

**ASSESS THE POSSIBILITY OF WAX DEPOSITION  
FROM OIL-IN-WATER DISPERSION**

Kasidit Smathwitthayawech

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**By:** Kasidit Smathwitthayawech  
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Asst. Prof. Pomthong Malakul


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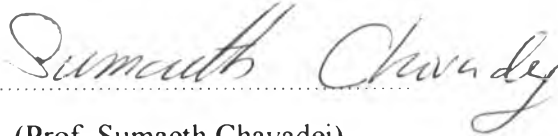
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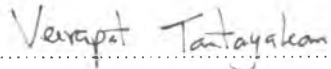
  
..... College Dean  
(Asst. Prof. Pomthong Malakul)

**Thesis Committee:**

  
.....  
(Prof. H. Scott Fogler)

  
.....  
(Asst. Prof. Pomthong Malakul)

  
.....  
(Prof. Sumaeth Chavadej)

  
.....  
(Dr. Veerapat Tantayakom)

## ABSTRACT

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Kasidit Smathwjtthayawech: Assess the Possibility of Wax  
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Paraffin deposition in subsea pipelines poses severe challenge in the transportation of crude oil. In field operations, water commonly co-exists with oil further complicating the wax deposition characteristics. Several oil/water two-phase flow patterns can occur depending on the operating flow rates of oil and water. Among the possible two-phase flow patterns, the paraffin deposition from oil-in-water dispersed flow is not well understood. This study investigates the possibility of wax deposition from oil-in-water dispersed flow as well as the effect of operating conditions on the deposit thickness. A model oil-in-water emulsion was prepared and its stability characterized. Paraffin deposition experiments performed with model emulsions using a cold finger apparatus. The oil content of the emulsion was varied from 5 vol% to 50 vol%. The bulk fluid temperature was set at 45°C. Deposit formed on a clean cold finger surface tends to slough off while deposit can continue to grow on a n-C<sub>28</sub> surface. It was observed that the deposit grows rapidly and reaches plateau thickness. Sloughing off deposit was also observed over the course of deposit growth, leading to large uncertainties in the recorded deposit weight. Deposit wax content was also characterized.

## บทคัดย่อ

กยดิส สมรรถวิทยาเวช : การศึกษาโอกาสในการเกิดตะกอนพาราฟินจากอิมัลชันชนิด  
น้ำในน้ำมัน (Assess the Possibility of Wax Deposition from Oil-in-Water Dispersion)

อ. ที่ปรึกษา : ศ. สก็อต ฟอกเลอร์ (Prof. Scott H. Fogler) และ ผศ. ดร. ปมทอง มาลากุล 52 หน้า

ตะกอนพาราฟินภายในท่อขนส่งน้ำมันใต้ทะเลเป็นสาเหตุหลักที่ทำให้การดำเนินการ  
ขาดความต่อเนื่องด้วยการปิดระบบและเปลี่ยนหรือล้างท่อขนส่งน้ำมันใต้ทะเล การเกิดและสะสม  
ของตะกอนพาราฟินจึงเป็นปัญหาที่ส่งผลกระทบต่อธุรกิจน้ำมัน น้ำที่ปะปนมากับน้ำมัน  
สามารถก่อให้เกิดความซับซ้อนในการอธิบายลักษณะการไหลในท่อขนส่งน้ำมันซึ่งสามารถเกิด  
ได้หลายรูปแบบขึ้นอยู่กับอัตราการไหลของทั้งน้ำและน้ำมัน ทั้งนี้โอกาสในการเกิดตะกอน  
พาราฟินสำหรับอิมัลชันชนิดน้ำในน้ำมันไม่เป็นที่เข้าใจนัก งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษา  
โอกาสในการเกิดและสะสมของตะกอนพาราฟิน รวมถึงผลกระทบจากสภาวะต่างๆต่อตะกอน  
พาราฟิน โดยอิมัลชันของน้ำในน้ำมันที่ใช้ในการศึกษาจะถูกเตรียมและวิเคราะห์คุณลักษณะก่อน  
นำไปทดลองด้วยอุปกรณ์จำลองพื้นผิวท่อขนส่งน้ำมันใต้ทะเลหรือโคลด์ฟิงเกอร์ สภาวะที่ศึกษา  
คือสัดส่วนน้ำมันร้อยละ 5 และ 50 อุณหภูมิสำหรับผิวท่อจำลองและของไหลมีค่า 5 และ 45 องศา  
เซลเซียส จากการทดลองพบว่าอิมัลชันน้ำในน้ำมันไม่สามารถเกาะติดบนผิวท่อจำลองได้ แต่  
สามารถเกาะติดบนผิวที่เคลือบด้วยนอร์มอลพาราฟินซี-28 (จำนวนคาร์บอน 28 อะตอม) ได้ โดย  
ปริมาณการเติบโตของตะกอนพาราฟินทั้งสัดส่วนน้ำมันร้อยละ 5 และ 50 จะเกิดอย่างรวดเร็วใน  
ช่วงแรกและคงที่สำหรับสัดส่วนน้ำมันร้อยละ 5 แต่สัดส่วนร้อยละ 50 จะมีการเติบโตที่สูงกว่าเมื่อ  
ระยะเวลาดำเนินการมากกว่า 2 ชั่วโมง เมื่อทำการวิเคราะห์สัดส่วนพาราฟินในตะกอนพบว่า  
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