Spiral SDK: Predicting Asphalt Feed

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Spiral SDK: Predicting Asphalt Feed

Using new SDK functionality for distillation analysis

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Using the SDK at Chevron

- Chevron Assay Group started with Spiral in 1999
- Engineering and Planning functions in addition to Assay Properties
- How can flow rates and properties be estimated for complex routings?
- Aveva Spiral spreadsheet tools offer a solution for faster prototyping and emergency predictions.
- Specific example on getting asphalt properties on a “real fractionated” basis

Spiral SDK (Software Development Kit)

- Spiral’s SDK allows for assay creation and manipulation from Excel.

- Spiral’s Fenske type distillation can be used for refining distillation analysis. Column calibration, multiple injections and unlimited blending and splitting are available from simple spread sheet structures.

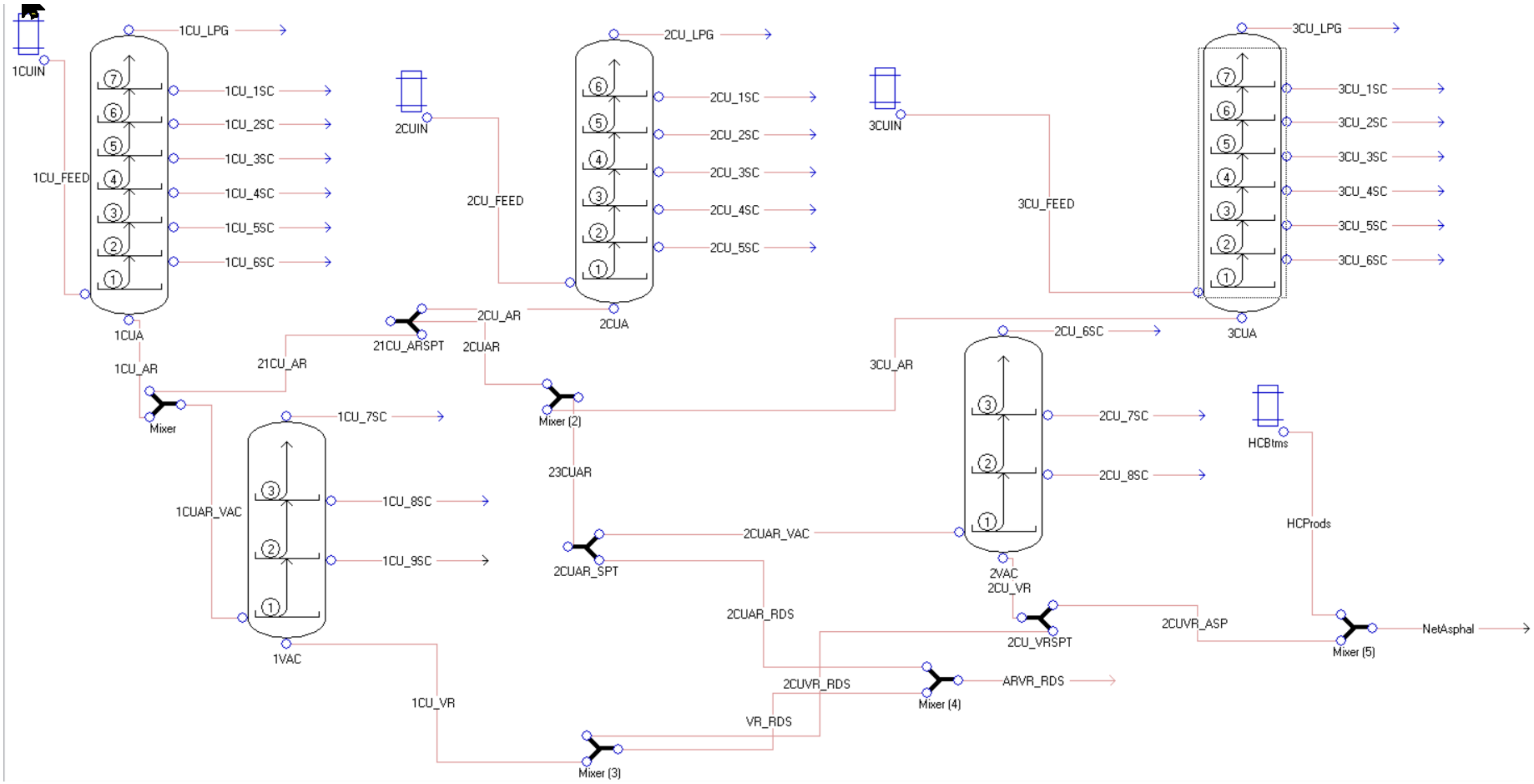
- The full power of Spiral Assay is matched with Excel allowing for optimization, target setting and monitoring of complex crude distillation scenarios.

- This example demonstrates a multi-column scenario to optimize and monitor asphalt feed.

- Planning and Engineering functions streamline prototyping, emergency calcs, monitoring and performance of oil flows from the crude unit.

