

ProMax is a powerful Microsoft<sup>®</sup> Windows<sup>®</sup> based process simulation package for use in gas processing, oil refining and chemical facilities.

BR&E's process simulation software has served customers worldwide for over 30 years. ProMax provides more benefits to our clients than ever before.

**BR&H** 





Generate..

## Optimize.

Collaborate...

Benefit....

# Prosper



clients. Both novice and experienced users gain engineering and simulation skills by attending BR&E training sessions. Class lengths are one to three days.

## ProMax with **TSWEET** and **PROSIM**

### Why You NEED ProMax...

ProMax is a powerful and versatile stream based process simulation package. Use ProMax to design and optimize gas processing, refining, and chemical facilities. ProMax contains over 50 thermodynamic package combinations, over 1500 components, OLE Automation tie-ins, specifiers, solvers (including minimizer/maximizer), crude oil characterization and Microsoft Excel® spreadsheet embedding. Get all of this with amazing flexibility and ease of use.



#### **Meeting the Demands of Today's Engineer - Customer Services**

A ProMax license includes much more than just outstanding software with extensive online help. BR&E provides free technical support, free initial modeling and free training. If the numerous process examples and detailed help included with ProMax do not answer all of your questions, you have peace of mind knowing that the BR&E support staff is just a call away.

> Engineers design complex plants that are challenging to optimize and operate efficiently. BR&E accepts this challenge and offers free initial modeling for Operating Company

> > **ProMax training sessions** are FREE. Anyone wanting to learn more about ProMax is welcome.

> > > Bryan Research & Engineering, Inc.

## Simple user interface and multiple flowsheets

## provide the ultimate workflow...



#### Flowsheet Drawing Using Microsoft Visio<sup>®</sup>

ProMax uses Microsoft Visio as its drawing package. You will find that Visio's functionality empowers you to enhance your process flowsheets. Simply drag and drop blocks, streams and process data onto your flowsheet. Combining ProMax, Visio and you is true innovation.





ProMax combines the technology of TSWEET and PROSIM. Now all of a facility's independent processes can be modeled in a single project. You have the flexibility to choose the best property package for each process while sharing data between flowsheets.



# **Cross-Flowsheet** Connector ■ 2 3 3 4 m m m m 12 6 0 ] 5° 5° D Benefits:

- Directly link independent process flowsheets.
- Simplify the simulation by process specific flowsheets.

#### Benefits:

- Completely customize the drawing.
- Easily automate ProMax using VB, VBA, etc.
- Display customized stream material balance directly on drawing.
- Import / Export data directly from / to Excel.
- Enjoy the world's best flowsheeting tool as your simulator.
- Improve workflow efficiency.

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### **Multiple Flowsheets in ProMax**





### ProMax is so easy to use, you will be

## empowered to add more to any project.



#### The ProMax Project Viewer

Navigate and access all elements of your project via the ProMax Project Viewer. Specifications and results for streams and unit operations can be accessed by double-clicking the item in the flowsheet or by using the navigation tree in the Project Viewer.

The Project Viewer tree lists flowsheets, streams, blocks, environments, oils and calculators.





#### Benefits:

- View results during execution.
- Navigate quickly through complex projects.
- Easily view the entire project.
- Use the Project Viewer as a "Table of Contents" for the simulation.
- The navigation tree concept is used in other aspects of the user interface.



Environments link property packages and components to flowsheets. You can assign each flowsheet in a project a different environment or multiple flowsheets can use the same environment. In addition, environments can be created from scratch, edited or duplicated.

