

## **BAB 5**

### **KESIMPULAN DAN SARAN**

#### **5.1 Kesimpulan**

1. Konsentrasi pendemulsi *polyaluminium chloride* (PAC) memberikan pengaruh signifikan terhadap respon perubahan pH, persentase penurunan turbiditas, dan persentase minyak yang terpisah dalam campuran emulsi;
2. Temperatur memberikan pengaruh signifikan terhadap respon perubahan pH, persentase penurunan turbiditas, dan persentase pemisahan minyak dalam campuran emulsi;
3. Interaksi konsentrasi pendemulsi *polyaluminium chloride* (PAC) dengan temperatur memberikan pengaruh signifikan terhadap respon perubahan pH, persentase penurunan turbiditas, dan persentase pemisahan minyak dalam campuran emulsi;

#### **5.2 Saran**

Saran pada penelitian ini adalah perlunya memastikan kembali cara kerja, khususnya kalibrasi alat ukur yang tersedia dan akan digunakan dalam penelitian seperti pH meter beserta pengkajian ulang analisa yang presisi dalam penentuan persentase pemisahan minyak dalam campuran emulsi. Apabila dilakukan kembali penelitian ini maka perlu mencari kondisi optimum pada saat penambahan PAC dan temperatur yang tidak terlalu tinggi. Selain itu, untuk mengetahui efektivitas dan efisiensi proses demulsifikasi dalam emulsi yang dihasilkan maka perlu melakukan peninjauan variasi pengaruh seperti jenis pendemulsi, penyesuaian pH, dan waktu pengadukan dan pengendapan campuran emulsi yang akan dilakukan pada proses demulsifikasi.

## DAFTAR PUSTAKA

- Abdulredha, M.M., Hussain, S.A., dan Abdullah, L.C., 2019, Separation Emulsion via Non-Ionic Surfactant: An Optimization, *Processes*, 7, pp. 382-400.
- Adanur, S., 2001, Handbook of Weaving, edisi 1, Technomic Publishing, Pennsylvania, pp. 1-5, 9-11, 69-70, 110, dan 222.
- Alther, G.R., 1997, Oils Found in Wastewater: What are They? How to Separate and Eliminate Them from Wastewater A Layman's Guide to Emulsion Breaking, [courses.washington.edu/h2owaste/assignments/BIOMINOIL\\_GUIDE.doc](http://courses.washington.edu/h2owaste/assignments/BIOMINOIL_GUIDE.doc), diakses pada 23 Oktober 2019.
- Al-Sabagh, A.M., Nasser, N.M., Khamis, E.A., dan Abd-El-Raouf, M., 2015, Resolution of water in crude oil emulsion by some novel aromatic amine polyesters, *Egyptian Journal of Petroleum*, 24, pp. 363-374.
- Amuda, O.S., Amoo, I.A., dan Ajayi, O.O., 2006, Performance optimization of coagulation/flocculant in the treatment of wastewater from a beverage industry, *J. Hazard. Mater.*, 129, pp. 69-72.
- Badan Pusat Statistik Indonesia, 2018, Statistik Air Bersih, [www.bps.go.id](http://www.bps.go.id), diakses pada 10 Oktober 2019.
- Bolto, B., dan Gregory, J., 2007, Review: Organic polyelectrolytes in water treatment, *Water Research*, 41, pp. 2301-2324.
- Chang, Q., 2016, *Colloid and Interface Chemistry for Water Quality Control*, edisi 1, Academic Press, London, pp. 57 dan 59.
- Cheremisinoff, P.N., 1995, *Handbook of Water and Wastewater Treatment Technology*, edisi 1, CRC Taylor & Francis, Boca Raton, pp. 18-22, 39, dan 113-114.
- Clark, M., 2011, Chapter 1. Fundamental Principles of Dyeing, in M. Clark (Ed.). *Handbook of Textile and Industrial Dyeing*, Woodhead Publishing Limited, Cambridge, pp. 13-14 dan 22-24.
- Coca, J., Gutierrez, G., dan Benito, J.M., 2011, Treatment of Oily Wastewater, in J. Coca-Prados dan G. Gutierrez-Cervello (Ed.). *Water Purification and Management*, Springer Science, Dordrecht, pp. 1-56.
- Correia, V.M., Stephenson, T., dan Judd, S.J., 1994, Characterisation of Textile Wastewaters – A review, *Environmental Technology*, 15, pp. 917-929.

