出國洽公報告

計畫編號： 289

289林園石化芳香烴製程整合及新產品開發

石化事業部
企劃處企劃師　　陳國棟
企劃處策略組工程師　　莊秀涝

出國地點:美國
出國期間:89年10月16日至89年10月29日
報告日期:90年元月03日

保存年限：3年

5B0-HRD-06
頁次：1/1

目　　錄

壹、前言：

對位二甲苯係本公司主要石化產品之一，生產於石化事業部林園石化廠芳二組的第一/二吸附分離工場及芳三組的第三吸附分離工場。第一/二吸附分離工場早在民國六十八年即完成設計生產，基於當時的技術，對位二甲苯產品純度僅達99.0%回收率亦祇有93%而已。多年來由於製程公司的不斷研究與發展及對工場吸附劑性能的改良，目前此產品純度已提升至99.8%以上，而且回收率也已經高於97%，不但大幅減少了下游工廠產品的不良率，更減輕了工場的生產成本。現其製程已被廣泛的使用在世界上(包括目前的台塑麥寮廠)。今由於公司上級長官的睿智領導，有鑑於此產品將來的世界潮流趨勢以及下游廠商未來的要求，更顧慮到今後市場的競爭能力，因而擬定了對位二甲苯產品純度提升及芳香烴增產計劃。其主要目的為將本公司此種產品純度提升至98%以上，並提高產能由年產40萬噸至年產54萬噸。全部計劃從民國八十六年開始進行，工程包括有吸附分離製程設計、修改與裝建,吸附劑ADS-7更換為ADS-27，第一/第三異構化裝置換新觸媒及第二異構化觸媒類型更換和製程修

改等，其中第一階段吸附分離製程設計、修改與裝建，吸附劑更換與第一、第三異構化觸媒換新等部份已於今年五月陸續完成,並從89年2月起開始提供下游廠商中美和公司高純度的對位二甲苯產品了。

緊接著即是第二階段的後段工程:即第二異構化裝置觸媒類型更換與製程修改設計和第二吸附分離工場終餾塔修改等工作，其中第二異構化觸媒類型更換與製程修改設計已於今年四月經董事會通過，七月與美國 EXXONMOBIL 公司完成簽約手續，預定採用其 MHAI 異構化技術並由其首先進行工場修改的基本設計, 接著再由本公司自己進行細部設計與施工。此基本設計工作自今年八月五日開始進行預計十八個月內完成。在設計工作進行中除平時雙方均以電報及 E-mail 進行問題討論外，預計在第八週及第十六週時由雙方各派代表進行面對面之 process review meeting 。這次我等之奉派出國主要任務之一即為此:至 EXXONMOBIL 公司所在地休士頓參與此項會議，會後再至吸附分離製程設計公司 UOP 公司所在地芝加哥參加工場第一階段完成 revamping 後的操作問題討論，最後於返程中至洛杉機

Oratec 公司參觀了解有關塔槽周邊設備與運用，於 10 月 30 日返廠上班，共為期十四天。

貳、工作紀要

一、MHAI 製程研討

89 年 10 月 16 日下午二時由高雄出發,經過國際換日線,抵達休士頓時還是 10 月 16 日，惟已深夜 12 時了。經過 ExxonMobil 公司委託之接機人員接送至旅館後更已到 17 日凌晨一時,在整頓好行李後就寢。10 月 17 日早上，休士頓晴天，正是工作的好天氣，一早到 ExxonMobil 公司途中，看見美國地大物博，公共建設完備，百姓生活秩序良好，真令人羨慕，在這樣的環境工作，的確是另有一番風味。ExxonMobil 公司位在休士頓靠海的 Baytown，德州的化學工場多集中在這一帶，放眼望去，煙囪林立，想必夜晚時分，工場燈光點燃時，必是如同天上繁星一般壯觀。看了沿途美景，終究到達 ExxonMobil 公司。抵達會議辦公室，首先與 ExxonMobil 公司的有關人員見面及相互認識後，會議準時於 9 點鐘開始。全部會議討論摘要如下；

1.1.參與會議人員:

ExxonMobil 公司人員；

Ronald J Cimini, PH.D (TS&L Technical Support Group Leader)

David R. Starkey (Licensing Executive ,TS&L)

Andy M. Heister (Manager, TS&L technical Support)

Selma Kwok (Engineer, TS&L technical Support)

K.A.(Ken) Garrison (Engineering Associate, Basic Chemical Baytown Chemical Plant)

C.P.C. 人員；

陳期闖 (第二分離工場長)

陳國棟 (專案經理)

莊秀涝 (策略組方法工程師)

1.2.進行議題：

討論內容如附件一

1.2.1. Overview of process scheme

MHAI 製程主要目的為將 P-X 產量提高至年產能 18 萬噸。

操作條件：	design
WHSV	12.0
H_2/HC Mole Ratio	3.3
Inlet Pressure, PSIG	160
EB Conversion, wt%	75

1.2.2. Overview of PFDs

完成該製程之初步 PFDs，其中包括反應器部份進料量及補充氫氣量的控制，進料輸送設備、加熱爐、反應器、壓縮機、換熱器等等之查核；去庚烷塔及週邊設計查核；新增苯塔及週邊設備說明，圖件如附件二。

1.2.3. Heat & material balance

以 PR II 模擬結果之熱/質量平均資料，以供查核管線及公用物料之用，資料如附件三。

1.2.4.Reactor Section

1.2.4.1.換熱器部份

反應器進出料換熱器 4651E 經查核後，對觸媒操作初期/末期(SOC/EOC)所需之 duty 分別為 78/88 MMBTU/HR，較原設計 143 MMBTU/HR 之值少，故現有之 4651F 不須修改。

反應器出口冷凝器 4652E 及 4653E 之 SOC/EOC 為 32/33；4.9/4.9 MMBTU/HR，比較原設計 48 MMBTU/HR 及 5.8 MMBTU/HR，兩部冷凝器仍可繼續使用。

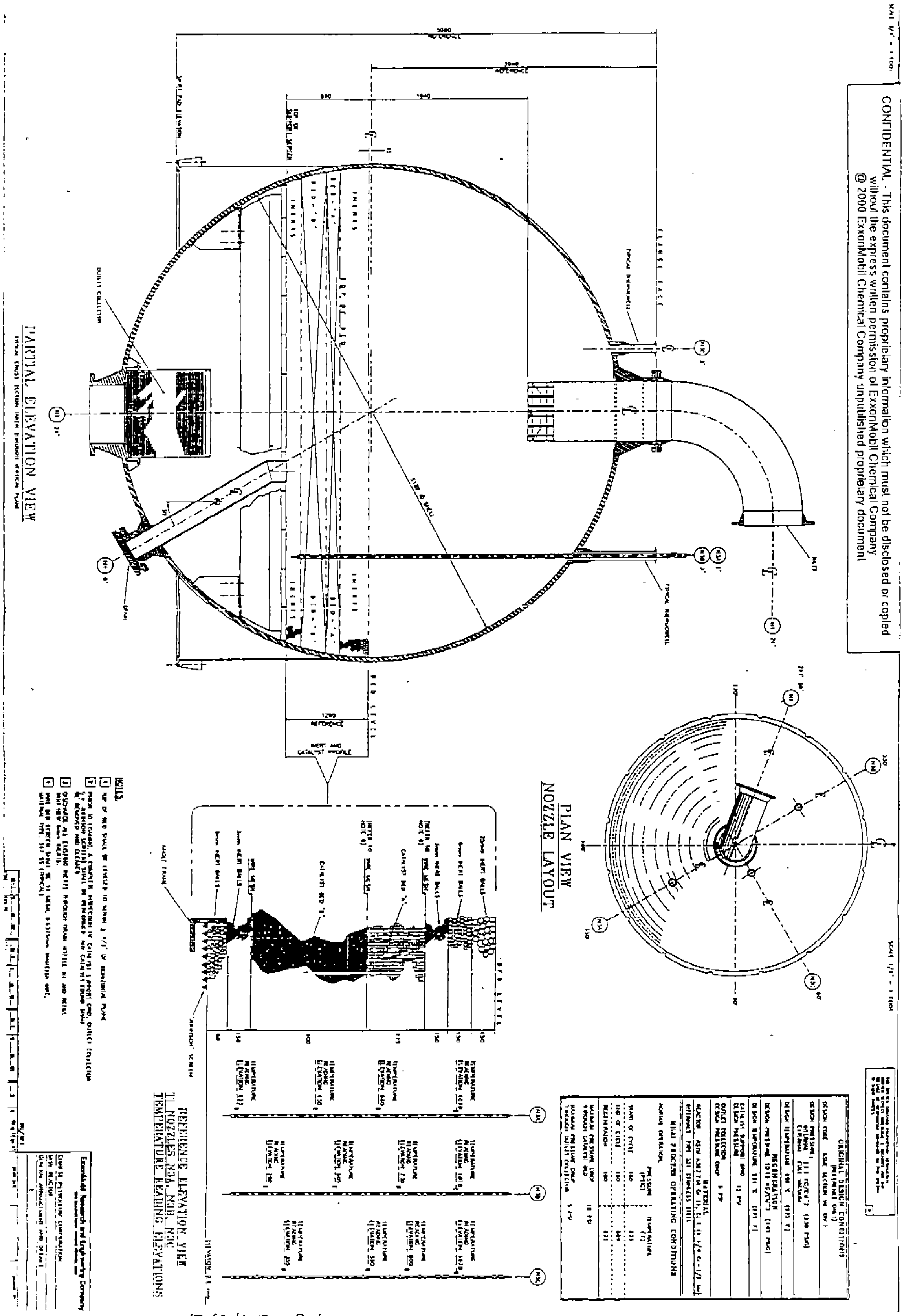
加熱爐 4651F 之 SOC/EOC 為 47/48 MMBTU/HR，比

較原設計 85 MMBTU/HR，4651F 仍可繼續使用。

1.2.4.2.反應器部份

就現有之 support screen 及溫度計 nozzle，內部觸媒及墊球裝填方式及溫度位置；為能確實掌握反應器內溫度變化，共有三支溫度計，擺設地點為原來位置，而每一測量溫度計之測點共四個測試點。

觸媒裝填方式，以一般裝填即可(不必使用密實裝填(dense loading))，但因反應器直徑大，觸媒床高度比較淺，故在裝填時須特別考慮到是否鋪平的問題，以免產生溝流(channeling flow)現象而影響操作。另在觸媒層之上、下層還需鋪置 1/8"、1/4"、1" 鋁墊球以增進油氣之分配效果及避免觸媒平面因沖擊而改變。目前林園廠唯獨無 1/8"及 1"之鋁墊球，已申請請購中。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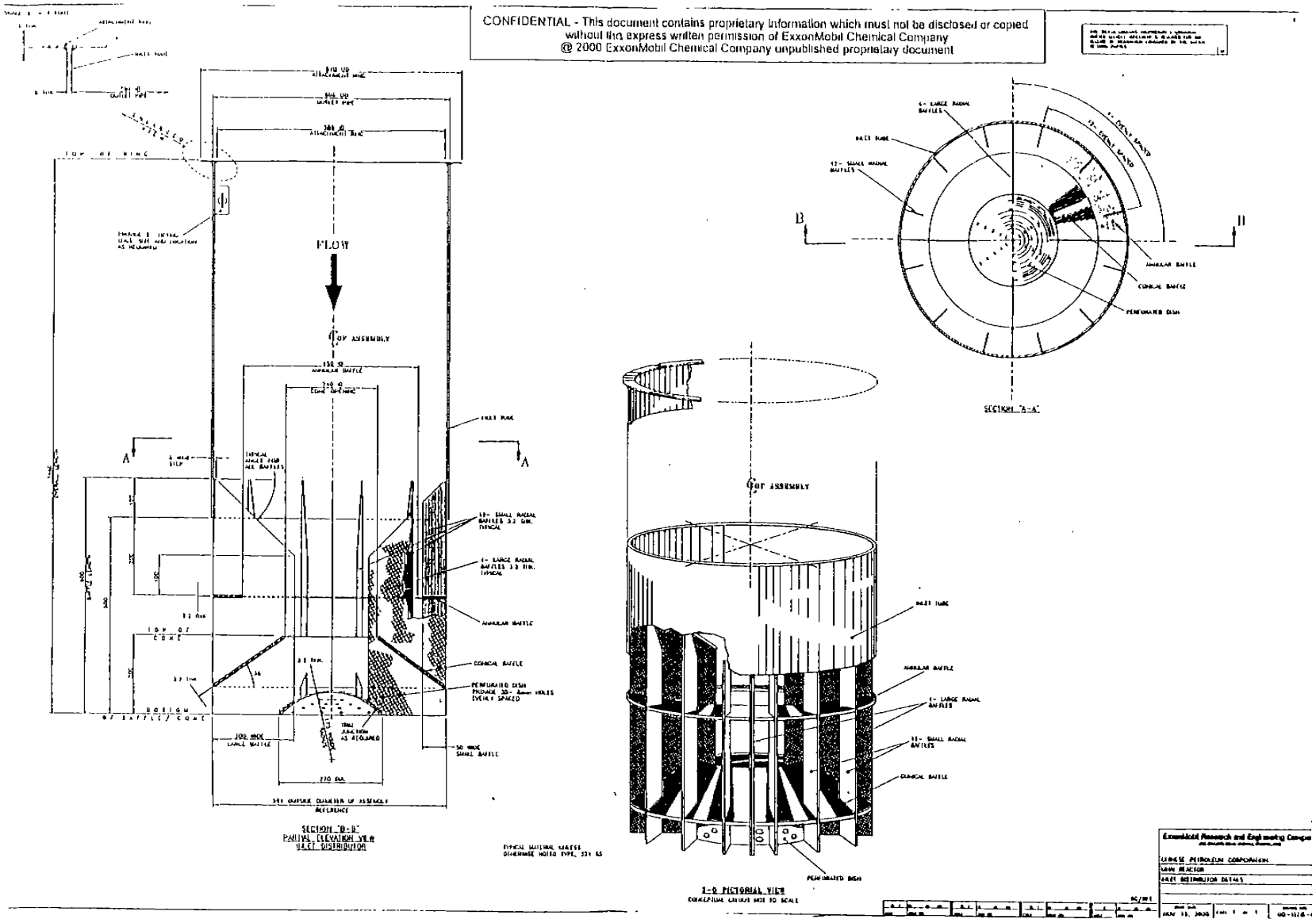
PARTIAL ELEVATION VIEW
PLAN VIEW
NOZZLE LAYOUT
REFERENCE ELEVATION VIEW
TI NOZZLES N3A, N3B, N3C
TEMPERATURE READING ELEVATIONS
NOTES
ORIGINAL DESIGN CONDITIONS
MILD PROCESS OPERATING CONDITIONS
INERT AND CATALYST PROFILE



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對於反應器部份之控制將有些許改變，第一、氫氣改自壓縮機出口處引入，並與 recycle gas 混合後，利用氫氣線上成份分析來調整補充氫氣量以達設計之氫油比，第二、於 minimum flow 上加一控制閥，若循環氣體量過小時，可調整 minimum flow 流量及壓縮機轉速，以保護壓縮機及製程穩定性。

1.2.4.3..壓縮機：原設計與 MHAI 製程比較

	Design	MHAI
	"Mini"	Lineout
MW	6.8	8.9
H_2/HC		3.3
H_2 purity, mol%	74	74
Reactor H2 pp, PSIA		>100
Inlet, PSIG	262	132
Outlet, PSIG	317	172
ACFM	8,000	5,020
Polytropic Heat ,ft	24,200	25,400

經查核，壓縮機設計在高流量及高壓，可操作在低流量及低壓狀況下，故壓縮機所須之馬力降低，以上壓縮機操作條件以現有之壓縮機 4651C 仍可使用。

1.2.5.蒸餾部份

現有異構化裝置製程除去庚烷塔外，又增加一苯塔及其週邊設備，以下為蒸餾部份之討論。

1.2.5.1.去庚烷塔(4651V)及週邊設備

a.去庚烷塔

頂部輕成份排放至第四媒組工場之氣液分離器，輕迴流取消，內件不須更換，苯塔之進料由第 44 層側取，側取層之內件修改如下圖：

去庚烷塔內件修改圖

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CPC MHAI Project
Deheptanizer Tower 4651V
Sidedraw Partial Drawoff Tray

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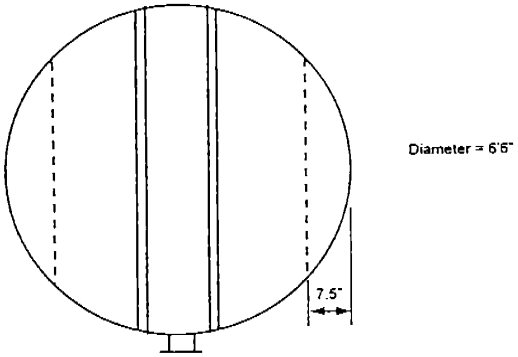
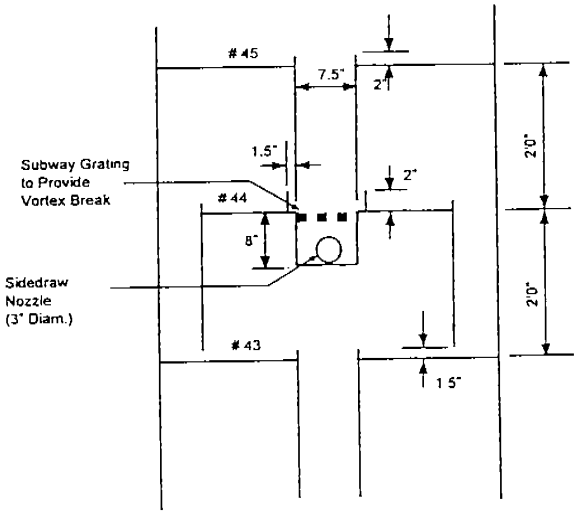




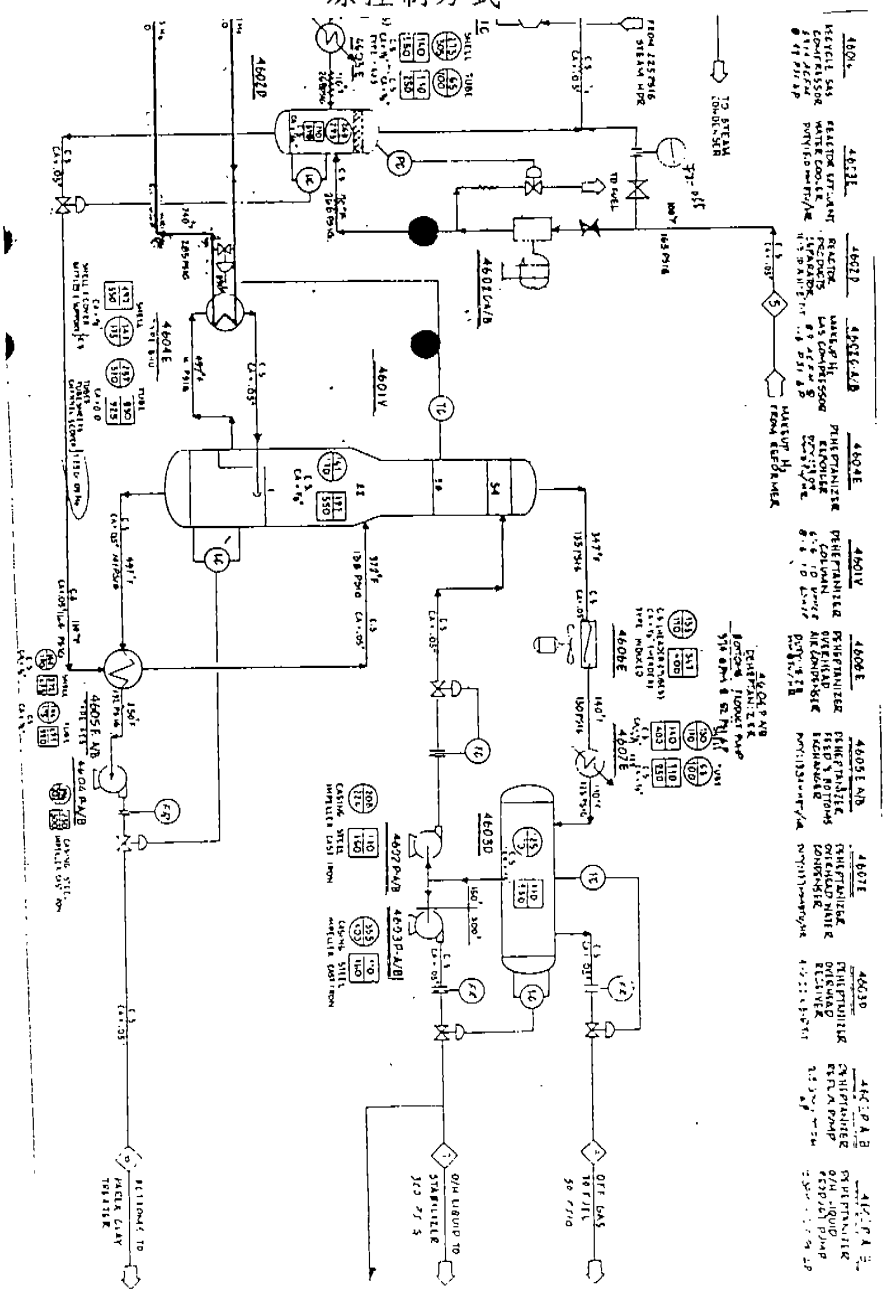
再沸器 4654E 加熱改以底部第 12 層溫度控制(新增儀控)，原 36 層溫度控制點改控制苯塔進料之控制閥。

b.熱交換器部份

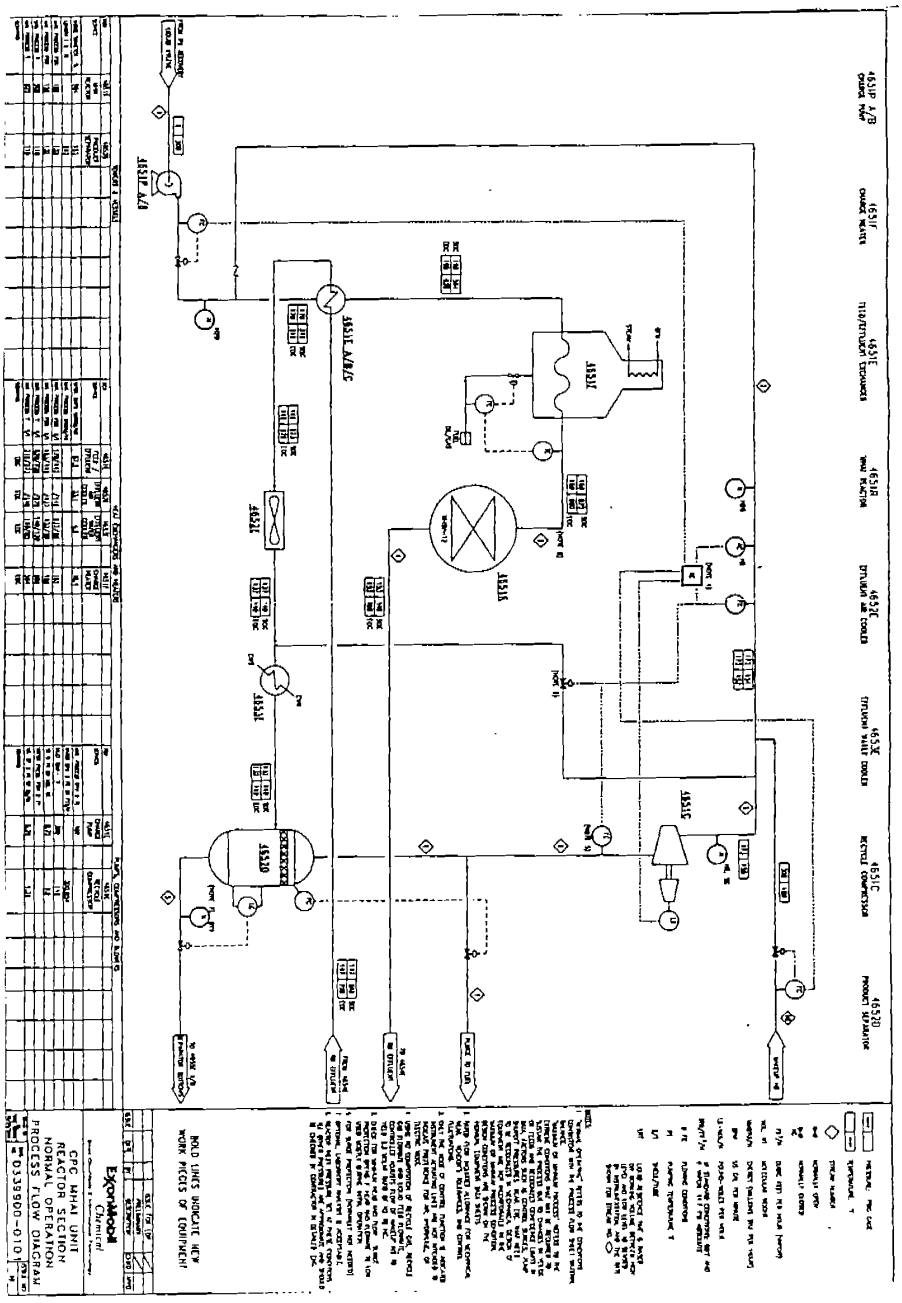
4654E 再沸器之 Duty/蒸發量設計值為 33.5MMBUT/HR/65%，修改後操作值為 31.9 MMBUT/HR/50%，故本座再沸器可保留。4655E 進料與底部流體換熱器，Duty 設計值為 22.9 MMBUT/HR，操作 Duty 為 19.9 MMBUT/HR，可用。4657E 塔頂水冷凝器，Duty 設計值為 1.6 MMBUT/HR，操作 Duty 為 1.2 MMBUT/HR，可用。4656E 頂部空氣冷凝器，Duty 設計值為 21.0 MMBUT/HR，操作 Duty 為 19.8 MMBUT/HR，可用。

c.頂部控制方式

原控制方式



修改後控制方式



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d.輸送設備

4652P 塔頂迴流泵浦，可用，控制閥亦不須修改。4653P 因輕質油泵出量由原 40GPM 減至 0.6GPM，泵量大量減少，須增配最小迴流管線，故建議 ExxonMobil 公司重新計算新的 4653P，現有的泵浦移給第一吸附分離工場 4601V 頂部輕迴流用，如此可節省設備及操作費用，免於浪費。4654P 之揚程夠將混合二甲苯輸送至吸附分離裝置，故沿用。

1.2.5.2.苯塔及週邊設備

a.本單元為全新系統，新增設備如下：

苯塔(4652V)

白土塔(兩座)

白土塔熱交換器(4668E)

白土塔換熱器(4669E)

塔頂冷凝器(4662E)

頂部流體冷卻器(4663E)

苯產品冷卻器(4664E)

再沸器(4666E)

塔底流體(4665E)

輕質氣體冷凝器(4667E)

迴流槽(4663D)

氣液分離器(4664D)

迴流泵浦(4663P)

產品泵浦(4664P)

塔底泵浦(4665P)

b.白土塔系統

擬將苯產品中溴指數處理至小於 20ppm，白土塔末期操作溫度須約達 400℃，為避免流體在白土塔內有氣化現象，故於 4651V 側取管線上增設 4662P，以避免流體氣化。

c.苯塔

塔槽尺寸：(ID-T) 18"-48"，Flooding range60%~70%，single pass ，trays，進料層為23層，共67層，sieve trays，成品取出層為62/56層，取出量以56層及49層之溫差控制，苯純度為98.5wt%，每日產量100kl。塔頂為水冷式冷凝器(4662E)，以迴流槽4663D壓力控制調節Light gas排放至low pressure burner燃燒，benzene drag 則以4663D液位控制調節。再沸器(4666E)之熱源為中壓蒸汽，蒸汽量以第六層溫度控制，塔底餾出物主要成份為甲苯，則送轉烷化工場或輸油課甲苯槽。

