

A Guide to ROSA 6.0



ROSA 6.0 Information

- <u>http://www.dow.com/liquidseps/design/rosa.htm</u>
 - Download program
 - Installation instructions
 - ROSA FAQs (Frequently Asked Questions) ANSWER CENTER
 - A Guide to ROSA 6.0 program
 - ROSA version history



New Temperature Correction Factor (TCF)

- Incorporated new TCF
- Based on tests carried out by FilmTec (2003-2004)
 Note: The published TCF documents will be updated.



Effect of Temperature





Brackish Water

- ROSA 6.0 predicts a higher feed pressure at temperatures < 25°C
- ROSA 6.0 predicts lower permeate TDS at temperatures < 25°C
- ROSA 6.0 predicts higher permeate TDS at temperatures > 25°C



Effect of Temperature





Seawater

- Both show similar pressure trend
- ROSA 6.0 predicts lower permeate TDS at temperatures < 25°C
- ROSA 6.0 predicts <u>significantly</u> higher permeate TDS at temperatures > 25°C



Improved Calculation Model for NO₃ Rejection



- More hardness improves the NO3 rejection while more sodium has the opposite effect.
- Based on tests carried out at FilmTec (2003).
- It applies to XLE, LE, BW30LE, BW30, SG, and LP membranes.



Print Out: System Design Overview

ROSA	#1054 (Sample Projection010version)	(mml)		
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e Options <u>Wi</u> ndow <u>H</u> ep				and the second
	Rev Water 128	491.7P mg1	To System Reservery (SA: 3)	61.11%
	Nate Camiltanian Fast Tampanian	The New 20143	Finding Parties (Pasi 2) Finding Parties (Pasi 2)	0.83
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Two reports are available in ROSA 6.0:

- **System Design Overview:** Contains system design diagram with each stream clearly numbered, and summary of key system design parameters.
- **Detailed Report:** Contains detailed information on system design.

Both reports can be printed and/or emailed separately.



User Data: ROSA menu \rightarrow Options \rightarrow User data

Please en	nter your name and compar	ny's name, then click enter.	
	Your Name: Michael Y. Kim		
Co	mpany Name: The Dow Chemica	al Company	
Default Pro	pject Directory: \\fmnt01\u3511	1518\My Documents	Change
		to to any Documents	change
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2.		inaci -	
	Set Default Report Langu	age: EN - English	
	Set Default Prin	nter: ZH - Chinese	
		ES - Spanish	
		Hide Welcome Screen	

- 1. To save all three files (.rosa, .html, overview.html), select default project directory by clicking on "**Change**" and select **folder destination**.
- 2. ROSA reports can now be printed in English, Chinese or Spanish by selecting it as your default report language in the User Data section.



System Design Overview & Detailed Report:

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Pass #	730	=1	Pase 2											
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Element Type	BW30-400	37330-400	10.E-44000.E	E-440										
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Energy and power consumption, osmotic pressure and net driving pressures are included in the System design overview and Detailed report

A Guide to ROSA 6.0



Configuration Section: Blending option has been added for both single and double pass systems.

🛱 ROSA System Selection and Data Entry
Eile Options Calculation Help
Project Name: Sample Projection System Perm Flow: 749.97 gpm
Case Number: 1 Add Remove System Feed Flow: 1,100 gpm System Recovery: 68.18 %
Dosing Chemical: None No Degasification C Pct Carbon Removal C CO2 Pressure (atm) C Urrent Pass: Pass 2 C Pass 2 C Co2 Pressure (atm) C Co2 Pressure (
Configuration for Pass 2 Number of Stages In Pass: Perm Flow: 674.97 gpm Recirculation Leops Recovery: 90.00 % Blend Permeate 75.00 gpm
Fouling Factor: 0.85 Feed Flow: 749.91 Operating Temp: 22.0 C Perm Flux: 20.45
Configuration for Stage 2 in Pass 2 Select a Stage in the Pass: Stage 2
Boost None psi Back Pressure: None psi Feed Feed #2
Same Back Pressure for all stages: V Number of Pressure Vessels in Stage: 6
Number of Elements in Each Vessel: 6 Total Number of Elements in Stage: 36 Blend Permeate
Broduct Name: XLE-440 Specs Use the Same Element in the pass: Image: Construction of the pass: Image: Construction of the pass:
Unit set used: gpm (Flow); psig (pressure) \\fmnt01\u351151\$\My Documents\Sample Projection01.html 8/5/2004



