ABSTRAK

Industri tekstil tumbuh positif pada triwulan pertama tahun 2024. Berdasarkan data Badan Pusat Statistik (BPS), industri tekstil dan pakaian jadi tumbuh mencapai 2,64%. Peningkatan performa ini turut berkontribusi terhadap pertumbuhan ekonomi di Indonesia, yaitu sebesar 19,28%. Tujuan dari penelitian ini adalah menganalisis pemenuhan baku mutu kualitas air limbah, pemenuhan waktu tinggal untuk masing-masing unit pengolahan sesuai kriteria desain, dan memberikan rekomendasi untuk meningkatkan performa IPAL. Jenis penelitian ini menggunakan metode deskriptif kuantitatif menggunakan uji ANOVA Single Factor dan uji lanjut beda nyata dengan LSD. PT X merupakan salah satu perusahaan yang bergerak dalam bidang industri tekstil terpadu. Dalam mengolah air limbah produksi, PT X memiliki Instalasi Pengolahan Air Limbah (IPAL) dengan kapasitas 18.000 m3

/hari - 19.000 m3

/hari, seluas ±3.711 m2

. Air limbah
yang diolah oleh IPAL bersumber dari proses produksi meliputi proses scouring (pemasakan), dyeing (pencelupan), dan finishing (penyempurnaan). Berdasarkan analisis, kualitas air limbah yang dihasilkan oleh IPAL PT X untuk parameter suhu (23,3
oC), pH (7,72), TSS (4 mg/L), amonia (0,93 mg/L), BOD (21,20 mg/L), COD, (85,33 mg/L), dan warna (89 Pt.Co) sudah memenuhi baku mutu yang dipersyaratkan dalam Lampiran II Permen LHK P.16 tahun 2019 tentang Baku Mutu Air Limbah, sedangkan parameter minyak dan lemak belum memenuhi baku mutu yaitu 49,45 mg/L. Hal tersebut disebabkan karena adanya limbah dari proses

pemasakan (scouring) yang mengandung minyak dan lemak dan juga disebabkan karena adanya kontaminasi bahan pencemar berupa oli atau pelumas mesin yang masuk pada saluran pembawa karena lokasi saluran pembawa yang berdekatan dengan area bengkel alat produksi. Waktu tinggal dari masing-masing unit pengolahan IPAL PT X yang terdiri dari unit bar screen (0,74 m/detik), unit ekualisasi (4,32 jam), unit koagulasi (59,47 detik), flokulasi (54,77 detik), primary clarifier (2,01 jam), oxidation ditch (19,44 jam), dan secondary clarifier (2,36 jam) sudah sesuai dengan kriteria desain. Kosentrasi minyak dan lemak yang masih melebihi baku mutu dapat diatasi dengan menambahkan unit grease trap pada saluran pembawa sebelum air limbah masuk ke unit ekualisasi untuk memisahkan minyak dan lemak dengan air limbah. Dalam meningkatkan performa IPAL, direkomendasikan untuk melakukan pembubuhan bahan kimia di unit koagulasi dan flokulasi secara otomasi, memperbaiki lokasi injeksi polimer anionik yang seharusnya diletakkan diatas unit flokulasi, dan otomasi pemantauan lumpur menggunakan sludge level sensor.
Kata kunci : Efisiensi Penyisihan, Tekstil, Kualitas Air Limbah, Kriteria Desain, Minyak dan Lemak, Otomasi, Uji Anova, Rekomendasi IPAL, Waktu Tinggal.

ABSTRACT

The textile industry showed a positive growth trajectory during the first quarter of 2024. According to data from the Central Statistics Agency (BPS), the textile and apparel industry showed a growth rate of 2.64%. This improved performance also contributed to Indonesia's economic growth which reached 19.28%. The objectives of this study were to evaluate the extent to which wastewater quality standards were met, assess the extent to which the required residence time for each treatment unit was adhered to, and provide recommendations to improve the performance of the wastewater treatment plant (WWTP). This study used a quantitative descriptive methodology, using the ANOVA single factor test and continued with the least

significant difference test with LSD. PT X is one of the companies engaged in the integrated textile industry. In treating wastewater generated from its production process, PT X operates a wastewater treatment plant (WWTP) with a capacity of 18,000-19,000 cubic meters per day with an area of approximately 3,711 square meters. The wastewater treated by the WWTP is sourced from the production process including the scouring, dyeing, and finishing processes. Based on the analysis, the quality of wastewater produced by the PT X WWTP for the parameters of temperature (23.3oC), pH (7.72), TSS (4 mg/L), ammonia (0.93 mg/L), BOD (21.20 mg/L), COD, (85.33 mg/L), and color (89 Pt.Co) has met the quality standards required in Appendix II of the Minister of Environment and Forestry Regulation P.16 of 2019 concerning Wastewater Quality Standards, while the oil and fat parameter has not met the quality standards, namely 49.45 mg/L. The presence of waste from the cooking process (scouring) is a contributing factor, as this contains oil and fat. Additionally, contamination from engine oil or lubricants entering the carrier channel due to the proximity of the carrier channel to the production equipment workshop area is a further cause. The residence time of each PT X WWTP treatment unit, which consists of a bar screen unit (0.74 m/sec), an equalization unit (4.32 hours), a coagulation unit (59.47 seconds), a flocculation unit (54.77 seconds), a primary clarifier (2.01 hours), an oxidation ditch (19.44 hours), and a secondary clarifier (2.36 hours), is in accordance with the design criteria. The concentration of oil and grease that still exceeds the quality standards can be mitigated by the installation of a grease trap unit in the carrier channel, situated prior to the wastewater entering the equalization unit. This will facilitate the separation of oil and grease from the wastewater.To enhance the performance of the WWTP, it is recommended that the addition of chemicals in the coagulation and flocculation units be automated, that the location of the anionic polymer injection be optimized, and that sludge monitoring be automated using a sludge level sensor.

Keywords: ANOVA Test, Chemical Automation, Design Criteria, Detention Time,

Oil and Grease, Removal Efficiency, Textile, Wastewater Quality, WWTP

Recommendation.