Environment1      Property Package Components Extended Components Binary Interactions Options Notes      Pure Component Filtering Criteria      Name CASEN Chasting Time Classification	Containing Elements	Over 1500 pu in ProMax, m This allows y	re components ar any with multiple ou to choose fron	re available e aliases. n over 7900
Name     Formula     LASHN     Chemical type     Classification       All     All     All     All     All       Available Pure Components     Installed Pure Components     Installed Pure Components       Sort By     Molecular Weight     Installed Pure Components       Installed Pure Components     Number of Items (11)       H2     Installed Pure Components       Hydrogen     Installed Pure Components       Hydrogen     Installed Pure Components       Water Gas     Installed Pure Components       Protum     Installed Pure Components	Containing Elements Any  Environment1  Property Package Components E	component na it easy to loca	nteractions   Options   Reactions	Iters make t you need.
Helium, Isotope OI Mass 3       Deuterium Hydride       Available Oils       Number of Items (2)       Dil A       Oil B	Use Predefined Package     Use Custom Package     Predefined Packages     Current Packages     Available Packages     Package     Package	Vapor Package Peng-Robinson	Liquid Package	A
Environment     Environment     OK     Car	Peng-Robinson Polar Regular Solution-IG Regular Solution-SRK Scatchard-Hamer-IG Scatchard-Hamer-PR Scatchard-Hamer-SRK SRK SRK SRK Polar TK Wilson-IG	Peng-Robinson Polar Ideal Gas Peng-Robinson SRK Ideal Gas Peng-Robinson SRK SRK SRK SRK Polar Ideal Gas	Peng-Robinson Polar Regular Solution Regular Solution Scatchard-Hamer Scatchard-Hamer Scatchard-Hamer SRK SRK Polar TK Wilson	
	Package Types All Environment Environment1	3	Molar volume/liquid density me	ethod

Specify a custom package or select from over 50 predefined thermodynamic package combinations. These packages enable the user to simulate a variety of different gas processing, refining, electrolytic and molecular chemical systems. For example:

-SRK	-BWRS
-Peng Robinson	-Chien-Null
-NRTL	-Lee-Kesler
-Electrolytic ELR	-Margules

-NBS Steam Tables -UNIFAC -UNIQUAC -Van Laar

-Wilson -Scatchard-Hamer -Heat Transfer Fluid -TK Wilson

## Gas Processing

#### **Process Focus - Amine Sweetening**

Amine sweetening in ProMax is a significant improvement from TSWEET, the industry standard. Benefits include more complete thermodynamic models, calculation of more thermo-physical properties and better integration with hydrocarbon packages and unit operations. These benefits allow you to

model many more processes such as complex absorber / stripper configurations. These benefits andw you to model many more processes such as complex absorber / stripper configurations, three-phase flashes and oils in amine units. The following amines are available either individually or as blends: MEA, DEA, DGA, MDEA, DIPA, TEA, and AMP. ProMax also introduces BR&E's new Electrolytic-ELR model. This new model is a significant improvement to the NRTL acid gas model in TSWEET. The sweetening package also continues TSWEET's unprecedented ability to model selective absorption using CO, kinetics.

		Ionic Stre	ngth 0.06177:	36		
	Molarity	n[Molarity]	Molar Flow	Mole Fraction	Mass Flow	Mass Fraction
	amol/L	pluouuud	lbmol/h	%	lb/h	%
N2	0.000151097	3.82074	0.0399235	0.000372174	1.1184	0.000411939
CO2	0.0013093	2.88296	0.34595	0.003225	15.2251	0.00560786
H2S	5.5368e-005	4.25674	0.0146296	0.00013638	0.498604	0.000183651
C1	0.0313026	1.50442	8.27092	0.077103	132.686	0.0488723
C2	0.0028014	2.55262	0.740199	0.00690027	22.2571	0.00819797
C3	0.00107357	2.96917	0.283663	0.00264436	12.5083	0.0046072
iC4	9.06783e-005	4.0425	0.0239594	0.000223354	1.39257	0.000512928
nC4	0.000151617	3.81925	0.0400609	0.000373455	2.32843	0.000857631
iC5	2.49136e-005	4.60356	0.00658279	6.13659e-005	0.47494	0.000174935
nC5	4.36984e-005	4.35953	0.0115462	0.000107635	0.833043	0.000306835
nC6	1.06173e-005	4.97398	0.00280536	2.61521e-005	0.241753	8.9045e-005
nC7	1.61703e-006	5.79128	0.000427259	3.98299e-006	0.0428122	1.57691e-005
DEA	0.576281	0.239366	152.268	1.41946	16008.8	5.89652
H2O	37.5465	-1.57457	9920.7	92.4825	178724	65.8296
[HCO3-]	0.196775	0.706031	51.9927	0.484685	3172.43	1.1685
[H+]	5.59402e-009	8.25228	1.47808e-006	1.37789e-008	1.48981e-006	5.48744e-010
[DEACOO-]	0.982803	0.00753353	259.681	2.42079	38468.4	14.1691
[CO3]	0.0230753	1.63685	6.09705	0.0568378	365.877	0.134764
[DEAH+]	1.23088	-0.0902162	325.229	3.03184	34521	12.7151
[OH-]	2.58946e-005	4.58679	0.00684198	6.37821e-005	0.116364	4.28604e-005
[HS-]	0.00512732	2.29011	1.35476	0.0126293	44.8073	0.0165039
[S]	2.10113e-010	9.67755	5.55169e-008	5.17538e-010	1.78021e-006	6.55704e-010