Detailed Report: Total blended product = permeate + blended flow % system recovery = (total blended flow / raw feed flow) x 100%

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Project 1	Informatio	en:												
System	Details P	ass 2												
Feed Flo	w to Stage 1			749	9.91 gpm	Pass 2 P	ermeate Flow	07	4.97 gpm	Osmoti	ic Pressure:			
East Pro	ber Flow to s	ystern		1100	los priz	Fass 2 B	becovery	9	0.01 %		Concerni	reed 0.03 p	sig	
Engling	Eactor			110	s Se	Feed Te	mperature		22.0 C		Concent	rate 0.30 p	sig.	
Cham D	hee				lone	Numba	r of Flamonts		4.03 mg/i	4.1073r	IS NOP	age 0.10 p	oler.	
Total Ac	tive Area			47520	0.00 ft2	Averas	- Part - Plus		e as efd	Power	Se there	47.33 k	W	
Water C	lassification	: RO Pe	rmea	te SDI < 1		Bypass	Blending Flow	. 7	5.00 EDM	Specific	c Energy	1.05 k	Wh/kgal	
System	Recovery			68	3.18 %	Total Bl	ended Produc	t 74	9.97 gpm		67			
	-													
Charan	Flement	-	=Ele	Feed Flow	Feed Press	Recirc Flow	Conc Flow	Conc Press	Perm Fl	low Avg Flux	Perm Press	Boost Press	Perm TDS	
Stage	Fleinkilt	# F V	# E16	(gpm)	(psig)	(gpm)	(gpm)	(psig)	(gp	m) (gfd)	(psig)	(psig)	(mg/l)	
1	XLE-440	12	6	749.91	111.05	0.00	262.31	84.21	487.	.60 22.16	0.00	0.00	0.70	
2	XLE-440	6	6	262.31	79-21	0.00	74-94	64.09	187.	37 17.03	0.00	0.00	1.19	
														-
						Pass Streams (mg/l as lon)	5							
				1	Concer	ntrate	, 	P	ermeate					
Name	Feed	A	ajuste	ed Feed	Stage 1	Stage 2	Stage 1	Stage 2	Total	Blended Tota	1			_
NH4	0.00			0.00	0.00	0.00	0.00	0.00	0.00		0.00			
K	0.25			0.25	0.57	1.54	0.07	0.18	0.10		0.12			
Na	0.88			0.88	2.45	8.31	0.04	0.11	0.05		0.14			
Mg	0.02			0.02	0.04	0.15	0.00	0.00	0.00		0.00			
Ca Sz	0.03			0.03	0.09	0.31	0.00	0.00	0.00		0.00			
Ra	0.01			0.01	0.02	0.00	0.00	0.00	0.00		0.00			
CO3	0.00			0.00	0.00	0.00	0.00	0.00	0.00		0.00			
HCO3	1.88			1.88	5.11	17.27	0.46	0.57	0.49		0.59			
NO3	0.37			0.37	0.85	2.26	0.11	0.28	0.16		0.18			
Cl	0.29			0.29	0.81	2.75	0.01	0.03	0.02		0.04			*
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New Project C	reated									[1443, 15]				



Detailed Report: Permeate quality contains extra column which displays the blended permeate quality.

