A Preliminary Study on Batik Effluent in Kelantan State: A Water Quality Perspective

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Abstract—Batik industries generate a huge contribution to Malaysia’s economy development. However, batik industries also produce large amounts of effluents with a high concentration of pollutants which required extensive treatment before discharging into the environment. The Kelantan Department of Environment (DOE), in this study, has found that the batik industry in the state has the lowest level of compliance with the department’s law and regulations. Its director, Khairuddin Mohamad Idris said the study revealed that between January and September 2010, the batik industry in Kelantan only recorded a five per cent level of compliance compares to other manufacturing industries. Therefore a study was carried out within five batik factories in Kota Bharu, Kelantan as a preliminary study aiming to describe the batik effluent from factories selected. In this study, the physical parameter such as pH, dissolve oxygen (DO), total dissolve solid (TDS), chemical oxygen demand (COD) and salinity were measured. This study showed that the value of COD is between 700 to 4900 mg/L which is higher than the acceptable condition for discharge of industrial effluent containing COD for textile industry. Correlation analysis showed that COD was positively correlated with temperature and pH, and was negatively correlated with DO and TDS. With the increase demand of batik products, the effluent with high COD value will also increase and making it one of the main sources of severe pollution in Malaysia. Therefore, awareness education of batik effluent pollution to the batik industry entrepreneurs is very crucial, especially on the importance of clean practices in the production of batik.

Keywords—batik, COD, effluent.

I. INTRODUCTION

THE rapidly growing textile industries in Malaysia especially the batik industries in the East Cost of Peninsular Malaysia have contributed positively to the Malaysia’s economic growth. In Kelantan, batik is mostly produced by small medium enterprises (SME) and also by a small scale industry which is known as cottage industry. SME normally built its industrial units in many places and some of them were built alongside of the river. However, the cottage industry manufacturers prefer to build its industrial unit in their home backyard. Obviously, textile industries consume large amount of water and chemicals during their wet processing. The chemicals reagent used in textile sector are diverse in chemicals composition ranging from inorganic to organic.

Some parameters of the textile (including batik) must comply with the Environmental Quality Act (1974) regulations for Industrial Effluent 2009 (1974) [1]. The Kelantan Department of Environment (DOE), indicated that the batik industry in the Kelantan state has the lowest level of compliance with the department’s law and regulations. Its director, Khairuddin Mohamad Idris revealed that between January and September 2010, the batik industry in Kelantan only recorded a five per cent level of compliance compares to other manufacturing industries [8]. Therefore this research was aim to determine the physical characteristic of the batik effluents. The chemical oxygen demand (COD) level also will be disclosed in this study.

II. MATERIALS AND METHODS

Five of medium to small batik industrial units had been selected as sampling stations (Figure 1) for this study. Water samples were collected from the last pond of the effluents (after dyeing and washing process), before it is being discharged. The physical parameters such as temperature, pH, dissolve oxygen (DO) and total dissolve solid (TDS) were analyzed in situ using YSI Model 556 (Yellow Springs, OH, USA) multiprobe meter while the chemical oxygen demand (COD) were analyzed in the laboratory using HACH Spectrophotometer (DR 2800).
Fig. 1 represents sampling station used in the study

III. RESULTS AND DISCUSSION

Data obtained was analyzed and compared with the industrial effluents standard in Environmental Quality Act 1974 (Table 1). The effluent showed that temperature average value for the five batik factories was 29.40°C, average pH was 8.45, average TDS was 5.15 mg/L, average DO was 2.03 mg/L, average salinity was 4.49 mg/L and average for COD was 1911.53 mg/L. From the six parameters that have been analyzed, the average value of temperature, pH and TDS were within the standard limit while the average value of COD was higher than the standard limit.

Correlation analysis was carried out between COD and other parameter. The correlation analysis showed that COD was positively correlated with temperature and pH, and was negatively correlated with DO and TDS. The temperature of the batik wastewater is acceptable since it is under the standard limit. High temperature will reduce the solubility of gases in water that ultimately express as high COD. While extremely low temperature will affects adversely the efficiency of sedimentation in the effluent [2]. The pH value of the effluents has a direct affect on organisms and indirect effect on the toxicity of certain pollutants in the water. At either very high or very low pH, the water cannot support most of the organisms. Therefore pH is an important factor in the chemical and biological system of the water. Meanwhile, the impact of organic pollutant on the waste water is expressed in COD which all depends on the DO value [3].

TDS is also used to define the organic content of the water and the total ions in solution respectively [10]. The value of TDS and DO are depending on the various chemicals and reagent that have been used in the batik making process. Therefore, the value obtained from the both parameters will affect COD value in the batik wastewater.

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<tbody>
<tr>
<td>Temp °C</td>
<td></td>
<td>40</td>
<td>32.43</td>
<td>30.29</td>
<td>28.15</td>
<td>26.94</td>
<td>29.21</td>
</tr>
<tr>
<td>pH</td>
<td>-</td>
<td>5.5–9.0</td>
<td>7.92</td>
<td>8.29</td>
<td>8.88</td>
<td>7.65</td>
<td>9.52</td>
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<tr>
<td>TDS mg/L</td>
<td></td>
<td>3000</td>
<td>5.91</td>
<td>4.11</td>
<td>3.16</td>
<td>9.33</td>
<td>3.22</td>
</tr>
<tr>
<td>DO mg/L</td>
<td>*</td>
<td>1.77</td>
<td>2.23</td>
<td>2.1</td>
<td>2.05</td>
<td>2.01</td>
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<tr>
<td>COD mg/L</td>
<td></td>
<td>250</td>
<td>1473.33</td>
<td>1422.67</td>
<td>772.67</td>
<td>945.00</td>
<td>4944.00</td>
</tr>
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* Not stated in Environmental Quality Act (Industrial Effluent Regulations, 2009)

The discussion above shows that the value of COD is influenced by the value of temperature, pH, TDS and DO of the batik effluent. The measurement of oxygen demand is an easy way to detect the degree of pollution by organic matter. The discharge of the effluents with high COD value to the receiving stream or drainage can lead to the depletion of dissolve oxygen and thus creates anaerobic condition [4]. Under anaerobic condition foul smelling compound such as hydrogen sulfides may be produced. This will consequently distress the biological activity especially in the receiving stream.

IV. CONCLUSION

In batik making process, the effluents are often rich in color and organic pollutants which require a proper treatment before discharging into the environment. It is known that high demand of batik products will contribute in the production of more effluent with high COD value and creating it as one of the main sources of severe pollution in Malaysia. This preliminary finding should be a starting point to find an intriguing application for the treatment of liquid effluents in local industries such as batik industry. Therefore, awareness education of batik effluent pollution to the batik industry entrepreneurs and manufacturers is essential especially emphasized on the importance of clean practices in the production of batik. We hope someday, Kelantan will produce what we called a ‘green batik’.

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REFERENCE