

C

NMP

\*

( / / , / / , / / )

C

C

( NMP)

BASF

(C )

HYSYS 3.1

( < α < / )

. [ ]

. [ ]

C

. [ ]

(DMF)

(ACN)

. [ ]

. [ ]

HYSYS

[ ]

C

( )

NMP

(SBR)

( / %)

(BR)

( " )

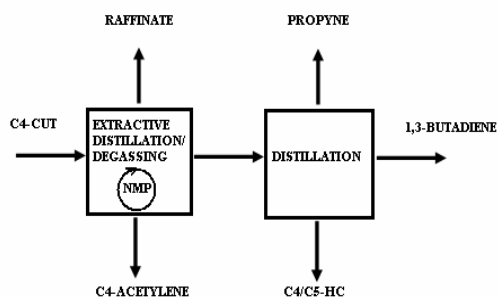
BASF

[ ] C NMP

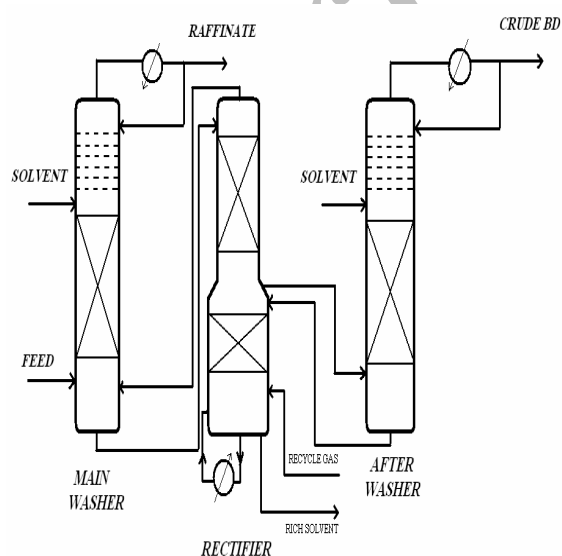
(NMP)

	Boiling Point (°C)	Solubility In NMP (vol/vol at 1atm)	Selectivity*
Less soluble			
Propane	-42.1	3.08	13.5
i-Butane	-11.7	14.87	8.52
Propylene	-47.7	5.37	7.73
Propadiene	-34.3	18.4	2.26
n-Butane	-0.5	9.5	4.37
i-Butene	-6.9	15.42	2.69
1-Butene	-6.3	15.6	2.66
Trans2Butene	0.9	20.4	2.03
Cis2Butene	3.7	25.1	1.65
1,3Butadiene	-4.7	41.5	1
More soluble			
Methylacetylene	-23.2	43	1/1.09
1,2-Butadiene	10.8	78	1/1.88
1-Butyne	8.1	102	1/2.46
Vinylacetylene	5.1	226	1/5.44

\* Selectivity=Solubility of 1,3-BD/Solubility of compound



[ ]



[ ]

( )

NMP

)

(Main Washer (MW)

NMP

( )

C

NMP

Rectifier

(After Washer (AW) )

NMP

NMP

Raschig Super Ring

[ ]

( )

[ ]

:

	Top stream of MW		Top stream of AW	
	Exp. Value *	Sim. Value**	Exp. Value	Sim. Value
wt%				
Propane	0.038	0.038	0	0
Propene	0.17	0.17	0	0
Propadiene	0.038	0.038	0	0
M-acetylene	0	0	0.285	0.083
n-Butane	32.95	32.73	0	0
i-Butane	7.01	6.96	0	0
1-Butene	15.21	15.12	0	0
i-Butene	33.67	33.47	0.024	0
Trans2-Butene	6.26	6.23	0.016	0.006
Cis2-Butene	4.17	4.51	0.392	0.046
1,3-BD	0.162	0	98.53	98.88
1,2-BD	0	0	0.171	0.317
1-Butyne	0	0	0.003	0.018
V-acetylene	0	0	0	0.009
C5	0.114	0	0.056	0.072
NMP	0	0	0	0.009
H <sub>2</sub> O	0.193	0.74	0.515	0.558
Temperature (°C)	45	45.6	44.9	46.1
Flowrate(kg/h)	30569	31716	20237	21005