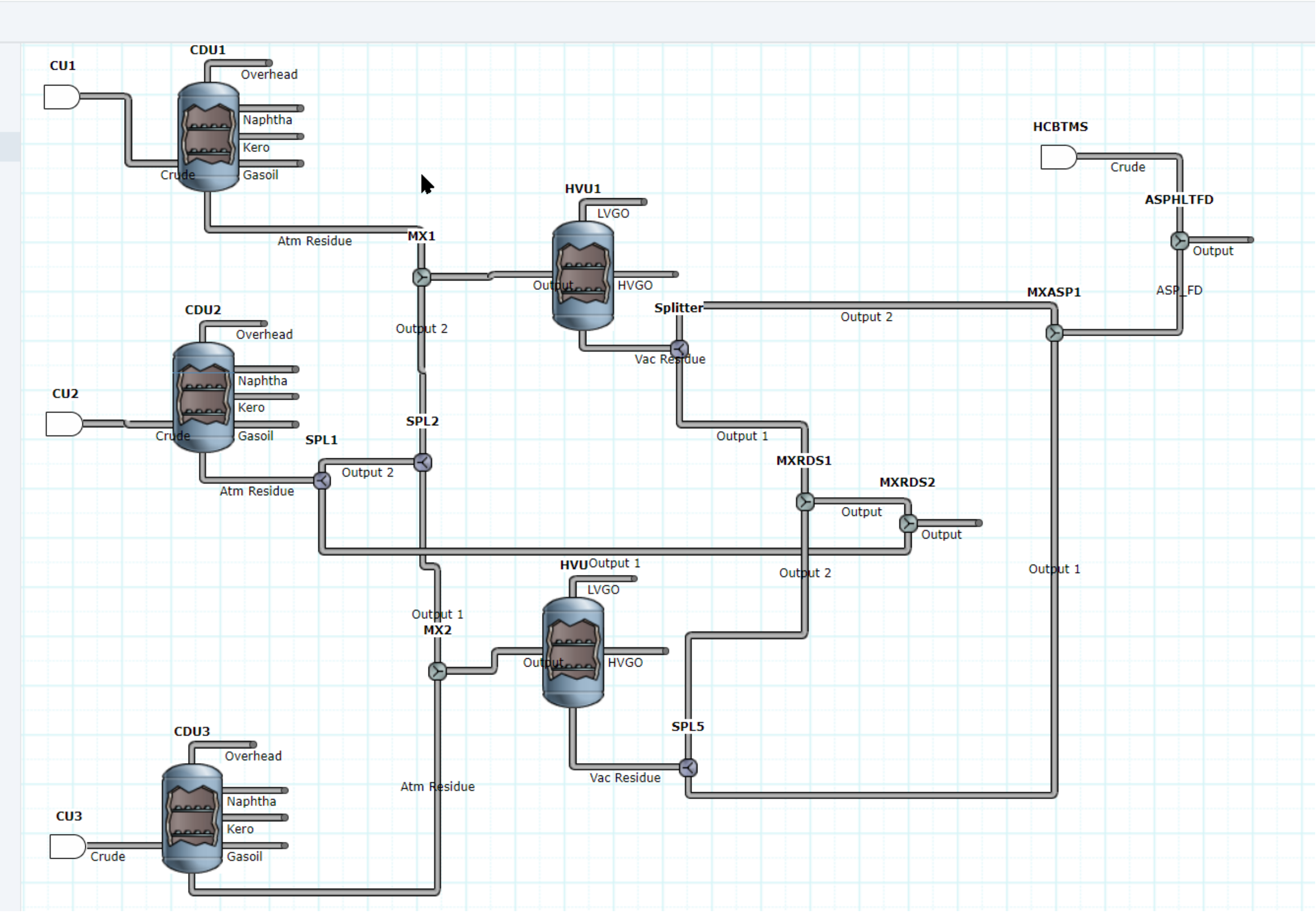
Topology of the system in Spiral Assay Flowsheet

The initial model was put together in Spiral Flowsheet program involves 3 Atmos units feeding 2 VDUs. 2CU ATB can feed either VDU.



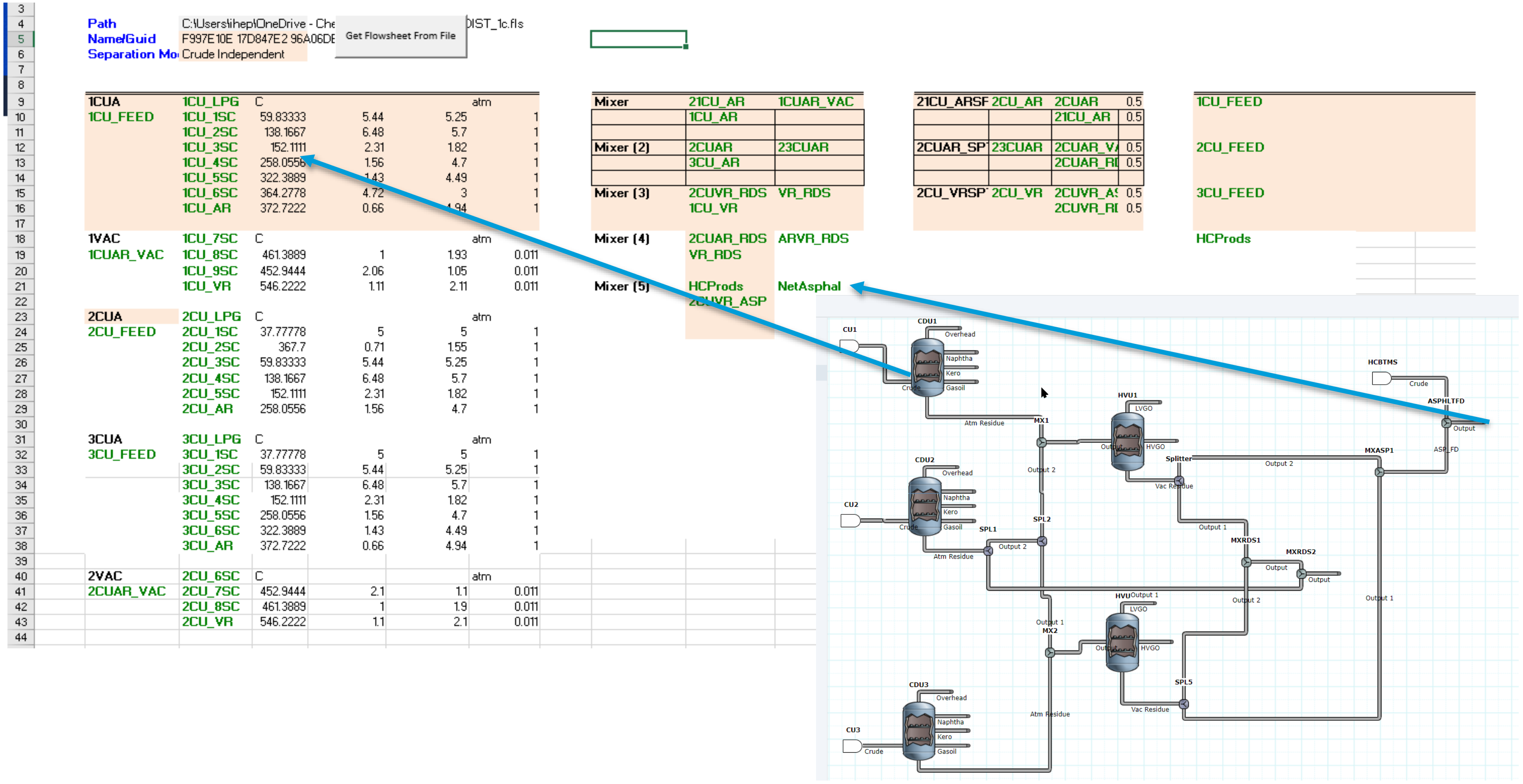
Topology of the system in Spiral Assay Flowsheet

Rebuilt using the Flowsheet tool from SpiralIntranet.