苯塔結構圖

ExxonMobil Chemical Company

CPC MHAI Project
Benzene Tower 4652V
Benzene Tower Plan

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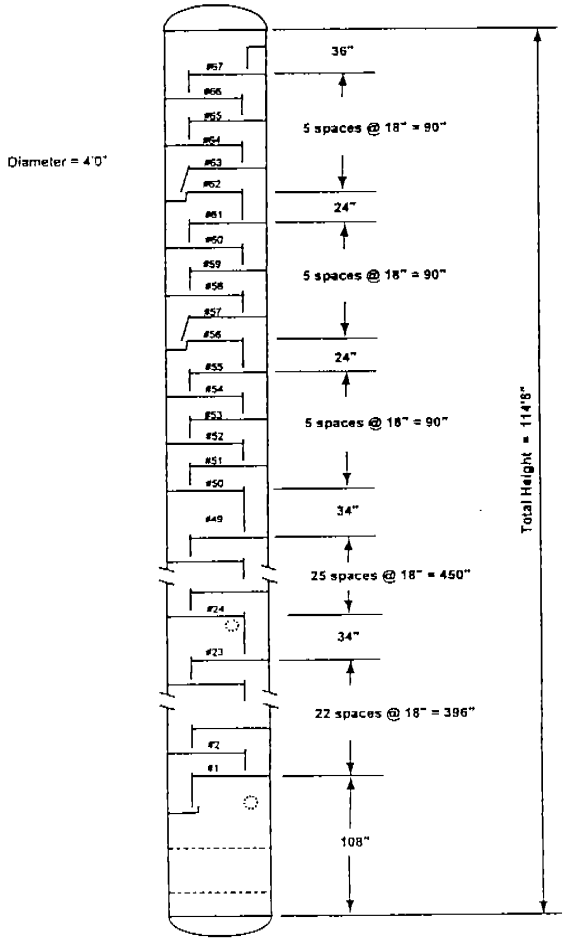
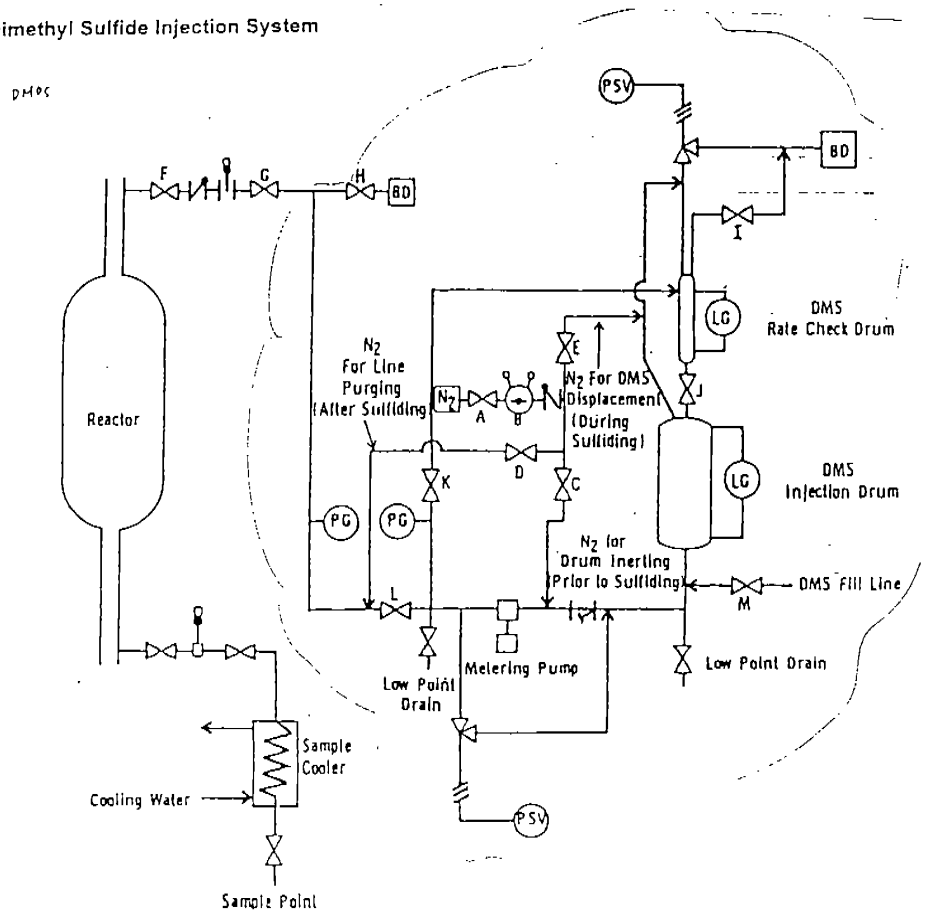


1.2.5.3.預硫化

MHAI 觸媒預硫化之硫化劑為 DMDS，時間為觸媒進油前，此屬 MHAI 觸媒開爐前處理步驟。

預硫化裝置如圖

Figure A3-1 Dimethyl Sulfide Injection System



1.2.5.4.再生

再生時，需使用儀器空氣，控制再生氣體中氧成份在 0.4mole%，即以調整再生後之循環氣體量為之，但忌水份，故進反應器之再生氣體須以乾燥器先去除水份，其 maximum 水份含量為 5 ppmV。

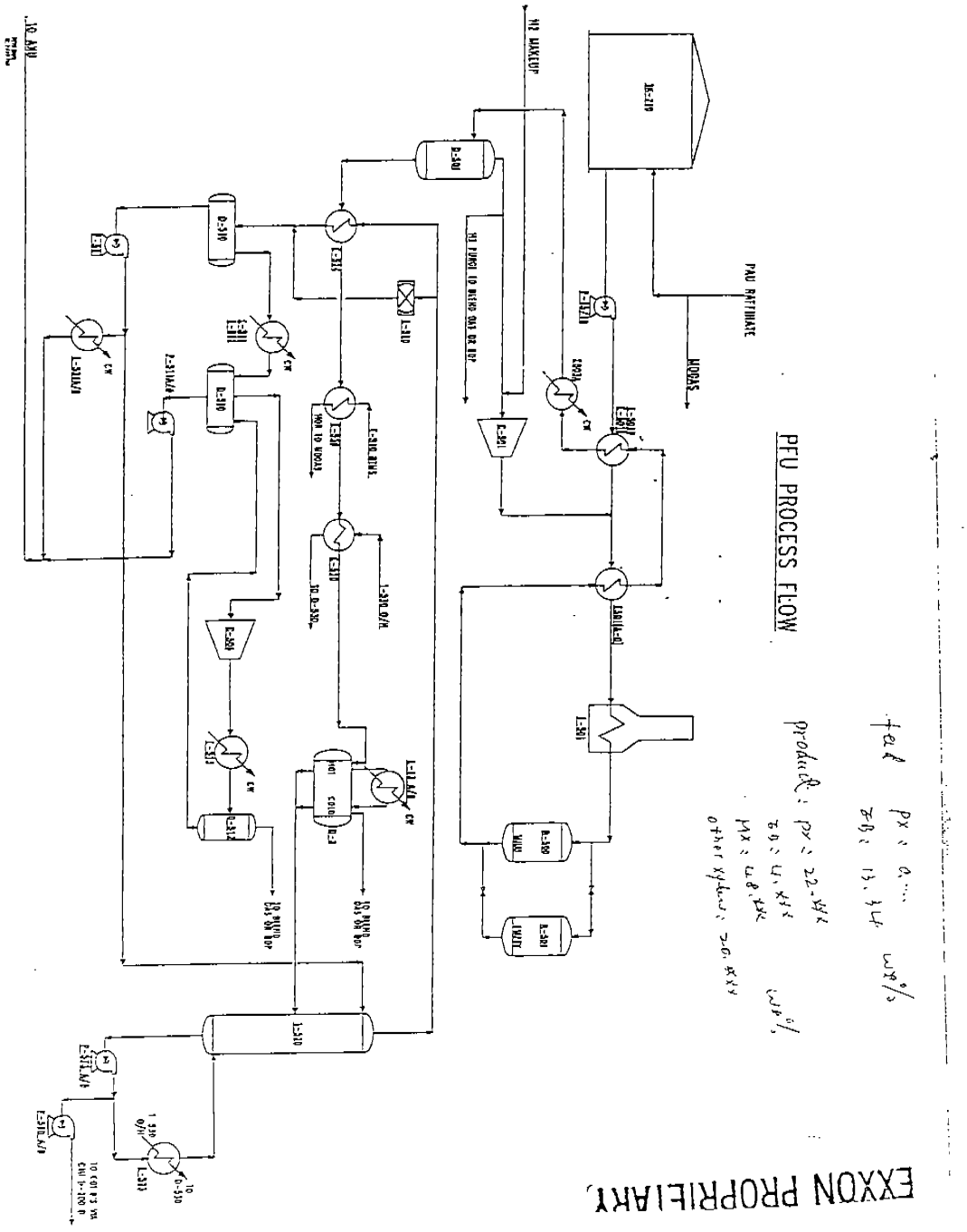
1.2.5.5.MAHI 製程工場參觀

a.進廠前置作業

10 月 19 日一早，ExxonMobil 公司伙伴送來安全帽、防護鏡及工作服(衣服是美國尺寸，我們一竿人等穿起來像是古代人，尤其是女性，更糟，衣服上節尚可當洋裝，更何況長褲則可沿路掃地，好不狼狽樣)，待裝備穿戴齊全後，坐上車直駛廠區，這時，又可領會到美國地大的優點。辦公區與廠區約一公里遠，進入廠區前被要求配件要確實穿戴(即使是在廠區的路上走)。

b. PFU PROCESS FLOW

該工場最大的特點為進料有一座 15000kl 之緩衝槽，可不受限對位二甲苯工場短暫停爐而獨立操作，擁有一座高壓分離器及一座低壓分離器，可節省氫氣量，進料 EB 含量約 13%，產品品質中對位二甲苯約 22%、EB 約 4%、間位二甲苯約 48%、鄰位二甲苯約 20%及其它，此間工場使用 MHAI 製程後迄今已六年，尚未再生，操作狀況平穩。流程圖如下


PFU PROCESS FLOW
EXXON PROPRIETARY

工場參觀完畢，亦是我等一行人在 ExxonMobil 公司任務完成時，傍晚時分與 ExxonMobil 公司與會人員道別後，踏上回旅社的路上，休息後，隔日將飛往芝加哥另一段工作之旅。

二、芝加哥

10 月 20 日，芝加哥天候寒冷，厚重衣服終於派上用場。與 UOP 公司討論議題為吸附分離工場 revamping 後操作問題探討，為讓其事先了解與準備，於出國前就將問題 E-mail 給承辦人。詳細如下:

2.1.參與開會人員:

UOP 公司:

Ed M. Victor (Process Coordinator, Separations & Aromatics Operating Technical Services Department)
Yasushi Fujii (Process Coordinator, Separations & Aromatics Operating Technical Services Department)
T.Y. Chen (Senior Marketing representative Far East Marketing)

C.P.C.人員:

陳期闖 (第二分離工場長)

陳國棟 (專案經理)

莊秀涝 (策略組方法工程師)。。。

2.2.討論內容: (附件四)

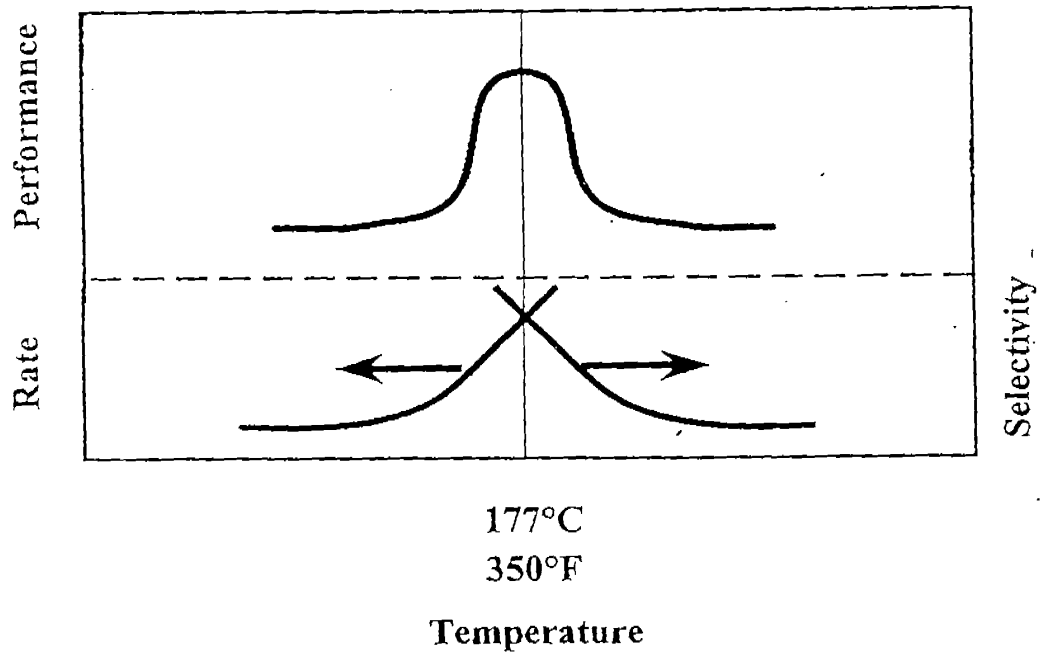
2.2.1 吸附分離罐最適化的操作溫度與影響：

2.2.1.1.依據 UOP 的研究吸附罐之操作溫度以控制於 177℃(± 2℃)為最佳，因為在此狀況下吸附劑

可得到最理想的質能傳輸效率及吸附選擇性。

2.2.1.2.溫度對吸附劑性能影響曲線圖如下

Temperature Effect



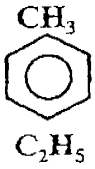
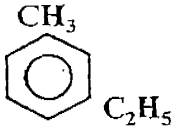
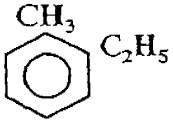
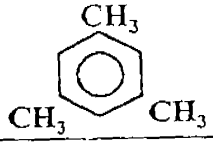
2.2.2.，請重新審核吸附分離工場進料點改變規劃，並檢討是否為造成對位二甲苯產品含微量 C9 的原因。

2.2.2.1.對位二甲苯產品中含微量 C9 的原因為前段二甲苯分餾部份操作不良，操作中應多注意二甲分餾部份操作，如利用塔內差溫控制及裝設 on-line GC 監視等。目前因本廠三套二甲分餾裝置均無此設置，擬提資料請 UOP 規劃差溫控制設置點後建議裝設。

2.2.2.3.C9-C10 重成份易屯積在吸附劑上、增加解附劑用量、消耗公用物料，當重成份濃度增高到一定量，則影響對位二甲苯產品品質，C11 甚至在吸附劑上產生聚合反應，堵塞吸附孔隙，降低吸附劑壽命。

2.2.2.4.若吸附分離進料中含有 C9 成份，尤以以下成份 pMEB，因其親合力與 PX 相當對吸附劑與產品影響更巨：

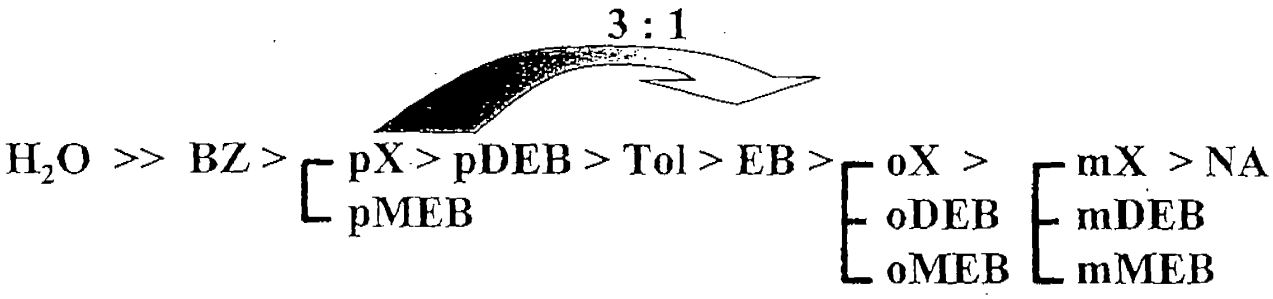
C_9 Aromatics

Feed C_9A Component		Boiling Point, °F(°C)
	1,4 Methylethylbenzene	324 (162)
	1,3 Methylethylbenzene	322 (161)
	1,2 Methylethylbenzene	329 (165)
	1,3,5 Trimethylbenzene	329 (165)

吸附劑親和力的排序

Parex Adsorbent

Relative Affinity Scale



PRX-MLTC-Sec. 2-15

2.2.3.二甲苯分離工場因景氣不佳，長期間停爐方法及旋轉閥、吸附劑保護討論:

2.2.3.1.吸附分離裝置停爐步驟如附件四 Parex unit shutdown I/II/III。

2.2.3.2.吸附罐保持壓力 50 psig 左右，不足時以 N2 補充。

2.2.3.3.旋轉閥 Teflon seat 因長久停滯未轉動，其未接觸部位恐有下垂之慮，最好取出，待開爐再裝回，避免因此造成磨損。

2.2.4.吸附劑水的添加與控制

2.2.4.1.注入水水質需為去離子及脫氧水，由解附劑處注入。

2.2.4.2.吸附劑 ADS-27 之注入水量應維持進料量的 150 ppmw。其水量計算應包含進料含水量、解附劑及第二沖洗液含水量等之總和。

2.2.4.3.在吸附區的液體中水要保持 60-80wt-ppm。操作中經由各 on-line 水份分析儀及水腳排水量計算調整水的平衡。

2.2.4.5.由吸附罐吸附劑取樣點取樣也可確認吸附劑的水含

量。

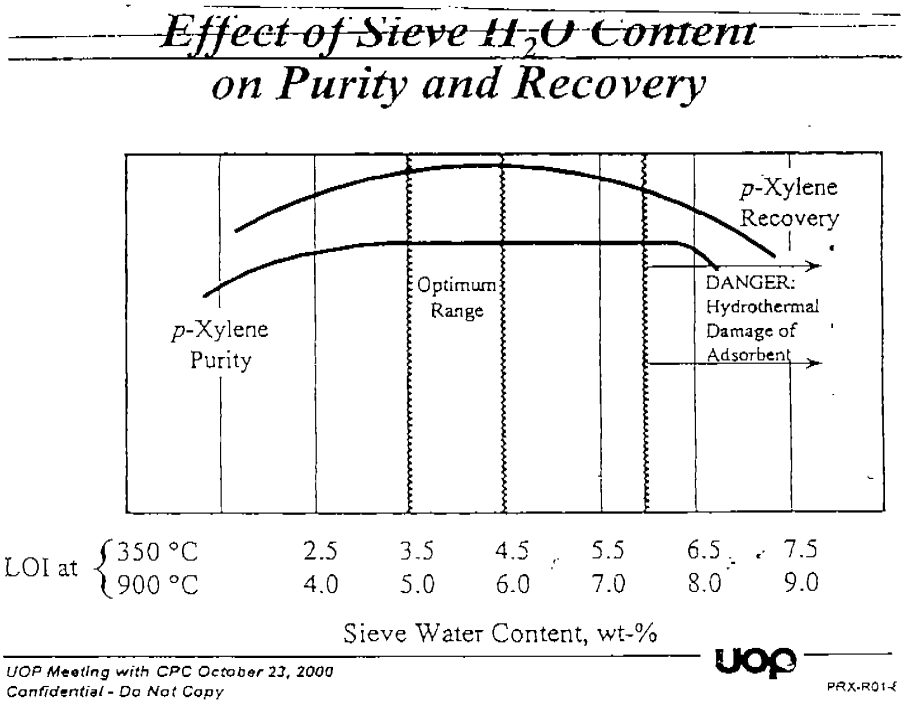
2.2.5.水份對吸附效率之影響

2.2.5.1.注入水過多將造成:

a.工場操作效率降低:諸如產品純度降低、回收率下降等。

b. 吸附劑永久的損害。

2.2.5.2.注入水少於理想值時，將影響吸附選擇性，進而造成產品污染不合格。通常污染為MX含量高。



2.2.6.吸附罐端部沖洗液

2.2.6.1.進入流量

進入端部沖洗液的流量係由解附劑流量內分取。目的為預防端部污染。其流量大小以足夠阻止吸附罐上下二端部柵格板(grid)上呼吸管因旋轉閥轉動吸附床變換時壓力改變，所造成之呼吸汙染即可。

2.2.6.2.流出流量

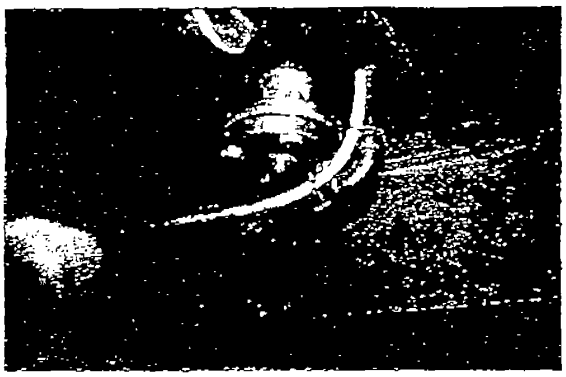
a. 目的為減少進入端部沖洗液的流量再流入吸附床而影響吸附罐各工作區之流量計算值(zone flow)，以及減少因此而可能發生的吸附罐污染

b. 流出流量之設定為流入流量的 50%，視污染狀況可逐漸提高至 70%，以減少對吸附罐內部流量計算值的影響。

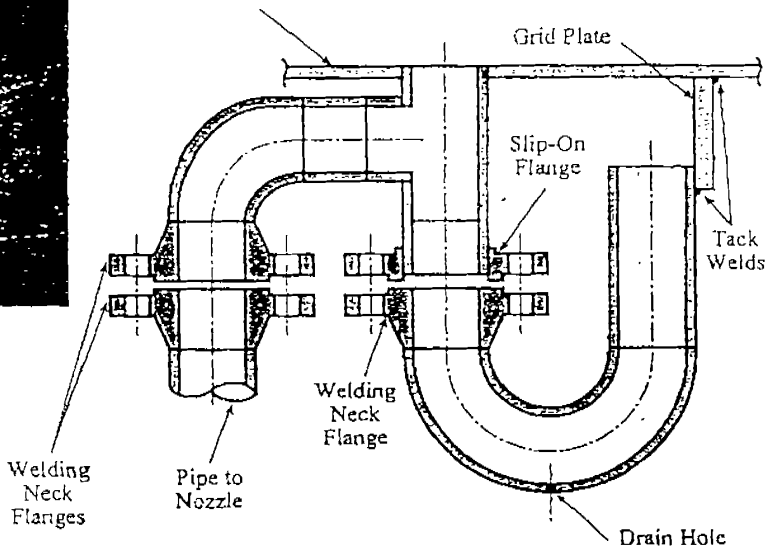
c. Snorkel design

Snorkel Design

Old Design



New Design



三、洛杉磯之旅(拜訪 ORATEC 公司)

結束 UOP 公司的訪問後，轉往洛杉磯拜訪 ORATEC 公司。ORATEC 公司為一家儀器公司，由簡介中了解最新的儀器發展與運用，資料如附件五。

參、心得與感想

首先感謝上級給了這次美國行的機會，使我能親身体驗、了解美國的文化。在美之時正值美國總統大選前二週，雖然平時由雜誌及媒體可見到許多有關總統候選人的資訊及報導，並了解二人實力相當競爭激烈，但當身抵美國時，卻見到各處並無異樣，街頭難得見到競選廣告，更未見競選花招，電視媒体除電視政見辯論全國聯播外宣傳亦不多。美國人民各個仍然兢兢業業的從事本人工作，毫不受影響，問及心理感受時回答僅是關心但不參與不影響作息。此與台灣的選舉迥然不同，從政府至社團、民間、從都市遠至偏僻地區無不同樣沸騰，幾乎可說是全民參與的全民運動，其耗用大量的資源及社會成本。

到了 ExxonMobil 公司先會見參與本案的諸位人士，眼見個個忙碌的工作於每人之小隔間內。ExxonMobil 為世界級之大公司其位於休士頓之石化部總公司並不如想像中豪華，辦公區與工場區集中在一起和本廠相似，但員工有高昂的工作熱忱度，人人獨當一面工作勤奮，未見悠閒人力，即使中午休息時間亦到處可見到有人在辦公桌上繼續辦公。包括我們的會議亦被徵求在中午用餐稍

事寒喧後隨即開始，下午下班也在完成當日預定進度才停止，公司並無所為謂的 overtime(第一天開會即至近 6 點)。此種敬業精神確是值得即將面臨競爭的我們去學習的。

在 ExxonMobil 二天會期的設計資料檢視討論中，除了當場相互澄清與補正者外，還提列了 18 項 action item list(附件五)由雙方會後分頭進行。在新製程中由於我們規定苯產品之溴指數必須小於 20，因此事後 ExxonMobil 公司認為還要增加一白土塔處理，基於白土種類不同、性能迥異及工程範圍(scope)規定，此應由白土廠家設計(包括相關換加熱系統之 sizing)ExxonMobil 僅提供設計成份而已。在這次的會議中經努力爭取結果已獲同意以本廠常用之白土廠牌資料代為設計，如此將來可為公司節省部份設計費用，此為此行令我們感到欣慰之事。

到了 UOP 公司由 UOP 中國人陳德裕先生帶領至製程操作技術服務部門開會，會中討論吸附分離工場 revamping 後之操作問題，有關 revamping 後之操作問題及疑問均於此會議中獲得澄清與了解(附件四)，並對 ADS-27 有更深入認識，此不但有助於今後工場之操作，對我之專業知識亦大有收獲。

肆、建議與結論

這次行程由於路途遙遠，啟程須搭飛機 15 小時包括轉機等候共需 20 小時，又加上兩地時差有 13 小時，恰好日夜顛倒，對不常遠行的我們，真可謂是一段艱辛的行程，但想起能利用期間假日欣賞異地人情風光、增廣見聞，不盡又覺得欣喜且疲意全消。謹此再次感謝上級給予這次美國行的機會。

對於行程中上級所交予的任務可謂圓滿達成。以下為對此行任務基於有益操作及減輕成本考量，做如下的建議與決定，此仍有待與經理與有關部門討論再作最後執行；

1. 新設備苯塔迴流槽排氣，因其主要成份為 $C5^{-}$可回收當燃料氣使用，但因其壓力低僅 3 psig 而燃氣系統壓力卻為 40 psig 無法排入，因此 ExxonMobil 公司設計一增壓泵浦、一冷卻器及一分離槽再送燃料氣系統。考慮投資、日後維護成本及操作之簡易性建議變更設計為直接送入異構化加熱爐燃燒，再將異構化加熱爐燃器擇一改為 low pressure burner 即可。
2. 當討論 MHAI 觸媒再生時，ExxonMobil 公司提到為保護觸媒其循環氣体水含量必需控制小於 5PPMV，因此必需利用乾燥劑乾

燥才可。此與本工場目前使用觸媒再生方法迥然不同(不需乾燥)，其原始預定拆除之二舊廢棄乾燥器、空地供新苯塔建造用之計劃是否須另行討論與研議?因此在會中先提議請 ExxonMobil 公司提供再生時反應器出口氣体之可能含水量資料並計算評估現有二舊乾燥器是否適用。MHAI 觸媒再生選擇有二其優缺點為:A.off-site 再生優點；因 MHAI 觸媒壽命長(可達 6 年以上)可不必投資乾燥器及相關設備，又本觸媒為租用，一則可不必承擔再生風險二則可隨時選擇更換新型觸媒。缺點為觸媒卸除與包裝均需在無氧環境下工作，危險性高且須運至國外處理，將來技術、承包商及運輸都可能是問題，另若用新觸媒租金將提高(22.5$/lb 每年(前二年)),操作操作成本增加。B.on-site 再生優點為時間易控制、觸媒可再用、租金較便宜(13$/lb 每年)，操作成本低，缺點為須投資乾燥設備。

3. 對位二甲苯產品 revamping 後常有微量 C9(0.1wt%)出現，影響純度，經與 UOP 討論結果指出進料中若含有 pMEB(C9)成份，復加上前段二甲苯分餾塔操作不良時確會發現，因此成份之親合力與 PX 相近。解決之道為多注意二甲苯塔分餾操作及進料成份，操

作時藉著塔槽中段的 PDIC 控制以及在該處設置 on-line GC 監視以為預防，目前本廠三套 Parex 工場均無此設備，今後是否裝設仍有待討論研究後提請長官裁示。

伍、附　　件

附件一.

