

การสร้างแบบจำลองทางคอมพิวเตอร์และทำออปติไมเซชัน
ของทอกันหลักที่อยู่ในโรงกลั่นน้ำมัน



นายพลชม จันทรอุไร

วิทยานิพนธ์นี้เป็นส่วนหนึ่ง ของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรมหาบัณฑิต
ภาควิชาวิศวกรรมเคมี

บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
จุฬาลงกรณ์มหาวิทยาลัย

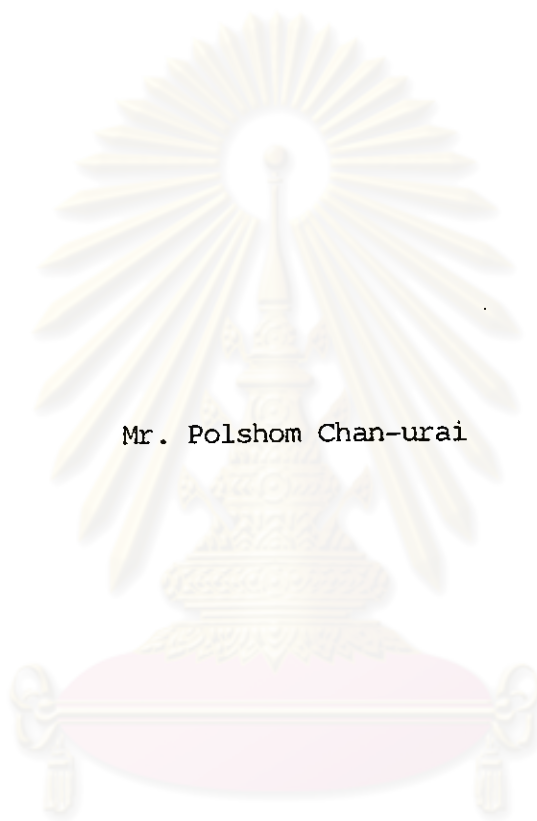
พ.ศ. 2529

ISBN 974-566-881-8

013538

I16633258

COMPUTER MODELLING AND OPTIMIZATION
OF AN EXISTING OIL REFINERY TOPPING COLUMN



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จุฬาลงกรณ์มหาวิทยาลัย

A Thesis Submitted in Partial Fulfilment of the Requirements
for the Degree of Master of Engineering
Department of Chemical Engineering

Graduate School

Chulalongkorn University

1986

ISBN 974-566-881-8

Thesis Title Computer Modelling and Optimization of An Existing
 Oil Refinery Topping Column
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Accepted by the Graduate School, Chulalongkorn University in
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หัวข้อวิทยานิพนธ์	การสร้างแบบจำลองทางคอมพิวเตอร์และทำออปติไมเซชันของ หอกลิ้นหลักที่มีอยู่ในโรงกลั่นน้ำมัน
ชื่อนิสิต	นายพลชม จันทร์อุไร
อาจารย์ที่ปรึกษา	รองศาสตราจารย์ ดร.วิวัฒน์ ตันทะพานิชกุล
ภาควิชา	วิศวกรรมเคมี
ปีการศึกษา	2528

บทคัดย่อ



แบบจำลองของหอกลิ้นน้ำมันดิบที่มีจิ่ง รัง แห่งหนึ่ง ได้ถูกสร้างขึ้นโดยใช้แนวความคิดของการกลั่นสารผสมเทียมแฝงหลายชนิด (pseudomulticomponent) น้ำมันดิบจะถูกแบ่งเป็นส่วนประกอบ (fractions) ที่มีคุณสมบัติต่างกันชัดเจนจำนวน 39 ส่วน ในขั้นตอนแรกได้ทำการกำหนดหอกอุปมานเชิงทฤษฎี (theoretical analogue) ของหอกลิ้นจิ่ง ปรากฏว่าผลการคำนวณของหอกลิ้นอุปมานั้น สอดคล้องอย่างดีพอควรกับข้อมูลที่ได้จากหอกลิ้นจิ่ง รวมทั้งอุณหภูมิของแต่ละชั้นและเส้นแสดงจุดเดือดจริงของการกลั่นของทุก ๆ ผลิตภัณฑ์ที่แยกได้ วิธีที่ใช้แก้แบบจำลองได้ปรับปรุงมาจากวิธีของนิวตัน-ราฟสัน ต่อไป ได้ใช้โปรแกรมคอมพิวเตอร์นี้ จำลองผลการกลั่นน้ำมันดิบที่สภาวะอัตราส่วนการบ่อนกลับและอุณหภูมิการแฟลชต่าง ๆ แล้วเปรียบเทียบเงื่อนไขการทำงานทั้งหมดที่ไม่ได้ให้ผลิตภัณฑ์ที่ผิดรายละเอียดคุณภาพ เพื่อหาเงื่อนไขการทำงานที่เหมาะสมที่สุดในแง่การเพิ่มกำไรรวม