\*Exp.=Experimental

\*\*Sim.=Simulation

	Flowrate (kg/h)	Temperature (°C)
C4-Cut	32634	46.7
Solvent (MW Tower)	291787	42
Solvent (AW Tower)	80000	42

[ ]

NRTL UNIQUAC WILSON

[ ]

**Raffinate**  
**MW**

NRTL

MW

MW

NRTL

C

( )

(Raffinate)

Raffinate

( )

After Washer Main Washer

( )

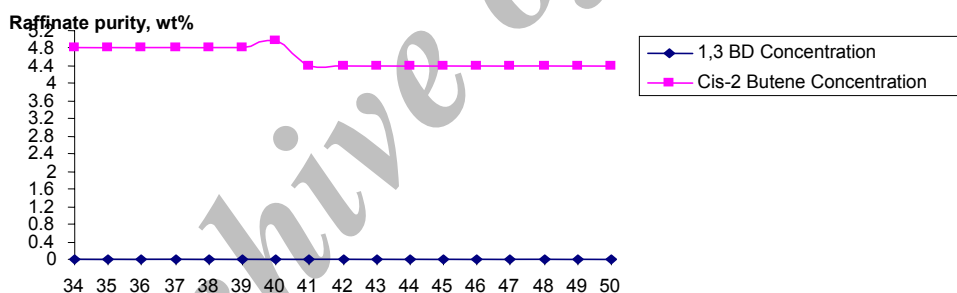
**AW**

C

AW

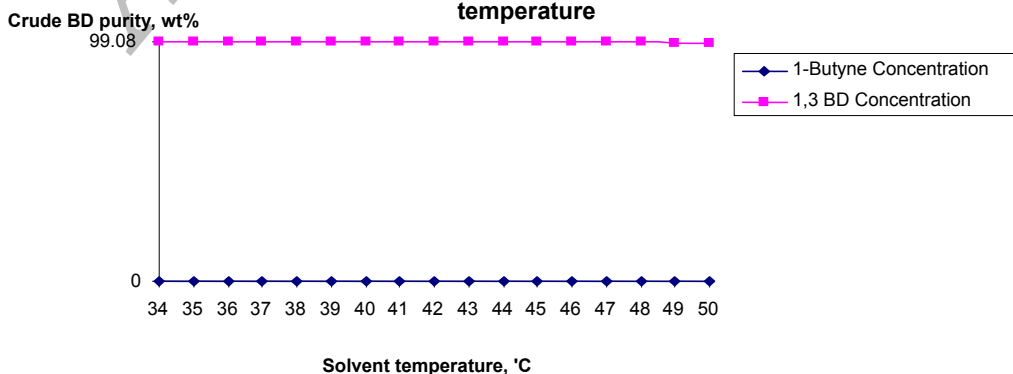
( ) AW  
AW MW ( ) (Crude BD)  
Crude BD  
( ) AW  
( ) AW °C kg/h AW  
AW °C °C  
( kg/h ) %  
AW MW

Sensitivity of Raffinate purity to changes in solvent temperature

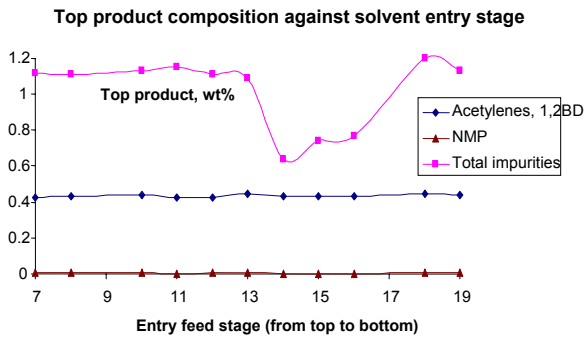


MW Raffinate :