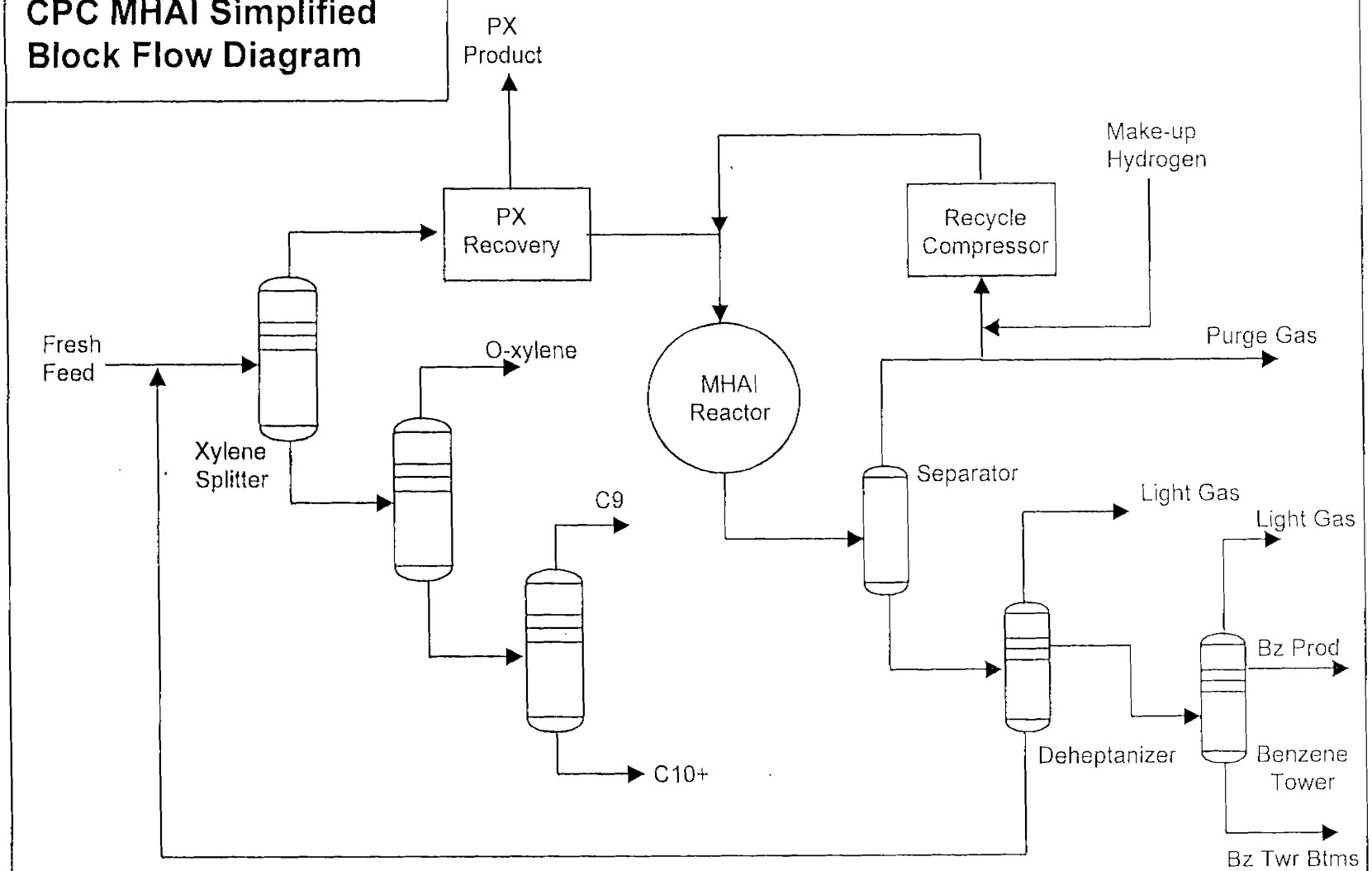
CPC MHAI Process Review Meeting

October 17-19, 2000

CPC MHAI PROCESS REVIEW MEETING

- Overview of Process Scheme
- Overview of PFDs
- Heat & Material Balances
- Reactor Section
- Fractionation Scheme
- Operating Modes
- Tour of Baytown Isomerization Unit

CPC MHAI Simplified Block Flow Diagram



CPC MHAI Heat & Material Balances

- Start of Cycle (SOC)
- End of Cycle (EOC)
- De-edging
- Regeneration (Not Complete)

CPC MHAI: Design Operating Conditions

	Design
Weight Hourly Space Velocity, hr^{-1}	12.0
H_2/HC Mole Ratio	3.3
Pressure (rx inlet), PSIG	160
Ethylbenzene Conversion, wt%	75

Reactor Section

CPC MHAI: Reactor Section

- Impact of SOC and EOC on Process Duties
- Heater Performance
- Compressor Performance
- Reactor Loading & Internals
- Control Scheme/Analyzers

Feed / Effluent Exchanger 4651E (Existing)

- 3 Shells, A,B,C
- Design Duty 143 MMBTU/H
- MHAI duty (SOC/EOC) 78/88 MMBTU/H
- MHAI Pressure drop ~ 5 psi (S&T)

Reactor Effluent Condenser 4652E (Existing)

- Airfin Cooler
- 3 Bays
- Design Duty 48 MMBTU/H
- MHAI duty (SOC/EOC) 32/33 MMBTU/H
- MHAI Pressure drop < 5 psi

Reactor Effluent Trim Condenser 4653E (Existing)

- Water cooler
- Design Duty 5.8 MMBTU/H
- MHAI duty (SOC/EOC) 4.9/4.9 MMBTU/H
- MHAI duty (de-edge, spillback) < 5 MMBTU/H
- MHAI Pressure drop < 5 psi

Charge Heater 4651F (Existing)

- Arbor type
- 36 Passes
- Design duty 85 MMBTU/H
- Design outlet temp 900 F
- MHAI duty (SOC/EOC) 47/48 MMBTU/H
- MHAI pressure drop < 5 psi

Recycle Gas Compressor 4651C (Existing)

- Steam driven
- Designed at high flow, high pressure
- Can operate at lower flow, lower pressure
- Lower compressor horsepower required
- Evaluated at normal & de-edge conditions

CPC MHAI: Compressor Performance

	"Maxi" Design	MHAI Normal
MW	6.8	8.9
H2/HC		3.3
H2 Purity, mol%	74	74
Reactor H2 pp, PSIA		>100
Inlet, PSIG	262	132
Outlet, PSIG	317	172
ACFM	8,000	5,020
Polytropic Head, ft	24,200	25,400

CPC MHAI: Compressor Performance

	"Mini" Design	MHAI Lineout
MW	6.8	12.2
H2/HC		1.0
H2 Purity, mol%	74	65
Reactor H2 pp, PSIA		60
Inlet, PSIG	262	120
Outlet, PSIG	288	145
ACFM	4,190	3,950
Polytropic Head, ft	11,780	13,400

Note: Lineout case includes 50% spillback flow

MHAI Reactor Loading and Internals

- Shown on Reactor Diagram

MHAI Control/Analyzers Schemes

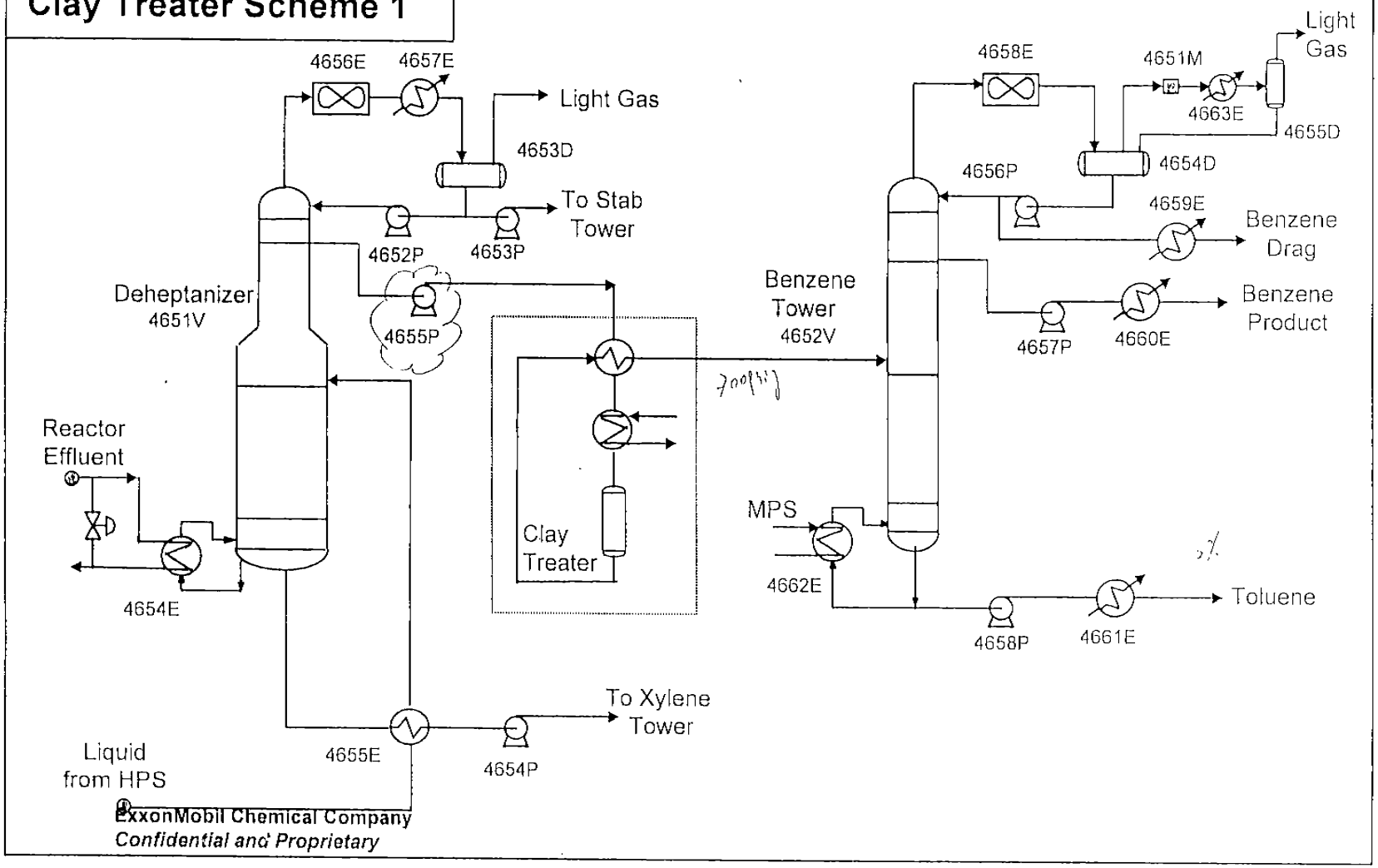
- Modes of process control shown on PFDs
  - →H2:HC Ratio Control
  - →Compressor Spillback Control
- Analyzers

Fractionation Section

Fractionation Section

- Clay Treater Location
- Tower Optimization
- Tower Design
- Heat Exchangers
- Control Scheme
- Analyzers

CPC MHAI
Fractionation Section
Clay Treater Scheme 1



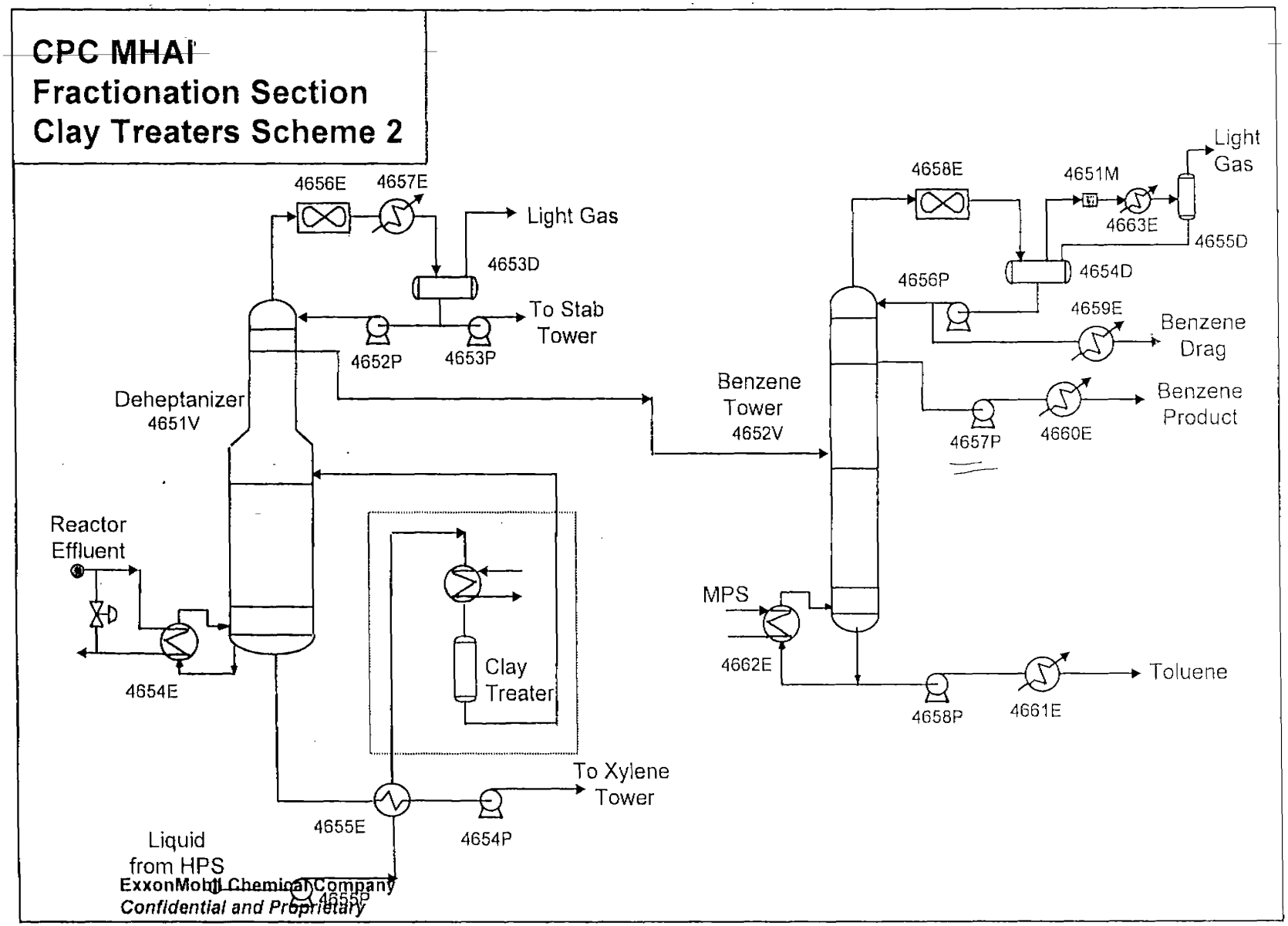
Clay Treater Location

- Scheme 1:
  - Benzene Tower Feed
    - Smaller Equipment
    - High Pressure Operation (>300 psig)
    - Heavies from Clay Treating will exit with Benzene Tower Bottoms

Clay Treater Location

- Scheme 2:
  - Deheptanizer Feed
    - Larger Equipment
    - Do not Need Clay Treater Fd/Eff Heat Exchanger
    - Shorter Clay Life than Scheme 1
    - Heavies from Clay Treating will exit through Deheptanizer Bottoms
    - Potential Channeling Problem

CPC MHAI
Fractionation Section
Clay Treaters Scheme 2



Tower Optimization

- Deheptanizer
  - Sidedraw Location
  - Operating Pressure
- Benzene Tower
  - Number of Trays
  - Sidedraw Location
  - Feed Location

Deheptanizer Optimization

- Sidedraw Location
  - Benzene/Toluene Split (Toluene Recovery)
  - Non-aromatics in Sidedraw
- Operating Pressure
  - System Hydraulics
    - Light End Battery Limit
    - Feed Pressure

Benzene Tower Optimization

- Number of Trays
  - → Duty Requirement
- Sidedraw Location
  - → Benzene Purity
    - Toluene Content
    - Non-aromatics Content
- Feed Location
  - → Duty Requirement

Deheptanizer Tower 4651V (Existing)

- Partial liquid drawoff added at tray 44
- TI point added for control
- Existing trays rated at MHAI conditions

Benzene Tower Internals 4652V (New)

- Sieve trays
- Flush nozzle for reflux return
- Sidedraw partial liquid drawoff at tray# 56
- Alternate partial liquid drawoff at tray # 62
- Flashing feed distributor at tray # 23
- Bottom tray sealed, spillover to boot
- Reboiler liquid & product withdrawn from common nozzle at tower bottom
- Reboiler return below bottom tray

Benzene Tower Sizing 4652V (New)

- Portion of tray area unused
- 18" tray spacing acceptable
- 48" diameter adequate
- Flooding ranges 60% to 70%
- Single pass trays

CPC MHAI : Pump Requirement

- New Pumps
  - → Deheptanizer Sidedraw (4655P)
    - Pending Decision on Clay Treater Location
  - → Benzene Overhead Reflux/Drag (4656P)
    - Sized for Drag Stream ΔP Requirement
  - → Benzene Product (4657P)
  - → Benzene Tower Bottoms (4658P)

CPC MHAI : Pump Requirement

- Existing Pumps
  - 4651P, 4652P
    - Pump delivers more head than required at similar flowrate
    - Need to check valve for DP capability
  - 4653P
    - Low Flow: may need to add spillback/min-flow capability
    - Need to check control valve for flow requirement
  - 4654P
    - P_{out} may not meet requirement for Deheptanizer bottoms battery limit conditions

Deheptanizer Preheater 4655E (Existing)

- 2 Shells, Type AES
- Design Duty 22.9 MMBTU/H
- Operating duty 19.9 MMBTU/H
- Process Pressure drop < 12/4 psi (S/T)

Deheptanizer Reboiler 4654E (Existing)

- 1 Shells, "Once-through" Thermosiphon, Type BHU
- Design Duty 33.5 MMBTU/H
- Operating Duty 31.9 MMBTU/H
- Effluent Pressure drop < 5 psi
- Reboil Pressure drop ~1 psi
- Reboiled with Reactor Effluent
- Designed for 65% vaporization
- Rated at 50% vaporization
- Effluent bypass varies from 25% (de-edge) to 60 % (EOC)

Deheptanizer Overhead Trim Cooler 4657E (Existing)

- Water Cooler
- Design Duty 1.6 MMBTU/H
- Operating Duty 1.2 MMBTU/H
- Process Pressure drop < 5 psi

Deheptanizer Overhead Condenser 4656E (Existing)

- Airfin Condenser
- 2 Bays
- Design Duty 21.0 MMBTU/H
- Operating Duty 19.8 MMBTU/H
- Process Pressure drop < 5 psi

Benzene Product Cooler 4660E (New)

- Water Cooler
- Operating Duty .34 MMBTU/H
- Process Pressure drop < 10 psi

Benzene Tower Bottoms Cooler 4661E (New)

- Water Cooler
- Operating Duty .21 MMBTU/H
- Process Pressure drop < 10 psi (S & T)

double pipe

Benzene Tower Reboiler 4662E (New)

- 1 Shell, Vertical Thermosiphon, Type NEN
- <25% Vaporization
- MHAI Duty 2.8 MMBTU/H
- Medium Pressure Steam as Heating Element
- Reboil Pressure drop < 3 psi

Benzene Tower Overhead Light Gas Cooler 4663E (New)

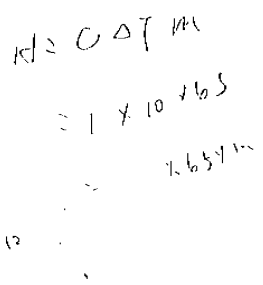
- Water Cooler
- Operating Duty .005 MMBTU/H
- Process Pressure drop < 10 psi (S & T)

Benzene Tower Overhead Condenser 4658E (New)

- Airfin Condenser
- 1 Bay
- Operating Duty 3.5 MMBTU/H
- Process Pressure drop < 5 psi

Bz Tower Drag Cooler 4659E (New)

- Water Cooler
- Operating Duty .012 MMBTU/H
- Process Pressure drop < 10 psi (S & T)



CPC MHAI : Utilities

- To be determined after finalized heat & material balance

Analyzers

- Deheptanizer
- Benzene Tower

Tower Control Scheme

- Deheptanizer
  - TC Locations
    - Parametric Study
      - C8+ Aromatics in Sidedraw
      - Benzene/Toluene Recovery
  - Auxiliary Equipment
- Benzene Tower
  - TC Locations
    - Parametric Study
      - Benzene Purity
      - Benzene Recovery
  - Auxiliary Equipment

CPC MHAI: Operating Cases

- Presulfiding & Startup
- De-edging
- Regeneration

Operating Cases

CPC MHAI: De-edging

- Objective: Accelerate time needed to reach target benzene purity
  - → H2 partial pressure 50-60 PSIA
    - Temper high initial activity
    - Reduced ring saturation
  - → Average reactor temperature 780-810 F
    - Minimum WHSV of 10.0
    - Maintain EBC at 75%
  - → Recycle compressor operation requires spillback
  - → Reduces initial light-ends production

PRESULFIDING & STARTUP

- Objective: Temper metal activity/exotherm at startup
  - →Used to temper initial metal activity
  - →Add DMDS just prior to oil-in
  - →Use >5x Theoretical ~ 10 liters DMDS
  - →Inject to provide 500 ppm at rx inlet
  - →Inject at point as close as possible to reactor inlet

CPC MHAI: De-edging

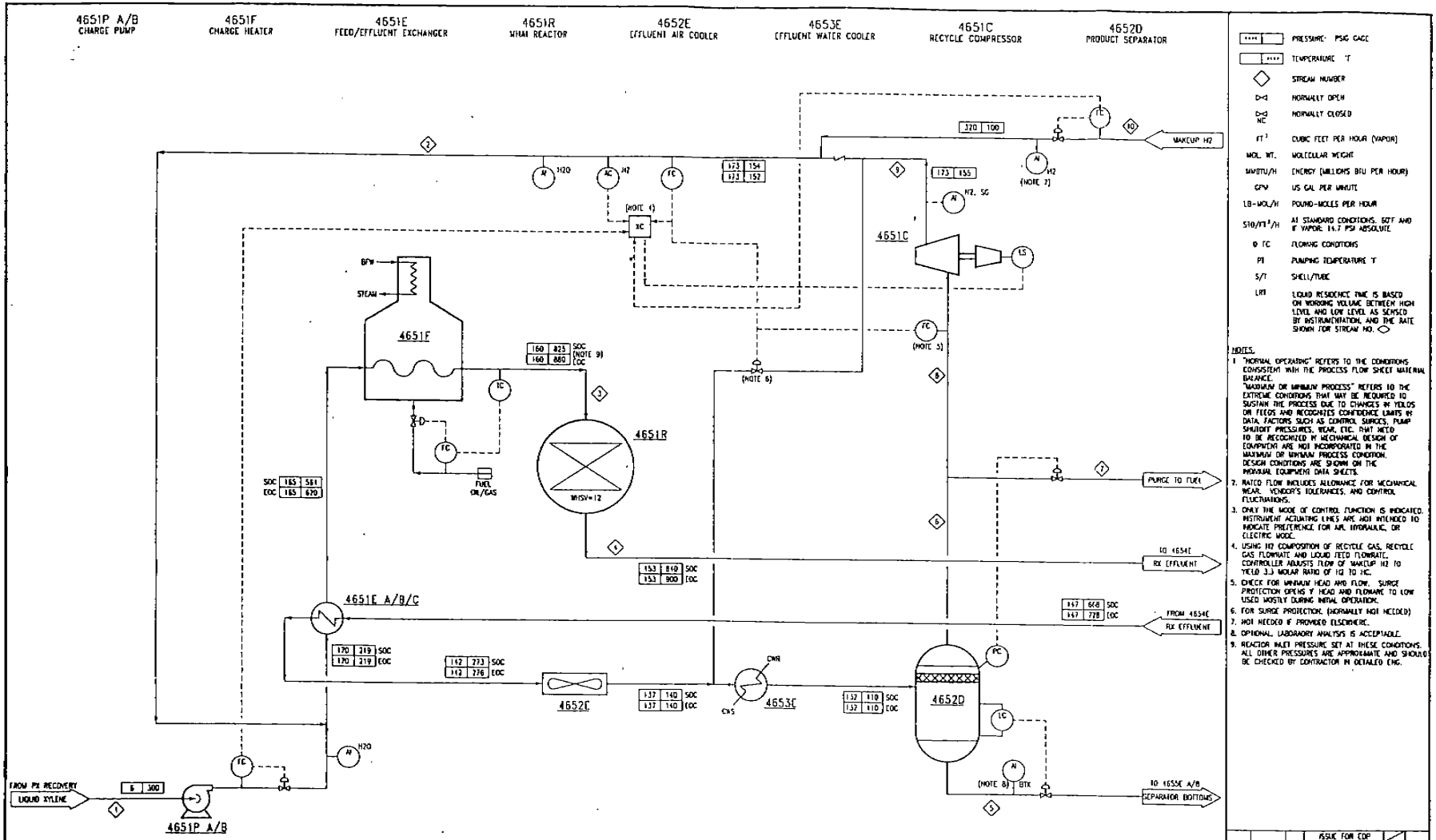
Pilot Plant Results

Days	H2 pp PSIA	C5- Yield Wt%	H2 Cons SCF/B
1	55	2.4	90
5	55	2.0	70
11	55	2.1	80
20	55	1.9	70
45	100	2.6	120
60	100	2.6	120

CPC MHAI : Regeneration

Reactor Inlet Pressure, kg/cm2a	19
Reactor Inlet Temperature, C	385
Reactor Outlet Temperature, C	468
Reactor Inlet Oxygen, mol% dry air	0.7
Burn Cycle, days	4-5

附件二.