🗮 ROSA -	[Sample Pr	ojectio	m01.h	itml]										×
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B C2E	19 8	(CD)	2											
		2.40												
														^
Stage	Element	#PV	#Ele	Feed Flow	Feed Press	Recirc Flow	Conc Flow	Conc Press	Perm Flo	w Avg Flux	Perm Press	Boost Press	Perm TDS	
				(gpm)	(perd)	(gpm)	(gpm)	(perd)	(gpn	n) (ptg)	(petg)	(paig)	(mg/l)	
1	XLE-440	12	6	749.91	111.05	0.00	262.31	84.21	487.6	0 22.16	0.00	0.00	0.70	
2	XLE-440	6	6	262.31	79-21	0.00	74-94	64.09	187.3	7 17.03	0.00	0.00	1.19	
I														
						Pass Streams				\sim				
	-				Concer	(mg/1 as ion)	,	2.						
Name	Feed	A	djuste	d Feed	Stana	Starag	Store t	Stateo	Total	Elandad Tota	1			
NH4	0.00			0.00	0.00	0.00	0.00	0.00	0.00	Decided 101	0.00			
K	0.00			0.25	0.57	1.54	0.07	0.00	0.10		0.12			
Na	0.88			0.88	2.45	8.21	0.04	0.11	0.45		0.14			
Mg	0.02			0.02	0.04	0.15	0.00	0.00	0.00		0.00			
Ca	0.03			0.03	0.09	0.31	0.00	0.00	0.00		0.00			
Sr	0.01			0.01	0.02	0.06	0.00	0.00	0.00		0.00			
Ba	0.00			0.00	0.00	0.00	0.00	0.00	0.00		0.00			
003	0.00			0.00	0.00	0.00	0.00	0.00	0.00		0.00			
HCO ₃	1.88			1.88	5.11	17.27	0.46	0.57	0.49		0.59			
NO3	0.37			0.37	0.85	2.26	0.11	0.28	0.16		0.18	1		
Cl	0.29			0.29	0.81	2.75	0.01	0.03	0.02		0.04			
F	0.00			0.00	0.00	0.02	0.00	0.00	c.oo		0.00	/		
S04	0.25			0.25	0.71	2.44	0.00	0.01	0.01		0.03			
Boron	0.00			0.00	0.00	0.00	0.00	0.00	0.00		0.00			
SiO2	0.06			0.06	0.17	0.57	0.00	0.01	0.00		0.01			
002	6.59			6.59	6.64	6.67	6.33	6.40	6.35		6.41			
TDS	4.03			4.03	10.81	35.68	0.70	1.19	0.83		1.11			
pH	5.69			5.69	6.12	6.63	5.11	5.20	5.13		5.21			
Design	Warnings -	- Pass	2											
-None-														
0.0														
Solubili	ity warnin	igs P	455 2											*
			_							Draw are				
New Project C	reated									j[1443, 15]				



EVA (Element Value Analysis) Spreadsheet is Incorporated into ROSA 6.0. (ROSA menu \rightarrow Options \rightarrow EVA)



EVA is an Excel spreadsheet which allows you to compare the economics of two membrane systems.

A Guide to ROSA 6.0

How to Use EVA Spreadsheet

- 1. Go to the **ROSA menu**
- 2. Choose "options"
- 3. Choose "Element Value Analysis (EVA)"
- 4. Choose "**new**"
- 5. Choose **column one or two** if you want this particular projection to be summarized in column **one or two** of EVA
- 6. Save it as **.xls file**
- 7. Create another case or projection in ROSA and perform calculations
- 8. Repeat Steps 1 through 3
- 9. Choose "**open**" and select **column one or two** depending on which column you chose in Step 5. If you chose column one in step 5, then choose column two and visa versa.
- 10. Find the Excel spreadsheet you saved your EVA in "**My documents**" and **open** it.
- 11. You should be able to see the two ROSA projection cases in column one and two.

Ability to Save ROSA Projections in Any Folder on Your Computer

- **Overview.html** An html file that contains the system design overview which includes the system design diagram and projection summary information. This is a read-only file and can be emailed to others.
- .html An html file that contains the ROSA Detailed Report. This is a read-only file and can be emailed to customers.
- **.rosa** A ROSA project file. When the User double clicks on a .rosa file, it will actually use the ROSA program to open the projection file, and the User can modify or run projections from here. This can be emailed to the others; it can be opened and modified as long as the ROSA 6.0 program is in their computer.