Spiral Flowsheet in SDK Module

Via the SDK, the setup in Spiral Flowsheet can be converted into SDK modules in Excel format.



Path C:\Users\ihep\OneDrive - Che DIST_1c.fls
Name/Guid F997E10E 17D847E2 96A06DE
Separation Mo Crude Independent

Get Flowsheet From File

1CUA	1CU_LPG	C		atm	
1CU_FEED	1CU_1SC	59.83333	5.44	5.25	1
	1CU_2SC	138.1667	6.48	5.7	1
	1CU_3SC	152.1111	2.31	1.82	1
	1CU_4SC	258.0556	1.56	4.7	1
	1CU_5SC	322.3889	1.43	4.49	1
	1CU_6SC	364.2778	4.72	3	1
	1CU_AR	372.7222	0.66	4.94	1
1VAC	1CU_7SC	C		atm	
1CUAR_VAC	1CU_8SC	461.3889	1	1.93	0.011
	1CU_9SC	452.9444	2.06	1.05	0.011
	1CU_VR	546.2222	1.11	2.11	0.011
2CUA	2CU_LPG	C		atm	
2CU_FEED	2CU_1SC	37.77778	5	5	1
	2CU_2SC	367.7	0.71	1.55	1
	2CU_3SC	59.83333	5.44	5.25	1
	2CU_4SC	138.1667	6.48	5.7	1
	2CU_5SC	152.1111	2.31	1.82	1
	2CU_AR	258.0556	1.56	4.7	1
3CUA	3CU_LPG	C		atm	
3CU_FEED	3CU_1SC	37.77778	5	5	1
	3CU_2SC	59.83333	5.44	5.25	1
	3CU_3SC	138.1667	6.48	5.7	1
	3CU_4SC	152.1111	2.31	1.82	1
	3CU_5SC	258.0556	1.56	4.7	1
	3CU_6SC	322.3889	1.43	4.49	1
	3CU_AR	372.7222	0.66	4.94	1
2VAC	2CU_6SC	C		atm	
2CUAR_VAC	2CU_7SC	452.9444	2.1	1.1	0.011
	2CU_8SC	461.3889	1	1.9	0.011
	2CU_VR	546.2222	1.1	2.1	0.011

Mixer	21CU_AR	1CUAR_VAC
	1CU_AR	
Mixer (2)	2CUAR	23CUAR
	3CU_AR	
Mixer (3)	2CUVR_RDS	VR_RDS
	1CU_VR	
Mixer (4)	2CUAR_RDS	ARVR_RDS
	VR_RDS	
Mixer (5)	HCProds	NetAsphal
	2CUVR_ASP	

21CU_ARSF	2CU_AR	2CUAR	0.5
		21CU_AR	0.5
2CUAR_SP	23CUAR	2CUAR_V	0.5
		2CUAR_RI	0.5
2CU_VRSP	2CU_VR	2CUVR_A	0.5
		2CUVR_RI	0.5

1CU_FEED

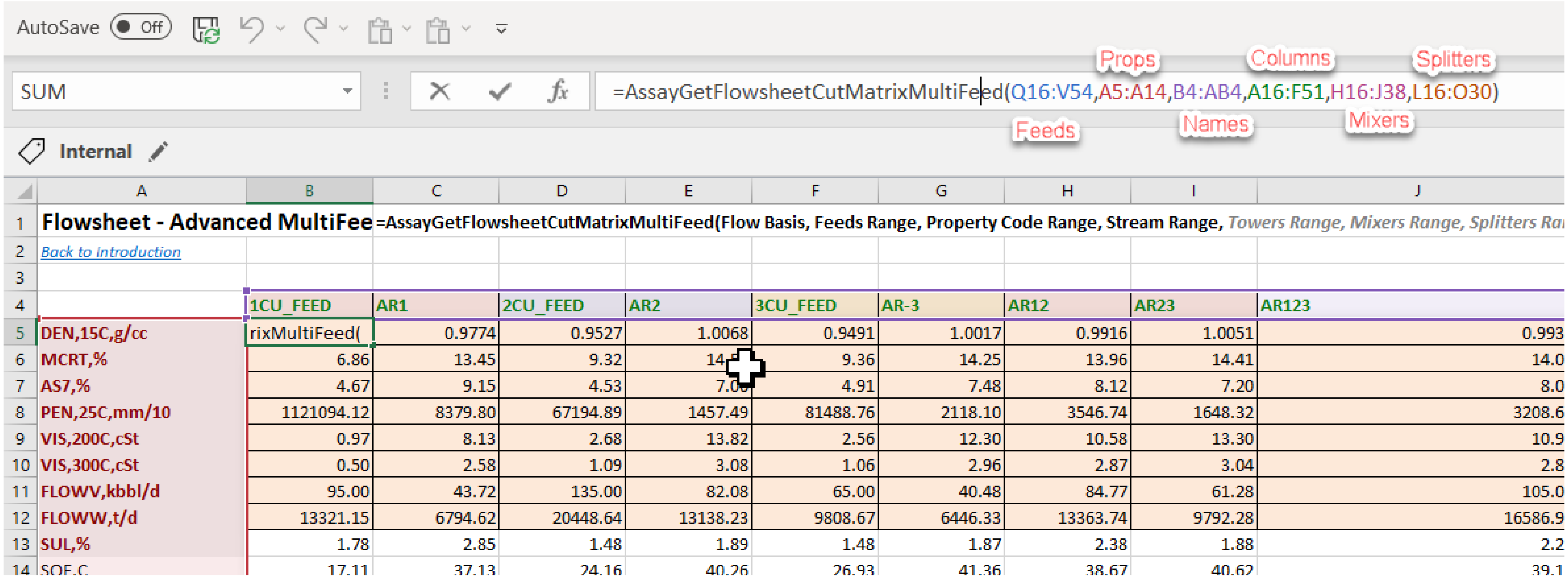
2CU_FEED

3CU_FEED

HCProds

Stream Qualities Representation

Next, the modules are linked together using a Spiral SDK assay call for each streams, that ranges the various inputs. Note the colored boundaries.