จุฬาลงกรณ์มหาวิทยาลัย

Thesis Title Computer Modelling and Optimization of An Existing
Oil Refinery Topping Column
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Department Chemical Engineering
Academic Year 1985



ABSTRACT

An actual topping column has been modeled using the concept of pseudomulticomponent distillation. The crude oil is divided into 39 fractions of distinct properties. A theoretical analogue of the actual column is first determined. The simulated results of the analogue column are found to agree reasonably well with the actual data, including the plate temperatures and the TBP distillation curves of the fractionated products. The modified 2N-Newton-Raphson method is used in the simulation. Next the present computer program was used to simulate the crude distillation at various reflux ratio and flash temperatures. Then all operating conditions that did not yield off-specification products were compared to find an optimum condition that most improved the overall profit.

จุฬาลงกรณ์มหาวิทยาลัย

ACKNOWLEDGEMENTS



The author wishes to express his sincere appreciation to Associate Professor Wiwut Tanthapanichakoon for his invaluable advice and comments to this study. Thanks also to Associate Professor Sutham Vanichseni, Assistant Professor Chairit Satayaprasert, and Associate Professor Kroekchai Sukanjanatee for serving on the thesis committee. In particular the author wishes to thank to the Thai Government for the financial support. Finally, the author is indebted to her parents for their encouragements.

Polshom Chan-urai

May, 1986.

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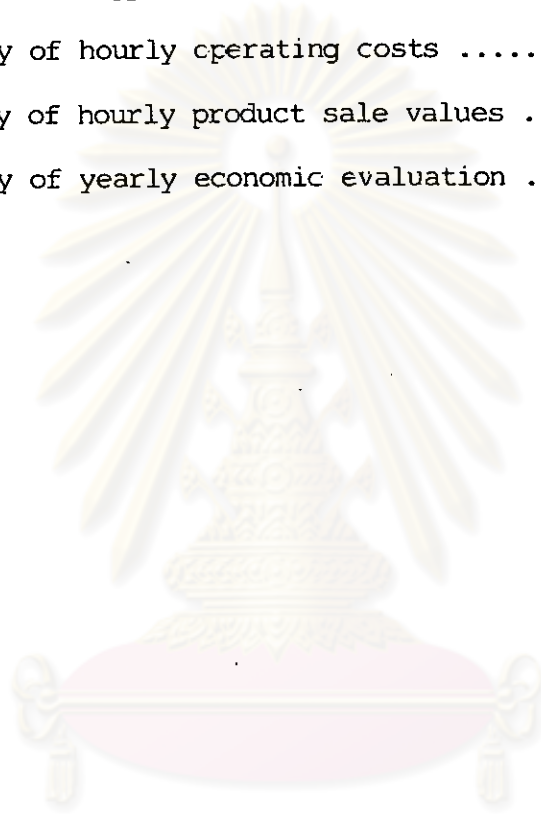
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NOMENCLATURES



A_{ji}	= Absorption factor
c	= Total number of components
C_i	= Component material balance matrix
F	= Column vector in total material balances, Eq.(29)
f_i	= Column vector in component material balances, Eq.(43)
F_0, F_j	= Equilibrium function, Eqs.(54,56)
FS_i	= Stripping steam flow rate, lb mol/h
G_j	= Enthalpy balance function, Eq.(59)
h_{ji}	= Component liquid enthalpy, Btu/lb mol
H_{ji}	= Component vapor enthalpy, Btu/lb mol
H	= J^{-1} , used in Broyden algorithm
J	= Jacobian matrix
K_{ji}	= Ideal solution K-value
l_{ji}	= Component liquid flow rate, lb mol/h
L_j	= Total liquid flow rate, lb mol/h
N	= Total number of theoretical stages
NW	= Sidestream withdrawal plate
NV	= Plate below which vapor stream from sidestripper is returned
NP	= Pumparound withdrawal plate
NQ	= Plate to which liquid-pumparound stream is returned
NF	= Feed plate
NT	= Bottom plate of main column
$NTOP$	= Top plate of sidestripper
$NBOT$	= Bottom plate of sidestripper

P_c	= Partial pressure of water, psia
P_j	= Pressure above plate j , psia
Q_j	= j -th plate head load, Btu/h
R_j	= Mole ratio factor, Eq.(18)
s	= Step size
T_B	= Average boiling point, R
T_j	= j -th plate temperature, C
T	= Total material balance matrix
v_{ji}	= Component vapor flow rate, lb mol/h
V_j	= Total vapor flow rate, lb mol/h
w_{ji}	= Component sidestream flow rate, lb mol/h
W_0, W_j	= Total sidestream flow rate, lb mol/h
x	= Column vector in Newton-Raphson equation, Eq.(66)
y	= Vector of functional values, Eq.(75)
0_j	= Flow ratio multiplier, Eq.(16)

Subscripts

a	= Assumed value
i	= Component number (for water, = c)
j	= Stage number
k	= Calculation trial number