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Sample projection 101.html	42 KB	HTML Document	6/10/	2004 1:52 PM	
🗃 Sample projection 1010verview.html	31 KB	HTML Document	6/10/	2004 1:52 PM	
Sample projection 1.rosa	3 KB	ROSA Document	6/10/	2004 1:48 PM	
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3 objects			73.6 KB	Second Local int	ranet 🔡

ROSA Projections

- Save multiple (10) case outputs (.html and overview.html)
- Ability to rename each case
- View each case in .html (Detailed report) and overview.html (System design overview and flowchart)
- Open ROSA projection with multiple cases by opening ROSA program

Detailed Report: Individual stage composition of permeate and concentrate have been added. Osmotic pressure and NDP have been included in the Detailed Report.

ROSA D	etailed Repo	rt - M	icrosof	t Internet E	spiloner								
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O Tat	- 0 - 3	3	6 8	Search 👷	Favorites 🐨	Meda 🕘 💭	· 4· 1 1	- 🖬					
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Feed Flow	r to Stage 1			500.0	o gpm	Pass 1 Pers	meate Flow	374-9	é gim	Comotic	c Pressure:		
Raw Wat	er Flow to Sys	sterrs		500.0	o gpm	Pass 1 Rec	overy	74.9	19 %		Fee	ed 4.14 pr	rig
Feed Pres	sure			190.4	45 psig	Feed Temp	perature	20	.o C		Concentral	te 15-45 ps	ig
Fouling 7	factor			0.1	85	Feed TDS		565.7	2 mg/1		Averag	9.79 pt	tig 👘
Chem. Do	ose			2900	0e	Number o	f Elements	9	O O	Averag	e NDP	154-75 pt	ig
Total Act	ive Area			36000.0	50 ft2	Average P	ass 1 Flux	15.0	xo grid	Power		51.79 ki	W
Water Cl	assification: V	Well W	ater SE	u < 3						Specific	Energy	2.30 k	Wh/gpm
Stage	Element	#PV	#Ele	Feed Flow (gpm)	Feed Press (psig)	Recirc Flow (gpm)	Cent Flow (gpm)	Conc Press (peig)	Ferm Flow (gpm)	Avg Flux (gfd)	Ferm Press (psig)	Boost Press (psig)	Perm TDS (mg/l)
1	BW30-400	10	6	500.00	185-45	0.00	232.94	160.30	267.06	16.02	0.00	0.00	2.35
2	BW30-400	5	6	232.94	155-30	0.00	125.04	131.10	107.89	t2.95	0.00	0.00	5.86
						Pass streams (ing/l as lon)							
Name	Feed		9	Adjusted Fe	d /	Cencer	strate	Chan	Ferme	ate	and and a		
NHA		0.00			0.00	scage s	Stage 2	Stage	0.00	0.00	0.00		
X	-	2.00			2.00	4.21	7.	68	0.07	0.19	0.11		
Na	1	17.18			17.18	36.75	68	19	0.11	0.31	0.17		
Mg		50.00		/	50.00	107.15	199.	26	0.15	0.41	0.23		
Ca	8	80.00			80.00	171.45	318.	83	0.24	0.64	0.35	1	
Sr		0.00			0.00	0.00	0.	00	0.00	0.00	0.00		
Ba		0.00			0.00	0.00	0,	00	0.00	0.00	0.00		
C03		0.53			0.53	2.21	6.	88	0.00	0.00	0.00		
HC03	13	50.00			150.00	319-05	587.	30	0.85	1.82	1.13		
N03	-	7.00			7.00	14.81	27	15	0.19	0.51	0.28		
-	-	0.00	-		130.00	321-41	247.	00	0.49	1.34	0.74		
80.4	10	20.00			0.00	0,00	200	00	0.00	0.00	0.00		
Beren		0.00			0.00	0.00	399	00	0.00	0.00	0.00		
SiO2		9.00			0.00	19.25	35	75	0.06	0.13	0.08		
CO2		5.05			5.05	5.70	24	32	5.02	6.06	2 13		
TDS	3	65.71			565.72	1210.74	2247.	66	2.35	5.86	3.35		
pH	1	7.60			7,60	7.83	7.	95	5.48	3.72	3-57		8
C) Done												S Local R	ntranet.

