor Regulation No 8 the year 2012 on the quality standard of liquid waste for industrial, hotel,

Table 2. Decrease Percentage Of Cu

Sam- pling Point	Critical Points	Jun 2017 versus Sep 2017		Jul 2017 versus Sep 2017		Aug 2017 versus Sep 2017	
		Sludge	Surface Wa- ter	Sludge	Surface Water	Sludge	Surface Water
1	A current	824,374		822,573		858,143	
2	B current	511,546		488,184		321,026	
3	End of AB current	702,075		646,678		619,975	
4	Filling under craftsman house and not flowing	957,181	100%	949,575	100%	919,795	100%
5	Swamp	171,760		579,643		512,342	

hospital, domestic and coal mining activities; Regulation of the Minister of Environment of the Republic of Indonesia No 5 the year 2014 on Wastewater Quality Standard; the quality standard of sludge (sediment) base on ANZECC ISQG-Low 2010 that Cr concentration is maximum 80 mg/kg.

The highest concentration in Cu and total Cr can be proof from COD value, turbidity value, TSS value, and TDS value. In sampling point 4 location, COD value shows 653,0 mg/L on June 2017 and 893,4 mg/L on August 2017. According to of South Sumatera Governor Regulation No 8 the year 2012 on the quality standard of liquid waste for industrial, hotel, hospital, domestic and coal mining activities; Regulation of the Minister of Environment of the Republic of Indonesia No 5 the year 2014 on Wastewater Quality Standard, the COD concentration value must be under 150 mg/L. According to South Sumatera Governor Regulation No 16 the year 2005 on Water Allocation and River Water Quality Standard, the COD concentration value must be under 100 mg/L. Base on these regulations, the COD concentrations value is not fulfill the government standart and will cause some damage too nature.

As known before, COD is a need of oxygen for organic material describing anorganic material in nature. The high of concentration COD value shows that many anorganic material to describe by organic material. So the high of concentration COD value similar to high need of oxygen and similar to high concentration of anorganic material include Cu and total Cr concentration too. High concentration of anorganic material is also show in turbidity, TSS and TDS. The high value of turbidity can block the sunray entering the water channels so fotosintesis process not happen. The cause of it such as dye, organic material and anorganic material.

According to Rusdiansyah (2006), household water channels have unsteady non uniform properties, meaning that this channel has a flow influenced by the speed and direction that changes to space and time where the aeration process depends on the rate of flow rate so that the concentration of substance which is the parameter of water quality at each point of uneven flow field and the quality is always changing depending on fluctuations in the flow rate that occurs. In Figure 2. And 3. There is trendline that shows the depth location on this area, but the concentration value of Cu and Total Cr is not spread evenly.

In order to find the most influential factors to the concentration of the content in the small industrial estate, researcher assume the datas on sample of September 2017 as the outlier data because it's extremely different. The percentage decrease of it shows as in Table 2. and Table 3 below.

As shown in Table 2. And Table 3. that the decrease percentage of ions Cu and Total Cr for sludge and surface water on June until September 2017 has differs markedly. Base on this obser-

Table 2. Decrease Percentage of Total Cr

Sampling Point	Critical Points	Jun 2017 versus Sep 2017		Jul 2017 versus Sep 2017		Aug 2017 versus Sep 2017	
		Sludge	Surface Water	Sludge	Surface Water	Sludge	Surface Water
1	A current	148,994		89,035		268,205	
2	B current	209,809	-	222,923	-	232,491	-
3	End of AB current	294,161		265,119		393,324	
4	Filling under craftsman house and not flowing	802,938	51,86%	840,107	49,39%	792,031	34,02%
5	Swamp	76,860	38,38%	155,112	44,61%	96,765	32,81%

vation and calculation researcher assume that the reason for this decreases was the most influential factors to the concentration of the content in this area is the weather.

4. CONCLUSION

Household water channels have unsteady non uniform properties, meaning that this channel has a flow influenced by the speed and direction that changes to space and time where the aeration process depends on the rate of flow rate so that the concentration of substance which is the parameter of water quality at each point of uneven flow field and the quality is always changing depending on fluctuations in the flow rate that occurs. So household water channel was not an ideal place to throw out the textile wastewater that not processed yet. Because of the high mobility of it can be a contaminant to nature whether it is far away and long-term period from the source. In this research location, the quality of surface water and sludge include the concentration of Cu and total Cr are intense influenced by the weather.

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