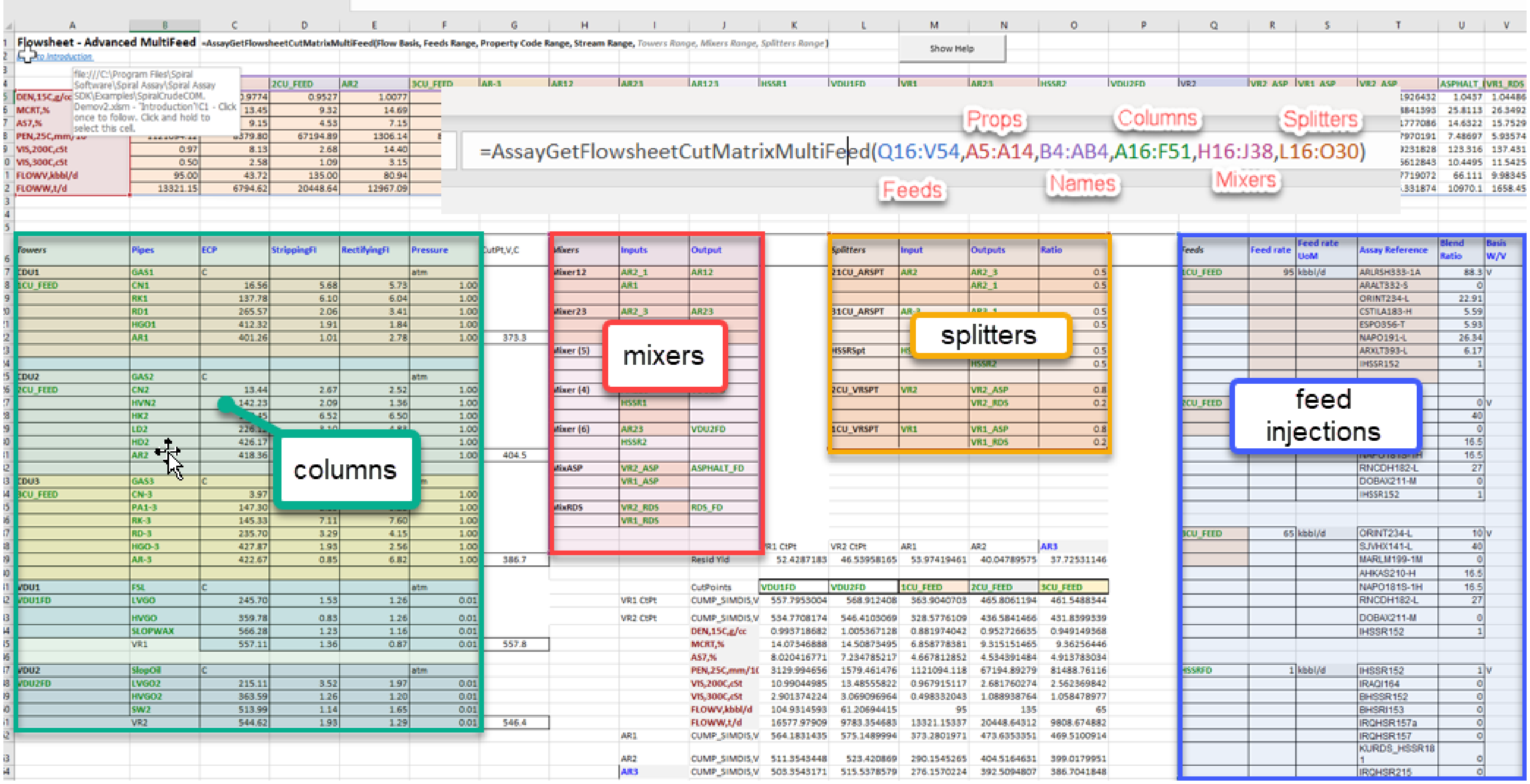


=AssayGetFlowsheetCutMatrixMultiFeed(Q16:V54,A5:A14,B4:AB4,A16:F51,H16:J38,L16:O30)

	A	B	C	D	E	F	G	H	I	J
1	**Flowsheet - Advanced MultiFee**	**=AssayGetFlowsheetCutMatrixMultiFeed(Flow Basis, Feeds Range, Property Code Range, Stream Range,** *Towers Range, Mixers Range, Splitters Ra*								
2	*Back to Introduction*									
3										
4		**1CU_FEED**	**AR1**	**2CU_FEED**	**AR2**	**3CU_FEED**	**AR-3**	**AR12**	**AR23**	**AR123**
5	**DEN,15C,g/cc**	rixMultiFeed(	0.9774	0.9527	1.0068	0.9491	1.0017	0.9916	1.0051	0.993
6	**MCRT,%**	6.86	13.45	9.32	14	9.36	14.25	13.96	14.41	14.0
7	**AS7,%**	4.67	9.15	4.53	7.0	4.91	7.48	8.12	7.20	8.0
8	**PEN,25C,mm/10**	1121094.12	8379.80	67194.89	1457.49	81488.76	2118.10	3546.74	1648.32	3208.6
9	**VIS,200C,cSt**	0.97	8.13	2.68	13.82	2.56	12.30	10.58	13.30	10.9
10	**VIS,300C,cSt**	0.50	2.58	1.09	3.08	1.06	2.96	2.87	3.04	2.8
11	**FLOWV,kbbl/d**	95.00	43.72	135.00	82.08	65.00	40.48	84.77	61.28	105.0
12	**FLOWW,t/d**	13321.15	6794.62	20448.64	13138.23	9808.67	6446.33	13363.74	9792.28	16586.9
13	**SUL,%**	1.78	2.85	1.48	1.89	1.48	1.87	2.38	1.88	2.2
14	SOF,C	17.11	37.13	24.16	40.26	26.93	41.36	38.67	40.62	39.1

Complex Model Representation in SDK Module

The fully connected distillation complex for 3 atmos units, 2 vdus, various splitters and mixers and 4 separate oil injections: 3 crude 1 for hydrocracker frac bottoms.