ROSA Project Converter Converts Previous ROSA 5.x Data to ROSA 6.0: (Start \rightarrow ROSA \rightarrow ROSA Project Converter \rightarrow Select ROSA 5.x project database to convert \rightarrow Select folders to write ROSA 6 files into)

	ROSA Project Conversion Utility	
1.	Select R85A 5.* project database to convert: \\fmnt01\u351151\$\My Documents\DWS Migration Data\Rosa54\Data\Wtdata	Browse
	 Projects found in Wtdata54.mdb Amazon for Greg Candesal Amazon2 Amazon3 Anderson Water Systems Aqua Chem LHD-8 3K HPR0 Aquatech 20 mgd sw 	<
2.	Select Folder to write ROSA 6 files into: \\fmnt01\u351151\$\My Documents	Browse
3.	Convert	

Three Ways to Create Second Pass Feed Pressure

In the Configuration Section:

- **1.** Calc: ROSA automatically calculates the booster pressure required to produce specified permeate flow.
- **2. Spec**: ROSA allows the User to specify the booster pressure.
- **3.** None: No booster pressure in the second pass. Need to specify permeate backpressure in the first pass to create feed pressure in the second pass.

Note: This allows ROSA 6.0 to calculate energy/power consumption accurately according to the design parameters.

1. Calc: Automatically calculate the booster pump pressure in the second pass. (Default)

🛱 ROSA System Selection and Data Entry	
Eile Options Calculation Help	
Project Name: Sample Projection	System Perm Flow: 750.00 gpm
	System Feed Flow: 1,100 gpm
Case Number: Add <u>R</u> emove	System Recovery: 68.18 %
Dosing Chemical: None • No Degasification • Pct Carbon Removal • CO2 Pressure (atm) •	# of Pass(es): 2 + Current Pass: Pass 2 -
Configuration for Pass 2	irculation Loops
Number of Stages In Pass: 2 - Recovery: 90.00 % Blend	Permeate 75.00 gpm
Fouling Factor: 0.85 Feed Flow: 750.00 gpm Pass	2 Conc. to Pass 2 Feed:
Operating Temp: 22.0 C Perm Flux: 20.45 gfd	
Configuration for Stage 1 in Pass 2 System Configuration	
Select a Stage in the Pass: Stage 1	Conc #1
Boost Calc - Feed -	Berm #1 becomes
Back Pressure: None psi Fump Efficiency 80 %	Feed #2
Same Back Pressure for all stages: 🔽	
Number of Pressure Vessels in Stage: 12	Conc.#2
Number of Elements in Each Vessel: 6	Democrate
Blend	Permeate
Broduct Name: ALL-440 Specs	form Calculations
Unit set used: gpm (Flow); psig (pressure) \\fmnt01\u351151\$\My Documents	Sample Projection01.html 8/6/2004