PRESSURE- PSIG GAGE
TEMPERATURE °F
STREAM NUMBER
NORMALLY OPEN
NORMALLY CLOSED
FT³ CUBIC FEET PER HOUR (VAPOR)
MOL. WT. MOLECULAR WEIGHT
MMBTU/H ENERGY (MILLIONS BTU PER HOUR)
GPM US GAL PER MINUTE
LB-MOL/H POUND-MOLES PER HOUR
STD/FT³/H AT STANDARD CONDITIONS, 60°F AND IF VAPOR, 14.7 PSI ABSOLUTE
@ FC FLOWING CONDITIONS
PT PUMPING TEMPERATURE °F
S/T SHELL/TUBE
LRT LIQUID RESIDENCE TIME IS BASED ON WORKING VOLUME BETWEEN HIGH LEVEL AND LOW LEVEL AS SENSED BY INSTRUMENTATION, AND THE RATE SHOWN FOR STREAM NO.

NOTES.
1. "NORMAL OPERATING" REFERS TO THE CONDITIONS CONSISTENT WITH THE PROCESS FLOW SHEET MATERIAL BALANCE.
"MAXIMUM OR MINIMUM PROCESS" REFERS TO THE EXTREME CONDITIONS THAT MAY BE REQUIRED TO SUSTAIN THE PROCESS DUE TO CHANGES IN YIELDS OR FEEDS AND RECOGNIZES CONFIDENCE LIMITS IN DATA, FACTORS SUCH AS CONTROL SURGES, PUMP SHUTOFF PRESSURES, WEAR, ETC. THAT NEED TO BE RECOGNIZED IN MECHANICAL DESIGN OF EQUIPMENT ARE NOT INCORPORATED IN THE MAXIMUM OR MINIMUM PROCESS CONDITION. DESIGN CONDITIONS ARE SHOWN ON THE INDIVIDUAL EQUIPMENT DATA SHEETS.
2. RATED FLOW INCLUDES ALLOWANCE FOR MECHANICAL WEAR, VENDOR'S TOLERANCES, AND CONTROL FLUCTUATIONS.
3. ONLY THE MODE OF CONTROL FUNCTION IS INDICATED. INSTRUMENT ACTUATING LINES ARE NOT INTENDED TO INDICATE PREFERENCE FOR A/E, HYDRAULIC, OR ELECTRIC MODE.
4. USING H2 COMPOSITION OF RECYCLE GAS, RECYCLE GAS FLOWRATE AND LIQUID FEED FLOWRATE, CONTROLLER ADJUSTS FLOW OF MAKEUP H2 TO YIELD 3.3 MOLAR RATIO OF H2 TO HC.
5. CHECK FOR MINIMUM HEAD AND FLOW. SURGE PROTECTION OPENS IF HEAD AND FLOWRATE TO LOW USED MOSTLY DURING INITIAL OPERATION.
6. FOR SURGE PROTECTION. (NORMALLY NOT NEEDED)
7. NOT NEEDED IF PROVIDED ELSEWHERE.
8. OPTIONAL. LABORATORY ANALYSIS IS ACCEPTABLE.
9. REACTOR INLET PRESSURE SET AT THESE CONDITIONS. ALL OTHER PRESSURES ARE APPROXIMATE AND SHOULD BE CHECKED BY CONTRACTOR IN DETAILED ENG.

TOWERS & VESSELS

ITEM	4651R		4652D
SERVICE:	MHAI REACTOR		PRODUCT SEPARATOR
INSIDE DIAMETER IN.	204		123
LENGTH T-T IN.	204		242
MAX. PROCESS PSIG			
MIN. PROCESS PSIG	130		
MAX. PROCESS °F	910		110
MIN. PROCESS °F	825		110
REMARKS:			

HEAT EXCHANGERS AND HEATERS

ITEM	4651E	4652E	4653E	4651F
SERVICE:	FEED / EFFLUENT	EFFLUENT AIR COOLER	EFFLUENT WATER COOLER	CHARGE HEATER
OPER. DUTY: MMBTU/HR	87.5	33.1	4.9	48.1
MAX. PROCESS: MMBTU/HR				
MAX. PROCESS: PSIG				
MIN. PROCESS: PSIG S/T	163/134	/134	132/	160
MAX. PROCESS °F S/T	870/738	/273	110/120	600
MIN. PROCESS °F S/T		/110	110/85	
REMARKS:	EOC	EOC	EOC	EOC

PUMPS, COMPRESSORS AND BLOWERS

ITEM	4651C	4651C
SERVICE	CHARGE PUMP	RECYCLE COMPRESSOR
MAX. PROCESS GPM @ FC	488	
RATED GPM @ FC OR FT3/H		265,379
INLET TEMP. °F	300	110
SG @ PT OR MOL WT	0.877	8.7
WATER PRESS. PSIG @ PT		
NPSH @ PT OR Cp/Cv	0.76	1.31
REMARKS:		

ISSUE	DATE	BY	DESCRIPTION	CHKD	APPD
			ISSUE FOR EDP		
	10/6/00		PRELIMINARY		

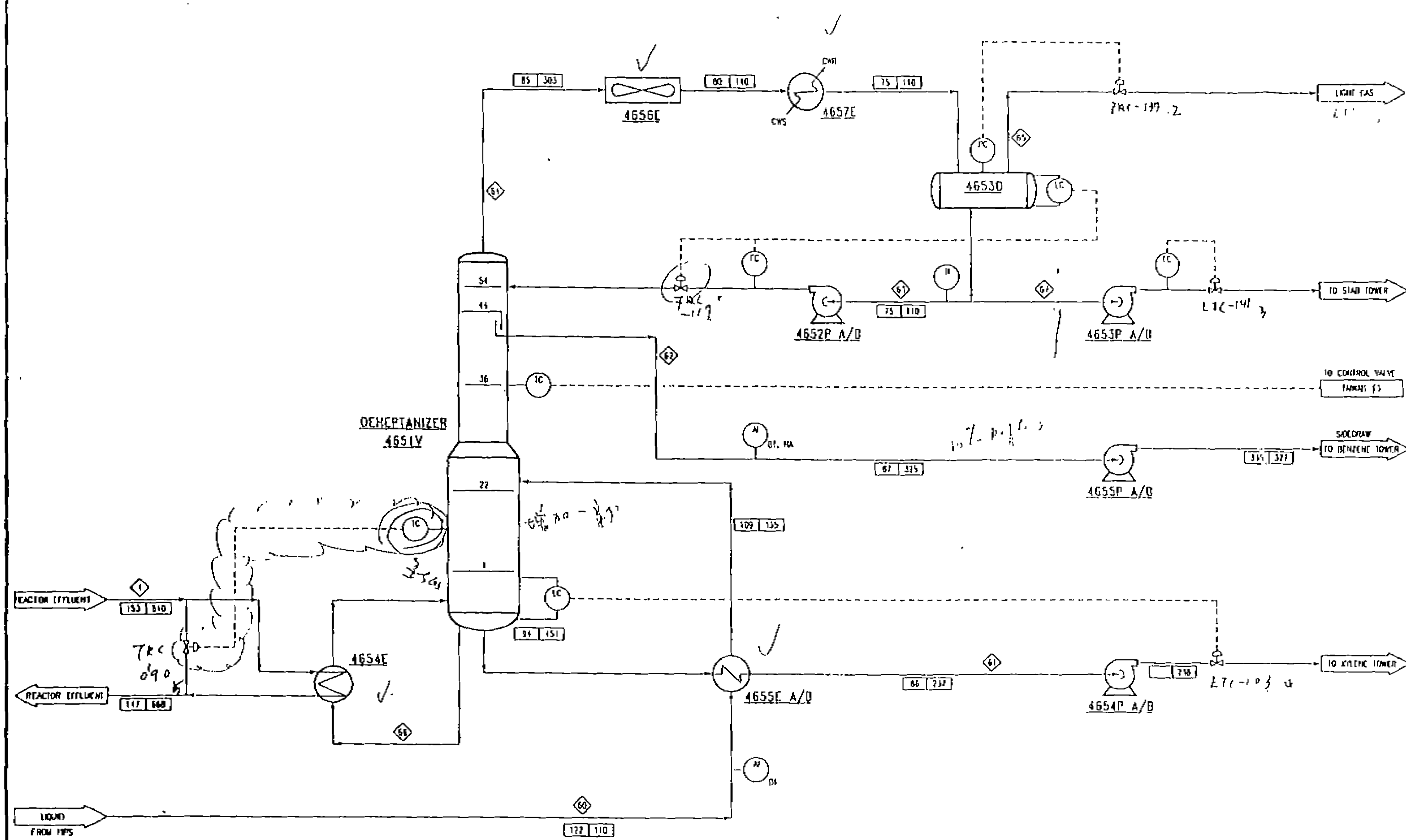
ExxonMobil Chemical
Basic Chemicals & Intermediates Technology

MHAI UNIT
REACTOR SECTION
CPC, TAIWAN
PROCESS FLOW DIAGRAM

DWG NO. TAIWAN #1 ISSUE NO. 5

C:\PUBCAD\MSC\FLOW DIAGRAMS\TAIWAN1

4654E	4655E A/B	4651V	4656E	4657E	4653D
DEHEPTANIZER REBOILER	DEHEPTANIZER FEED/BOTTOMS	DEHEPTANIZER	DEHEPTANIZER CONDENSER	DEHEPTANIZER TRIM CONDENSER	DEHEPTANIZER OVERHEAD ACCUMULATOR



4652P	4653P A/B	4654P A/B	4655P A/B
OVERHEAD LIQUID PUMP	DEHEPTANIZER OVHD LIQUID PUMP	DEHEPTANIZER BOTTOMS PUMP	DEHEPTANIZER SIDEDRAW PUMP

Symbol	Meaning
[xxxx |]	PRESSURE PSIG GAGE
[| xxxx]	TEMPERATURE °F
◇	STREAM NUMBER
	NORMALLY OPEN
N.C.	NORMALLY CLOSED
FT^3	CUBIC FEET PER HOUR (VAPOR)
MOL WT	MOLECULAR WEIGHT
MMBTU/H	ENERGY (MILLIONS BTU PER HOUR)
GPM	US GAL PER MINUTE
LB-MOL/H	POUND-MOLES PER HOUR
STD FT^3/H	AT STANDARD CONDITIONS 60°F AND IF VAPOR 14.7 PSI ABSOLUTE
@ FC	FLOWING CONDITIONS
PT	PUMPING TEMPERATURE °F
S/T	SHELL/TUBE
LRT	LIQUID RESIDENCE TIME IS BASED ON WORKING VOLUME BETWEEN HIGH LEVEL AND LOW LEVEL AS SENSED BY INSTRUMENTATION, AND THE RATE SHOWN FOR STREAM NO. ◇

NOTES

1. "NORMAL OPERATING" REFERS TO THE CONDITIONS CONSISTENT WITH THE PROCESS FLOW SHEET MATERIAL BALANCE.
   "MAXIMUM OR MINIMUM PROCESS" REFERS TO THE EXTREME CONDITIONS THAT MAY BE REQUIRED TO SUSTAIN THE PROCESS DUE TO CHANGES IN YIELDS OR FEEDS AND RECOGNIZES CONFIDENCE LIMITS IN DATA. FACTORS SUCH AS CONTROL SURGES, PUMP SHUTOFF PRESSURES, WEAR, ETC. THAT NEED TO BE RECOGNIZED IN MECHANICAL DESIGN OF EQUIPMENT ARE NOT INCORPORATED IN THE MAXIMUM OR MINIMUM PROCESS CONDITION. DESIGN CONDITIONS ARE SHOWN ON THE NORMAL EQUIPMENT DATA SHEETS.
2. RATED FLOW INCLUDES ALLOWANCE FOR MECHANICAL WEAR, VENDOR'S TOLERANCES, AND CONTROL FLUCTUATIONS.
3. ONLY THE MODE OF CONTROL FUNCTION IS INDICATED. INSTRUMENT ACTUATING LINES ARE NOT INTENDED TO INDICATE PREFERENCE FOR AIR, HYDRAULIC, OR ELECTRIC MODE.

TOWERS & VESSELS

ITEM	4651V	4653D
SERVICE:	DEHEPTANIZER	DEHEPTANIZER OVERHEAD ACCUMULATOR
INSIDE DIAMETER IN	78,107	54
LENGTH T-T IN	1490	162
MAX. PROCESS: PSIG		
MIN. PROCESS: PSIG	97	76
MAX. PROCESS: °F		110
MIN. PROCESS: °F	461	110
REMARKS:		

HEAT EXCHANGERS AND HEATERS

ITEM	4654E	4655E A/B	4656E	4657E
SERVICE:	DEHEPTANIZER REBOILER	DEHEPTANIZER FEED / BOTTOMS	DEHEPTANIZER OVERHEAD AIR COOLER	DEHEPTANIZER OVERHEAD WATER COOLER
OPER. DUTY: MMBTU/HR	31.9	19.9	19.6	1.7
MAX. PROCESS: MMBTU/HR				
MAX. PROCESS: PSIG				
MIN. PROCESS: PSIG S/T	95/153	173/95	86	81/65
MAX. PROCESS: T S/T				
MIN. PROCESS: T S/T	452/810	336/452	30.3	140/113
REMARKS:				

PUMPS, COMPRESSORS AND BLOWERS

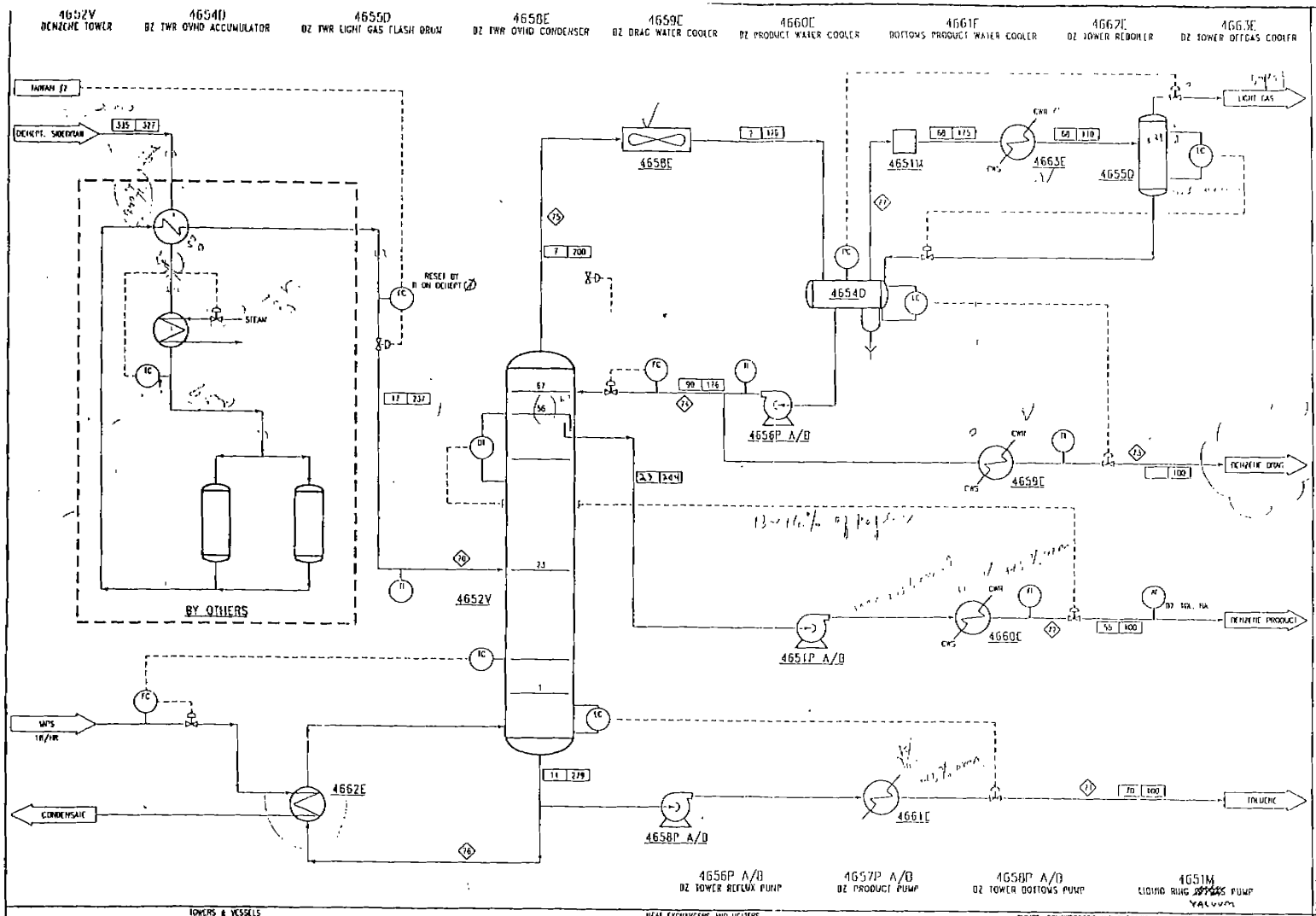
ITEM	4652P	4653P	4654P	4655P
SERVICE:	DEHEPTANIZER REFLUX PUMP	DEHEPTANIZER OVHD LIQUID PUMP	DEHEPTANIZER BOTTOMS PUMP	DEHEPTANIZER SIDEDRAW
NOR. PROCESS GPM @ FC	716	1	179	31
RATED GPM @ FC	300	11	166	
FLEX TEMP. °F	110	110	237	375
SG @ PT OR MOL. WT.	.81	81	67	88
VAPOR PRESS. PSIA @ PT				
VIS. CP @ PT OR Cp/Cv	.40	40	.35	18
REMARKS:				

ISSUE	DATE	BY	DESCRIPTION	CHK'D	APP'D
			ISSUE FOR EOP		
	12/16/xx		PRELIMINARY		

ExxonMobil Chemical
Basic Chemicals & Intermediates Technology

MHAI UNIT
FRACTIONATION SECTION
CPC, TAIWAN
PROCESS FLOW DIAGRAM

DWG NO TAIWAN #2 — ISSUE NO. 1



PRESSURE PSIG GAGE

TEMPERATURE °F

STREAM NUMBER

NORMALLY OPEN

NORMALLY CLOSED

CUBIC FEET PER HOUR (VAPOR)

MOLECULAR WEIGHT

ENERGY (MILLIONS BTU PER HOUR)

US GAL PER MINUTE

POUND-MOLES PER HOUR

AT STANDARD CONDITIONS: 60°F AND IF VAPOR, 14.7 PSI ABSOLUTE

RUNNING CONDITIONS

PUMPING TEMPERATURE °F

SHELL/TUBE

LIQUID RESIDENCE TIME IS BASED ON WORKING VOLUME BETWEEN HIGH LEVEL AND LOW LEVEL AS SENSED BY INSTRUMENTATION, AND THE RATE SHOWN FOR STREAM NO ◇

NOTES:

1. "NORMAL OPERATING" REFERS TO THE CONDITIONS CONSISTENT WITH THE PROCESS FLOW SHEET MATERIAL BALANCE.
   "MAXIMUM OR MINIMUM PROCESS" REFERS TO THE EXTREME CONDITIONS THAT MAY BE REQUIRED TO SUSTAIN THE PROCESS DUE TO CHANGES IN FEEDS OR NEEDS AND RECOGNIZES CONFIDENCE LIMITS ON DATA, FACTORS SUCH AS CONTROL SURGES, PUMP SHUTOFF PRESSURES, WEAR, ETC THAT NEED TO BE RECOGNIZED IN MECHANICAL DESIGN OF EQUIPMENT ARE NOT INCORPORATED IN THE MAXIMUM OR MINIMUM PROCESS CONDITION. DESIGN CONDITIONS ARE SHOWN ON THE INDIVIDUAL EQUIPMENT DATA SHEETS.
2. RATED FLOW INCLUDES ALLOWANCE FOR MECHANICAL WEAR, VENDOR'S TOLERANCES, AND CONTROL FLUCTUATIONS
3. ONLY THE MODE OF CONTROL FUNCTION IS INDICATED INSTRUMENT ACTUATING LINES ARE NOT INTENDED TO INDICATE PREFERENCE FOR AIR, HYDRAULIC, OR ELECTRIC MODE

ISSUE	DATE	BY	DESCRIPTION	CHKD	APVD
			ISSUE FOR EOP		
	4/15/00		PRELIMINARY		

ExxonMobil Chemical
Basic Chemicals & Intermediate Petrochemicals

MHAI UNIT
FRACTIONATION
CPC, TAIWAN
PROCESS FLOW DIAGRAM

DWG NO TAIWAN #3 ISSUE NO 3

TOWERS & VESSELS

ITEM	4652V	4654D	4655D
SERVICE	BENZENE TOWER	BENZENE OVERHEAD ACCUMULATOR	BENZENE LIGHT GAS FLASH DRUM
INSIDE DIAMETER IN.	18	54	42
LENGTH T-T IN.		108	18
MAX. PROCESS PSIG			
NOR. PROCESS PSIG	15	2	85
MAX. PROCESS °F	379	177	270
MIN. PROCESS °F	278	122	110
REMARKS			

HEAT EXCHANGERS AND HEATERS

ITEM	4658E	4659E	4660E	4661E	4662E	4663E
SERVICE	BZ TOWER OVERHEAD CONDENSER	BZ DRAG WATER COOLER	BZ PRODUCT WATER COOLER	BZ BOTTOMS WATER COOLER	BZ TOWER REBOILER	BZ TOWER OVHD VAPOR GAS WATER COOLER
DESIGN DUTY MMBTU/HR	3.5	.01	.34	.7	2.8	0
MAX. PROCESS MMBTU/HR						
MAX. PROCESS PSIG						
MIN. PROCESS PSIG	8	66	66	81	15	175
MAX. PROCESS °F						
MIN. PROCESS °F	200	173	204	279	280	68
REMARKS						

PUMPS, COMPRESSORS AND DRIVERS

ITEM	4656P	4651P	4658P
SERVICE	BZ TOWER REFLUX PUMP	BENZENE PRODUCT PUMP	BZ TOWER BOTTOMS PUMP
MAX. PROCESS GPM @ °F	95	70	10
RATED GPM @ °F			
HEAT ITEM °F	177	204	279
% @ PT ON MOL PT	84	89	87
WATER PRESS PSIA @ PT			
NPSH GPM @ PT ON CURVE	46	28	25
REMARKS			

PROBLEM MHAI SOC — OUTPUT — STREAM SUMMARY — SXKAMH 10/15/00

LICENSED EXCLUSIVELY FOR USE BY: MOBIL Corporation and Affiliates

STREAM ID	1	2	3	4
NAME	LIQ XYLENE FEED	TOTAL REACTOR FEED RECYCLE GAS		REACTOR EFFLUENT
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1725.711	7593.126	9318.837	9321.595
M LB/HR	183.122	65.749	248.871	248.817
TEMPERATURE, F	300.000	152.777	825.000	840.000
PRESSURE, PSIA	21.000	187.700	174.700	167.700
MOLECULAR WEIGHT	106.114	8.659	26.706	26.693
ENTHALPY, MM BTU/HR	21.687	21.353	168.365	170.586
BTU/LB	118.429	324.766	676.516	685.589
MOLE FRACTION LIQUID	1.00000	.00000	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR -----				
RATE, LB-MOL/HR	N/A	7593.126	9318.837	9321.595
M LB/HR	N/A	65.749	248.871	248.817
M FT3/HR	N/A	266.565	738.420	778.392
STD VAP RATE(1), M FT3/HR	N/A	2881.466	3536.344	3537.391
MOLECULAR WEIGHT	N/A	8.659	26.706	26.693
ENTHALPY, BTU/LB	N/A	324.766	676.516	685.589
CP, BTU/LB-F	N/A	.993	.768	.770
DENSITY, LB/M FT3	N/A	246.653	337.030	319.653
Z (FROM DENSITY)	N/A	1.0026	1.0041	1.0040
THERMAL COND, BTU/HR-FT-F	N/A	.05806	.09485	.09433
VISCOSITY, CP	N/A	.01355	.01866	.01893
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1725.711	N/A	N/A	N/A
M LB/HR	183.122	N/A	N/A	N/A
FT3/HR	3919.790	N/A	N/A	N/A
GAL/MIN	488.701	N/A	N/A	N/A
STD LIQ RATE, FT3/HR	3365.110	N/A	N/A	N/A
MOLECULAR WEIGHT	106.114	N/A	N/A	N/A
ENTHALPY, BTU/LB	118.429	N/A	N/A	N/A
CP, BTU/LB-F	.525	N/A	N/A	N/A
DENSITY, LB/FT3	46.717	N/A	N/A	N/A
Z (FROM DENSITY)	5.8510E-03	N/A	N/A	N/A
SURFACE TENSION, DYNE/CM	16.3725	N/A	N/A	N/A
TH COND, BTU/HR-FT-F	.06101	N/A	N/A	N/A
VISCOSITY, CP	.26435	N/A	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

PROJECT CPC LIN TUAN — PRO/II VERSION 4.16.1 MOBIL 4.5 — 386/EM

PROBLEM MHAI SOC — OUTPUT — STREAM SUMMARY — SXKAMH 10/15/00

LICENSED EXCLUSIVELY FOR USE BY: MOBIL Corporation and Affiliates

STREAM ID	5	6	7	8
NAME	HPS LIQUID	HPS GAS	PURGE GAS	COMP SUCTION
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1788.120	7533.475	318.329	7215.004
M LB/HR	181.304	67.513	2.855	64.711
TEMPERATURE, F	110.000	110.000	110.000	110.000
PRESSURE, PSIA	146.700	146.700	146.700	146.700
MOLECULAR WEIGHT	101.394	8.962	8.969	8.969
ENTHALPY, MM BTU/HR	5.307	18.814	.796	18.033
BTU/LB	29.274	278.675	278.674	278.674
MOLE FRACTION LIQUID	1.00000	.00000	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR -----				
RATE, LB-MOL/HR	N/A	7533.475	318.329	7215.004
M LB/HR	N/A	67.513	2.855	64.711
M FT3/HR	N/A	314.137	13.274	300.854
STD VAP RATE(1), M FT3/HR	N/A	2858.829	120.801	2737.974
MOLECULAR WEIGHT	N/A	8.962	8.969	8.969
ENTHALPY, BTU/LB	N/A	278.675	278.674	278.674
CP, BTU/LB-F	N/A	.946	.945	.945
DENSITY, LB/M FT3	N/A	214.915	215.090	215.090
Z (FROM DENSITY)	N/A	1.0006	1.0006	1.0006
THERMAL COND, BTU/HR-FT-F	N/A	.05361	.05360	.05360
VISCOSITY, CP	N/A	.01301	.01302	.01302
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1788.120	N/A	N/A	N/A
M LB/HR	181.304	N/A	N/A	N/A
FT3/HR	3476.212	N/A	N/A	N/A
GAL/MIN	433.398	N/A	N/A	N/A
STD LIQ RATE, FT3/HR	3380.667	N/A	N/A	N/A
MOLECULAR WEIGHT	101.394	N/A	N/A	N/A
ENTHALPY, BTU/LB	29.274	N/A	N/A	N/A
CP, BTU/LB-F	.424	N/A	N/A	N/A
DENSITY, LB/FT3	52.155	N/A	N/A	N/A
Z (FROM DENSITY)	.0467	N/A	N/A	N/A
SURFACE TENSION, DYNE/CM	26.3017	N/A	N/A	N/A
TH COND, BTU/HR-FT-F	.07222	N/A	N/A	N/A
VISCOSITY, CP	.64525	N/A	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

CONFIDENTIAL + PROPRIETARY

HEAT + MATERIAL BALANCES

PRELIMINARY

附件二.

