

# Pengaruh proses ozonasi dan kavitasi ultrasonik terhadap pengolahan limbah cair batik dengan pralakuan koagulasi-flokulasi = The effects of ozonation and ultrasonic cavitation processes on batik wastewater treatment with coagulation-flocculation as pretreatment

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## Abstrak

Industri batik menghasilkan limbah cair dalam volume besar dengan kandungan organik yang tinggi. Zat warna pada limbah cair batik sukar diolah dengan proses biologis sehingga diperlukan pengolahan lebih lanjut untuk mengurangi beban pencemar sebelum dilepaskan ke lingkungan. Penelitian ini bertujuan untuk mengamati kinerja dari masing-masing metode kavitasi ultrasonik, ozonasi, dan kombinasi ozonasi dan kavitasi ultrasonik untuk mengolah limbah cair batik yang terlebih dahulu diberikan pralakuan koagulasi-flokulasi dengan koagulan *Polyaluminium Chloride* (PAC). Variasi yang dilakukan pada penelitian adalah intensitas gelombang ultrasonik (20%, 30%, dan 60%) serta pH limbah (4, 7, dan 10). Pada penelitian ini didapatkan bahwa metode kavitasi ultrasonik dengan intensitas ultrasonik 20% menghasilkan penyisihan COD, TSS, dan warna (Pt-Co) masing-masing sebesar 65,59%, 91,51%, dan 93,41%. Pada proses ozonasi dengan pH 4 diperoleh penyisihan COD, TSS, dan warna (Pt-Co) masing-masing sebesar 70,51%, 94,35%, dan 96,10%. Adapun metode kombinasi ozonasi/kavitasi ultrasonik dengan pH 4 dan intensitas ultrasonik 20% menghasilkan penyisihan COD, TSS, dan Pt-Co tertinggi, yakni sebesar 77,02%, 95,15%, dan 94,88% secara berturut-turut.

.....The batik industry produces large volumes of liquid waste with high organic content. Wastewater treatment is needed to reduce pollutant load before being released into the environment. This study aims to observe the performance of each ultrasonic cavitation, ozonation, and a combination of both methods to treat batik wastewater, which is first given a coagulation-flocculation pre-treatment with *Polyaluminium Chloride* (PAC) coagulant. Variations made in the study are the intensity of ultrasonic waves (20%, 30%, and 60%) and the wastewater's pH (4, 7, and 10). In this study, it was found that the ultrasonic cavitation method with an ultrasonic intensity of 20% produced COD, TSS, and color (Pt-Co) removal of 65.59%, 91.51%, and 93.41%, respectively. In the ozonation process with pH 4, COD, TSS, and color (Pt-Co) removal were obtained at 70.51%, 94.35%, and 96.10%, respectively. The combined ozonation/ultrasonic cavitation method with a pH of 4 and an ultrasonic intensity of 20% produced the highest removal of COD, TSS, and Pt-Co by 77.02%, 95.1%, and 94.88%, respectively.