2. Spec: Specify a booster pump pressure in the second pass.

🛱 ROSA System Selection and Data Entry
Eile Options Calculation Help
Project Name: Sample Projection
Case Number: 1 Add <u>R</u> emove
Dosing Chemical: None Vo Degasification # of Pass(es): 2
Adjusted pH: None Current Pass: Pass 2 -
Configuration for Pass 2
Number of Stages In Pass: 2 - Pass recovery to be calculated P
Fouling Factor: 0.85 Feed Flow: 750.00 gpm Pass 2 Conc. to Pass 2 Feed:
C Operating Temp: 22.0 C
Configuration for Stage 1 in Pass 2 System Configuration
Select a Stage in the Pass: Stage 1
Boost (Spec) [200 psi] Booster pressure Conc.#1
Back Pressure: None psi Pump Efficiency 80 % Feed Perm #1 becomes Feed #2
Same Back Pressure for all stages: 🔽
Number of Pressure Vessels in Stage: 12
5 Number of Elements in Each Vessel: 6
Total Number of Elements in Stage: 72 Blend Permeate
Product Name: XLE-440 V Specs
Use the Same Element in the pass: 🔽 Perform Calculations
Unit set used: gpm (Flow); psig (pressure) \\fmnt01\u351151\$\My Documents\Sample Projection01.html 8/6/2004

3. None: No booster pump in the second pass, but permeate backpressure in the first pass.

File Options Calculation Help Project Name: Sample Projection Case Number: I I I Add Remove Dosing Chemical: None Adjusted pH: None Configuration for Pass 2 Permeate flow to be calculated Number of Stages In Pass: Permeate flow to be calculated Pass recovery to be calculated Pass 2 Conc. to Pass 2 Feed: Poperating Temp: 22.0 C Permeate Blow: 749.91 gpm Pass 2 Conc. to Pass 2 Feed: Select a Stage In Pass: System Configuration Select a Stage In the Pass: Stage I I Boost None Psi Pump Efficiency 80 % Same Back Pressure for all stages: Image: Pass Pump Efficiency 80 %
Project Name: Sample Projection Case Number: 1 Add Remove Josing Chemical: None • No Degasification • Pet Carbon Removal • O Pet Carbon Removal • CO2 Pressure (atm) • CO2 Pressure (atm) • CO2 Pressure (atm) • Configuration for Pass 2 • Configuration for Pass 2 • Configuration for Pass: • Pass 2 • Configuration for Pass 2 • Permeate flow to be calculated Pass recovery to be calculated Pass 2 Conc. to Pass 2 Feed: Permeate backpressure Operating Temp: 22.0 C Permeate Dackpressure System Configuration for Stage 1 in Pass 2 System Configuration for Permeate backpressure Same Back Pressure for all stages:
Case Number: 1 Add Remove Image: State of the pass o
Dosing Chemical: None Adjusted pH: None Configuration for Pass 2 Number of Stages In Pass: 2 Permeate flow to be calculated Pass recovery to be calculated Pass 2 Conc. to Pass 2 Feed: Operating Temp: 22.0 Configuration for Stage 1 in Pass 2 Select a Stage in the Pass: Stage 1 Boost None Select a Stage in the Pass: Stage 1 Boost Same Back Pressure: None Same Back Pressure for all stages:
Configuration for Pass 2 Number of Stages In Pass: 2 Fouling Factor: 0.85 Operating Temp: 22.0 C Configuration for Stage 1 in Pass 2 Select a Stage in the Pass: Stage 1 Boost None v Back Pressure: None psi Pump Efficiency 80 % Same Back Pressure for all stages: v
Fouling Factor: 0.85 reed Flow: 749.91 gpm Operating Temp: 22.0 C Permeate backpressur Configuration for Stage 1 in Pass 2 System Configuration Select a Stage in the Pass: Stage 1 System Configuration Boost None Perm #1 becomes Back Pressure: None Select all stages: Solution Same Back Pressure for all stages: Solution Select all stages: Solution
Select a Stage in the Pass: Stage 1 Boost None Stage 1 Back Pressure: None psi Pump Efficiency 80 % Same Back Pressure for all stages: V
Same Back Pressure for all stages: 🔽
Number of Pressure Vessels in Stage: 12 Number of Elements in Each Vessel: 6 Total Number of Elements in Stage: 72 Product Name: XLE-440 Specs
Use the Same Element in the pass: Image: Perform Calculations Unit set used: gpm (Flow): psig (pressure) \\fmnt01\u351151\$\My Documents\Sample Projection01 html \$/6/2004

Print Out of System Design Overview: Definition of recoveries are clearly defined by stream numbers.