J

STREAM ID	9	10
NAME	COMP DISCH	MAKEUP H2
PHASE	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----		
RATE, LB-MOL/HR	7215.004	378.123
M LB/HR	64.711	1.038
TEMPERATURE, F	155.076	100.000
PRESSURE, PSIA	187.700	320.000
MOLECULAR WEIGHT	8.969	2.745
ENTHALPY, MM BTU/HR	20.802	.551
BTU/LB	321.456	531.115
MOLE FRACTION LIQUID	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000
----- TOTAL VAPOR ------		
RATE, LB-MOL/HR	7215.004	378.123
M LB/HR	64.711	1.038
M FT3/HR	254.165	7.177
STD VAP RATE(1), M FT3/HR	2737.974	143.491
MOLECULAR WEIGHT	8.969	2.745
ENTHALPY, BTU/LB	321.456	531.115
CP, BTU/LB-F	.968	2.564
DENSITY, LB/M FT3	254.602	144.647
Z (FROM DENSITY)	1.0023	1.0112
THERMAL COND, BTU/HR-FT-F	.05708	.08550
VISCOSITY, CP	.01370	.00898
----- TOTAL LIQUID -----		
RATE, LB-MOL/HR	N/A	N/A
M LB/HR	N/A	N/A
FT3/HR	N/A	N/A
GAL/MIN	N/A	N/A
STD LIQ RATE, FT3/HR	N/A	N/A
MOLECULAR WEIGHT	N/A	N/A
ENTHALPY, BTU/LB	N/A	N/A
CP, BTU/LB-F	N/A	N/A
DENSITY, LB/FT3	N/A	N/A
Z (FROM DENSITY)	N/A	N/A
SURFACE TENSION, DYNE/CM	N/A	N/A
TH COND, BTU/HR-FT-F	N/A	N/A
VISCOSITY, CP	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE [60 F AND 14.696 PSIA]

STREAM ID	60	61	62
NAME	DEC7 FEED	DEC7 BOTTOMS	DEC7 SIDEDRAW
PHASE	MIXED	DRY LIQUID	DRY LIQUID
----- TOTAL STREAM -----			
RATE, LB-MOL/HR	1788.239	1584.098	134.615
M LB/HR	181.314	168.180	10.918
TEMPERATURE, F	110.076	236.899	325.066
PRESSURE, PSIA	136.700	100.700	101.338
MOLECULAR WEIGHT	101.393	106.173	81.104
ENTHALPY, MM BTU/HR	5.307	14.544	1.422
BTU/LB	29.268	86.473	130.205
MOLE FRACTION LIQUID	.99962	1.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000
----- TOTAL VAPOR ------			
RATE, LB-MOL/HR	.681	N/A	N/A
M LB/HR	6.425E-03	N/A	N/A
M FT3/HR	3.046E-02	N/A	N/A
STD VAP RATE(1), M FT3/HR	.258	N/A	N/A
MOLECULAR WEIGHT	9.436	N/A	N/A
ENTHALPY, BTU/LB	272.129	N/A	N/A
CP, BTU/LB-F	.909	N/A	N/A
DENSITY, LB/M FT3	210.955	N/A	N/A
Z (FROM DENSITY)	1.0000	N/A	N/A
THERMAL COND, BTU/HR-FT-F	.05187	N/A	N/A
VISCOSITY, CP	.01316	N/A	N/A
----- TOTAL LIQUID -----			
RATE, LB-MOL/HR	1787.558	1584.098	134.615
M LB/HR	181.308	168.180	10.918
FT3/HR	3476.139	3440.946	243.653
GAL/MIN	433.389	429.001	30.378
STD LIQ RATE, FT3/HR	3380.439	3093.753	198.737
MOLECULAR WEIGHT	101.420	106.173	81.104
ENTHALPY, BTU/LB	29.259	86.473	130.205
CP, BTU/LB-F	.424	.488	.511
DENSITY, LB/FT3	52.158	48.878	44.809
Z (FROM DENSITY)	.0435	.0293	.0218
SURFACE TENSION, DYNE/CM	26.3085	19.0917	11.8498
TH COND, BTU/HR-FT-F	.07221	.06539	.05958
VISCOSITY, CP	.64506	.34717	.18470

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE [60 F AND 14.696 PSIA]

STREAM ID	63	64	65	66
NAME	DEC7 TWR REFLUX	DEC7 OVERHEAD	DEC7 OFFGAS	DEC7 REBOIL
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY LIQUID
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1181.998	1251.527	66.529	4096.871
M LB/HR	88.251	90.459	1.985	434.682
TEMPERATURE, F	110.000	302.914	110.000	450.882
PRESSURE, PSIA	90.000	100.000	90.000	108.477
MOLECULAR WEIGHT	74.662	72.279	29.830	106.101
ENTHALPY, MM BTU/HR	2.790	24.005	.386	88.836
BTU/LB	31.611	265.373	194.309	204.371
MOLE FRACTION LIQUID	1.00000	.00000	.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	1251.527	66.529	N/A
M LB/HR	N/A	90.459	1.985	N/A
M FT3/HR	N/A	91.672	4.352	N/A
STD VAP RATE(1), M FT3/HR	N/A	474.934	25.247	N/A
MOLECULAR WEIGHT	N/A	72.279	29.830	N/A
ENTHALPY, BTU/LB	N/A	265.373	194.309	N/A
CP, BTU/LB-F	N/A	.384	.450	N/A
DENSITY, LB/M FT3	N/A	986.764	456.052	N/A
Z (FROM DENSITY)	N/A	.8950	.9629	N/A
THERMAL COND, BTU/HR-FT-F	N/A	.02598	.01725	N/A
VISCOSITY, CP	N/A	.01218	.01074	N/A
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1181.998	N/A	N/A	4096.871
M LB/HR	88.251	N/A	N/A	434.682
FT3/HR	1734.157	N/A	N/A	10709.093
GAL/MIN	216.207	N/A	N/A	1335.160
STD LIQ RATE, FT3/HR	1677.883	N/A	N/A	7997.469
MOLECULAR WEIGHT	74.662	N/A	N/A	106.101
ENTHALPY, BTU/LB	31.611	N/A	N/A	204.371
CP, BTU/LB-F	.407	N/A	N/A	.625
DENSITY, LB/FT3	50.889	N/A	N/A	40.590
Z (FROM DENSITY)	.0216	N/A	N/A	.0290
SURFACE TENSION, DYNE/CM	23.3089	N/A	N/A	8.3965
TH COND, BTU/HR-FT-F	.07222	N/A	N/A	.05121
VISCOSITY, CP	.40137	N/A	N/A	.15478

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	67	70	71	72
NAME	DEC7 OVHD LIQUID	BZ TOWER FEED	BZ TOWER BOTTOMS	BENZENE PRODUCT
PHASE	DRY LIQUID	MIXED	DRY LIQUID	DRY LIQUID
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	3.000	134.615	27.971	99.645
M LB/HR	.224	10.918	2.596	7.784
TEMPERATURE, F	110.000	237.173	100.000	100.000
PRESSURE, PSIA	90.000	32.000	85.000	70.000
MOLECULAR WEIGHT	74.662	81.104	92.795	78.119
ENTHALPY, MM BTU/HR	7.080E-03	1.630	6.641E-02	.217
BTU/LB	31.611	149.298	25.584	27.911
MOLE FRACTION LIQUID	1.00000	.59829	1.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	54.076	N/A	N/A
M LB/HR	N/A	4.318	N/A	N/A
M FT3/HR	N/A	11.993	N/A	N/A
STD VAP RATE(1), M FT3/HR	N/A	20.521	N/A	N/A
MOLECULAR WEIGHT	N/A	79.843	N/A	N/A
ENTHALPY, BTU/LB	N/A	245.727	N/A	N/A
CP, BTU/LB-F	N/A	.334	N/A	N/A
DENSITY, LB/M FT3	N/A	360.025	N/A	N/A
Z (FROM DENSITY)	N/A	.9490	N/A	N/A
THERMAL COND, BTU/HR-FT-F	N/A	.01403	N/A	N/A
VISCOSITY, CP	N/A	.00995	N/A	N/A
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	3.000	80.539	27.971	99.645
M LB/HR	.224	6.600	2.596	7.784
FT3/HR	4.401	135.846	48.835	144.576
GAL/MIN	.549	16.937	6.089	18.025
STD LIQ RATE, FT3/HR	4.259	120.157	47.743	141.080
MOLECULAR WEIGHT	74.662	81.951	92.795	78.119
ENTHALPY, BTU/LB	31.611	86.217	25.584	27.911
CP, BTU/LB-F	.407	.470	.403	.387
DENSITY, LB/FT3	50.889	48.586	53.149	53.041
Z (FROM DENSITY)	.0216	7.2176E-03	.0247	.0169
SURFACE TENSION, DYNE/CM	23.3089	17.4002	27.0456	26.2495
TH COND, BTU/HR-FT-F	.07222	.06562	.07267	.07267
VISCOSITY, CP	.40137	.25740	.50200	.45872

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	73	74	75	76
NAME	BENZENE DRAG	BZ TWR REFLUX	BZ TWR OVERHEAD	BZ TOWER REBOIL
PHASE	DRY LIQUID	DRY LIQUID	DRY VAPOR	DRY LIQUID
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	5.000	750.645	257.645	793.926
M LB/HR	.390	19.571	20.110	73.673
TEMPERATURE, F	100.000	176.915	199.583	278.744
PRESSURE, PSIA	70.000	105.000	21.700	29.100
MOLECULAR WEIGHT	78.084	78.084	78.052	92.795
ENTHALPY, MM BTU/HR	1.086E-02	1.161	4.730	7.836
BTU/LB	27.826	59.327	235.185	106.363
MOLE FRACTION LIQUID	1.00000	1.00000	.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	N/A	257.645	N/A
M LB/HR	N/A	N/A	20.110	N/A
M FT3/HR	N/A	N/A	80.808	N/A
STD VAP RATE[1], M FT3/HR	N/A	N/A	97.772	N/A
MOLECULAR WEIGHT	N/A	N/A	78.052	N/A
ENTHALPY, BTU/LB	N/A	N/A	235.185	N/A
CP, BTU/LB-F	N/A	N/A	.312	N/A
DENSITY, LB/M FT3	N/A	N/A	248.855	N/A
Z (FROM DENSITY)	N/A	N/A	.9620	N/A
THERMAL COND, BTU/HR-FT-F	N/A	N/A	.01162	N/A
VISCOSITY, CP	N/A	N/A	.00939	N/A
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	5.000	250.645	N/A	793.926
M LB/HR	.390	19.571	N/A	73.673
FT3/HR	7.264	304.135	N/A	1570.190
GAL/MIN	.906	47.892	N/A	195.764
STD LIQ RATE, FT3/HR	7.080	355.301	N/A	1355.167
MOLECULAR WEIGHT	78.084	78.084	N/A	92.795
ENTHALPY, BTU/LB	27.826	59.327	N/A	106.363
CP, BTU/LB-F	.388	.430	N/A	.505
DENSITY, LB/FT3	53.750	50.949	N/A	46.919
Z [FROM DENSITY]	.0169	.0236	N/A	7.2628E-03
SURFACE TENSION, DYNE/CM	26.1814	20.9187	N/A	16.0382
TH COND, BTU/HR-FT-F	.07267	.06918	N/A	.06244
VISCOSITY, CP	.45683	.31315	N/A	.24620

[1] STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	77
NAME	BZ TWR ACCUM VAPOR
PHASE	DRY VAPOR
----- TOTAL STREAM -----	
RATE, LB-MOL/HR	2.000
M LB/HR	.148
TEMPERATURE, F	176.263
PRESSURE, PSIA	16.300
MOLECULAR WEIGHT	73.913
ENTHALPY, MM BTU/HR	3.373E-02
BTU/LB	228.163
MOLE FRACTION LIQUID	.00000
MOLE FRACTION FREE WATER	.00000
----- TOTAL VAPOR ------	
RATE, LB-MOL/HR	2.000
M LB/HR	.148
M FT3/HR	.814
STD VAP RATE[1], M FT3/HR	.759
MOLECULAR WEIGHT	73.913
ENTHALPY, BTU/LB	228.163
CP, BTU/LB-F	.308
DENSITY, LB/M FT3	181.624
Z (FROM DENSITY)	.9720
THERMAL COND, BTU/HR-FT-F	.01077
VISCOSITY, CP	.00910
----- TOTAL LIQUID -----	
RATE, LB-MOL/HR	N/A
M LB/HR	N/A
FT3/HR	N/A
GAL/MIN	N/A
STD LIQ RATE, FT3/HR	N/A
MOLECULAR WEIGHT	N/A
ENTHALPY, BTU/LB	N/A
CP, BTU/LB-F	N/A
DENSITY, LB/FT3	N/A
Z [FROM DENSITY]	N/A
SURFACE TENSION, DYNE/CM	N/A
TH COND, BTU/HR-FT-F	N/A
VISCOSITY, CP	N/A

[1] STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	1	2	3	4
NAME	LIQ XYLENE FEED	TOTAL RECYCLE GAS	REACTOR FEED	REACTOR EFFLUENT
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	1.6944E-15	5694.8448	5694.8448	5576.5268
2 METHANE	3.8728E-14	369.4868	369.4868	373.5876
3 ETHANE	4.1314E-15	1490.2520	1490.2520	1606.1677
4 PROPANE	2.1724E-14	1.7995	1.7995	2.0708
5 BUTANES	3.7862E-14	.4709	.4709	.6965
6 PENTANES	1.1117E-11	.0991	.0991	.2347
7 BENZENE	.1054	14.3215	14.4269	127.5275
8 TOLUENE	8.6905	1.6453	10.3357	41.7267
9 EBENZENE	161.4708	.6165	162.0873	40.5218
10 PXYLENE	40.3804	5.0224	45.4028	367.1803
11 MXYLENE	1108.4269	10.5159	1118.9428	809.9083
12 OXYLENE	405.2855	3.9349	409.2204	362.4440
13 N-NONANE	.2889	3.9302E-04	.2892	.0336
14 MEB	9.5603E-05	6.3352E-03	6.4308E-03	.8968
15 TMB	4.7198E-05	.0418	.0418	9.8256
16 C10	7.9489E-07	2.4459E-03	2.4467E-03	1.2725
17 C5NA	.0917	.0342	.1259	.1292
18 C6NA	7.2165E-07	.0143	.0143	.0082
19 C7NA	9.7790E-06	4.6497E-03	4.6594E-03	.0416
20 C8NA	.9703	.0127	.9830	.7144
RATE, LB-MOL/HR	1725.7105	7593.1264	9318.8369	9321.5946

STREAM ID	5	6	7	8
NAME	HPS LIQUID	HPS GAS	PURGE GAS	COMP SUCTION
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	5.4951	5571.0313	235.4101	5335.6201
2 METHANE	2.7043	370.8833	15.5011	351.3369
3 ETHANE	54.8050	1551.3627	65.7172	1489.4958
4 PROPANE	.2297	1.8411	.0794	1.7945
5 BUTANES	.2056	.4908	.0208	.4709
6 PENTANES	.1314	.1034	4.3716E-03	.0991
7 BENZENE	112.5769	14.9506	.6319	14.3215
8 TOLUENE	40.0090	1.7178	.0726	1.6453
9 EBENZENE	39.8781	.6437	.0272	.6165
10 PXYLENE	361.9363	5.2441	.2216	5.0224
11 MXYLENE	798.9287	10.9799	.4640	10.5159
12 OXYLENE	358.3359	4.1083	.1736	3.9349
13 N-NONANE	.0331	4.1055E-04	1.7340E-05	3.9302E-04
14 MEB	.8901	6.6153E-03	2.7951E-04	6.3352E-03
15 TMB	9.7867	.0389	1.8439E-03	.0418
16 C10	1.2699	2.5540E-03	1.0791E-04	2.4459E-03
17 C5NA	.0936	.0357	1.5070E-03	.0342
18 C6NA	.0728	.0153	6.3200E-04	.0143
19 C7NA	.0367	4.9108E-03	2.0515E-04	4.6497E-03
20 C8NA	.7011	.0133	5.6249E-04	.0127
RATE, LB-MOL/HR	1788.1198	7533.4747	318.3289	7215.0038

STREAM ID	9	10	60	61
NAME	COMP DISCH	MAKEUP H2	DEC7 FEED	DEC7 BOTTOMS
PHASE	DRY VAPOR	DRY VAPOR	MIXED	DRY LIQUID
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	5335.6283	359.2165	5.4951	4.2005E-15
2 METHANE	351.3369	18.1499	2.7043	8.9735E-14
3 ETHANE	1489.4958	.7562	54.8050	1.1699E-14
4 PROPANE	1.7995	.0000	.2297	5.7030E-14
5 BUTANES	.4709	.0000	.2056	2.1318E-14
6 PENTANES	.0991	.0000	.1314	3.1411E-11
7 BENZENE	14.3215	.0000	112.5769	.0321
8 TOLUENE	1.6453	.0000	40.0090	13.8778
9 EBENZENE	.6165	.0000	39.8781	39.7872
10 PXYLENE	5.0224	.0000	361.9363	361.4436
11 MXYLENE	10.5159	.0000	798.9287	798.0260
12 OXYLENE	3.9349	.0000	358.3359	358.2562
13 N-NONANE	3.9302E-04	.0000	.0331	.0331
14 MEB	6.3352E-03	.0000	.8901	.8901
15 TMB	.0418	.0000	9.7867	9.7867
16 C10	2.4459E-03	.0000	1.2699	1.2699
17 C5NA	.0342	.0000	.2124	1.6691E-08
18 C6NA	.0143	.0000	.0728	1.9460E-06
19 C7NA	4.6497E-03	.0000	.0367	2.6040E-05
20 C8NA	.0127	.0000	.7011	.6947
RATE, LB-MOL/HR	7215.0038	378.1226	1780.2387	1584.0976

STREAM ID	62	63	64	65
NAME	DEC7 SIDEDRAW	DEC7 TWR REFLUX	DEC7 OVERHEAD	DEC7 OFFGAS
PHASE	DRY LIQUID	DRY LIQUID	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	2.3153E-03	.2176	5.7103	5.4922
2 METHANE	3.4093E-03	.8171	3.5179	2.6987
3 ETHANE	.1703	81.8330	136.4676	54.4269
4 PROPANE	1.5172E-03	1.1743	1.4025	.2252
5 BUTANES	3.0531E-03	3.3240	3.5266	.1941
6 PENTANES	4.5832E-03	5.6498	5.7766	.1125
7 BENZENE	106.6270	1068.0221	1073.9400	3.2071
8 TOLUENE	26.1234	3.1672	3.1784	3.1979E-03
9 EBENZENE	.0909	2.2490E-04	2.2556E-04	8.8687E-08
10 PXYLENE	.4927	9.0459E-04	9.0721E-04	3.2257E-07
11 MXYLENE	.9027	1.4314E-03	1.4355E-03	4.8173E-07
12 OXYLENE	.0797	5.0925E-05	5.1069E-05	1.4049E-08
13 N-NONANE	2.5930E-05	6.1608E-08	6.1788E-08	2.3049E-11
14 MEB	2.6631E-06	2.3575E-10	2.3640E-10	4.5781E-14
15 TMB	2.1335E-06	3.8838E-11	3.8941E-11	4.2424E-15
16 C10	2.5905E-09	2.5422E-13	2.6917E-13	1.4309E-14
17 C5NA	.0255	14.3484	14.5392	.1504
18 C6NA	.0468	3.1297	3.1557	.0181
19 C7NA	.0349	.3119	.3137	9.9599E-04
20 C8NA	6.4170E-03	6.3432E-05	6.3629E-05	3.6080E-08
RATE, LB-MOL/HR	134.6153	1181.9978	1251.5271	66.5293

STREAM ID	66	67	70	71
NAME	DEC7 REBOIL	DEC7 OVHD LIQUID	BZ TOWER FEED	BZ TOWER BOTTOMS
PHASE	DRY LIQUID	DRY LIQUID	MIXED	DRY LIQUID
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	1.0861E-14	5.5224E-04	2.3153E-03	6.0601E-16
2 METHANE	2.3201E-13	2.0739E-03	3.4893E-03	1.9053E-15
3 ETHANE	3.0243E-14	.2077	.1703	1.4454E-16
4 PROPANE	1.4742E-13	2.9805E-03	1.5172E-03	2.2110E-15
5 BUTANES	5.5093E-14	8.4366E-03	3.0531E-03	7.8736E-16
6 PENTANES	2.8726E-10	.0143	4.5832E-03	5.3583E-16
7 BENZENE	.1582	2.7107	106.6270	.2796
8 TOLUENE	48.4903	8.0385E-03	26.1234	26.1185
9 EBENZENE	106.0684	5.7082E-07	.0909	.0909
10 PXYLENE	948.0537	2.2959E-06	.4927	.4927
11 MXYLENE	2082.9065	3.6329E-06	.9027	.9027
12 OXYLENE	885.5855	1.2925E-07	.0797	.0797
13 N-NONANE	.0848	1.5637E-10	2.5930E-05	2.5930E-05
14 MEB	1.9055	5.9836E-13	2.6631E-06	2.6631E-06
15 TMB	19.4823	9.8575E-14	2.1335E-06	2.1335E-06
16 C10	2.2007	6.4523E-16	2.5905E-09	2.5905E-09
17 C5NA	1.1724E-07	.0364	.0255	2.6214E-11
18 C6NA	1.0502E-05	7.9435E-03	.0468	7.2026E-07
19 C7NA	1.2342E-04	7.9158E-04	.0349	1.0034E-04
20 C8NA	1.9270	1.6100E-07	6.4170E-03	6.4170E-03
RATE, LB-MOL/HR	4096.8710	3.0000	134.6153	27.9706

STREAM ID	72	73	74	75
NAME	BENZENE PRODUCT	BENZENE DRAG	BZ TWR REFLUX	BZ TWR OVERHEAD
PHASE	DRY LIQUID	DRY LIQUID	DRY LIQUID	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	6.2145E-07	2.7105E-06	1.3587E-04	2.4505E-03
2 METHANE	4.6613E-06	2.2924E-05	1.1492E-03	4.6317E-03
3 ETHANE	8.0177E-04	4.2467E-03	.2129	.3824
4 PROPANE	1.9632E-05	1.0446E-04	5.2365E-03	6.7340E-03
5 BUTANES	1.0841E-04	5.1461E-04	.0258	.0287
6 PENTANES	4.1375E-04	1.4410E-03	.0722	.0764
7 BENZENE	99.5763	4.9678	249.0290	255.8001
8 TOLUENE	4.9822E-03	1.1979E-07	6.0049E-06	6.1419E-06
9 EBENZENE	1.8891E-12	1.5500E-16	7.7699E-15	7.9869E-15
10 PXYLENE	2.3605E-12	1.4710E-16	7.3738E-15	7.5797E-15
11 MXYLENE	1.9100E-12	9.5179E-17	4.7712E-15	4.9032E-15
12 OXYLENE	4.0693E-15	2.0430E-16	1.0241E-14	1.0527E-14
13 N-NONANE	4.9014E-15	1.4394E-16	7.2156E-15	7.4130E-15
14 MEB	3.2281E-15	1.6207E-16	8.1243E-15	8.3512E-15
15 TMB	4.7685E-15	2.3941E-16	1.2001E-14	1.2336E-14
16 C10	1.1109E-14	5.5773E-16	2.7958E-14	2.8739E-14
17 C5NA	4.7420E-03	.0102	.5133	.5341
18 C6NA	.0254	.0137	.6871	.7086
19 C7NA	.0321	1.9604E-03	.0903	.1010
20 C8NA	9.9437E-11	1.6216E-16	8.1290E-15	8.3522E-15
RATE, LB-MOL/HR	99.6448	5.0000	250.6451	257.6451

STREAM ID	76	77
NAME	BZ TOWER REBOIL	BZ TWR ACCUM VAPOR
PHASE	DRY LIQUID	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR		
1 HYDROGEN	1.7201E-14	2.3119E-03
2 METHANE	5.4082E-14	3.4617E-03
3 ETHANE	4.1028E-15	.1653
4 PROPANE	6.2757E-14	1.3931E-03
5 BUTANES	2.2349E-14	2.4301E-03
6 PENTANES	1.5209E-14	2.7285E-03
7 BENZENE	7.9365	1.8034
8 TOLUENE	741.3548	1.7145E-08
9 EBENZLNE	2.5807	6.1996E-17
10 PXYLENE	13.9842	5.0835E-17
11 MXYLENE	25.6219	3.6829E-17
12 OXYLENE	2.2617	8.1715E-17
13 N-NONANE	7.3602E-04	5.3427E-17
14 MEB	7.5590E-05	6.4823E-17
15 TMB	6.0558E-05	9.5756E-17
16 C10	7.3529E-08	2.2308E-16
17 C5NA	7.4407E-10	.0105
18 C6NA	2.0444E-05	7.7289E-03
19 C7NA	2.8482E-03	7.3832E-04
20 C8NA	.1821	6.1022E-17
RATE, LB-MOL/HR	793.9258	2.0000