- Deng, S., Yu, G., Jiang, Z., Zhang, R., dan Ting, Y.P., 2005, Destabilization of oil droplets in produced water from ASP flooding, *Colloids and Surfaces A: Physicochem. Eng. Aspects*, 252, pp. 113-119.
- Flynn, D.J., 2009, Section 2.4. Applications – Waste Water: Chapter 27. Emulsion Treatment, in D.J. Flynn (Ed.). *The Nalco Water Handbook: Nalco Company*, edisi 3, McGraw-Hill, New York, pp. 1-21.
- Fresenius, W., Quentin, K.E., dan Schneider, W., 1988, *Water Analysis A Practical Guide to Physico-Chemical, Chemical and Microbiological Water Examination and Quality Assurance*, Springer-Verlag, Berlin, pp. 30-31.
- Gebbie, P., 2006, An Operator's Guide to Water Treatment Coagulants, [wioa.org.au/conference\\_papers/06\\_qld/documents/PeterGebbie.pdf](http://wioa.org.au/conference_papers/06_qld/documents/PeterGebbie.pdf), diakses pada 12 Desember 2020.
- Gries, T., Veit, D., dan Wulffhorst, B., 2015, *Textile Technology: An Introduction*, edisi 2, Hanser Publisher, Munich, pp. 50-53, 66-71, dan 161.
- Grishanov, S., 2011, Chapter 2. Structure and Properties of Textile Materials, in M. Clark (Ed.). *Handbook of Textile and Industrial Dyeing*, Woodhead Publishing Limited, Cambridge, pp. 56-57.
- Guo, J., Cao, J., Li, M., dan Xia, H., 2013, Influences of water treatment agents on oil-water interfacial properties of oilfield produced water, *Petroleum Science*, 10, pp. 415–420.
- Guo, T., Chen, X., Warig, C., dan Ge, M., 2018, Treatment of oilfield production wastewater by an integrated process, *Petroleum Science and Technology*, 36, pp. 1007-1013.
- Gupta, B.S., dan Hashim, M.A., 1996, Coagulation and Flocculation, in C.A. Sastri (Ed.), *Water Treatment Plants*, Narosa Publishing House, New Delhi , pp. 125-140.
- Hao, L., Jiang, B., Zhang, L., Yang, H., Sun, Y., Wang, B., dan Yang, N., 2016, Efficient Demulsification of Diesel-in-Water Emulsions by Different Structural Dendrimer-Based Demulsifiers, *Industrial & Engineering Chemistry Research*, 35, pp. 1748-1759.
- He, Y.M., Chen, K.Y., dan Zhang, T.Y., 2016, Advanced treatment of heavy oil wastewater for reuse by the combination of microwave enhanced coagulation and iron/carbon micro-electrolysis, *Journal of Water Reuse and Desalination*, 6, pp. 40-49.
- Holkar, C.R., Jadhav, A.J., Pinjari, D.V., Mahamuni, N.M., dan Pandit, A.B., 2016, A critical review on textile wastewater treatments: Possible approaches, *Journal of Environmental Management*, 182, pp. 351-366.

- Indrawijaya, B., 2018, Uji Absorbsi Pencelupan Kain Polyester Menggunakan Pewarna Disperse, *Jurnal Ilmiah Teknik Kimia Unpam*, 2, pp. 1-8.
- Karmakar, S.R., 1999, Chapter 1. Kind of fibres, in S.R. Karmakar (Ed.). *Chemical Technology in the Pre-Treatment Processes of Textiles*, Elsevier Science, Amsterdam, pp. 27-29
- Kawamura, S., 1996, Optimization of Basic Water Treatment Processes - Design and Operation: Coagulation and Flocculation, *Journal Water Supply Research and Technology*, 45, pp. 35-47.
- Kemmer, F.N., 1988, Part 2. Unit Operations of Water Treatment: Chapter 11. Emulsion Breaking, in F.N. Kemmer (Ed.). *The Nalco Water Handbook: Nalco Company*, edisi 2, McGraw-Hill, New York, pp. 1-18.
- Kohestanian, A., Hosseini, M., dan Abbasian, Z., 2008, The separation method for removing of colloidal particles from raw water, *American-Eurasian J. Agric. & Environ. Sci.*, 4, pp. 266-273.
- Kumar, P., Prasad, B., Mishra, I.M., dan Chand, S., 2007, Treatment of composite wastewater of a cotton textile mill by thermolysis and coagulation, *Journal of Hazardous Material*, 151, pp. 770-779.
- Lacasse, K., dan Baumann, W., 2004, *Textile Chemicals: Environmental Data and Facts*, edisi 1, Springer-Verlag, Heidelberg, pp. 87, 132-133, 142-163, 192-194, 272-273, 275, 282-284, dan 289-293, 385, dan 387.
- Liu, H., Qu, J., Hu, C., dan Zhang, S., 2003, Characteristics of nanosized polyaluminum chloride coagulant prepared by electrolysis process. *Colloids and Surfaces A*, 216, pp. 139-147.
- Manivasakam, N., 2013, Treatment of Textile Processing Effluents, Chemical Publishing, California, pp. 10-31, 72, dan 443.
- Martínez-Palou, R., dan Aburto, J., 2015, Chapter 11: Ionic Liquids as Surfactants – Applications as Demulsifiers of Petroleum Emulsions, in S. Handy (Ed.). *Ionic Liquids*, Intech Open, Rijeka, pp. 305-326.
- Moen, A.K., 2016, Destabilization of Emulsions in Porous Media, *Master Thesis*, Norwegian University of Science and Technology, Trondheim, Norway.
- Mohammed, R., Bailey, A., Luckham, P., dan Taylor, S., 1993, Dewatering of crude oil emulsions 2. Interfacial properties of the asphaltic constituents of crude oil, *Colloids Surf. A: Physicochem. Eng. Aspect*, 80, pp. 237-242.