Flowsheet - Advanced MultiFeed =AssayGetFlowsheetCutMatrixMultiFeed(Flow Basis, Feeds Range, Property Code Range, Stream Range, *Towers Range, Mixers Range, Splitters Range*)

to Introduction

file:///C:\Program Files\Spiral Software\Spiral Assay\Spiral Assay SDK\Examples\SpiralCrudeCOM.Demov2.xlsm - 'Introduction'!C1 - Click once to follow. Click and hold to select this cell.

=AssayGetFlowsheetCutMatrixMultiFeed(Q16:V54,A5:A14,B4:AB4,A16:F51,H16:J38,L16:O30)

			2CU_FEED	AR2
DEN,15C,g/cc		0.9774	0.9527	1.0077
MCRT,%		13.45	9.32	14.69
AS7,%		9.15	4.53	7.15
PEN,25C,mm/10	[illegible]	[illegible]379.80	67194.89	1306.14
VIS,200C,cSt	0.97	8.13	2.68	14.40
VIS,300C,cSt	0.50	2.58	1.09	3.15
FLOWV,kbbl/d	95.00	43.72	135.00	80.94
FLOWW,t/d	13321.15	6794.62	20448.64	12967.09

ASPHALT_	VR1_RDS
1.0437	1.04486
25.8113	26.3492
14.6322	15.7529
7.48697	5.93574
123.316	137.451
10.4495	11.5425
66.111	9.98345
10970.1	1658.45

Towers	Pipes	ECP	StrippingFl	RectifyingFl	Pressure	CutPt,V,C
CDU1	GAS1	C			atm	
1CU_FEED	CN1	16.56	5.68	5.73	1.00	
	RK1	137.78	6.10	6.04	1.00	
	RD1	265.57	2.06	3.41	1.00	
	HGO1	412.32	1.91	1.84	1.00	
	AR1	401.26	1.01	2.78	1.00	373.3
CDU2	GAS2	C			atm	
2CU_FEED	CN2	13.44	2.67	2.52	1.00	
	HVN2	142.23	2.09	1.36	1.00	
	HK2	[illegible]	6.52	6.50	1.00	
	LD2	[illegible]	[illegible]	[illegible]	1.00	
	HD2	426.17	[illegible]	[illegible]	1.00	
	AR2	418.36	[illegible]	[illegible]	1.00	404.5
CDU3	GAS3	C			[illegible]	
3CU_FEED	CN-3	3.97	[illegible]	[illegible]	1.00	
	PA1-3	147.30	[illegible]	[illegible]	1.00	
	RK-3	145.33	7.11	7.60	1.00	
	RD-3	235.70	3.29	4.15	1.00	
	HGO-3	427.87	1.93	2.56	1.00	
	AR-3	422.67	0.85	6.82	1.00	386.7
VDU1	FSL	C			atm	
VDU1FD	LVGO	245.70	1.53	1.26	0.01	
	HVGO	359.78	0.83	1.26	0.01	
	SLOPWAX	566.28	1.23	1.16	0.01	
	VR1	557.11	1.36	0.87	0.01	557.8
VDU2	SlopOil	C			atm	
VDU2FD	LVGO2	215.11	3.52	1.97	0.01	
	HVGO2	363.59	1.26	1.20	0.01	
	SW2	513.99	1.14	1.65	0.01	
	VR2	544.62	1.93	1.29	0.01	546.4

Mixers	Inputs	Output
Mixer12	AR2_1	AR12
	AR1	
Mixer23	AR2_3	AR23
	[illegible]	
Mixer (5)	[illegible]	[illegible]
	[illegible]	
Mixer (4)	[illegible]	[illegible]
	HSSR1	
Mixer (6)	AR23	VDU2FD
	HSSR2	
MixASP	VR2_ASP	ASPHALT_FD
	VR1_ASP	
MixRDS	VR2_RDS	RDS_FD
	VR1_RDS	

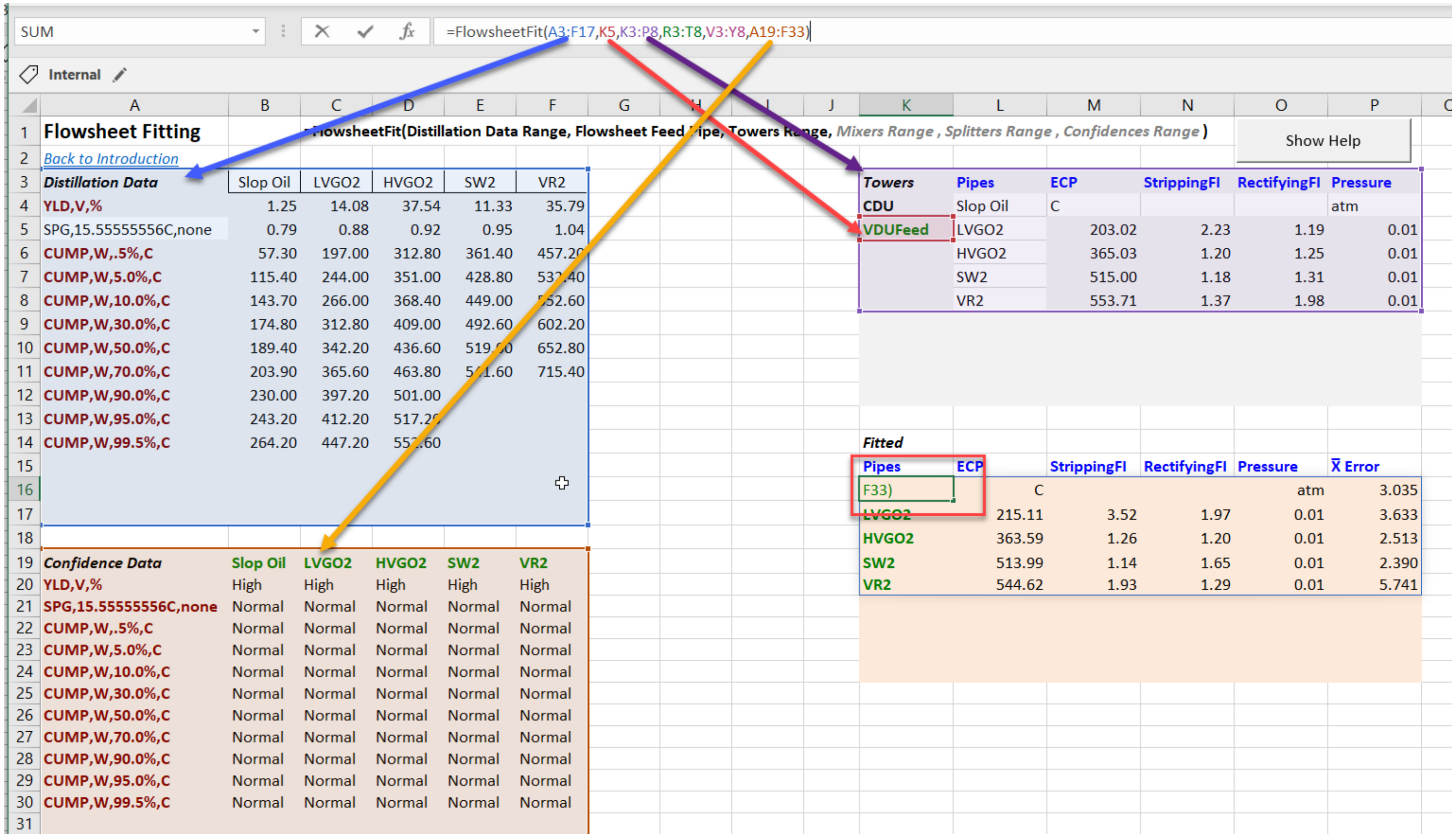
Splitters	Input	Outputs	Ratio
21CU_ARSPT	AR2	AR2_3	0.5
		AR2_1	0.5
31CU_ARSPT	AR-3	AR3_1	0.5
		[illegible]	0.5
HSSRSpt	HS[illegible]	[illegible]	0.5
		HSSR2	0.5
2CU_VRSPT	VR2	VR2_ASP	0.8
		VR2_RDS	0.2
1CU_VRSPT	VR1	VR1_ASP	0.8
		VR1_RDS	0.2

