

**DIESEL REMOVAL BY CONTINUOUS FROTH FLOTATION:
EFFECTS OF ULTRALOW INTERFACIAL TENSION AND
FOAM CHARACTERISTICS**

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A Thesis Submitted in Partial Fulfilment of the Requirements
for the Degree of Master of Science
The Petroleum and Petrochemical College, Chulalongkorn University
in Academic Partnership with
Case Western Reserve University, The University of Michigan,
The University of Oklahoma, and Institut Français du Pétrole
2004

ISBN 974-9651-44-8

121616279

Thesis Title: Diesel Removal by Continuous Froth Flotation : Effects of Ultralow Interfacial Tension and Foam Characteristics
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ศุภนิสา วัชรสิงห์ : กระบวนการแยกน้ำมัน ดีเซลออกจากน้ำเสียโดยระบบทำให้ลอยแบบต่อเนื่อง: ปัจจัยของแรงตึงผิวที่ต่ำมากและลักษณะของฟอง (Diesel Removal by Continuous Froth Flotation : Effects of Ultralow Interfacial Tension and Foam Characteristics) อ. ที่ปรึกษา: รศ. ดร. สุเมธ ชวเดช ผศ. ดร. ปราโมช รังสรรค์วิจิตร และ ศ. จอห์น เอฟ สเคมมีฮอร์น 88 หน้า ISBN 974-9651-44-8

กระบวนการทำให้ลอย (froth flotation) เป็นหนึ่งในวิธีการแยกสารโดยสารลดแรงตึงผิวซึ่งเหมาะสำหรับบำบัดน้ำเสียที่มีการปนเปื้อนของน้ำมันที่เจือจาง งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาความสัมพันธ์ระหว่างแรงตึงผิวที่มีค่าต่ำมากและประสิทธิภาพของการกำจัดน้ำมันดีเซลออกจากน้ำโดยวิธีการกระบวนการทำให้ลอยแบบต่อเนื่อง สารลดแรงตึงผิวแบบบรานซ์ อัลคอกซิล โพรพอกซีเลต ซัลเฟต โซเดียม ซอลท์ (Alfoterra 145-5PO) และโซเดียมโดเดซิล ซัลเฟต (SDS) ถูกนำมาใช้ในการศึกษาทดลองการเกิดไมโครอิมัลชันและกระบวนการทำให้ลอย ปัจจัยของความเข้มข้นสารลดแรงตึงผิว ความเค็ม และอัตราส่วนน้ำต่อน้ำมันได้ถูกศึกษาในการทดลองการเกิดไมโครอิมัลชันเพื่อหาสัดส่วนประกอบที่ให้ค่าแรงตึงผิวที่ต่ำมากเพื่อนำไปทดลองต่อในส่วนของการกระบวนการทำให้ลอย ในกระบวนการทำให้ลอยได้ทำการศึกษาปัจจัยของความเข้มข้นสารลดแรงตึงผิว ความเค็ม อัตราส่วนน้ำต่อน้ำมัน ความสูงของฟอง อัตราการเป่าอากาศ และเวลาเก็บกักต่อการกำจัดน้ำมัน จากผลการทดลอง ประสิทธิภาพของการกำจัดน้ำมันพบว่าที่แรงตึงผิวที่มีค่าต่ำมากไม่ได้เป็นเพียงปัจจัยเดียวที่มีผลต่อกระบวนการทำให้ลอย คอยพบว่าความเสถียรของฟองเป็นอีกปัจจัยที่สำคัญต่อกระบวนการทำให้ลอย ระบบที่ความเข้มข้นของบรานซ์ อัลคอกซิล โพรพอกซีเลต ซัลเฟต โซเดียม ซอลท์ 0.1 เปอร์เซ็นต์, ความเข้มข้นโซเดียมโดเดซิล ซัลเฟต 0.5 เปอร์เซ็นต์, ความเข้มข้นของเกลือ 4 เปอร์เซ็นต์, อัตราส่วนน้ำต่อน้ำมัน 1 ต่อ 19, อัตราการเป่าอากาศ 0.30 ลิตรต่อนาที, ความสูงของฟอง 26 เซนติเมตร และเวลาเก็บกัก 22 นาที ให้ประสิทธิภาพการกำจัดน้ำมันที่สูงที่สุดเท่ากับ 90.37 เปอร์เซ็นต์

