CHAPTER 5
CONCLUSION AND SUGESTION

5.1 Conclusion

Based on the results of the research and analysis in the discussion chapter, the following conclusions can be drawn:

1. The presence of a pretreatment unit proved highly effective in minimizing the potential formation of carcinogenic disinfection by-products (DBPs), specifically Total Trihalomethanes (TTHMs), compared to systems without pretreatment. Seven calculation models from previous studies with varying water characteristics were assessed. After evaluating their suitability against the characteristics of Kali Bonagung Surabaya water, as shown in Table 3.4, it was found that calculation model 4 had the highest conformity value of 0.789. Based on the calculations, the initial TTHMs concentration in river water was 2.79 µg/L. After simple processing through the RIPT unit and disinfection, the value decreased by 49% to 1.375 µg/L. With the addition of a pretreatment unit, the TTHMs concentration decreased further by 53% to 1.278 µg/L. Statistical analysis confirmed that the presence of the pretreatment unit significantly reduced the potential formation of TTHMs. Hypothesis testing yielded a p-value of 0.011, which is below the confidence threshold of 0.05. This indicates that the null hypothesis (H_0) was rejected, proving a statistically significant reduction.
2. Based on residual chlorine analysis, a dosage of 3 mg/L was identified as the most ideal. At this dosage, chlorine demand for bacterial inactivation was met while leaving free chlorine within the safe quality standard range. However, dosage determination is strongly influenced by pollutant content in the water. For example, under the same dosage but with different water conditions, effluent from scheme 2 showed high residual chlorine levels, indicating minimal chlorine reaction. This aligns with previous findings of elevated COD due to the accumulation of aliphatic compounds. Saturated

aliphatic compounds (alkanes) possess single bonds that are recalcitrant to chlorine reactions.

3. The research results also demonstrated that variations in contact time were directly proportional to the efficiency of organic matter removal. The reduction trends of UV254 and COD parameters were nearly identical. UV254, representing aromatic compounds, showed a shorter effective time range compared to COD. This difference is attributed to the mineralization process, in which residual molecular fragments are broken down into CO_2 and H_2O. Such chemical bond cleavage occurs in multiple stages and is hindered by the limited active sites on the catalyst surface, thereby requiring longer reaction times.

5.2 Sugestion

The following suggestions should be considered for subsequent studies:

1. In the photocatalyst immobilization process, further research should focus on variations in stirring speed, stirring duration, and drying temperature/method to identify the most stable formula for RIP-TiO_2 adhesion.
2. This study has not yet examined the reusability cycles of resin media to determine whether efficiency decreases or TiO_2 leaching occurs after continuous flow application.
3. Referring to the challenge highlighted by Munien et al. (2025), TiO_2 possesses a relatively large Band Gap Energy (Eg) of 3.2 eV, which restricts its activity to UV radiation. Therefore, future research is recommended to explore metal/non-metal doping of TiO_2 or its combination with ZnO, enabling the photocatalytic reactor to operate more efficiently under visible light or direct sunlight.