- Mohammed, R., Bailey, A., Luckham, P., Taylor, S., 1994. Dewatering of crude oil emulsions 3. Emulsion resolution by chemical means, *Colloids Surf. A: Physicochem. Eng. Aspect*, 83, pp. 261-271.
- Montgomery, D.C., 2013, *Design and Analysis of Experiments*, edisi 8, John Wiley & Sons, New Jersey, pp. 40, dan 183-224.
- Pal, R., 1994, Techniques for measuring the composition (oil and water content) of emulsions: a state of the art review, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 84, pp. 141-193.
- Papakostas, V., 2017, Oil-in-Water emulsions: Techniques and processes for maximizing the oil recovery in high water cut oil wells, *Diploma Thesis*, University of Crete, Crete, Yunani.
- Pang, Y.L., dan Abdullah, A.Z., 2012, Current Status of Textile Industry Wastewater Management and Research Progress in Malaysia: A Review, *Clean – Soil, Air, Water*, 41, pp. 1-14.
- Patel, H., dan Vashi, R.T., 2015, *Characterization and Treatment of Textile Wastewater*, edisi 1, Elsevier, Oxford, pp. 5-8.
- Perrin, P., Prigent, F., dan Hebraud, P., 2008, Chapter 2. Structure and Rheology of Stable Multiple Emulsions, in A. Aserin (Ed.),, *Multiple Emulsions: Technology and Applications*, edisi 1, John Wiley & Sons, New Jersey, pp. 30-31.
- Pintor, A.M.A., Vilar, V.J.P, Botelho, C.M.S., dan Boaventura, R.A.R., 2016, Oil and grease removal from wastewaters: Sorption treatment as an alternative to state-of-the-art technologies. A critical review, *Chemical Engineering Journal*, 297, pp. 229-255.
- Pramudono, B., dan Mat, H.B., 2005, Demulsifier Selection Based on the Evaluation of Demulsification Performance Indicators, *Reactor*, 9, pp. 59-66.
- Purnomo, A., 2011, Metode Demulsifikasi untuk Pemisahan Air dalam Emulsi Slop Oil, *Skripsi*, Universitas Indonesia, Depok, Indonesia.
- Rahimah, Z., Heldawati, H., dan Syauqiah, 2016, Pengolahan Limbah Deterjen dengan Metode Koagulasi-Flokulasi menggunakan Koagulan Kapur dan PAC, *Konversi*, 5, pp. 13-19.
- Rajak, V.K., Singh, I., Kumar, A., dan Mandal, A., 2016, Optimization of separation of oil from oil-in-water emulsion by demulsification using different demulsifiers, *Petroleum Science and Technology*, 34, pp. 1026-1032.