ABSTRACT

4571026063: PETROCHEMICAL TECHNOLOGY

Sunisa Watcharasing: Diesel Removal by Continuous Froth Flotation : Effects of Ultralow Interfacial Tension and Foam Characteristics

Thesis Advisors: Assoc. Prof. Sumaeth Chavadej, Asst. Prof. Pramoch Rangsunvigit, and Prof. John F. Scamehorn,, 88 pp.
ISBN 974-9651-44-8

Keywords: Froth flotation / Diesel removal / Ultra-low interfacial tension / Foam stability

Froth flotation is one of surfactant-based separation processes which is suitable for treating dilute oily wastewaters. The objective of this study was to investigate the relationship between the ultra-low IFT and the efficiency of diesel removal from water by using continuous froth flotation technique. Branched alcohol propoxylate sulfate, sodium salt (Alfoterra 145-5PO) and sodium dodecyl sulfate (SDS) were used for both microemulsion formation and froth flotation studies. Surfactant concentration, salinity, and oil to water ratio were varied in the microemulsion formation experiment in order to determine the compositions required to obtain ultra-low IFT. The effects of surfactant concentration, salinity, oil to water ratio, foam height, air flow rate, and HRT on the oil removal were investigated. From the results, the oil removal efficiency of the froth flotation process did not correspond to the minimum IFT of the system indicating that the ultra low IFT alone cannot be used as a sole criteria for froth flotation operation. Foam stability was revealed to be another crucial factor in the froth flotation operation. The system with 0.1 wt% Alfoterra, 0.5 wt% SDS, 4 wt% NaCl, 1:19 oil:water ratio, 0.15 L/min air flow rate, 26 cm foam height, and 49 min HRT gave the maximum oil removal (90.37 %).

ACKNOWLEDGEMENTS

This work has been a very memorable and valuable experience as well as a lot of knowledge to the author. It would not have been succeeded without the assistance of a number of individuals including organizations. The author would like to thank all of them for making this work a success.

First of all, my great appreciation is also extended to Assoc. Prof. Sumaeth Chavadej who acted as my Thai thesis advisor for providing many necessary things throughout this work. I would like to thank him for his constant valuable advice and support. This thesis would not have been succeeded without his professional aids.

I would like to express my highly gratefulness to Professor John F. Scamehorn for serving as my US thesis advisor for his guidance, insightful discussion and professional advice throughout my work.

Thank is also offered to Asst. Prof. Pramoch Rangsunvigit, my co-advisor for his encouragement, vigorous assistance, and kindly useful suggestions.

The expenses of this research work were mainly supported by The Advanced Research Scholar Grant from Thailand Research Fund (TRF), The Research Units of Applied Surfactants for Separation and Pollution Control from The Ratchadapisek Somphot Fund of Chulalongkorn University and The Petroleum and Petrochemical Consortium under The Ministry of Education.

The surfactant (branched alcohol propoxylate sulfate, sodium salt (Alfoterra 145-5PO Sulfate)) used in this research work was supported by Sasol North America Inc., Texas, USA.

I would like to express my deep appreciation to Ms. Ummarawadee Yanatatsaneejit, a Ph. D. student who acted as my colleague in this work, for her excellent suggestions and encouragements as well as making this research to be a fun filled activity. Besides, I would like to especially thank for her efforts to develop my technical writing style.

I would like to express my sincerely gratitude to all faculties and staff of the Petroleum and Petrochemical College for their kind assistance to facilitate all works.

Special thanks go to all PPC Ph.D. students and all PPC friends for their friendly assistance, cheerfulness, creative suggestions, and encouragement. The author had the most enjoyable time working with all of them.

Finally, the author would like to express deep appreciation to my parents, my sister, and my brother for their endless support and love throughout the two year study period.

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