B	ROSA -	[Sample P	rojectio	on010v	verview.	html]							_ 7 🗙
6	Eile Opt	tions <u>W</u> indo	w <u>H</u> elp	•									_ 8 ×
	ເຂີຊ			1 ?									
	Raw Water	r TDS						498.59 mg/1	•	% System Recovery (8A/1)		68.18 %	
	Water Clas	sification				Well Water SDI < 3			< 3	Fouling Factor (Part 1)		0.85	
11	Feed Temp	perature						22.0 C		Fouling Factor (Pass 2)		0.85	
Ш.,	D 4			D	. 1		- 2						
	Stage #			1	2	1	2						
	Element T	ype	BW	30-400 1	- BW30-400	XLE-440	XLE-440						
	Pressure Ve	essels per Stag	je –	18	9	12	6						
	Elements p	per Pressure V	essel	6	6	6	6						
	Total Num	iber of Eleme	nts	108	54	72	36						
	Pass Avera	age Flux		18.33	gfd	20.4	5 gfd						
	Stage Aver	age Flux	19	.58 gfd	15.84 gfd	22.16 gfd	17.03 gfd						
	Permeate 1	Back Pressure	0.0	00 psig	0.00 psig	0.00 psig	0.00 psig						
	Dooster Pr Chamical T	ressure Dose	0.0	JU psig	0.00 psig	0.00 psig	0.00 psig						
	Energy Co	nsumption		2.67 kW	h/kgal	1.05 kV	Vh/kgal						
II.'													
									A later Se ignere grown pag				
Ш.					_								
	Pass 1		_	Pa	ass 2		28 Sumply Propositional Discourse Lines						
	Stream #	(gpm)	(psig)	e 1DS (mg/l)	Stream	# (gpm) (psig)	e IDS (mg/l)		System Berigs Overview			
	1	1100.00	0.00	498.59	9 1A	824.9	1 -	4.03					
	3	1100.00	220.82	498.60	0 2A	749.9	1 0.00	4.03	0.000				
	5	275.09	147.26	1974.8	1 3A	749.9	1 116.05	4.03	111	C. Prove Provide Contraction (19)	í.		
	7	\$24.91		4.03	5A	74.94	4 64.09	35.68			12		
	7/1	% Recovery	74	.99	7A	674.9	7 -	0.83		L			
					84	75.00	7 0.00	4.05		+			
					74/24	% Reco	very 90	01	-	•			
	Project In	official information:											
	-												
	Design W	Varnings:											
1	- Pass 1												
	-None-												~
	Pace /												
Ne	w Project Ci	reated								(12897, 0)			

Definition of Recoveries in a Single Pass System

<u>without</u> side streams	Pass recovery = system recovery
(no B and 4)	= 7 / 2 = 8 / 1
<u>with</u> product blending (B)	Pass recovery = 7 / 2 = 7 / (1 – B)
(no 4)	System recovery = 8 / 1 = (7 + B) / 1
$\underline{\text{with}}$ internal stage recycle (4) and $\underline{\text{no}}$ product blending (B)	Pass recovery = system recovery = 7 / 2 = 8 / 1

Definition of Recoveries in a Double Pass System

System Design Overview

No recycle, no product blending (no R, B, 4, and 4A)	Pass 1 recovery = 7 / 2 = 7 / 1	Pass 2 recovery = 7A / 2A	System recovery = 8A /1
<u>with</u> only product blending (B). (no R, 4 and 4A)	Pass 1 recovery = 7 / 2 = 7 / 1	Pass 2 recovery = 7A / 2A = 7A / (1A – B)	System recovery = 8A / 1 = (7A + B) / 1
with only concentrate flow recycle from 2 nd pass to the 1 st pass feed (R). (no B, 4, and 4A)	Pass 1 recovery = 7 / 2 = 7 / (1+R) (Pass recovery greater than 100% not possible)	Pass 2 recovery = 7A / 2A	System recovery = 8A / 1
with blending (B) and concentrate flow recycle from 2 nd pass to the 1 st pass feed (R) (no 4 and 4A)	Pass 1 recovery = 7 / 2 = 7 / (1 + R) (Pass recovery greater than 100% not possible)	Pass 2 recovery = 7A / 2A = 7A / (1A - B)	System recovery = 8A / 1 = (7A + B) / 1

