

## EFFECTS OF AQUEOUS ENVIRONMENT THROUGH WASTEWATER LADEN HEAVY METAL IN MALAYSIA: A Review on Batik Industry

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**ABSTRACT:** Heavy metal pollution has become one of the most essential issues to consider in economic development. Existing metal ion in the solution at certain concentration can give detrimental health effect. Management of wastewater in industrial become significantly from influent until effluent discharge before release in order to preserve the environment. This paper reviews the current environmental issues produces from rapidly growing Batik's Industry. This effluent pollutions include wax, resin, heavy metal and dyes since it utilize a lot of chemicals product. From literature survey, it is evident that environmental threat from heavy metal discharge of Batik's Industry become frequently studied in persistence the environment for sustainable to the next generation.

**KEYWORDS:** *Heavy metal, Batik's Industry, wastewater and effluent.*

### 1.0 INTRODUCTION

Heavy metal that persistent in aqueous environment is one of the most crucial problems because it poses to human health even at low concentration (Long et al., 2013). Heavy metal are generally in state of cationic form and become ultimately problem when density over than 5 g per cubic meter (March, Dung and Piro, 2015). The dissolved of heavy metal ion in aqueous environment cannot be degraded so than consumed by human body through drinking water, bio-accumulation and food chain (Dexia et al., 2014). There are about 20 types of metal ion that classified as toxic metal whereas half of these such as Cu, Cd, Cr, As, Ni, Pb and Zn considered most hazardous which has risk to effect human health (Saifuddin and Kumaran, 2005). The detrimental health effects includes organ and nervous damage, cancer, reduced growth and death. Children may exposed higher dose metals since they consume more food for their development compare to adults thus bad to the next generation (Barakat, 2011). Industrial activity is one of the major sources of heavy metal in aqueous environment (Idriss and Ahmad, 2013). These industrial such as electroplating, steel fabrication, canning, wood preservatives, cement and textile that produce a different kind of heavy metal wastewater directly or indirectly discharged into the environment. In Malaysia's practice, industrial effluent discharge should comply regulation of Malaysian Environmental Quality Act, called Environmental Quality (Industrial Effluent) Regulations 2009 (Quality et al., 2009). The standard discharge limits from effluent discharge between 0.1 and 3 milligram per liter (Aziz, Adlan and Ariffin, 2008).

### 2.0 METHODOLOGY

#### **2.1. Industrial activity related to wastewater**

Heavy metal contamination in water is a common problem that encountered in many countries due to metal leaching or deposition, agricultural, urban wastes, fertilizer and industrial activity. An Industrial activity is the one of the major source that contribute to existence of heavy metal in aqueous environment (March, Dung and Piro, 2015). Industrial activity such as electroplating, textile, steel

fabrication, cement, metal processing, inorganic pigment manufacturing and canning produce a different kind of wastes from effluent discharge to the environment (Barakat, 2011). The pollution by industrial activity which contains hazardous toxic metals such as Hg, Cr, Pb, Zn, Cu, Ni, As, Co, and Sn has issues on threatening human health and ecosystems (Chervin, Parker and Nelson, no date).

The mainly sources of heavy metal produced not only involved metal activities but consume a lot of chemicals such as in textile industry (Society, 2008). Textile is the important sector that consume a large quantity of water in production process. Consequently, the discharge is highly polluted and toxic metal into environment without any prior treatment process. Textile industries are contributors and major source of pollution for metal contaminants in environment (Sarker *et al.*, 2015). Heavy metals present in different textile process include metal complex dye, dye stripping agent, odor-preventive agent, antifungal, mordant reactive and oxidizing compound (Rezić and Steffan, 2007)

## 2.2 Environmental impact threat for heavy metal pollution

The process of making batik utilized a lot of synthetic chemical whereas synthetic dyes used in this process containing heavy metals. From previous researcher (Mulyasari, Mukono and Sulistyorini, 2016) (Ho, Zakaria and Latif, 2014), wastewater that discharged from batik factories contains heavy metal such as Zinc (Zn), iron (Fe), copper (Cu), Chromium (Cr), Cadmium (Cd) and lead (Pb). Although heavy metals threat and toxicity to human health (as table 1) corresponding to the function of concentration, but chronic exposure to heavy metal and metalloids can adversely effects even at relatively low concentration. The contamination enter to the feeding cycle involves pollution of aquatic life or environment which absorbed by plants and animals and then consumed by human (Cserfalvi *et al.*, no date). Table 1 shows the toxicity heavy metal effect on human.

Table 1 Toxicity heavy metal effect on human

Heavy metal	Health Effect
Zinc (Zn)	Lethargy, neurological sign, depression, damage to nervous system and thirst (Quality <i>et al.</i> , 2009)
Chromium (Cr)	Human carcinogen, dermatitis, nausea, coughing and chronic asthma (Duruibe, Ogwuegbu and Egwurugwu, 2007)
Copper (Cu)	Insomnia, Wilson disease, liver damage, stomach and intestinal irritation (Griswold and Martin, 2009)
Iron (Fe)	Inhalation or contact causes damage to central nervous system (Järup, 2003)
Lead (Pb)	Fetal brain damage, congenital paralysis, sensor neural deafness, circulatory system, nervous system and kidney diseases (Tripathi and Rawat Ranjan, 2015)
Cadmium (Cd)	Human carcinogen, renal dysfunction, kidney damage, lung disease, bronchitis, gastrointestinal disorder, bone marrow, increase blood pressure and cancer (Tripathi and Rawat Ranjan, 2015)