Feeds	Feed rate	Feed rate UoM	Assay Reference	Blend Ratio	Basis W/V
1CU_FEED	95	kbbl/d	ARLRSH333-1A	88.3	V
			ARALT332-S	0	
			ORINT234-L	22.91	
			CSTILA183-H	5.59	
			ESPO356-T	5.93	
			NAPO191-L	26.34	
			ARXLT393-L	6.17	
			IHSSR152	1	
2CU_FEED	[illegible]	[illegible]	[illegible]	0	V
			[illegible]	40	
			[illegible]	0	
			[illegible]	16.5	
			NAPO181S-1H	16.5	
			RNCDH182-L	27	
			DOBAX211-M	0	
			IHSSR152	1	
3CU_FEED	65	kbbl/d	ORINT234-L	10	V
			SJVHX141-L	40	
			MARLM199-1M	0	
			AHKAS210-H	16.5	
			NAPO181S-1H	16.5	
			RNCDH182-L	27	
			DOBAX211-M	0	
			IHSSR152	1	
HSSRFD	1	kbbl/d	IHSSR152	1	V
			IRAQI164	0	
			BHSSR152	0	
			BHSRI153	0	
			IRQHSR157a	0	
			IRQHSR157	0	
			KURDS_HSSR181	0	
			IRQHSR215	0	

		VR1 CtPt	VR2 CtPt	AR1	AR2	AR3
	Resid Yld	52.4287183	46.53958165	53.97419461	40.04789575	37.72531146
	CutPoints	VDU1FD	VDU2FD	1CU_FEED	2CU_FEED	3CU_FEED
VR1 CtPt	CUMP_SIMDIS,V	557.7953004	568.912408	363.9040703	465.8061194	461.5488344
VR2 CtPt	CUMP_SIMDIS,V	534.7708174	546.4103069	328.5776109	436.5841466	431.8399339
	DEN,15C,g/cc	0.993718682	1.005367128	0.881974042	0.952726635	0.949149368
	MCRT,%	14.07346888	14.50875495	6.858778381	9.315151465	9.36256446
	AS7,%	8.020416771	7.234785217	4.667812852	4.534391484	4.913785034
	PEN,25C,mm/10	3129.994656	1579.461476	1121094.118	67194.89279	81488.76116
	VIS,200C,cSt	10.99044985	13.48555822	0.967915117	2.681760274	2.562369842
	VIS,300C,cSt	2.901374224	3.069096964	0.498332043	1.088938764	1.058478977
	FLOWV,kbbl/d	104.9314593	61.20694415	95	135	65
	FLOWW,t/d	16577.97909	9783.354683	13321.15337	20448.64312	9808.674882
AR1	CUMP_SIMDIS,V	564.1831435	575.1489994	373.2801971	473.6353351	469.5100914
AR2	CUMP_SIMDIS,V	511.3543448	523.420869	290.1545265	404.5164631	399.0179951
AR3	CUMP_SIMDIS,V	503.3543171	515.5378579	276.1570224	392.5094807	386.7041848

Using SDK Flowsheet Fitting for Column Calibration from Plant Data

Any of the column models can be tuned with plant data on a separate sheet if you do not already have ECP and FI from day-to-day unit monitoring



=FlowsheetFit(A3:F17,K5,K3:P8,R3:T8,V3:Y8,A19:F33)

Flowsheet Fitting =FlowsheetFit(Distillation Data Range, Flowsheet Feed Pipe, Towers Range, *Mixers Range , Splitters Range , Confidences Range*)