Sensitivity of Crude BD purity to changes in solvent temperature

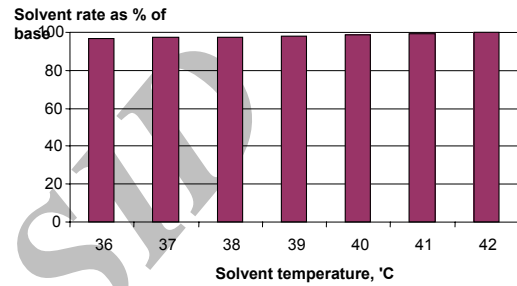


.AW BD :



( )

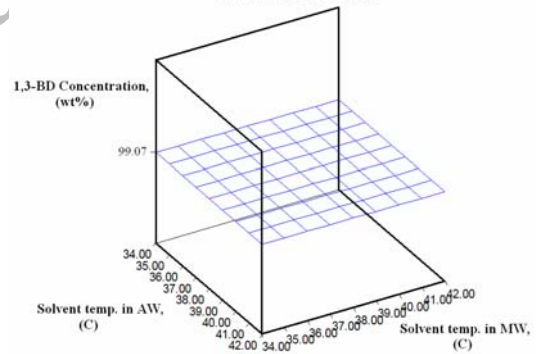
**Sensitivity of solvent rate to changes in solvent temperature in AW tower**



NRTL

AW

**Sensitivity of crude BD purity to changes in solvent temperature in MW and AW tower**



C

AW

AW

AW

- 1 - Schweitzer, P. A. (1996). *Handbook of Separation Technique for Chemical Engineers*. 3<sup>rd</sup> Edition. New York, McGraw Hill.
- 2 - Seader, J. D., Jeffery, J. S., Scott, D. B. Enhanced Distillation, in Perry, R. H. and Green, D. W. (1997). *Perry's Chemical Engineers' Handbook*. 7<sup>th</sup> Edition. New York, McGraw Hill.
- 3 - Michael, F. D., Jeffrey, P. K. Distillation, Azeotropic and Extractive, in Ruthven, D. M. (Ed.) (1997). *Encyclopedia of Separation Technology*. Vol. 1, New York, John Wiley.
- 4 - Lei, Z., Zhou, R. and Duan, Z. (2002). "Process improvement on separating C4 by extractive distillation." *Chemical Engineering Journal*, Vol. 85, PP. 379-386.

- 
- 5 - Hilal, N., Yousef, G. and Langston, P. (2001). "The reduction of extractive agent in extractive distillation and auto-extractive distillation." *Chem. Eng. Process.*, Vol. 41, No. 8, PP. 673-679.
  - 6 - Langston, P., Hilal, N., Shingfield, S. and Webb, S. (2005). "Simulation and optimization of extractive distillation with water as solvent." *Chem. Eng. Process.*, Vol.44, PP. 345-351.
  - 7 - *Basic Engineering Documents of BD Unit of Jam Petrochemical Company.*
  - 8 - *Process Economics Program Report 35C, SRI International.*
  - 9 - Munoz, R., Monton, J. B., Burguet, M. C. and De la Torre, J. (2006). "Separation of isobutyl acetate by extractive distillation and pressure-swing distillation: Simulation and Optimization." *Separation and Purification Technology*, Vol. 50, No. 2, PP. 175-183.
  - 10 - Prausnitz, J. M., Lichtenthaler, R. N. and De Azevedo, E. G. (1999). *Molecular Thermodynamics of Fluid-Phase Equilibria*. 3<sup>rd</sup> Edition. Prentice Hall PTR.
  - 11 - Mc Cabe, W. L., Smith, J. C. and Harriott, P. (2001). *Unit operations of chemical Engineering*. 6<sup>th</sup> Edition. Mc Graw Hill.

1 - Rectifier

Archive of SID