#### Benefits:

- Model virtually any amine unit configuration.
- Best available predictions of amine solution-acid gas VLE as well as actual plant data.
- Model real or ideal stages in absorbers and strippers.
- Optimize the type of amine, amine flow rate and reboiler duty.
- Determine hydrocarbon / BTEX absorption in amine solutions.



#### **Process Focus - Glycol Dehydration/Hydrate Inhibition**

BR&E is the leader in predicting the performance of both glycol dehydration and hydrate suppression systems. Benefits include rigorous predictions for water content, hydrate formation temperature, water dew point and  $CO_2$  freeze out. The best in industry BTEX solubility predictions from PROSIM have been carried forward into ProMax.



#### Benefits:

- Select EG, DEG, TEG, Methanol solvents with BR&E proprietary interactions.
- Utilize unsurpassed Methanol H<sub>2</sub>O Hydrocarbon VLE / VLLE / LLE predictions.
- Calculate hydrate, ice and solid  $CO_2$  formation temperatures, and water content.
- Predict BTEX and VOC emissions accurately.
- Optimize glycol flow rate.
- Calculate hydrate inhibitor requirements.



Display ionic species for liquid streams.

with BR&E proprietary interactions. rocarbon VLE / VLLE / LLE predictions. tion temperatures, and water content. ely.

## Refining

#### **Process Focus - LPG Recovery & Fractionation**

#### **Process Focus - Crude Oil Refining**

Volume I 



- Connect energy streams from exchangers directly to column stages.
- Model brazed aluminum multi-sided exchangers.
- Investigate operational performance.





#### Characterize single or multi-component oils and blends for use in common refining

- Three Phase Columns
- Complete Oil Characterization and Blending
- Side Strippers and Pumparounds

idons    Plots	Notes Curve Data				
-			Assay Type		
	T	BP		~	
	T	BP			
×	A:	STM D	86		
	E	SIM D FV	1160	~	
	Volume Fraction Dis	STM D	2887/SD		~
	%		F		
		2	60		
		8	180		
		23	300		
		35	400		
		68	650		
		82	800		
		93	1000		
		100	1500		
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		r	Edit		-
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		( 	Edit	High Temperature V	< >
	[7]	)   v	Edit Molecular Weight	High Temperature V	< >
	· · · · · · · · · · · · · · · · · · ·	)   v   	Edit	High Temperature V	< >
	(?) 	) 	Edit Molecular Weight	High Temperature V Cancel	< > Apply
			Edit Molecular Weight	High Temperature V Cancel	Apply
	TBP Curve	)   v   	Edit Molecular Weight	High Temperature V Cancel	Apply
	TEP Curve		Edit Molecular Weight	High Temperature V Cancel	
	TEP Curve		Edit Molecular Weight	High Temperature V Cancel	Apply 1
	TEP Curve		Edit Molecular Weight	High Temperature V Cancel	Apply 1
	TBP Curve		Edit Molecular Weight	High Temperature V Cancel e operationa	Apply 1
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay	Apply 1 Apply 1 I probler Types:
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay	Apply 1 Apply 1 I probler Types:
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP	Apply 1 Apply 1 I probler Types:
	TBP Curve Cut Points	]	Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP	Apply 1 Apply 1 I probler Types:
	TBP Curve Cut Points	]	Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP - ASTM DS	Apply 1 Apply 1 Types:
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP - ASTM D8	Apply 1 Apply 1 Types:
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP - ASTM D8	Apply 1 Apply 1 Types: 86
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP - ASTM D8 - ASTM D1	Apply Apply I probler Types: 36 .160
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP - ASTM D8 - ASTM D1	Apply 1 Apply 1 Types: 36 160
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP - ASTM D8 - ASTM D1 - ASTM D2	Apply Apply I probler Types: 36 160 2887/SD
	TBP Curve Cut Points		Edit Molecular Weight	High Temperature V Cancel e operationa e from Assay - TBP - ASTM D8 - ASTM D1 - ASTM D2	Apply Apply I probler Types: 36 160 2887/SD