Back to Introduction

	A	B	C	D	E	F
3	***Distillation Data***	Slop Oil	LVGO2	HVGO2	SW2	VR2
4	**YLD,V,%**	1.25	14.08	37.54	11.33	35.79
5	SPG,15.55555556C,none	0.79	0.88	0.92	0.95	1.04
6	**CUMP,W,.5%,C**	57.30	197.00	312.80	361.40	457.20
7	**CUMP,W,5.0%,C**	115.40	244.00	351.00	428.80	532.40
8	**CUMP,W,10.0%,C**	143.70	266.00	368.40	449.00	552.60
9	**CUMP,W,30.0%,C**	174.80	312.80	409.00	492.60	602.20
10	**CUMP,W,50.0%,C**	189.40	342.20	436.60	519.00	652.80
11	**CUMP,W,70.0%,C**	203.90	365.60	463.80	541.60	715.40
12	**CUMP,W,90.0%,C**	230.00	397.20	501.00		
13	**CUMP,W,95.0%,C**	243.20	412.20	517.20		
14	**CUMP,W,99.5%,C**	264.20	447.20	552.60		
15						
16						
17						
18						
19	***Confidence Data***	**Slop Oil**	**LVGO2**	**HVGO2**	**SW2**	**VR2**
20	**YLD,V,%**	High	High	High	High	High
21	**SPG,15.55555556C,none**	Normal	Normal	Normal	Normal	Normal
22	**CUMP,W,.5%,C**	Normal	Normal	Normal	Normal	Normal
23	**CUMP,W,5.0%,C**	Normal	Normal	Normal	Normal	Normal
24	**CUMP,W,10.0%,C**	Normal	Normal	Normal	Normal	Normal
25	**CUMP,W,30.0%,C**	Normal	Normal	Normal	Normal	Normal
26	**CUMP,W,50.0%,C**	Normal	Normal	Normal	Normal	Normal
27	**CUMP,W,70.0%,C**	Normal	Normal	Normal	Normal	Normal
28	**CUMP,W,90.0%,C**	Normal	Normal	Normal	Normal	Normal
29	**CUMP,W,95.0%,C**	Normal	Normal	Normal	Normal	Normal
30	**CUMP,W,99.5%,C**	Normal	Normal	Normal	Normal	Normal
31						

	K	L	M	N	O	P
3	***Towers***	**Pipes**	**ECP**	**StrippingFI**	**RectifyingFI**	**Pressure**
4	**CDU**	Slop Oil	C			atm
5	**VDUFeed**	LVGO2	203.02	2.23	1.19	0.01
6		HVGO2	365.03	1.20	1.25	0.01
7		SW2	515.00	1.18	1.31	0.01
8		VR2	553.71	1.37	1.98	0.01

Fitted

	K	L	M	N	O	P
15	**Pipes**	**ECP**	**StrippingFI**	**RectifyingFI**	**Pressure**	**X̄ Error**
16	F33)	C			atm	3.035
17	**LVGO2**	215.11	3.52	1.97	0.01	3.633
18	**HVGO2**	363.59	1.26	1.20	0.01	2.513
19	**SW2**	513.99	1.14	1.65	0.01	2.390
20	**VR2**	544.62	1.93	1.29	0.01	5.741

Plant data section can be called from PI-AF. Fitted parameters are linked back to the model.

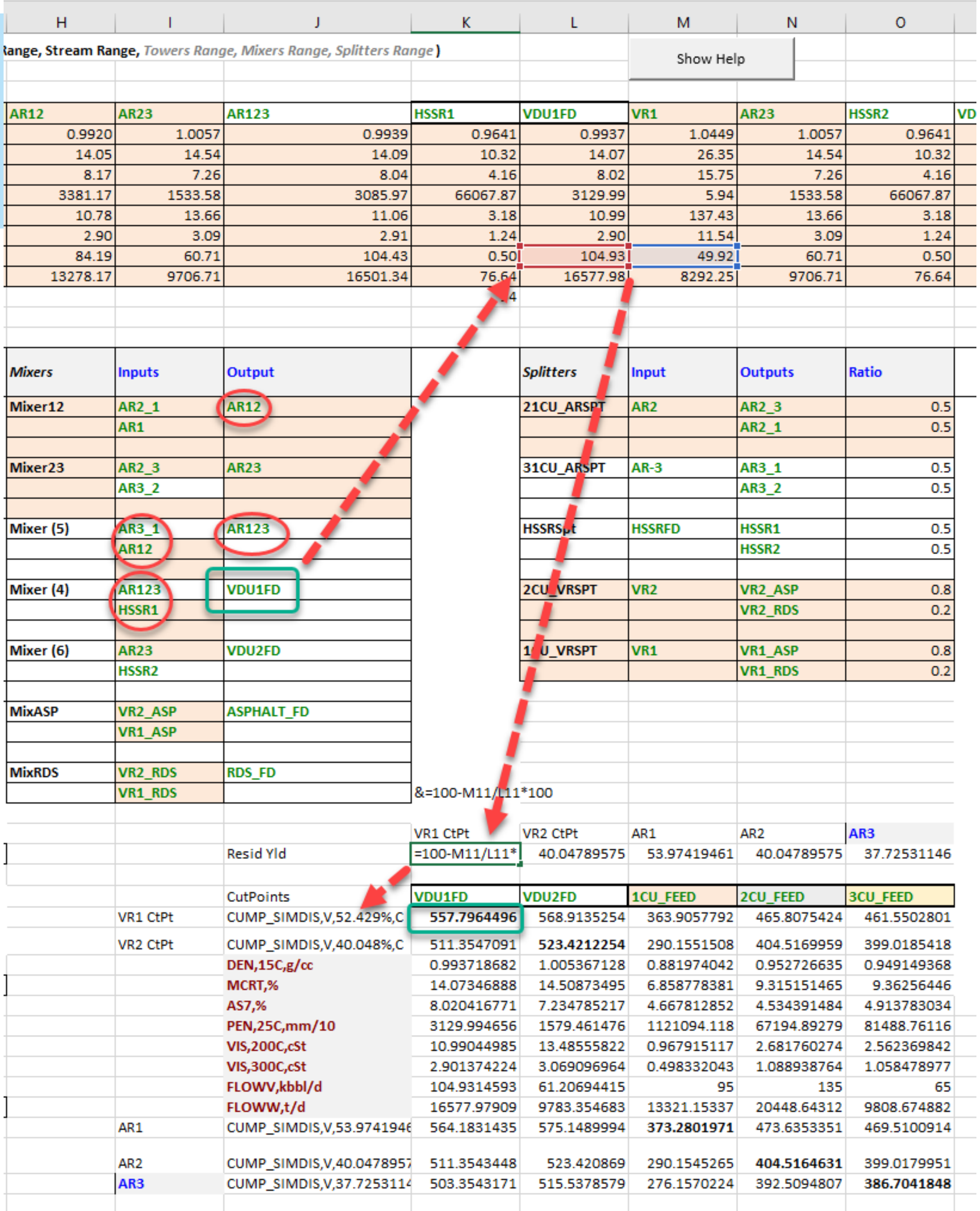
Calculating VDU cp

The CutPoint off the VDU can be a problem since the feed is a combination of 3 atmos resids.