Example of Product Blending

<u>Options</u> <u>Calculation</u> <u>H</u> elp	
Project Name: Sample Projection	System Perm Flow: 850.00 gpm
Case Number: 1 Add Remove	System Feed Flow: 1,100 gpp System Recovery: 77.27 %
Configuration for Pass 1 Number of Stages In Pass: 2 - Recovery:	# of Pass(es): 1 ÷ Current Pass: Pass 1 • 750.00 gpm Recirculation Loops 75.00 of Blend Permeate 100.00 gpm
Fouling Factor: 0.85 Feed Flow: Operating Temp: 22.0 C Perm Flux:	1,000 gpm □ Pass 1 Conc. to Pass 1 Feed: ↓6.67 gfd Max
Configuration for Stage 1 in Pass 1	System Configuration
Select a Stage in the Pass: Stage 1 Feed Pressure: None Back Pressure: None Psi Pump Efficiency 80 Select a Stage in the Pass: 9%	Conc.
Same Back Pressure for all stages: Image: Same Back Pressure for all stages: Number of Pressure Vessels in Stage: 18 Number of Elements in Each Vessel: 6 Total Number of Elements in Stage: 108 Braduet Name: BW30-400 Specs	Blend Permeate
Use the Same Element in the pass:	Perform Calculations

Please Note:

- Pass feed flow (1000 gpm) + blend permeate (100 gpm) = system feed flow (1100 gpm)
- Pass perm flow (750 gpm) + blend permeate (100 gpm) = system perm flow (850 gpm)
- System recovery (%) = system perm flow / system feed flow x 100%

Example of Pass 2 Concentrate Recycle to Pass 1 Feed

ROSA System Selection and Data Entry								
File Options Calculation Help								
Project Name: Sample Projection System Perm Flow: 750.0	o gpm							
System Feed Flow: 1,05	io gpm							
Case Number: 1 Add Remove System Recovery: 71.4	3 %							
	1							
# of Pass(es):	2 🕂 🛛							
Pass 1								
Configuration for Pass 1 Perm Flow: <u>Recirculation Loops</u> Recycle Flow:								
Number of Stages In Pass: 2 - Recovery 75.00 pc								
Field Flows - Pass 1 Conc. to Pass 1 Feed:								
Fouling Factor: 0.85 Feed Flow: 1,100 gpm Pass 2 Conc. to Pass 1 Feed: 50.00 gpm								
Operating Temp: 22.0 C Perm Flux: 18.33 gfd	Max							
Configuration for Stage 1 in Pass 1 System Configuration								
Select a Stage in the Pass: Stage 1 -								
Feed Pressure: None psi								
Pack Pressures None psi Pump Feed Perm #1 becomes								
Feed #2								
Same Back Pressure for all stages: 🔽								
Number of Pressure Vessels in Stage: 18								
Number of Elements in Each Vessel: 6								
Total Number of Elements in Stage: 108 Blend Permeate								
Product Name: BW30-400 Specs								
Use the Same Element in the pass: 🔽 Perform Calculations								
Unit set used: gpm (Flow); psig (pressure) \\fmnt01\u351151\$\My Documents\Sample Projection01.html 8	3/13/2004							

Please Note:

- Pass 1 feed flow shown (1100 gpm) includes the pass 2 conc. to pass 1 feed stream (50 gpm)
- Pass 1 feed flow (1100 gpm) = system feed flow (1050 gpm) + pass conc. to pass 1 feed (50 gpm)
- System feed flow (1050 gpm) = pass 1 feed flow (1100 gpm) pass 2 conc. to pass 1 feed (50 gpm)