Human carcinogen, renal dysfunction, kidney damage, lung disease, bronchitis, gastrointestinal disorder, bone marrow, increase blood pressure and cancer (Tripathi and Rawat Ranjan, 2015) Heavy metals is extremely dangerous because it is non-degradable, they are stable and tend to bio-accumulate and ultimately harm human health. Exposure to some metals such as lead, the fetus or developing child may interfere with the reproductive process (reprotoxic) which also effect the learning capacity and neuropsychological growing (Cserfalvi *et al.*, no date). In general of toxicity of metal ion form, it can be effect human health due to chemical reactivity of the ion with enzymes, structural protein and membrane system. Long term storage of heavy metal can takes place in hard tissues such as bone and teeth (Mahurpawar, 2015).

## 2.2 A challenges on monitoring effluent discharge for batik industry in Malaysia

By environmental concerning, batik industry should enhance an awareness of waste management due to wastewater produced can give detrimental health effect. In general practice, sample was collected manually and transported to the central laboratory to analyses wastewater contents for batik wastewater. During transportation, there will give some effect for heavy metal contents in samples due to light exposure, dissolved oxygen and precipitation, thus the sampling will give inefficient data (Li *et al.*, 2013)(Altin, Ozbekelge and Dogu, 1999).

Sample collected using a bottle at final discharge point, batik effluent storage tank, untreated batik effluent and environment (river, soil and inland water). Since batik effluent can contribute to environmental pollution due to dyestuff (heavy metal, color and toxicity) and auxiliaries, a proper waste management such as treatment techniques, effluent storage, and monitoring is required.

Batik effluent is the vital point discharge for sampling because the wastewater contents in effluent discharge influence the concentration of heavy metal in plants, soils, river and inland water. A detection and quantification of dyes and heavy metal in environmental becomes irrelevant due to reaction with natural sunlight and dissolved oxygen. A researcher report (S, Muslim and Rohasliney, 2015) ( $p < 0.05$ ), the Person's correlation analysis prove that concentration in plants and soil were strongly influenced by the concentration of heavy metal in batik effluents. Thus, extensive treatment and monitoring batik effluents become vital process in batik industry. Conductance measurement, pH value and temperature are significant parameter to characterize heavy metal and toxicity of dyestuff effluent or water sample. However, this techniques has limitation and not suitable for environmental sample that may contains large variety of complex substances. If batik effluents that containing heavy metal not process properly, it will cause pollution to the environment such as river water and ground water. Since heavy metal and dyestuff released to the environment is non-degradable, concentration must be reduce at acceptance level before release to the environment (Sharma et al., 2009). A method to detect dyes and level of toxicity are cost intensive and very difficult due to large of functional group in different dyes and the diverse properties. Analytical procedures for determine concentration of dyes in ppm (part per million) is limited.

In textile industry especially batik industry, AAS either flame or graphite is most widely used to determine heavymetal concentration in batik wastewater and characterize effluent samples. These mass spectrometry method have 354 been used in dyestuff industry but not suitable for large quantities and continuous discharge. One of researcher study the DNA using V79 cells to assess the toxicity on batik industrial wastewater (Awang et al., 2016). Several analytical for analysis dye are based on electrophoresis, chromatographic and spectroscopic method (Voltammetrik et al., 2016). However, all of those method is imperceptible for continuous monitoring. A regular monitoring is require to ensure the discharge is in acceptance level and enhance the awareness of entrepreneurs to control the factories activity processes and treatment capability.

Thus, an innovative economical wastewater treatment should be installed in batik industry. The discharged effluent and quality of river water should be monitor periodically. From the study of this researcher (Yaacob et al., 2015), many entrepreneurs do not have knowledge about relationship between batik industry and environment. More comprehensive program should be conduct for batik entrepreneurs on environmental issues such as environmental awareness program organized by DOE, to provides valuable information and ensure achieves green or clean production for future prospects (Yaacob and Zain, 2016)(Yaacob, Faizah and Zain, 2016).

### 3.0 CONCLUSION

Dyestuff wastewater that contains heavy metal and auxiliaries in textile industry especially batik industry render them to environmental pollution threat that can harm human. Most of batik industry directly discharge effluent to environment without any prior treatment due to economical factor. Some of industries store the effluent to the reservoir or storage tank. However, there is no proper waste management for continuously effluent discharge as the demand for SMEs industries to economic growth. The dyestuff wastewater required treatment process to achieved desire water quality and has a channel flow or drainage system. A regular monitoring discharge effluent is required to enhance the awareness of entrepreneurs to the characteristic of effluent discharge. Previously, sample is taken from the effluent discharge and environment such as river, soil and inland water to analysis the wastewater characteristic and determine the toxicity. The sample then transported to the laboratory, hence inefficient and less representative data. Then, as a proposed, a low-cost instrument should be installed

at final discharge point of effluent to determine the toxicity. From the monitoring information, an operator or employer can check and react to control the level of discharge effluent toxicity such as check the treatment operation, the process, production, and application of the dyes instantaneously. Lastly, the ideal waste management recommended should include an initial step of treatment system and monitoring system, thus discharge through the drainage system into the river as a regulation strict from department of environment.

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