#### **Process Focus - Chemicals**



Promax has pure components and exclusive thermodynamic property packages that allow simulation of many chemical plant processes.

- Over 50 property package combinations.
- More than 1500 components.
- Includes over 70 chemical groups.

#### Benefits:

- Investigate operational performance.
- Optimize using parametric studies.
- Evaluate process variations.

#### **Process Focus - Equipment Rating / Sizing**

#### **Heat Exchangers**

- Calculate complete exchanger details.
- Choose from over 30 heat transfer fluids.
- Generate TEMA datasheets.
- Rate as well as size: shell and tube, fin fan and compact exchangers.



🖤 Project Viewer - ProM







Shell-and-Tube

Air-Cooled

#### **Process Focus - Equipment Rating / Sizing**

#### **Pipelines / Gathering System Networks**

- Specify ambient conditions and overall heat transfer coefficient.
- Calculate pressue drop for horizontal, vertical and inclined flow.
- Obtain results for one, two and three phase flow.
- Select from a wide range of correlations.
- · Perform backward calculations.

#### **Column Sizing / Separator**

- Specify ASME pressure vessel materials of construction.
- Size three-phase separators with heavy liquid boots.
- Size two-phase horizontal and vertical separators.
- Specify detailed column internals.
- Size both packed and trayed columns.

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	Name Lean/Rich A	nine	Exe	cute
	Connections Proc	ess Data Rating Streams Tables Plots	Notes	
Accun		Results		
oler	Properties	Percent Quer Design	40.040	9/
	Overall	Percent Over Design	10.042	70
	Shell	Clean Querell Heat Transfer Coefficient	34.0000	DLU/(IIIII2
	Battle	Clean Overall Heat Transfer Coemclent	34.0000	BIU/(11112
	Tuke	Area Available For Heat Transfer	13033.1	11°2 #A0
	Tube	Effective Overall U	11039.1	IL'Z Dhu/(btE)
	Fin	Enective Overall OA	402314	Dtu/(nrr)
	Demand Pipe	End Point OA	400103	Dtu/(nrr)
	Supply Pipe	Effortive MTD	1.900010+007	E
os 👘	Besults	Effective with	47.3070	F
	IN W DOLLAR	P Correction Pactor	1 4005 04	400
oiler	Main Increment	Counter Or HEX	1005.31	11.3
	Side Increment	Supply Cross Sectional Flow Area	1.9262	Π°2 440
er		Demand Cross Sectional Flow Area	9.17887	π^2
		Supply Equivalent Diameter (dP)	1	in
		Supply Equivalent Diameter (H1)	1	IN .
p		Demand Equivalent Diameter (dP)	0.782	In
		Demand Equivalent Diameter (HT)	0.782	IN In
		Supply Flow Length	32.2099	π
		Demand Flow Length	20	Ħ
		Inside Tube Area Per Unit Length	2.45673	in
		Outside Tube Bare Area Per Unit Length	3.14159	in
		Fin Area Per Unit Tube Length	0	in
		Total Outside Tube Area Per Unit Length	3.14159	in



#### Benefits:

- Perform parametric studies.
- Investigate:
  - Fouling
  - Pressure Drop
- Minimize size and costs
- Maximize process efficiency

#### **Stream Analyses**

Adding an analysis to a stream gives you detailed supplementary information. Some analyses have graphical representations. Separating these analyses from standard stream data makes ProMax fast and efficient. Examples of these analyses are: phase envelopes, vapor pressure tests, fuel properties and solids formation. Other calculations available by using these tools include pH, acid gas loading and line sizing.