- Rios, G., Pazos, C., dan Coca, J., 1998, Destabilization of cutting oil emulsions using inorganic salts as coagulants, *Colloids and Surfaces A; Physicochemical and Engineering Aspects*, 138, pp. 383-389.
- Roshan, N., Ghader, S., dan Rahimpour, M.R., 2017, Application of the response surface methodology for modelling demulsification of crude oil emulsion using a demulsifier, *Journal of Dispersion Science and Technology*, 39, pp. 700-710.
- Sahu, O.P., dan Chaudhari, P.K., 2013, Review on Chemical treatment of Industrial Waste Water, *J. Appl. Sci. Environe. Manage.*, 17, pp. 241-257.
- Santander, M., Rodrigues, R. T., dan Rubio, J., 2011, Modified jet flotation in oil (petroleum) emulsion/water separations, *Colloid Surf. A*, 375, pp. 237–244.
- Schramm, L.L., Stasiuk, E.N., dan Marangoni, D.G., 2003, Surfactants and their applications, *Annual Reports Section “C” (Physical Chemistry)*, 99, pp. 3-48.
- Stepina, V., dan Vesely, V., 1992, Volume 23. Lubricants and Special Fluids Chapter 5. The Classification and Applications of Liquid Lubricants, Lubricants and Special Fluids, in D. Dowson (Ed.). *Tribology Series*, Elsevier Science, Amsterdam, pp. 529.
- Tao, M., Li, G., Fang, Z., dan Sun, L., 2017, Experimental Study on the Effect of pH on the Flocculation Demulsification Efficiency, *2017 2<sup>nd</sup> International Conference on Environmental Science and Engineering*, pp. 62-67.
- Textile School, 2018, Water Jet Weaving Machines, [www.textileschool.com/408/water-jet-weaving-machines/](http://www.textileschool.com/408/water-jet-weaving-machines/), diakses 18 Mei 2019.
- U.S. Environmental Protection Agency, 1974, Development Document for Effluent Limitations Guidelines and Standards for the Textile Mills: Point Source Category, [www.epa.gov/eg/textile-mills-effluent-guidelines-documents](http://www.epa.gov/eg/textile-mills-effluent-guidelines-documents), diakses pada 23 Oktober 2019.
- United Nations Statistics Division (UNdata), 2019, Woven fabric polyester staple fibres, [data.un.org](http://data.un.org), diakses pada 10 Oktober 2019.
- Valh, J.V., Marechal, A.M.L., Vajnhandl, S., Jeric, T., dan Simon, E., 2011, Volume 4. Water Quality Engineering Chapter 20. Water in the Textile Industry, in P. Wilderer (Ed.). *Treatise on Water Science*, Elsevier Science, Munich, pp. 685-706.
- Verma, A.K., Dash, R.R., dan Bhunia, P., 2012, A review on chemical coagulation/flocculation technologies for removal of colour from textile wastewaters, *Jour. of Env. Management*, 93, pp. 154-168.

- Water Right Group, 2019, Should I Be Concerned about pH Levels in My Water, [www.water-rightgroup.com](http://www.water-rightgroup.com), diakses pada 20 Juni 2019.
- Xin Feng Ming Group, 2012, Polyester chips, [www.xfmgroup.com/en/product\\_des.php?4/5](http://www.xfmgroup.com/en/product_des.php?4/5), diakses 24 Februari 2019.
- Yamashita, Y., Miyahara, R., dan Sakamoto, K., 2007, Part 3. Physicochemical Aspects and Formulations Chapter 28. Emulsion and Emulsification Technology, in K. Sakamoto, R. Lochhead, H.I. Maibach, dan Y. Yamashita (Ed.). *Cosmetic Science and Technology: Theoretical Principles and Applications*, Elsevier Science, Amsterdam, pp. 489-506.
- Yang, J.Y., Yan, L., Li, S.P., dan Xu, X.R., 2016, Treatment of aging oily wastewater by demulsification/flocculation, *Journal of Environmental Science and Health Part A*, 0, pp. 1-7.
- Yang, Z. H., Huang, J., Zeng, G. M., Ruan, M., Zhou, C. S., dan Li, L., 2009, Optimization of flocculation conditions for kaolin suspension using the composite flocculant of MBFGA1 and PAC by response surface methodology, *Bioresource Technology*, 100, pp. 4233–4239.
- Zhang, H., Fang, S., Ye, C., Wang, M., Cheng, H., Wen, H., dan Meng, X., 2008, Treatment of waste filature oil/water emulsion by combined demulsification and reverse osmosis, *Separation and Purification Technology*, 63, pp. 264-268.
- Zhang, Z., 2017, The flocculation mechanism and treatment of oily wastewater by flocculation, *Water Science & Technology*, 76, pp. 2630-2637.
- Zolfaghari, R., Fakhru'l-Razi, A., Abdullah, L.C., Elnashaie, S.S.E.H., dan Pendashteh, A., 2016, Demulsification techniques of water-in-oil and oil-in-water emulsions in petroleum industry, *Separation and Purification Technology*, 170, pp. 377-407.