

EXERGY ANALYSIS FOR A PETROLEUM REFINERY



Mr. Saran Umpuch

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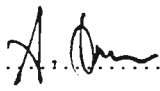
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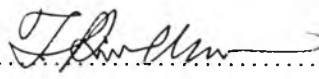
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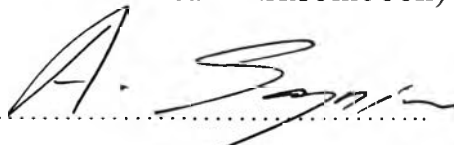
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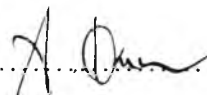
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บทคัดย่อ

นายศรัณย์ อัมพช : การวิเคราะห์เอ็กซ์เซอจีในโรงกลั่นน้ำมัน (Exergy Analysis for a Petroleum Refinery) อ. ที่ปรึกษา : ศ. ดร. แฟรงค์ อาร์ สจ๊วต ผศ. ดร. วีรศักดิ์ ฤกษ์สมบูรณ์ และ ดร.อนุสรณ์ แสงนันทกุล 126หน้า ISBN 974-334-147-1

การวิเคราะห์เอ็กซ์เซอจีเป็นวิธีการใหม่ในการหาประสิทธิภาพทางเทอร์โมไดนามิกของกระบวนการความร้อนและกระบวนการเคมี โดยใช้หลักของกฎข้อที่สองของเทอร์โมไดนามิกในการศึกษาที่ใช้ข้อมูลในการศึกษาจากโรงกลั่นน้ำมันที่สองของโรงกลั่นน้ำมันบางจากซึ่งประกอบด้วย9หน่วยการผลิตและใช้โปรแกรมProvision IIช่วยในการคำนวณ จากการศึกษาพบว่าประสิทธิภาพทางเทอร์โมไดนามิกของโรงกลั่นน้ำมันนี้ประมาณ30เปอร์เซ็นต์และในหน่วยการผลิตที่มีเตาเผาจะมีประสิทธิภาพต่ำกว่าหน่วยการผลิตอื่น แนวทางในการปรับปรุงประสิทธิภาพได้ถูกเสนอไว้สามแนวทางคือ 1)ลดอัตราส่วนป้อนกลับของหอกลิ้นบางตัว, 2)เพิ่มอุณหภูมิของอากาศโดยใช้ความร้อนจากเตาเผา, 3)ใช้เครื่องแลกเปลี่ยนความร้อนแทนเตาเผาในหน่วยแตกตาไโอดีกรีฟอร์มมิ่ง

ABSTRACT

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The aim of exergy analysis is to detect and evaluate quantitatively thermodynamic imperfection of the process under consideration. Therefore, exergy analysis can indicate the possibility of thermodynamic improvement of the process, but only an economic analysis can decide the expediency of a possible improvement. In this work, exergy analysis was implemented on plant2 which is one of the complexes in the Bangchak refinery. The complex consisted of 9 units in total. The exergetic efficiency of the overall and individual units was determined using the operating plant data in associate with a Provision II computer program. The results indicate that the exergetic efficiency of the complex is about 30% and the units equipped with furnaces yield lower exergetic efficiency. A number of modifications for thermodynamic improvement of the complex have been proposed as follows: i) to reduce a reflux ratio of distillation column, ii) to preheat air with effluent combustion gas, and iii) to replace a furnace with a high pressure steam heat exchanger in Catalytic Reforming Unit.

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LIST OF SYMBOLS

B	=	Total exergy
B_p	=	Potential exergy
B_k	=	Kinetic exergy
B_{ph}	=	Physical exergy
B_{ch}	=	Chemical exergy
$\sum \Delta B_{gu}$	=	Useful exergy increase in heat reservoir
$-\sum \Delta B_{gf}$	=	Useful exergy loss of feeding heat reservoir (positive if added to system)
B_{au}	=	Exergy in useful product
B_d	=	Exergy delivered to system in feed materials
B_{df}	=	Exergy delivered in driving materials (fuel)
C_p	=	Heat Capacity
H	=	Enthalpy
H_0	=	Enthalpy at reference standard
S	=	Entropy
S_0	=	Entropy at reference standard
P	=	Partial pressure
P_0	=	Reference pressure, 1 atmosphere
T	=	Temperature
T_0	=	Reference temperature, 25°C
μ_i	=	Chemical potential of species i
X_i	=	Mole fraction of species i
R	=	Gas constant
γ_i	=	Activity coefficient of species i