	🗖 Analysis Selection 🛛 😨 🔀
	Select Type To Add Amine Analysis Distillation Curves Freeze-out, Hydrate, H20 Dewpoint Fuel Properties Line Sizing Phase Envelope Vapor Pressure, Dew, Bubble Point
Project Viewer - ProMax@\\INTBRE-DC-02\UserDocs\gavin\Wy Documents\Simulations\Training E	OK Cancel
Aralysis Presse Envelope 1 Conditions Tables Plot Plot Type Phase Envelope (PT) Phase Envelope (PT) Phase Envelope (PT) Phase Envelope (PT) Phase Envelope (PT) Add Analysis. Delete Analysis	Solve         -VF = 0%         -VF = 100%         -VF = 0 (Model of the formation)
10 From: Absorber To: Solved	

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#### Reporting

- Generate Reports via Microsoft Word, Excel, RTF (Rich Text Format) and Raw XML.
- Customize your report from a single property of one stream to any combination of properties of blocks, streams and other simulation items.

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nmxHeading 5 + Arial	- 8 -			•   1= I=
Print leading to Marian				- ·
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		Process Str	eams Report	
		All St	reams	
		labulated b	y lotal Phase	
Client Name: ABC Engine	eering			
Location: Bryan, TX				Job
Flowsheet: Flowsheet1				
		Conn	actions	
		1	2	3
From Block		DTWR-101	VSSL-101	DTWR-10
To Block		VSSL-101	DTWR-101	K-100
		Stream C	omposition	
0.1. P		1	2	3
Mole Fraction Methana		76	70	76
Ethane		2,23368	3.97355E-05	0.0030
Propane		1.93119	2.28776E-05	0.00315
-Butane		0.441373	2.32742E-06	0.000780
n-Butane		0.795225	1.00697E-05	0.0013
-Pentane		0.357137	1.69707E-06	0.000608
n-Pentane		0.270618	1.22317E-06	0.000407
n-Heptane		0.643219	1.03258E-06	0.00102
Benzene		0.988611	0.000761874	0.0104
o-Xylene		3.92125	0.00165627	0.210
Ethylbenzene		0.163956	5.51473E-05	0.00513
Toluene		2.28579	0.00130498	0.0435
/vater Triathylene Olycol		64.5406	99.9582	21.8
Theirlylene olycor		0.00341043	0.037333	
		Stream	Properties	
Property	Units	1	2	3
Temperature	F	199.949	188.122	299.
Pressure	psia	14.7	14.7	1
Mole Fraction Vapor	%	100	0	
Mole Fraction Light Liquid	20	0	100	
Molecular Weight	IbAbmol	25.8166	18.0679	121
Mass Density	lb/ft^3	0.0539479	60.3936	63.8
Molar Flow	lbmol/h	48.4524	4.40476	124.
Mass Flow	lb/h	1250.88	79.5846	151:
vapor Volumetric Flow	ft/'3/h	23186.7	1.31777	236
Std Vapor Volumetric Flow	MMSCED	0.441287	0.164293	29.5
Std Liquid Volumetric Flow	sabu	3.67829	0.159041	26.8
Compressibility		0.993766	0.000632606	0.00353
Enthalpy	Btu/h	-3.62704E+06	-532961	-3.46683E
Mass Cp	Btu/(lb*F)	0.443144	0.970116	0.639
deal Gas CpCV Ratio		1.21122	1.32301	1.02



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### **TSWEET**<sup>®</sup> & **PROSIM**<sup>®</sup> *Process Simulation Software*





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