STREAM ID	1	2	3	4
NAME	LIQ XYLENE FEED	TOTAL RECYCLE GAS	REACTOR FEED	REACTOR EFFLUENT
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1727.967	7603.056	9331.023	9332.923
M LB/HR	183.342	65.817	249.159	249.176
TEMPERATURE, F	300.000	152.751	880.000	900.000
PRESSURE, PSIA	21.000	187.700	174.700	167.700
MOLECULAR WEIGHT	106.103	8.657	26.702	26.699
ENTHALPY, MM BTU/HR	21.713	21.374	179.200	182.466
BTU/LB	118.427	324.752	719.222	732.278
MOLE FRACTION LIQUID	1.00000	.00000	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	7603.056	9331.023	9332.923
M LB/HR	N/A	65.817	249.159	249.176
M FT3/HR	N/A	266.903	771.357	815.646
STD VAP RATE(1), M FT3/HR	N/A	2885.234	3540.969	3541.690
MOLECULAR WEIGHT	N/A	8.657	26.702	26.699
ENTHALPY, BTU/LB	N/A	324.752	719.222	732.278
CP, BTU/LB-F	N/A	.993	.784	.787
DENSITY, LB/M FT3	N/A	246.592	323.012	305.494
Z (FROM DENSITY)	N/A	1.0026	1.0045	1.0044
THERMAL COND, BTU/HR-FT-F	N/A	.05807	.09767	.09741
VISCOSITY, CP	N/A	.01355	.01929	.01962
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1727.967	N/A	N/A	N/A
M LB/HR	183.342	N/A	N/A	N/A
FT3/HR	3925.100	N/A	N/A	N/A
GAL/MIN	489.363	N/A	N/A	N/A
STD LIQ RATE, FT3/HR	3369.505	N/A	N/A	N/A
MOLECULAR WEIGHT	106.103	N/A	N/A	N/A
ENTHALPY, BTU/LB	118.427	N/A	N/A	N/A
CP, BTU/LB-F	.525	N/A	N/A	N/A
DENSITY, LB/FT3	46.710	N/A	N/A	N/A
Z (FROM DENSITY)	5.8512E-03	N/A	N/A	N/A
SURFACE TENSION, DYNE/CM	16.3649	N/A	N/A	N/A
TH COND, BTU/HR-FT-F	.06100	N/A	N/A	N/A
VISCOSITY, CP	.26423	N/A	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	5	6	7	8
NAME	HPS LIQUID	HPS GAS	PURGE GAS	COMP SUCTION
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1790.421	7542.502	322.462	7220.197
M LB/HR	181.503	67.673	2.892	64.765
TEMPERATURE, F	110.000	110.000	110.000	110.000
PRESSURE, PSIA	146.700	146.700	146.700	146.700
MOLECULAR WEIGHT	101.374	8.972	8.970	8.970
ENTHALPY, MM BTU/HR	5.311	18.855	.806	18.045
BTU/LB	29.261	278.626	278.626	278.626
MOLE FRACTION LIQUID	1.00000	.00000	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	7542.502	322.462	7220.197
M LB/HR	N/A	67.673	2.892	64.765
M FT3/HR	N/A	314.509	13.446	301.070
STD VAP RATE(1), M FT3/HR	N/A	2062.255	122.369	2739.945
MOLECULAR WEIGHT	N/A	8.972	8.970	8.970
ENTHALPY, BTU/LB	N/A	278.626	278.626	278.626
CP, BTU/LB-F	N/A	.945	.945	.945
DENSITY, LB/M FT3	N/A	215.169	215.116	215.116
Z (FROM DENSITY)	N/A	1.0006	1.0006	1.0006
THERMAL COND, BTU/HR-FT-F	N/A	.05358	.05359	.05359
VISCOSITY, CP	N/A	.01302	.01302	.01302
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1790.421	N/A	N/A	N/A
M LB/HR	181.503	N/A	N/A	N/A
FT3/HR	3480.817	N/A	N/A	N/A
GAL/MIN	433.972	N/A	N/A	N/A
STD LIQ RATE, FT3/HR	3385.096	N/A	N/A	N/A
MOLECULAR WEIGHT	101.374	N/A	N/A	N/A
ENTHALPY, BTU/LB	29.261	N/A	N/A	N/A
CP, BTU/LB-F	.424	N/A	N/A	N/A
DENSITY, LB/FT3	52.143	N/A	N/A	N/A
Z (FROM DENSITY)	.0467	N/A	N/A	N/A
SURFACE TENSION, DYNE/CM	26.2882	N/A	N/A	N/A
TH COND, BTU/HR-FT-F	.07222	N/A	N/A	N/A
VISCOSITY, CP	.64443	N/A	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	9	10
NAME	COMP DISCH	MAKEUP H2
PHASE	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----		
RATE, LB-MOL/HR	7220.197	382.858
M LB/HR	64.765	1.051
TEMPERATURE, F	155.076	100.000
PRESSURE, PSIA	187.700	320.000
MOLECULAR WEIGHT	8.970	2.745
ENTHALPY, MM BTU/HR	20.816	.558
BTU/LB	321.403	531.115
MOLE FRACTION LIQUID	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000
----- TOTAL VAPOR ------		
RATE, LB-MOL/HR	7220.197	382.858
M LB/HR	64.765	1.051
M FT3/HR	254.347	7.267
STD VAP RATE(1), M FT3/HR	2739.945	145.288
MOLECULAR WEIGHT	8.970	2.745
ENTHALPY, BTU/LB	321.403	531.115
CP, BTU/LB-F	.968	2.564
DENSITY, LB/M FT3	254.632	144.647
Z (FROM DENSITY)	1.0023	1.0112
THERMAL COND, BTU/HR-FT-F	.05708	.08550
VISCOSITY, CP	.01370	.00898
----- TOTAL LIQUID -----		
RATE, LB-MOL/HR	N/A	N/A
M LB/HR	N/A	N/A
FT3/HR	N/A	N/A
GAL/MIN	N/A	N/A
STD LIQ RATE, FT3/HR	N/A	N/A
MOLECULAR WEIGHT	N/A	N/A
ENTHALPY, BTU/LB	N/A	N/A
CP, BTU/LB-F	N/A	N/A
DENSITY, LB/FT3	N/A	N/A
Z (FROM DENSITY)	N/A	N/A
SURFACE TENSION, DYNE/CM	N/A	N/A
TH COND, BTU/HR-FT-F	N/A	N/A
VISCOSITY, CP	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	60	61	62
NAME	DEC7 FEED	DEC7 BOTTOMS	DEC7 SIDEDRAW
PHASE	MIXED	DRY LIQUID	DRY LIQUID
----- TOTAL STREAM -----			
RATE, LB-MOL/HR	1790.540	1584.580	136.194
M LB/HR	181.513	168.207	11.092
TEMPERATURE, F	110.076	236.675	326.392
PRESSURE, PSIA	136.700	100.700	101.338
MOLECULAR WEIGHT	101.373	106.152	81.446
ENTHALPY, MM BTU/HR	5.310	14.524	1.457
BTU/LB	29.254	86.345	130.926
MOLE FRACTION LIQUID	.99962	1.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000
----- TOTAL VAPOR ------			
RATE, LB-MOL/HR	.683	N/A	N/A
M LB/HR	6.440E-03	N/A	N/A
M FT3/HR	3.053E-02	N/A	N/A
STD VAP RATE(1), M FT3/HR	.259	N/A	N/A
MOLECULAR WEIGHT	9.447	N/A	N/A
ENTHALPY, BTU/LB	272.084	N/A	N/A
CP, BTU/LB-F	.908	N/A	N/A
DENSITY, LB/M FT3	211.210	N/A	N/A
Z (FROM DENSITY)	1.0000	N/A	N/A
THERMAL COND, BTU/HR-FT-F	.05184	N/A	N/A
VISCOSITY, CP	.01316	N/A	N/A
----- TOTAL LIQUID -----			
RATE, LB-MOL/HR	1789.857	1584.580	136.194
M LB/HR	181.506	168.207	11.092
FT3/HR	3480.742	3441.522	247.842
GAL/MIN	433.963	429.073	30.900
STD LIQ RATE, FT3/HR	3384.866	3094.574	201.993
MOLECULAR WEIGHT	101.408	106.152	81.446
ENTHALPY, BTU/LB	29.245	86.345	130.926
CP, BTU/LB-F	.424	.488	.513
DENSITY, LB/FT3	52.146	48.875	44.756
Z (FROM DENSITY)	.0435	.0293	.0219
SURFACE TENSION, DYNE/CM	26.2950	19.8923	11.8155
TH COND, BTU/HR-FT-F	.07221	.06540	.05948
VISCOSITY, CP	.64424	.34724	.18458

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	63	64	65	66
NAME	DEC7 TWR REFLUX	DEC7 OVERHEAD	DEC7 OFFGAS	DEC7 REBOIL
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY LIQUID
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1179.720	1249.526	66.806	4094.903
M LB/HR	88.082	90.299	1.994	434.383
TEMPERATURE, F	110.000	302.921	110.000	450.657
PRESSURE, PSIA	90.000	100.000	90.000	108.477
MOLECULAR WEIGHT	74.663	72.267	29.840	106.077
ENTHALPY, MM BTU/HR	2.784	23.964	.387	88.708
BTU/LB	31.612	265.380	194.321	204.217
MOLE FRACTION LIQUID	1.00000	.00000	.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR -----				
RATE, LB-MOL/HR	N/A	1249.526	66.806	N/A
M LB/HR	N/A	90.299	1.994	N/A
M FT3/HR	N/A	91.531	4.370	N/A
STD VAP RATE(1), M FT3/HR	N/A	474.174	25.352	N/A
MOLECULAR WEIGHT	N/A	72.267	29.840	N/A
ENTHALPY, BTU/LB	N/A	265.380	194.321	N/A
CP, BTU/LB-F	N/A	.384	.450	N/A
DENSITY, LB/M FT3	N/A	986.539	456.228	N/A
Z (FROM DENSITY)	N/A	.8951	.9629	N/A
THERMAL COND, BTU/HR-FT-F	N/A	.02598	.01725	N/A
VISCOSITY, CP	N/A	.01218	.01074	N/A
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1179.720	N/A	N/A	4094.903
M LB/HR	88.082	N/A	N/A	434.383
FT3/HR	1730.963	N/A	N/A	10702.785
GAL/MIN	215.809	N/A	N/A	1334.374
STD LIQ RATE, FT3/HR	1674.790	N/A	N/A	7993.118
MOLECULAR WEIGHT	74.663	N/A	N/A	106.077
ENTHALPY, BTU/LB	31.612	N/A	N/A	204.217
CP, BTU/LB-F	.407	N/A	N/A	.625
DENSITY, LB/FT3	50.886	N/A	N/A	40.586
Z (FROM DENSITY)	.0216	N/A	N/A	.0290
SURFACE TENSION, DYNE/CM	23.3063	N/A	N/A	8.3949
TH COND, BTU/HR-FT-F	.07222	N/A	N/A	.05122
VISCOSITY, CP	.40137	N/A	N/A	.15480

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	67	70	71	72
NAME	DEC7 OVHD LIQUID	BZ TOWER FEED	BZ TOWER BOTTOMS	BENZENE PRODUCT
PHASE	DRY LIQUID	MIXED	DRY LIQUID	DRY LIQUID
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	3.000	136.194	31.672	97.522
M LB/HR	.224	11.092	2.936	7.618
TEMPERATURE, F	110.000	238.555	100.000	100.000
PRESSURE, PSIA	90.000	32.000	85.000	70.000
MOLECULAR WEIGHT	74.663	81.446	92.702	78.119
ENTHALPY, MM BTU/HR	7.081E-03	1.658	7.513E-02	.213
BTU/LB	31.612	149.491	25.589	27.911
MOLE FRACTION LIQUID	1.00000	.60002	1.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR -----				
RATE, LB-MOL/HR	N/A	54.475	N/A	N/A
M LB/HR	N/A	4.363	N/A	N/A
M FT3/HR	N/A	12.104	N/A	N/A
STD VAP RATE(1), M FT3/HR	N/A	20.672	N/A	N/A
MOLECULAR WEIGHT	N/A	80.095	N/A	N/A
ENTHALPY, BTU/LB	N/A	246.084	N/A	N/A
CP, BTU/LB-F	N/A	.335	N/A	N/A
DENSITY, LB/M FT3	N/A	360.466	N/A	N/A
Z (FROM DENSITY)	N/A	.9489	N/A	N/A
THERMAL COND, BTU/HR-FT-F	N/A	.01407	N/A	N/A
VISCOSITY, CP	N/A	.00995	N/A	N/A
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	3.000	81.719	31.672	97.522
M LB/HR	.224	6.729	2.936	7.618
FT3/HR	4.402	138.674	55.240	141.496
GAL/MIN	.549	17.289	6.887	17.641
STD LIQ RATE, FT3/HR	4.259	122.561	54.005	138.076
MOLECULAR WEIGHT	74.663	82.346	92.702	78.119
ENTHALPY, BTU/LB	31.612	86.862	25.589	27.911
CP, BTU/LB-F	.407	.472	.403	.387
DENSITY, LB/FT3	50.886	48.526	53.150	53.041
Z (FROM DENSITY)	.0216	7.2471E-03	.0247	.0169
SURFACE TENSION, DYNE/CM	23.3063	17.3539	27.0412	26.2494
TH COND, BTU/HR-FT-F	.07222	.06551	.07267	.07267
VISCOSITY, CP	.40137	.25727	.58099	.45822

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	73	74	75	76
NAME	BENZENE DRAG	BZ TWR REFLUX	BZ TWR OVERHEAD	BZ TOWER REBOIL
PHASE	DRY LIQUID	DRY LIQUID	DRY VAPOR	DRY LIQUID
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	5.000	250.060	257.060	791.317
M LB/HR	.390	19.526	20.064	73.356
TEMPERATURE, F	100.000	176.798	199.580	278.477
PRESSURE, PSIA	70.000	105.000	21.700	29.100
MOLECULAR WEIGHT	78.084	78.084	78.051	92.702
ENTHALPY, MM BTU/HR	1.086E-02	1.157	4.719	7.792
BTU/LB	27.826	59.277	235.184	106.218
MOLE FRACTION LIQUID	1.00000	1.00000	.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR -----				
RATE, LB-MOL/HR	N/A	N/A	257.060	N/A
M LB/HR	N/A	N/A	20.064	N/A
M FT3/HR	N/A	N/A	80.625	N/A
STD VAP RATE(1), M FT3/HR	N/A	N/A	97.550	N/A
MOLECULAR WEIGHT	N/A	N/A	78.051	N/A
ENTHALPY, BTU/LB	N/A	N/A	235.184	N/A
CP, BTU/LB-F	N/A	N/A	.312	N/A
DENSITY, LB/M FT3	N/A	N/A	248.852	N/A
Z (FROM DENSITY)	N/A	N/A	.9620	N/A
THERMAL COND, BTU/HR-FT-F	N/A	N/A	.01162	N/A
VISCOSITY, CP	N/A	N/A	.00939	N/A
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	5.000	250.060	N/A	791.317
M LB/HR	.390	19.526	N/A	73.356
FT3/HR	7.264	383.210	N/A	1563.173
GAL/MIN	.906	47.777	N/A	194.889
STD LIQ RATE, FT3/HR	7.008	354.475	N/A	1349.305
MOLECULAR WEIGHT	78.084	78.084	N/A	92.702
ENTHALPY, BTU/LB	27.826	59.277	N/A	106.218
CP, BTU/LB-F	.388	.430	N/A	.505
DENSITY, LB/FT3	53.749	50.953	N/A	46.928
Z (FROM DENSITY)	.0169	.0236	N/A	7.2568E-03
SURFACE TENSION, DYNE/CM	26.1806	20.9258	N/A	16.0449
TH COND, BTU/HR-FT-F	.07267	.06918	N/A	.06246
VISCOSITY, CP	.45681	.31331	N/A	.24618

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	77
NAME	BZ TWR ACCUM VAPOR
PHASE	DRY VAPOR
----- TOTAL STREAM -----	
RATE, LB-MOL/HR	2.000
M LB/HR	.148
TEMPERATURE, F	176.146
PRESSURE, PSIA	16.300
MOLECULAR WEIGHT	73.828
ENTHALPY, MM BTU/HR	3.368E-02
BTU/LB	228.124
MOLE FRACTION LIQUID	.00000
MOLE FRACTION FREE WATER	.00000
----- TOTAL VAPOR -----	
RATE, LB-MOL/HR	2.000
M LB/HR	.148
M FT3/HR	.814
STD VAP RATE(1), M FT3/HR	.759
MOLECULAR WEIGHT	73.828
ENTHALPY, BTU/LB	228.124
CP, BTU/LB-F	.308
DENSITY, LB/M FT3	181.440
Z (FROM DENSITY)	.9720
THERMAL COND, BTU/HR-FT-F	.01077
VISCOSITY, CP	.00910
----- TOTAL LIQUID -----	
RATE, LB-MOL/HR	N/A
M LB/HR	N/A
FT3/HR	N/A
GAL/MIN	N/A
STD LIQ RATE, FT3/HR	N/A
MOLECULAR WEIGHT	N/A
ENTHALPY, BTU/LB	N/A
CP, BTU/LB-F	N/A
DENSITY, LB/FT3	N/A
Z (FROM DENSITY)	N/A
SURFACE TENSION, DYNE/CM	N/A
TH COND, BTU/HR-FT-F	N/A
VISCOSITY, CP	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	1	2	3	4
NAME	LIQ XYLENE FEED	TOTAL RECYCLE GAS	REACTOR FEED	REACTOR EFFLUENT
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	1.5301E-15	5702.2919	5702.2919	5582.4184
2 METHANE	3.2985E-14	371.1027	371.1027	369.9396
3 ETHANE	4.3565E-15	1491.1916	1491.1916	1613.2253
4 PROPANE	2.1452E-14	1.7750	1.7750	2.0865
5 BUTANES	8.0355E-15	.4670	.4670	.6924
6 PENTANES	1.3191E-11	.0989	.0989	.2346
7 BENZENE	.1067	14.0492	14.1559	125.1757
8 TOLUENE	10.0730	1.8976	11.9706	48.1404
9 EBENZENE	161.4810	.6162	162.0972	40.5243
10 PXYLENE	40.0350	4.9600	44.9950	362.7915
11 MXYLENE	1119.1614	10.6526	1129.8140	820.8169
12 OXYLENE	395.7531	3.8316	399.5847	353.0662
13 N-NONANE	.2889	3.9263E-04	.2893	.0336
14 MEB	9.4120E-05	6.4448E-03	6.5389E-03	.9128
15 TMB	4.5694E-05	.0471	.0471	11.2219
16 C10	7.6082E-07	1.2433E-03	1.2441E-03	.6650
17 C5NA	.0917	.0341	.1259	.1292
18 C6NA	8.2503E-07	.0148	.0148	.0806
19 C7NA	1.1017E-05	4.7072E-03	4.7182E-03	.0416
20 C8NA	.9754	.0128	.9882	.7182
RATE, LB-MOL/HR	1727.9672	7603.0559	9331.0231	9332.9226

STREAM ID	5	6	7	8
NAME	HPS LIQUID	HPS GAS	PURGE GAS	COMP SUCTION
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	5.5063	5576.9128	238.4265	5338.5764
2 METHANE	2.6797	367.2600	15.7531	352.7255
3 ETHANE	55.0857	1558.1398	66.5640	1490.4258
4 PROPANE	.2316	1.8550	.0793	1.7750
5 BUTANES	.2045	.4878	.0209	.4670
6 PENTANES	.1314	.1033	4.4151E-03	.0989
7 BENZENE	110.4988	14.6768	.6275	14.0492
8 TOLUENE	46.1584	1.9820	.0847	1.8976
9 EBENZENE	39.8805	.6438	.0275	.6162
10 PXYLENE	357.6098	5.1815	.2215	4.9600
11 MXYLENE	809.6881	11.1283	.4758	10.6526
12 OXYLENE	349.0632	4.0027	.1711	3.8316
13 N-NONANE	.0331	4.1013E-04	1.7535E-05	3.9263E-04
14 MEB	.9061	6.7325E-03	2.8783E-04	6.4448E-03
15 TMB	11.1717	.0501	2.1020E-03	.0471
16 C10	.6637	1.2989E-03	5.5529E-05	1.2433E-03
17 C5NA	.0936	.0357	1.5246E-03	.0341
18 C6NA	.0732	.0154	6.5880E-04	.0148
19 C7NA	.0367	4.9173E-03	2.1023E-04	4.7072E-03
20 C8NA	.7048	.0134	5.7180E-04	.0128
RATE, LB-MOL/HR	1790.4208	7542.5018	322.4618	7220.1975

STREAM ID	9	10	60	61
NAME	COMP DISCH	MAKEUP H2	DEC7 FEED	DEC7 BOTTOMS
PHASE	DRY VAPOR	DRY VAPOR	MIXED	DRY LIQUID
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	5338.5764	363.7155	5.5063	4.2086E-15
2 METHANE	352.7255	18.3772	2.6797	8.9849E-14
3 ETHANE	1490.4258	.7657	55.0857	1.1983E-14
4 PROPANE	1.7750	.0000	.2316	5.9006E-14
5 BUTANES	.4670	.0000	.2045	2.2102E-14
6 PENTANES	.0989	.0000	.1314	3.2986E-11
7 BENZENE	14.0492	.0000	110.4988	.0312
8 TOLUENE	1.8976	.0000	46.1584	16.3731
9 EBENZENE	.6162	.0000	39.8805	39.7901
10 PXYLENE	4.9600	.0000	357.6098	357.1303
11 MXYLENE	10.6526	.0000	809.6881	808.7891
12 OXYLENE	3.8316	.0000	349.0632	348.9912
13 N-NONANE	3.9263E-04	.0000	.0331	.0331
14 NEB	6.4448E-03	.0000	.9061	.9061
15 TMB	.0471	.0000	11.1717	11.1710
16 C10	1.2433E-03	.0000	.6637	.6637
17 C5NA	.0341	.0000	.2124	1.7566E-08
18 C6NA	.0148	.0000	.0732	2.0626E-06
19 C7NA	4.7077E-03	.0000	.0367	2.7543E-05
20 C8NA	.0128	.0000	.7048	.6984
RATE, LB-MOL/HR	7220.1975	382.8584	1790.5396	1584.5803

STREAM ID	62	63	64	65
NAME	DEC7 SIDEDRAW	DEC7 TWR REFLUX	DEC7 OVERHEAD	DEC7 OFFGAS
PHASE	DRY LIQUID	DRY LIQUID	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	2.3745E-03	.2170	5.7209	5.5033
2 METHANE	3.5228E-03	.8056	3.4817	2.6741
3 ETHANE	.1730	81.8352	136.7491	54.7033
4 PROPANE	1.5489E-03	1.1781	1.4081	.2270
5 BUTANES	3.0663E-03	3.2897	3.4911	.1931
6 PENTANES	4.6100E-03	5.6230	5.7498	.1125
7 BENZENE	104.5380	1065.3050	1071.2325	3.2185
8 TOLUENE	29.7895	3.6908	3.7040	1.7408E-03
9 EBENZENE	.0905	2.2967E-04	2.3034E-04	9.1086E-08
10 PXYLENE	.4848	9.1312E-04	9.1577E-04	3.2747E-07
11 MXYLENE	.9112	1.4830E-03	1.4872E-03	5.0196E-07
12 OXYLENE	.0774	5.0875E-05	5.1018E-05	1.4118E-08
13 N-NONANE	2.5722E-05	6.2203E-08	6.2465E-08	2.3393E-11
14 NEB	2.7042E-06	2.4502E-10	2.4650E-10	4.7990E-14
15 TMB	7.2256E-06	1.9124E-10	1.9175E-10	2.3170E-14
16 C10	1.1680E-09	2.8503E-13	3.0275E-13	1.6186E-14
17 C5NA	.0254	14.2950	14.4820	.1506
18 C6NA	.0468	3.1610	3.1873	.0183
19 C7NA	.0349	.3168	.3186	1.0173E-01
20 C8NA	6.3834E-03	6.4181E-05	6.4381E-05	3.6650E-08
RATE, LB-MOL/HR	136.1940	1179.7199	1249.5258	66.8059

STREAM ID	66	67	70	71
NAME	DEC7 REBOIL	DEC7 OVHD LIQUID	BZ TOWER FEED	BZ TOWER BOTTOMS
PHASE	DRY LIQUID	DRY LIQUID	MIXED	DRY LIQUID
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	1.0856E-14	5.5182E-04	2.3745E-03	7.5851E-16
2 METHANE	2.3101E-13	2.0486E-03	3.5228E-03	2.3355E-15
3 ETHANE	3.0931E-14	.2081	.1738	1.8225E-16
4 PROPANE	1.5226E-13	2.9958E-03	1.5489E-03	1.2770E-16
5 BUTANES	5.6994E-14	8.3655E-03	3.0663E-03	9.5636E-16
6 PENTANES	3.0052E-10	.0143	4.6100E-03	6.5776E-16
7 BENZENE	.1633	2.7090	104.5380	.3166
8 TOLUENE	57.0661	9.3857E-03	29.7895	29.7846
9 EBENZENE	105.8923	5.8403E-07	.0905	.0905
10 PXYLENE	935.1003	2.3220E-06	.4848	.4848
11 MXYLENE	2107.3165	3.7711E-06	.9112	.9112
12 OXYLENE	861.2552	1.2937E-07	.0774	.0774
13 N-NONANE	.0846	1.5838E-10	2.5722E-05	2.5722E-05
14 MEB	1.9365	6.2512E-13	2.7042E-06	2.7042E-06
15 TMB	23.0923	4.8633E-13	7.2256E-06	7.2256E-06
16 C10	1.1430	7.2687E-16	1.1680E-09	1.1680E-09
17 C5NA	1.2292E-07	.0364	.0254	3.2071E-11
18 C6NA	1.1089E-05	8.0383E-03	.0468	8.6937E-07
19 C7NA	1.3002E-04	8.0557E-04	.0349	1.1786E-04
20 C8NA	1.9333	1.6321E-07	6.3834E-03	6.3834E-03
RATE, LB-MOL/HR	4094.9835	3.0000	136.1940	31.6717

STREAM ID	72	73	74	75
NAME	BENZENE PRODUCT	BENZENE DRAG	BZ TWR REFLUX	BZ TWR OVERHEAD
PHASE	DRY LIQUID	DRY LIQUID	DRY LIQUID	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	6.2503E-07	2.7709E-06	1.3898E-04	2.5129E-03
2 METHANE	4.6172E-06	2.3149E-05	1.1577E-03	4.6759E-01
3 ETHANE	8.0238E-04	4.3363E-03	.2169	.3899
4 PROPANE	1.9661E-05	1.0676E-04	5.3395E-03	6.8687E-01
5 BUTANES	1.0685E-04	5.1770E-04	.0259	.0289
6 PENTANES	4.0884E-04	1.4533E-03	.0727	.0769
7 BENZENE	97.4542	4.9675	248.4323	255.1995
8 TOLUENE	4.8761E-03	1.1981E-07	5.9921E-06	6.1290E-06
9 EBENZENE	1.5955E-12	1.3377E-16	6.6900E-15	6.8773E-15
10 PXYLENE	1.9708E-12	1.2549E-16	6.2759E-15	6.4516E-15
11 MXYLENE	1.6376E-12	4.9301E-16	2.4656E-14	2.5340E-14
12 OXYLENE	3.3698E-15	1.7287E-16	8.6453E-15	8.8873E-15
13 N-NONANE	4.1332E-15	1.2403E-16	6.2032E-15	6.3733E-15
14 MEB	3.1102E-15	1.5955E-16	7.9794E-15	8.2028E-15
15 TMB	5.0142E-15	2.5722E-16	1.2864E-14	1.3224E-14
16 C10	2.0376E-14	1.0427E-15	5.2148E-14	5.3607E-14
17 C5NA	4.6433E-03	.0102	.5119	.5327
18 C6NA	.0252	.0139	.6934	.7150
19 C7NA	.0320	1.9995E-03	.1000	.1028
20 C8NA	8.2103E-11	1.3602E-16	6.8427E-15	7.0310E-15
RATE, LB-MOL/HR	97.5222	5.0000	250.0596	257.0596

STREAM ID	76	77
NAME	BZ TOWER REBOIL	BZ TWR ACCUM VAPOR
PHASE	DRY LIQUID	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR		
1 HYDROGEN	1.8951E-14	2.3711E-03
2 METHANE	5.0351E-14	3.4950E-03
3 ETHANE	4.5534E-15	.1687
4 PROPANE	3.1906E-15	1.4225E-03
5 BUTANES	2.3895E-14	2.4418E-03
6 PENTANES	1.6434E-14	2.7479E-03
7 BENZENE	7.9102	1.7998
8 TOLUENE	744.1678	1.7111E-08
9 EBENZENE	2.2620	5.3500E-17
10 PXYLENE	12.1124	5.0180E-17
11 MXYLENE	22.7665	1.9076E-16
12 OXYLENE	1.9349	6.9137E-17
13 N-NONANE	6.4266E-04	4.6034E-17
14 MEB	6.7565E-05	6.3811E-17
15 TMB	1.8053E-04	1.0288E-16
16 C10	2.9182E-08	4.1703E-16
17 C5NA	8.0129E-10	.0105
18 C6NA	2.1721E-05	7.8021E-03
19 C7NA	2.9446E-03	7.5165E-04
20 C8NA	.1595	5.1481E-17
RATE, LB-MOL/HR	791.3173	2.0000

STREAM ID	1	2	3	4
NAME	LIQ XYLENE FEED	TOTAL RECYCLE GAS	REACTOR FEED	REACTOR EFFLUENT
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1725.711	2791.784	4517.494	4517.752
M LB/HR	183.122	31.018	214.140	214.152
TEMPERATURE, F	300.000	136.224	825.000	840.000
PRESSURE, PSIA	21.000	159.700	150.700	145.700
MOLECULAR WEIGHT	106.114	11.110	47.402	47.402
ENTHALPY, MM BTU/HR	21.687	8.530	126.039	127.583
BTU/LB	118.429	275.000	588.583	595.760
MOLE FRACTION LIQUID	1.00000	.00000	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	2791.784	4517.494	4517.752
M LB/HR	N/A	31.018	214.140	214.152
M FT3/HR	N/A	111.638	412.015	431.359
STD VAP RATE(1), M FT3/HR	N/A	1059.436	1714.314	1714.412
MOLECULAR WEIGHT	N/A	11.110	47.402	47.402
ENTHALPY, BTU/LB	N/A	275.000	588.583	595.760
CP, BTU/LB-F	N/A	.822	.668	.669
DENSITY, LB/M FT3	N/A	277.842	519.736	496.456
Z (FROM DENSITY)	N/A	.9986	.9970	.9974
THERMAL COND, BTU/HR-FT-F	N/A	.04832	.06644	.06565
VISCOSITY, CP	N/A	.01397	.01765	.01794
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1725.711	N/A	N/A	N/A
M LB/HR	183.122	N/A	N/A	N/A
FT3/HR	3919.790	N/A	N/A	N/A
GAL/MIN	488.701	N/A	N/A	N/A
STD LIQ RATE, FT3/HR	3365.110	N/A	N/A	N/A
MOLECULAR WEIGHT	106.114	N/A	N/A	N/A
ENTHALPY, BTU/LB	118.429	N/A	N/A	N/A
CP, BTU/LB-F	.525	N/A	N/A	N/A
DENSITY, LB/FT3	46.717	N/A	N/A	N/A
Z (FROM DENSITY)	5.8510E-03	N/A	N/A	N/A
SURFACE TENSION, DYNE/CM	16.3725	N/A	N/A	N/A
TH COND, BTU/HR-FT-F	.06101	N/A	N/A	N/A
VISCOSITY, CP	.26435	N/A	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	5	6	7	8
NAME	HPS LIQUID	HPS GAS	PURGE GAS	COMP SUCTION
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1807.979	5227.869	142.356	5087.528
M LB/HR	182.069	61.884	1.685	60.208
TEMPERATURE, F	110.000	110.000	110.000	110.000
PRESSURE, PSIA	134.700	134.700	134.700	134.700
MOLECULAR WEIGHT	100.703	11.837	11.834	11.834
ENTHALPY, MM BTU/HR	5.326	15.332	.417	14.919
BTU/LB	29.254	247.750	247.787	247.787
MOLE FRACTION LIQUID	1.00000	.00000	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	5227.869	142.356	5087.528
M LB/HR	N/A	61.884	1.685	60.208
M FT3/HR	N/A	236.484	6.440	230.136
STD VAP RATE(1), M FT3/HR	N/A	1983.090	54.022	1930.633
MOLECULAR WEIGHT	N/A	11.837	11.834	11.834
ENTHALPY, BTU/LB	N/A	247.750	247.787	247.787
CP, BTU/LB-F	N/A	.773	.773	.773
DENSITY, LB/M FT3	N/A	261.681	261.615	261.615
Z (FROM DENSITY)	N/A	.9967	.9967	.9967
THERMAL COND, BTU/HR-FT-F	N/A	.04434	.04435	.04435
VISCOSITY, CP	N/A	.01364	.01364	.01364
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1807.979	N/A	N/A	N/A
M LB/HR	182.069	N/A	N/A	N/A
FT3/HR	3508.213	N/A	N/A	N/A
GAL/MIN	437.388	N/A	N/A	N/A
STD LIQ RATE, FT3/HR	3411.112	N/A	N/A	N/A
MOLECULAR WEIGHT	100.703	N/A	N/A	N/A
ENTHALPY, BTU/LB	29.254	N/A	N/A	N/A
CP, BTU/LB-F	.425	N/A	N/A	N/A
DENSITY, LB/FT3	51.890	N/A	N/A	N/A
Z (FROM DENSITY)	.0428	N/A	N/A	N/A
SURFACE TENSION, DYNE/CM	26.0479	N/A	N/A	N/A
TH COND, BTU/HR-FT-F	.07222	N/A	N/A	N/A
VISCOSITY, CP	.63575	N/A	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	9	10	11
NAME	COMP DISCH	MAKEUP H2	SPILLBACK
PHASE	DRY VAPOR	DRY VAPOR	DRY VAPOR
----- TOTAL STREAM -----			
RATE, LB-MOL/HR	5087.528	222.351	2518.095
M LB/HR	60.208	.610	29.800
TEMPERATURE, F	138.755	100.000	138.753
PRESSURE, PSIA	159.700	320.000	159.700
MOLECULAR WEIGHT	11.834	2.745	11.834
ENTHALPY, MM BTU/HR	16.248	.324	8.042
BTU/LB	269.860	531.115	269.858
MOLE FRACTION LIQUID	.00000	.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000
----- TOTAL VAPOR ------			
RATE, LB-MOL/HR	5087.528	222.351	2518.095
M LB/HR	60.208	.610	29.800
M FT3/HR	204.103	4.220	101.022
STD VAP RATE(1), M FT3/HR	1930.633	84.378	955.575
MOLECULAR WEIGHT	11.834	2.745	11.834
ENTHALPY, BTU/LB	269.860	531.115	269.858
CP, BTU/LB-F	.788	2.564	.788
DENSITY, LB/M FT3	294.984	144.647	294.985
Z (FROM DENSITY)	.9976	1.0112	.9976
THERMAL COND, BTU/HR-FT-F	.04640	.08550	.04640
VISCOSITY, CP	.01412	.00898	.01412
----- TOTAL LIQUID -----			
RATE, LB-MOL/HR	N/A	N/A	N/A
M LB/HR	N/A	N/A	N/A
FT3/HR	N/A	N/A	N/A
GAL/MIN	N/A	N/A	N/A
STD LIQ RATE, FT3/HR	N/A	N/A	N/A
MOLECULAR WEIGHT	N/A	N/A	N/A
ENTHALPY, BTU/LB	N/A	N/A	N/A
CP, BTU/LB-F	N/A	N/A	N/A
DENSITY, LB/FT3	N/A	N/A	N/A
Z (FROM DENSITY)	N/A	N/A	N/A
SURFACE TENSION, DYNE/CM	N/A	N/A	N/A
TH COND, BTU/HR-FT-F	N/A	N/A	N/A
VISCOSITY, CP	N/A	N/A	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	60
NAME	DEC7 FEED
PHASE	MIXED
----- TOTAL STREAM -----	
RATE, LB-MOL/HR	1808.097
M LB/HR	182.079
TEMPERATURE, F	110.069
PRESSURE, PSIA	124.700
MOLECULAR WEIGHT	100.702
ENTHALPY, MM BTU/HR	5.325
BTU/LB	29.247
MOLE FRACTION LIQUID	.99955
MOLE FRACTION FREE WATER	.00000
----- TOTAL VAPOR ------	
RATE, LB-MOL/HR	.815
M LB/HR	1.024E-02
M FT3/HR	3.981E-02
STD VAP RATE(1), M FT3/HR	.309
MOLECULAR WEIGHT	12.565
ENTHALPY, BTU/LB	242.079
CP, BTU/LB-F	.741
DENSITY, LB/M FT3	257.337
Z (FROM DENSITY)	.9958
THERMAL COND, BTU/HR-FT-F	.04232
VISCOSITY, CP	.01370
----- TOTAL LIQUID -----	
RATE, LB-MOL/HR	1807.282
M LB/HR	182.068
FT3/HR	3507.945
GAL/MIN	437.354
STD LIQ RATE, FT3/HR	3410.711
MOLECULAR WEIGHT	100.741
ENTHALPY, BTU/LB	29.235
CP, BTU/LB-F	.425
DENSITY, LB/FT3	51.901
Z (FROM DENSITY)	.0396
SURFACE TENSION, DYNE/CM	26.0568
TH COND, BTU/HR-FT-F	.07221
VISCOSITY, CP	.63566

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	61	62	63	64
NAME	DEC7 BOTTOMS	DEC7 SIDEDRAW	DEC7 TWR REFLUX	DEC7 OVERHEAD
PHASE	DRY LIQUID	DRY LIQUID	DRY LIQUID	DRY VAPOR
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	1584.097	133.221	1190.242	1289.018
M LB/HR	168.250	10.874	89.803	92.758
TEMPERATURE, F	230.413	316.543	110.000	293.393
PRESSURE, PSIA	90.700	91.338	80.000	90.000
MOLECULAR WEIGHT	106.212	81.623	74.946	71.960
ENTHALPY, MM BTU/HR	14.015	1.367	2.850	24.363
BTU/LB	83.299	125.738	31.738	262.648
MOLE FRACTION LIQUID	1.00000	1.00000	1.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR -----				
RATE, LB-MOL/HR	N/A	N/A	N/A	1289.018
M LB/HR	N/A	N/A	N/A	92.758
M FT3/HR	N/A	N/A	N/A	104.587
STD VAP RATE(1), M FT3/HR	N/A	N/A	N/A	489.161
MOLECULAR WEIGHT	N/A	N/A	N/A	71.960
ENTHALPY, BTU/LB	N/A	N/A	N/A	262.648
CP, BTU/LB-F	N/A	N/A	N/A	.377
DENSITY, LB/M FT3	N/A	N/A	N/A	886.890
Z (FROM DENSITY)	N/A	N/A	N/A	.9036
THERMAL COND, BTU/HR-FT-F	N/A	N/A	N/A	.02432
VISCOSITY, CP	N/A	N/A	N/A	.01190
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	1584.097	133.221	1190.242	N/A
M LB/HR	168.250	10.874	89.803	N/A
FT3/HR	3427.372	240.504	1756.117	N/A
GAL/MIN	427.309	29.995	218.945	N/A
STD LIQ RATE, FT3/HR	3095.023	198.008	1699.437	N/A
MOLECULAR WEIGHT	106.212	81.623	74.946	N/A
ENTHALPY, BTU/LB	83.299	125.738	31.738	N/A
CP, BTU/LB-F	.485	.525	.404	N/A
DENSITY, LB/FT3	49.090	45.198	51.137	N/A
Z (FROM DENSITY)	.0265	.0198	.0192	N/A
SURFACE TENSION, DYNE/CM	20.2619	12.4224	23.5209	N/A
TH COND, BTU/HR-FT-F	.06586	.06013	.07222	N/A
VISCOSITY, CP	.35788	.19126	.40447	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

PROBLEM MNAI DEEDGE OUTPUT SXKAMH
STREAM SUMMARY 10/15/00
LICENSED EXCLUSIVELY FOR USE BY: MOBIL Corporation and Affiliates

STREAM ID	65	66	67	70
NAME	DEC7 OFFGAS	DEC7 REBOIL	DEC7 OVHD LIQUID	BZ TOWER FEED
PHASE	DRY VAPOR	DRY LIQUID	DRY LIQUID	MIXED
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	87.776	4023.917	3.000	133.221
M LB/HR	2.730	427.036	.225	10.874
TEMPERATURE, F	110.000	440.808	110.000	239.263
PRESSURE, PSIA	80.000	98.477	80.000	32.000
MOLECULAR WEIGHT	31.100	106.124	74.946	81.623
ENTHALPY, MM BTU/HR	.530	84.614	7.136E-03	1.623
BTU/LB	194.093	198.142	31.738	149.296
MOLE FRACTION LIQUID	.00000	1.00000	1.00000	.60266
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR -----				
RATE, LB-MOL/HR	87.776	N/A	N/A	52.934
M LB/HR	2.730	N/A	N/A	4.245
M FT3/HR	6.465	N/A	N/A	11.774
STD VAP RATE(1), M FT3/HR	33.310	N/A	N/A	20.087
MOLECULAR WEIGHT	31.100	N/A	N/A	80.196
ENTHALPY, BTU/LB	194.093	N/A	N/A	246.270
CP, BTU/LB-F	.439	N/A	N/A	.316
DENSITY, LB/M FT3	422.246	N/A	N/A	360.554
Z (FROM DENSITY)	.9638	N/A	N/A	.9409
THERMAL COND, BTU/HR-FT-F	.01625	N/A	N/A	.01409
VISCOSITY, CP	.01047	N/A	N/A	.00995
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	N/A	4023.917	3.000	80.287
M LB/HR	N/A	427.036	.225	6.629
FT3/HR	N/A	10403.745	4.397	136.692
GAL/MIN	N/A	1297.091	.548	17.042
STD LIQ RATE, FT3/HR	N/A	7857.118	4.295	120.761
MOLECULAR WEIGHT	N/A	106.124	74.946	82.564
ENTHALPY, BTU/LB	N/A	198.142	31.738	87.195
CP, BTU/LB-F	N/A	.616	.404	.472
DENSITY, LB/FT3	N/A	41.046	51.137	48.495
Z (FROM DENSITY)	N/A	.0263	.0192	7.2635E-03
SURFACE TENSION, DYNE/CM	N/A	8.8956	23.5209	17.3318
TH COND, BTU/HR-FT-F	N/A	.05184	.07222	.06546
VISCOSITY, CP	N/A	.15907	.40447	.25125

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	71	72	73	74
NAME	BZ TOWER BOTTOMS	BENZENE PRODUCT	BENZENE DRAG	BZ TWR REFLUX
PHASE	DRY LIQUID	DRY LIQUID	DRY LIQUID	DRY LIQUID
----- TOTAL STREAM -----				
RATE, LB-MOL/HR	32.788	93.432	5.000	241.685
M LB/HR	3.039	7.299	.390	18.869
TEMPERATURE, F	100.000	100.000	100.000	175.645
PRESSURE, PSIA	85.000	70.000	70.000	105.000
MOLECULAR WEIGHT	92.679	78.119	78.072	78.072
ENTHALPY, MM BTU/HR	7.777E-02	.204	1.087E-02	1.109
BTU/LB	25.591	27.911	27.845	58.792
MOLE FRACTION LIQUID	1.00000	1.00000	1.00000	1.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000	.00000
----- TOTAL VAPOR ------				
RATE, LB-MOL/HR	N/A	N/A	N/A	N/A
M LB/HR	N/A	N/A	N/A	N/A
M FT3/HR	N/A	N/A	N/A	N/A
STD VAP RATE(1), M FT3/HR	N/A	N/A	N/A	N/A
MOLECULAR WEIGHT	N/A	N/A	N/A	N/A
ENTHALPY, BTU/LB	N/A	N/A	N/A	N/A
CP, BTU/LB-F	N/A	N/A	N/A	N/A
DENSITY, LB/M FT3	N/A	N/A	N/A	N/A
Z (FROM DENSITY)	N/A	N/A	N/A	N/A
THERMAL COND, BTU/HR-FT-F	N/A	N/A	N/A	N/A
VISCOSITY, CP	N/A	N/A	N/A	N/A
----- TOTAL LIQUID -----				
RATE, LB-MOL/HR	32.788	93.432	5.000	241.685
M LB/HR	3.039	7.299	.390	18.869
FT3/HR	57.174	135.562	7.262	369.998
GAL/MIN	7.128	16.901	.905	46.130
STD LIQ RATE, FT3/HR	55.895	132.284	7.087	342.546
MOLECULAR WEIGHT	92.679	78.119	78.072	78.072
ENTHALPY, BTU/LB	25.591	27.911	27.845	58.792
CP, BTU/LB-F	.403	.387	.387	.429
DENSITY, LB/FT3	53.150	53.841	53.750	50.997
Z (FROM DENSITY)	.0247	.0169	.0169	.0236
SURFACE TENSION, DYNE/CM	27.0399	26.2495	26.1802	21.0023
TH COND, BTU/HR-FT-F	.07267	.07267	.07267	.06924
VISCOSITY, CP	.58073	.45822	.45683	.31493

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

PROBLEM NHAI DEEDGE OUTPUT SXKAMH
STREAM SUMMARY 10/15/00
LICENSED EXCLUSIVELY FOR USE BY: MOBIL Corporation and Affiliates

STREAM ID	75	76	77
NAME	BZ TWR OVERHEAD	BZ TOWER REBOIL	BZ TWR ACCUM VAPOR
PHASE	DRY VAPOR	DRY LIQUID	DRY VAPOR
----- TOTAL STREAM -----			
RATE, LB-MOL/HR	248.685	767.524	2.000
M LB/HR	19.405	71.133	.146
TEMPERATURE, F	199.573	278.410	174.995
PRESSURE, PSIA	21.700	29.100	16.300
MOLECULAR WEIGHT	78.031	92.679	72.972
ENTHALPY, MM BTU/HR	4.564	7.553	3.325E-02
BTU/LB	235.205	106.183	227.822
MOLE FRACTION LIQUID	.00000	1.00000	.00000
MOLE FRACTION FREE WATER	.00000	.00000	.00000
----- TOTAL VAPOR ------			
RATE, LB-MOL/HR	248.685	N/A	2.000
M LB/HR	19.405	N/A	.146
M FT3/HR	77.999	N/A	.813
STD VAP RATE(1), M FT3/HR	94.372	N/A	.759
MOLECULAR WEIGHT	78.031	N/A	72.972
ENTHALPY, BTU/LB	235.205	N/A	227.822
CP, BTU/LB-F	.312	N/A	.308
DENSITY, LB/M FT3	248.788	N/A	179.568
Z (FROM DENSITY)	.9620	N/A	.9725
THERMAL COND, BTU/HR-FT-F	.01162	N/A	.01082
VISCOSITY, CP	.00939	N/A	.00911
----- TOTAL LIQUID -----			
RATE, LB-MOL/HR	N/A	767.524	N/A
M LB/HR	N/A	71.133	N/A
FT3/HR	N/A	1515.741	N/A
GAL/MIN	N/A	188.976	N/A
STD LIQ RATE, FT3/HR	N/A	1308.409	N/A
MOLECULAR WEIGHT	N/A	92.679	N/A
ENTHALPY, BTU/LB	N/A	106.183	N/A
CP, BTU/LB-F	N/A	.505	N/A
DENSITY, LB/FT3	N/A	46.929	N/A
Z (FROM DENSITY)	N/A	7.2554E-03	N/A
SURFACE TENSION, DYNE/CM	N/A	16.0464	N/A
TH COND, BTU/HR-FT-F	N/A	.06246	N/A
VISCOSITY, CP	N/A	.24617	N/A

(1) STANDARD VAPOR VOLUME IS 379.49 FT3/LB-MOLE (60 F AND 14.696 PSIA)

STREAM ID	1	2	3	4
NAME	LIQ XYLENE FEED	TOTAL RECYCLE GAS	REACTOR FEED	REACTOR EFFLUENT
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	1.6944E-15	1847.6753	1847.6753	1729.4647
2 METHANE	3.8728E-14	143.9513	143.9513	143.7191
3 ETHANE	4.1314E-15	785.1226	785.1226	903.3920
4 PROPANE	2.1724E-14	.8068	.8068	1.1185
5 BUTANES	3.7862E-14	.1890	.1890	.4131
6 PENTANES	1.1117E-11	.0387	.0387	.1735
7 BENZENE	.1054	5.3521	5.4575	113.5724
8 TOLUENE	8.6905	.7342	9.4247	46.4352
9 EBENZENE	161.4708	.2435	161.7144	40.4286
10 PXYLENE	40.3804	1.9655	42.3459	363.2013
11 MXYLENE	1108.4269	4.1162	1112.5431	801.4597
12 OXYLENE	405.2055	1.5331	406.8186	357.1981
13 N-NONANE	.2889	1.5491E-04	.2890	.0335
14 MEB	9.5603E-05	3.7282E-03	3.8238E-03	1.3378
15 TMB	4.7198E-05	.0211	.0212	12.5433
16 C10	7.9489E-07	1.6875E-03	1.6883E-03	2.3053
17 C5NA	.0917	.0159	.1077	.1292
18 C6NA	7.2165E-07	5.7669E-03	5.7676E-03	.0796
19 C7NA	9.7790E-06	1.8404E-03	1.8501E-03	.0388
20 C8NA	.9703	5.0029E-03	.9753	.7088
RATE, LB-MOL/HR	1725.7105	2791.7835	4517.4941	4517.7524

STREAM ID	5	6	7	8
NAME	HPS LIQUID	HPS GAS	PURGE GAS	COMP SUCTION
PHASE	DRY LIQUID	DRY VAPOR	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	4.4425	3328.7677	90.6649	3240.1079
2 METHANE	2.6635	271.6711	7.3841	263.8939
3 ETHANE	75.5441	1596.8476	43.4740	1553.6777
4 PROPANE	.2724	1.6367	.0447	1.5975
5 BUTANES	.2140	.3843	.0105	.3742
6 PENTANES	.1327	.0787	2.1437E-03	.0766
7 BENZENE	107.9279	10.8896	.2965	10.5972
8 TOLUENE	45.6607	1.4941	.0407	1.4538
9 EBENZENE	40.1718	.4955	.0135	.4822
10 PXYLENE	361.1284	3.9993	.1089	3.8918
11 MXYLENE	797.1187	8.3751	.2281	8.1501
12 OXYLENE	355.5814	3.1192	.0849	3.0355
13 N-NONANE	.0334	3.1529E-04	8.5827E-06	3.0673E-04
14 MEB	1.3339	7.5886E-03	2.0655E-04	7.3819E-03
15 TMB	12.5236	.0404	1.1704E-03	.0418
16 C10	2.3035	3.4354E-03	9.3493E-05	3.3412E-03
17 C5NA	.1124	.0324	8.8311E-04	.0316
18 C6NA	.0735	.0117	3.1951E-04	.0114
19 C7NA	.0368	3.7450E-03	1.0196E-04	3.6439E-03
20 C8NA	.7035	.0102	2.7718E-04	9.9059E-03
RATE, LB-MOL/HR	1807.9786	5227.8689	142.3560	5087.5279

STREAM ID	9	10	60	61
NAME	COMP DISCH	MAKEUP H2	DEC7 FEED	DEC7 BOTTOMS
PHASE	DRY VAPOR	DRY VAPOR	MIXED	DRY LIQUID
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	3240.1879	211.2337	4.4425	4.3279E-14
2 METHANE	263.8939	10.6728	2.6635	2.1490E-14
3 ETHANE	1553.6777	.4447	75.5441	6.2692E-14
4 PROPANE	1.5975	.0000	.2724	2.2561E-14
5 BUTANES	.3742	.0000	.2140	4.0252E-14
6 PENTANES	.0766	.0000	.1327	1.3460E-11
7 BENZENE	10.5972	.0000	107.9279	.0215
8 TOLUENE	1.4538	.0000	45.6607	14.7497
9 EBENZENE	.4822	.0000	40.1718	40.0770
10 PXYLENE	3.8918	.0000	361.1284	360.6321
11 MXYLENE	8.1501	.0000	797.1187	796.2205
12 OXYLENE	3.0355	.0000	355.5814	355.5055
13 N-NONANE	3.0673E-04	.0000	.0334	.0333
14 MEB	7.3819E-03	.0000	1.3339	1.3339
15 TMB	.0418	.0000	12.5236	12.5236
16 C10	3.3412E-03	.0000	2.3035	2.3035
17 C5NA	.0316	.0000	.2312	9.5136E-09
18 C6NA	.0114	.0000	.0735	1.2437E-06
19 C7NA	3.6439E-03	.0000	.0168	1.0317E-05
20 C8NA	9.9059E-04	.0000	.7035	.6966
RATE, LB-MOL/HR	5087.5279	222.3507	1808.0975	1584.0971

STREAM ID	62	63	64	65
NAME	DEC7 SIDEDRAW	DEC7 TWR REFLUX	DEC7 OVERHEAD	DEC7 OFFGAS
PHASE	DRY LIQUID	DRY LIQUID	DRY VAPOR	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	1.6044E-03	.1190	4.5598	4.4406
2 METHANE	3.0346E-03	.5476	3.2080	2.6591
3 ETHANE	.2122	77.1010	152.4329	75.1109
4 PROPANE	1.6538E-03	.9579	1.2287	.2684
5 BUTANES	2.9570E-03	2.4090	2.6201	.2051
6 PENTANES	4.2420E-03	4.0840	4.2125	.1182
7 BENZENE	100.4312	1094.1543	1101.6295	4.7359
8 TOLUENE	30.8932	1.5943	3.6085	5.2207E-03
9 EBENZENE	.0947	2.0101E-04	2.0163E-04	1.1363E-07
10 PXYLENE	.4963	7.7091E-04	7.7324E-04	3.9477E-07
11 MXYLENE	.8982	1.1946E-03	1.1982E-03	5.7721E-07
12 OXYLENE	.0759	3.9756E-05	3.9871E-05	1.5727E-08
13 N-NONANE	2.5390E-05	5.1550E-08	5.1707E-08	2.7864E-11
14 MEB	3.4998E-06	2.4503E-10	2.4652E-10	6.8536E-14
15 TMB	4.0398E-06	6.9811E-11	6.9997E-11	1.1325E-14
16 C10	2.6300E-09	3.6657E-13	3.9429E-13	2.6849E-14
17 C5NA	.0222	11.9723	12.1813	.1790
18 C6NA	.0420	2.9607	2.9923	.0241
19 C7NA	.0344	.3396	.3421	1.5661E-03
20 C8NA	6.8724E-03	6.1355E-05	6.1560E-05	5.0466E-08
RATE, LB-MOL/HR	133.2208	1198.2420	1209.0179	87.7759

STREAM ID	66	67	70	71
NAME	DEC7 REBOIL	DEC7 OVHD LIQUID	BZ TOWER FEED MIXED	BZ TOWER BOTTOMS
PHASE	DRY LIQUID	DRY LIQUID		DRY LIQUID
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	1.0996E-13	2.9780E-04	1.6044E-03	5.7177E-16
2 METHANE	5.4606E-14	1.3710E-03	3.0346E-03	2.2382E-15
3 ETHANE	1.5932E-13	.1930	.2122	2.5003E-16
4 PROPANE	5.7338E-14	2.3902E-03	1.6530E-03	1.5191E-16
5 BUTANES	1.0231E-13	6.0314E-03	2.9570E-03	1.0230E-15
6 PENTANES	1.2608E-10	.0102	4.2420E-03	6.9229E-16
7 BENZENE	.1060	2.7394	100.4312	.3278
8 TOLUENE	51.0692	8.9988E-03	30.8932	30.8885
9 EBENZENE	105.0760	5.0326E-07	.0947	.0947
10 PXYLENE	929.6844	1.9301E-06	.4963	.4963
11 MXYLENE	2041.0245	2.9910E-06	.8982	.8982
12 OXYLENE	862.6656	9.9536E-08	.0759	.0759
13 N-NONANE	.0838	1.2906E-10	2.5390E-05	2.5390E-05
14 MEB	2.7994	6.1549E-13	3.4998E-06	3.4998E-06
15 TMB	24.8284	1.7478E-13	4.0398E-06	4.0398E-06
16 C10	3.8775	9.1765E-16	2.6300E-09	2.6300E-09
17 C5NA	6.7790E-08	.0300	.0222	3.3066E-11
18 C6NA	6.7538E-06	7.4126E-03	.0420	8.7614E-07
19 C7NA	8.7001E-05	8.5033E-04	.0344	1.2639E-04
20 C8NA	1.9024	1.5361E-07	6.8724E-03	6.8724E-03
RATE, LB-MOL/HR	4023.9173	3.0000	133.2208	32.7884

STREAM ID	72	73	74	75
NAME	BENZENE PRODUCT	BENZENE DRAG	BZ TWR REFLUX	BZ TWR OVERHEAD
PHASE	DRY LIQUID	DRY LIQUID	DRY LIQUID	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR				
1 HYDROGEN	4.1712E-07	1.8708E-06	9.0431E-05	1.6944E-03
2 METHANE	3.9287E-06	1.9976E-05	9.6556E-04	3.9962E-03
3 ETHANE	9.6795E-04	5.3262E-03	.2575	.4687
4 PROPANE	2.0739E-05	1.1495E-04	5.5564E-03	7.1895E-03
5 BUTANES	1.0182E-04	5.0418E-04	.0244	.0272
6 PENTANES	3.7196E-04	1.3510E-03	.0653	.0692
7 BENZENE	93.3682	4.9690	240.1854	246.9207
8 TOLUENE	4.6716E-03	1.2043E-07	5.8213E-06	5.9586E-06
9 EBENZENE	1.5315E-12	1.3423E-16	6.4884E-15	6.6763E-15
10 PXYLENE	1.8507E-12	1.2320E-16	5.9551E-15	6.1275E-15
11 MXYLENE	1.4817E-12	4.6527E-16	2.2490E-14	2.3141E-14
12 OXYLENE	3.0335E-15	1.6243E-16	7.8515E-15	8.0788E-15
13 N-NONANE	3.7444E-15	1.1747E-16	5.6782E-15	5.8392E-15
14 MEB	3.9094E-15	2.0933E-16	1.0118E-14	1.0411E-14
15 TMB	6.6049E-15	3.5366E-16	1.7095E-14	1.7590E-14
16 C10	1.6750E-14	8.9690E-16	4.3353E-14	4.4608E-14
17 C5NA	4.0630E-03	9.0741E-03	.4386	.4568
18 C6NA	.0225	.0126	.6080	.6275
19 C7NA	.0315	2.0513E-03	.0992	.1020
20 C8NA	8.0175E-11	1.4013E-16	6.7733E-15	6.9661E-15
RATE, LB-MOL/HR	93.4324	5.0000	241.6849	248.6849

STREAM ID	76	77
NAME	BZ TOWER REBOIL	BZ TWR ACCUM VAPOR
PHASE	DRY LIQUID	DRY VAPOR
COMP. MOLE RATES, LB-MOL/HR		
1 HYDROGEN	1.3384E-14	1.6021E-03
2 METHANE	5.2393E-14	3.0107E-03
3 ETHANE	5.8527E-15	.2059
4 PROPANE	3.5560E-15	1.5181E-03
5 BUTANES	2.3965E-14	2.3510E-03
6 PENTANES	1.6205E-14	2.5191E-03
7 BENZENE	7.6723	1.7663
8 TOLUENE	723.0496	1.6831E-08
9 EBENZENE	2.2178	5.3621E-17
10 PXYLENE	11.6175	4.9213E-17
11 MXYLENE	21.0252	1.8586E-16
12 OXYLENE	1.7770	6.4885E-17
13 N-NONANE	5.9435E-04	4.3543E-17
14 MEB	8.1926E-05	8.3620E-17
15 TMB	9.4564E-05	1.4127E-16
16 C10	6.1563E-08	3.5027E-16
17 C5NA	7.7403E-10	9.1121E-03
18 C6NA	2.0509E-05	6.8815E-03
19 C7NA	2.9585E-03	7.5708E-04
20 C8NA	.1609	5.2659E-17
RATE, LB-MOL/HR	767.5239	2.0000

CPC
Lin Yuan, Taiwan

UOP Visit

October 23, 2000

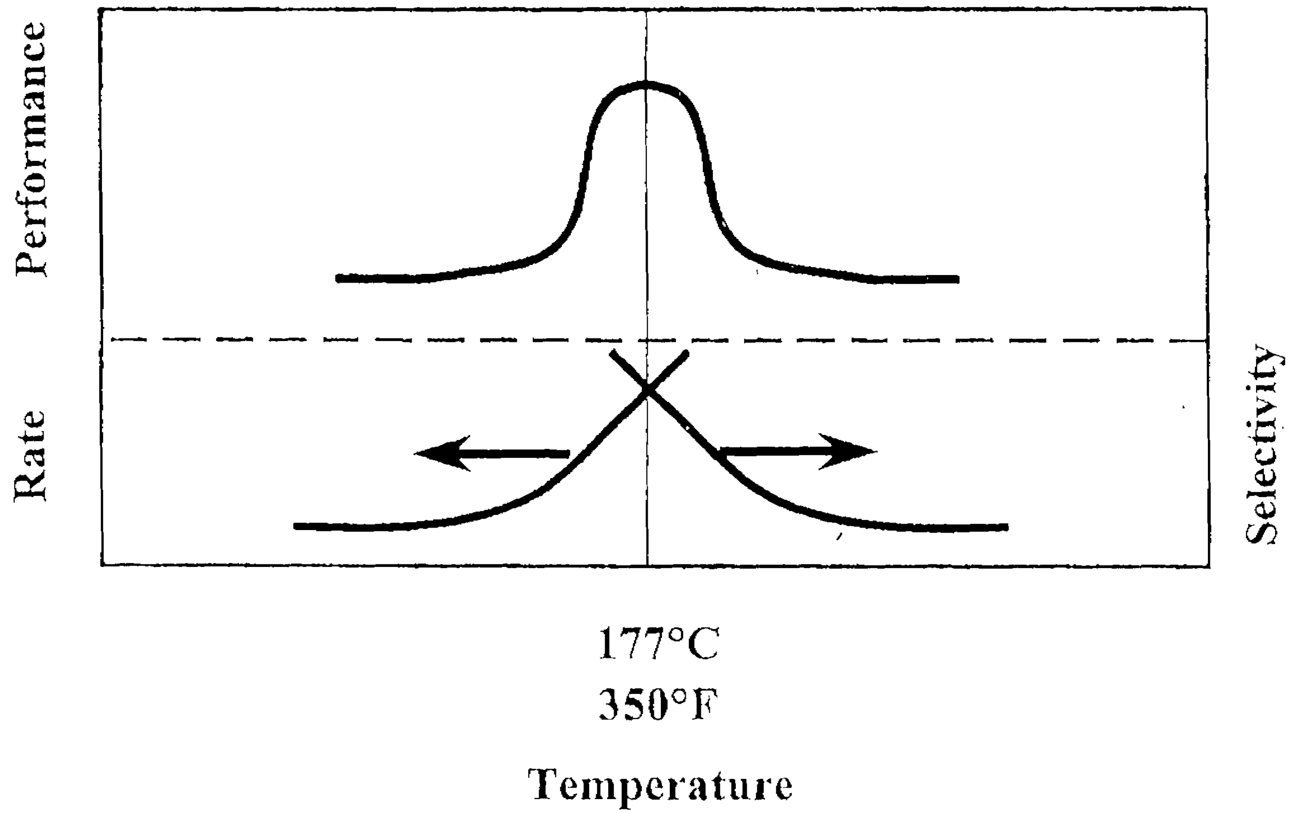
Agenda

- **Discuss CPC questions regarding the recently revamped Aromatics Complex Trains**

Parex Unit Chamber Temperature

- The Parex Chamber Temperature needs to be controlled at 177 C (+/- 2 C)
- The 177 C temperature is based on UOP studies
- The 177 C is based on providing 'optimal' mass transfer and adsorbent selectivity

Temperature Effect



Parex Unit Feed C9A Resolution

- Review the Parex Feed Specs
- Discuss what is causing the C9A to be high
- Discuss possible resolution

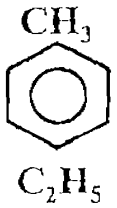
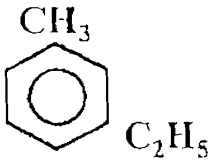
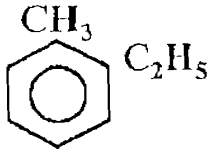
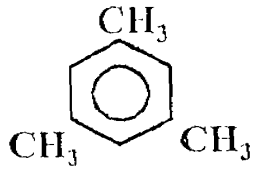
Parex Feed C9 Content

- C_9+ aromatics
  - Results from poor operation of upstream unit
  - C_9-C_{10} aromatics accumulate in the desorbent
    - ⇒ Increases desorbent circulation and utilities consumption
    - ⇒ May contaminate para-xylene product if concentration is high enough
  - C_{11}+ can polymerize on the adsorbent

Parex Feed Specifications

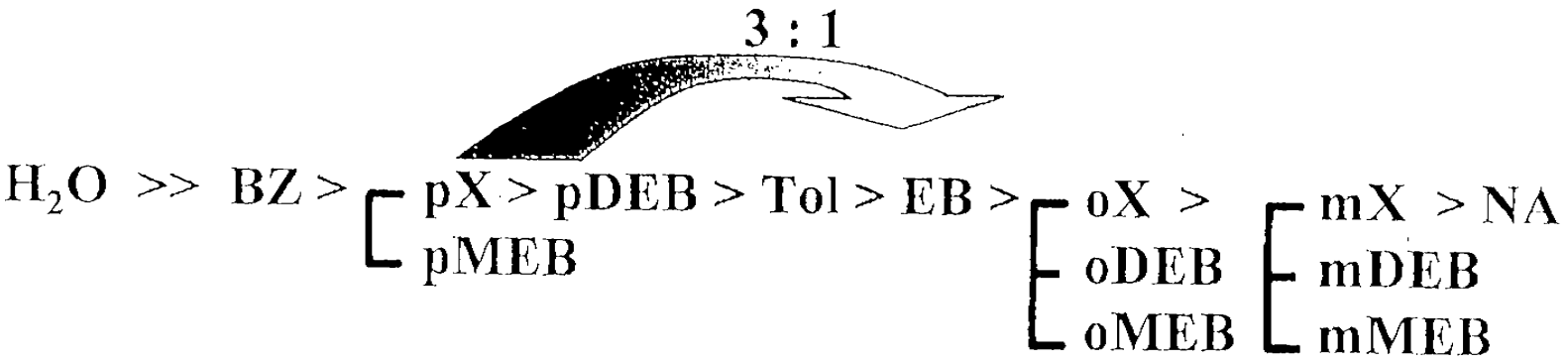
Component	Specification	Test Method
Benzene	500 wt ppm max	UOP 543
MEB	100 wt ppm max	UOP 931
Other C_9A	500 wt ppm max	UOP 931
Trace Heavies (C_{10}^+)	10 wt ppm max	UOP 931
Water	60 wt ppm max	UOP 481
Active Oxygen	1 wt ppm max	ASTM E 299
Dissolved Oxygen	1 wt ppm max	UOP 678
Carbonyl Number	2 wt ppm max	UOP 624
Bromine Index	20 mg/100g max	ASTM D 1492
Color (Pt-Co)	10 max	ASTM D 1209
Total Sulfur	1 wt ppm max	ASTM D 4045
Total Nitrogen	1 wt ppm max	ASTM D 4629
Total Chloride	5 wt ppm max	UOP 395
Lead	5 wt ppb max	UOP 350
Arsenic	1 wt ppb max	UOP 296
Copper	1 wt ppb max	UOP 144
Organic Chlorides	3 wt ppm max	UOP 395

C_9 Aromatics

Feed C_9A Component		Boiling Point, °F(°C)
	1,4 Methylethylbenzene	324 (162)
	1,3 Methylethylbenzene	322 (161)
	1,2 Methylethylbenzene	329 (165)
	1,3,5 Trimethylbenzene	329 (165)

Parex Adsorbent

Relative Affinity Scale

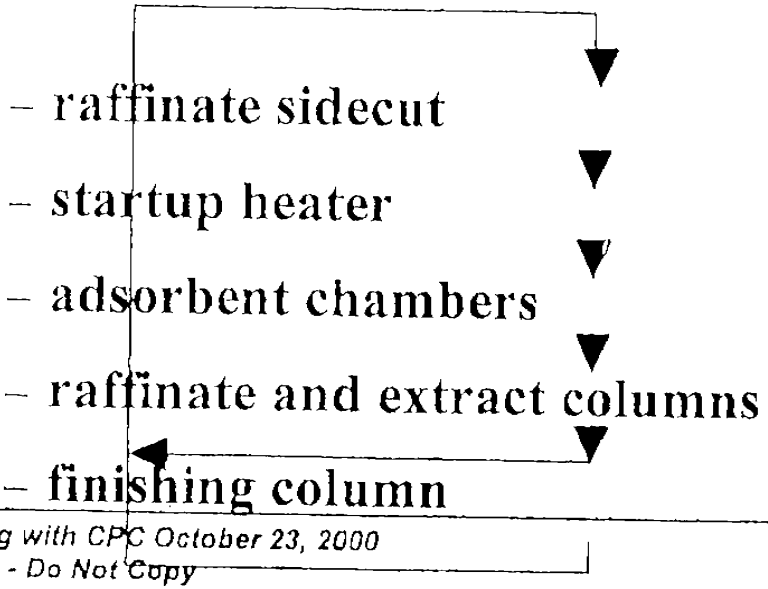


Orthoxylene Column Feed Temperature

- CPC to provide additional info on why Orthoxylene Column Feed Temperature increase to 415 F

Parex Unit Shutdown I

- Reduce Parex charge to 50 -70% design
- Bypass the low flow S/D for chamber circulation pumps
- Bypass the isomerization reactor
- Put the unit on "short circulation:"



Parex Unit Shutdown II

- Put finishing column on total reflux
- Set all pumparound zone flows equal to L2
- Unseat the rotary valve and rotary valve should stop indexing
- Open chamber circulation pumps common suction valves
- Open the RV bypass manifold
- Stop F, E, D flows to/from chambers
- Leave raffinate line from chambers open for pressure control
- Stop chamber circulation pumps
- Stop line and secondary flushes
- Stop water injection

Parex Unit Shutdown III

- Stop chamber head flushes & dome sealant
- Isolate the rotary valve and chambers
- Stop rotary valve hydraulic system
- Maintain 3.5 kg/cm^{2}g (50 psig) pressure in chambers using nitrogen

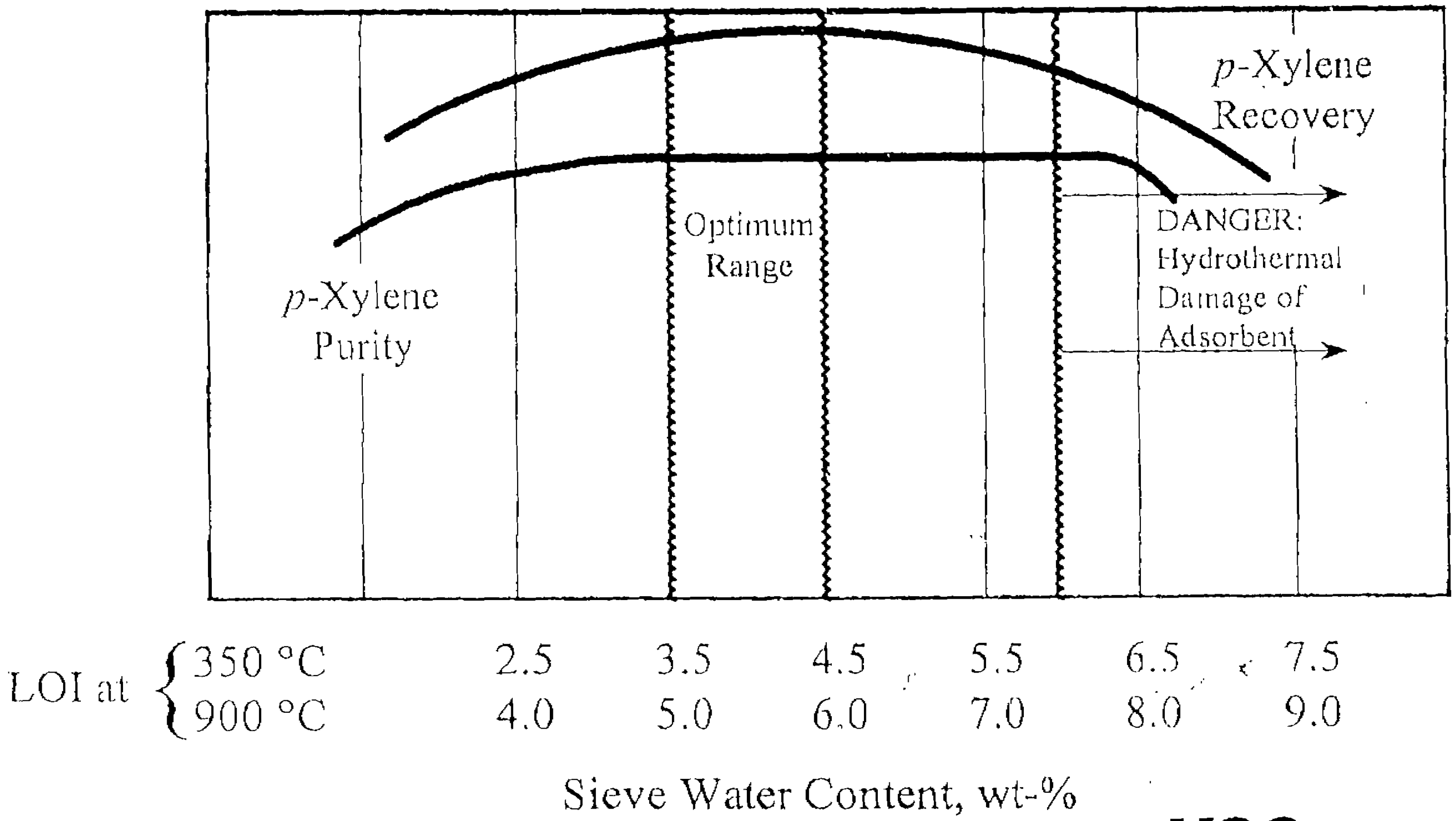
Parex Unit Adsorbent Hydration

- Deionized and deaerated water injected into desorbent stream
- Maintain 150 ppmw water injection based on Feed rate for ADS-27 Adsorbent
- Water content in total liquid, which is the sum of feed, desorbent and secondary flush, to the adsorption section should be 60-80 wt-ppm
- Monitor unit water balance via on-line moisture analyzers and water boots
- Adsorbent sample can also verify adsorbent hydration

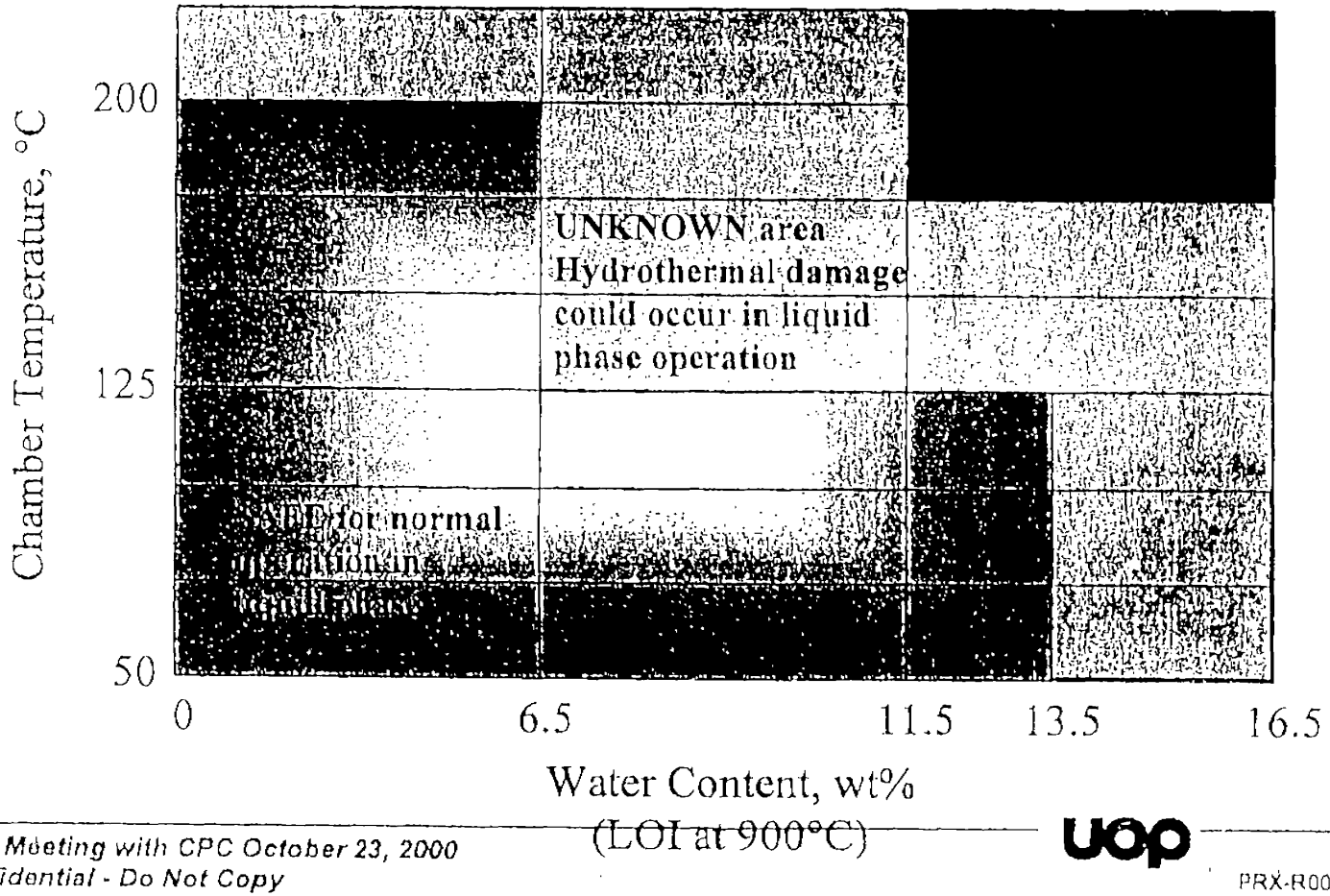
Effect of Water on Parex Adsorbent

- Excessive water in feed and desorbent streams can result in:
  - Loss of performance (i.e. recovery)
  - Permanent adsorbent damage (hydrothermal)
- Safeguard - perform water balance
  - Water recovery should be within 80 or 90%
  - If not, investigate immediately (i.e. exchanger leak, incorrect injection rate, laboratory error)
- Moisture analyzers
- Lower than 'optimal' water can result in a shift of the adsorbent selectivities causing product contamination (i.e. typically MX contamination)

Effect of Sieve H_2O Content on Purity and Recovery



Effect of Water on Parex Adsorbent Stability



Parex Unit Chamber
Head Flushes

Head Flush In

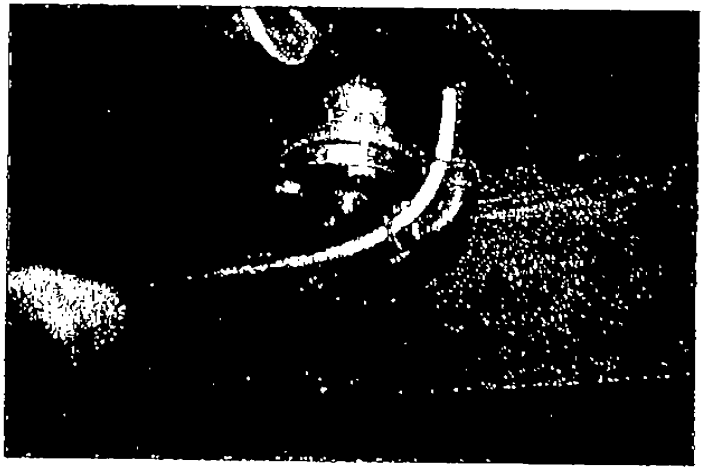
- Slipstream of main desorbent stream
- Flushed to prevent head contamination
- Flowrate sufficient to flush top or bottom grid vent volume within one Rotary Valve step time

Head Flush Out

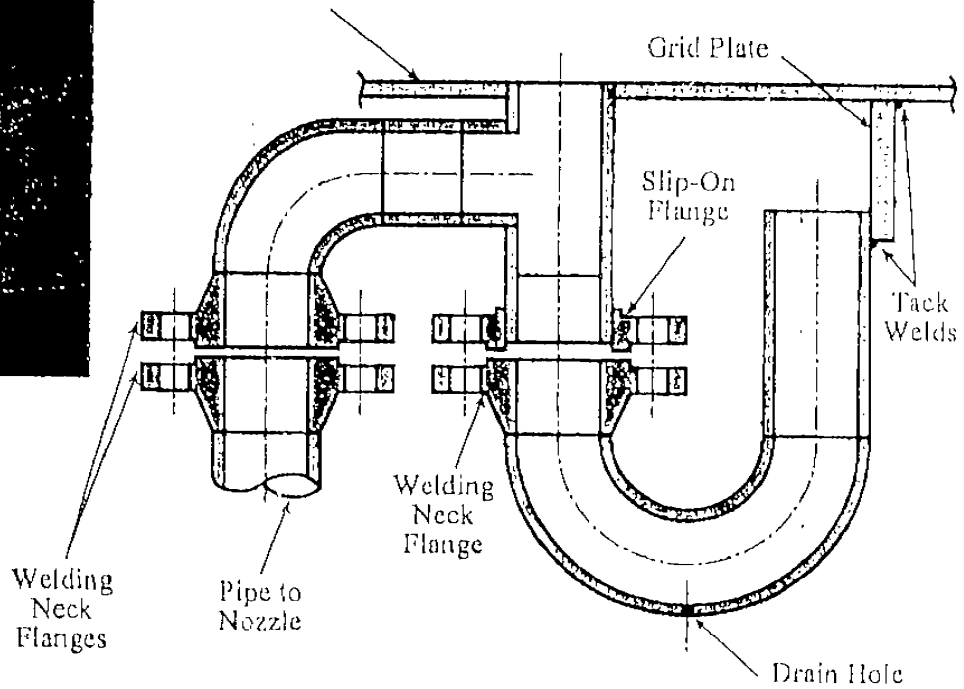
- Optimized to minimize C_8A while maximizing adsorbent capacity
- Reduces net flow into process thereby minimizing potential contamination from the heads and reduces impact on zone flows

Snorkel Design

Old Design



New Design



附件2

Year 2000 Readiness Disclosure

ORATEC Interventions, Inc.
3700 Haven Court
Menlo Park, CA 94025
December 23, 1999

Introduction

ORATEC Interventions, Inc. ("ORATEC®") makes the following Readiness Disclosure Statements regarding the Year 2000 processing capabilities of (1) its radiofrequency generators, (2) its automated design, production, and quality control processes and functions, and (3) its business and operational functions and systems, as provided for in the "Year 2000 Information and Readiness Disclosure Act", signed into law on October 19, 1998. These Statements clarify and supercede previous statements or representations that may have been made regarding the Year 2000 readiness status of ORATEC products and services.

Year 2000 Readiness Status

(1) ORA-50™, ORA-50™ S, and Vulcan® EAS™ ElectroThermal Generators.

The software in the ORA-50, ORA-50 S, and Vulcan EAS ElectroThermal Generators is not date or time dependent, i.e., the software does not use a date or time to perform any of its functions, and does not require a date or time in order to function properly. Therefore, the software in the ORA-50, ORA-50 S, and Vulcan EAS ElectroThermal Generators is not affected by the Year 2000 processing problem.

The microprocessor contained in the ORA-50, ORA-50 S, and Vulcan EAS generators is not date or time dependent, i.e., the microprocessor does not use a date or time to perform any of its functions, and does not require a date or time in order to function properly. Therefore, the microprocessor in the ORA-50, ORA-50 S, and Vulcan EAS ElectroThermal Generators is not affected by the Year 2000 processing problem.

(2) Design, Production, and Quality Control Processes and Functions

ORATEC has completed examining each of its computer-controlled and computer-aided design, production, and quality control processes and functions and has determined them to be capable of Year 2000 processing. ORATEC has developed a remediation plan to address potential effects on critical processes and functions of Year 2000 processing problems. ORATEC will provide additional notification regarding the potential effect of Y2K processing problems on the company's design, production, and quality control processes and functions to customers when that information is available.

(3) Business and Operational Functions and Systems

ORATEC has completed the process of examining each of its business and operational functions and systems and has determined each function and/or system to be Year 2000 ready. ORATEC has developed a remediation plan to address the potential effect on critical functions and systems of Year 2000 processing problems, should such action be required. ORATEC will provide additional notification regarding the potential effect of Y2K processing problems on its business and operational functions and systems when that information is available.

Future Updates to Year 2000 Readiness Status:

Updates to ORATEC's Year 2000 Readiness status will be posted periodically on ORATEC's website.

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