In this case the mass flowrate of any VDU product can be divided by the VDU feed rate to get the % yield.

Intersecting this % yield with the TBP of the VDU is the VR cutpoint.

In this example, the VR1 rate is divided by the VDU1 feed rate, subtracted from 100 , then intersected with the TBP of the VDU1FD stream, at 558C cutpoint.



ange, Stream Range, *Towers Range, Mixers Range, Splitters Range*)

H	I	J	K	L	M	N	O
AR12	AR23	AR123	HSSR1	VDU1FD	VR1	AR23	HSSR2
0.9920	1.0057	0.9939	0.9641	0.9937	1.0449	1.0057	0.9641
14.05	14.54	14.09	10.32	14.07	26.35	14.54	10.32
8.17	7.26	8.04	4.16	8.02	15.75	7.26	4.16
3381.17	1533.58	3085.97	66067.87	3129.99	5.94	1533.58	66067.87
10.78	13.66	11.06	3.18	10.99	137.43	13.66	3.18
2.90	3.09	2.91	1.24	2.90	11.54	3.09	1.24
84.19	60.71	104.43	0.50	104.93	49.92	60.71	0.50
13278.17	9706.71	16501.34	76.64	16577.98	8292.25	9706.71	76.64

Mixers	Inputs	Output
Mixer12	AR2_1	AR12
	AR1	
Mixer23	AR2_3	AR23
	AR3_2	
Mixer (5)	AR3_1	AR123
	AR12	
Mixer (4)	AR123	VDU1FD
	HSSR1	
Mixer (6)	AR23	VDU2FD
	HSSR2	
MixASP	VR2_ASP	ASPHALT_FD
	VR1_ASP	
MixRDS	VR2_RDS	RDS_FD
	VR1_RDS	

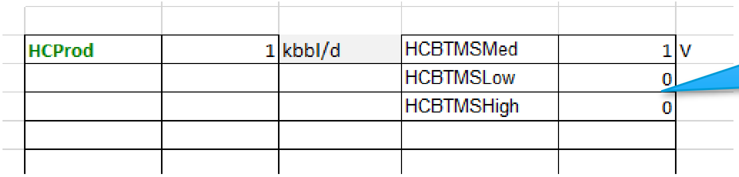
Splitters	Input	Outputs	Ratio
21CU_ARSPT	AR2	AR2_3	0.5
		AR2_1	0.5
31CU_ARSPT	AR-3	AR3_1	0.5
		AR3_2	0.5
HSSRSpt	HSSRFD	HSSR1	0.5
		HSSR2	0.5
2CU_VRSPT	VR2	VR2_ASP	0.8
		VR2_RDS	0.2
1CU_VRSPT	VR1	VR1_ASP	0.8
		VR1_RDS	0.2

&=100-M11/L11*100

		VR1 CtPt	VR2 CtPt	AR1	AR2	AR3
	Resid Yld	=100-M11/L11*	40.04789575	53.97419461	40.04789575	37.72531146
	CutPoints	VDU1FD	VDU2FD	1CU_FEED	2CU_FEED	3CU_FEED
VR1 CtPt	CUMP_SIMDIS,V,52.429%,C	**557.7964496**	568.9135254	363.9057792	465.8075424	461.5502801
VR2 CtPt	CUMP_SIMDIS,V,40.048%,C	511.3547091	**523.4212254**	290.1551508	404.5169959	399.0185418
	DEN,15C,g/cc	0.993718682	1.005367128	0.881974042	0.952726635	0.949149368
	MCRT,%	14.07346888	14.50873495	6.858778381	9.315151465	9.36256446
	AS7,%	8.020416771	7.234785217	4.667812852	4.534391484	4.913783034
	PEN,25C,mm/10	3129.994656	1579.461476	1121094.118	67194.89279	81488.76116
	VIS,200C,cSt	10.99044985	13.48555822	0.967915117	2.681760274	2.562369842
	VIS,300C,cSt	2.901374224	3.069096964	0.498332043	1.088938764	1.058478977
	FLOWV,kbbl/d	104.9314593	61.20694415	95	135	65
	FLOWW,t/d	16577.97909	9783.354683	13321.15337	20448.64312	9808.674882
AR1	CUMP_SIMDIS,V,53.9741946	564.1831435	575.1489994	**373.2801971**	473.6353351	469.5100914
AR2	CUMP_SIMDIS,V,40.0478957	511.3543448	523.420869	290.1545265	**404.5164631**	399.0179951
AR3	CUMP_SIMDIS,V,37.7253114	503.3543171	515.5378579	276.1570224	392.5094807	**386.7041848**

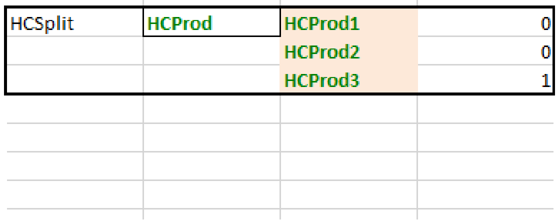
Asphalt Blend Component

Assays produced from the HC Bottoms stream can be injected and blended with the straight run vac resid material. Low, Medium and High severity can be chosen in the HC feed box, simulating the reactor frac bottoms.

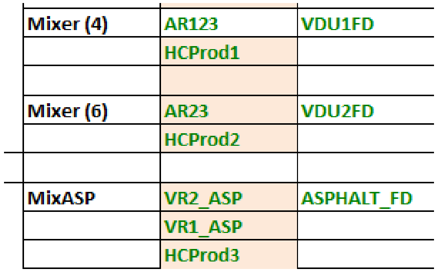


HCProd	1	kbbl/d	HCBTMSMed	1	V
			HCBTMSLow	0	
			HCBTMSHigh	0	

Assays for range of reactor severities



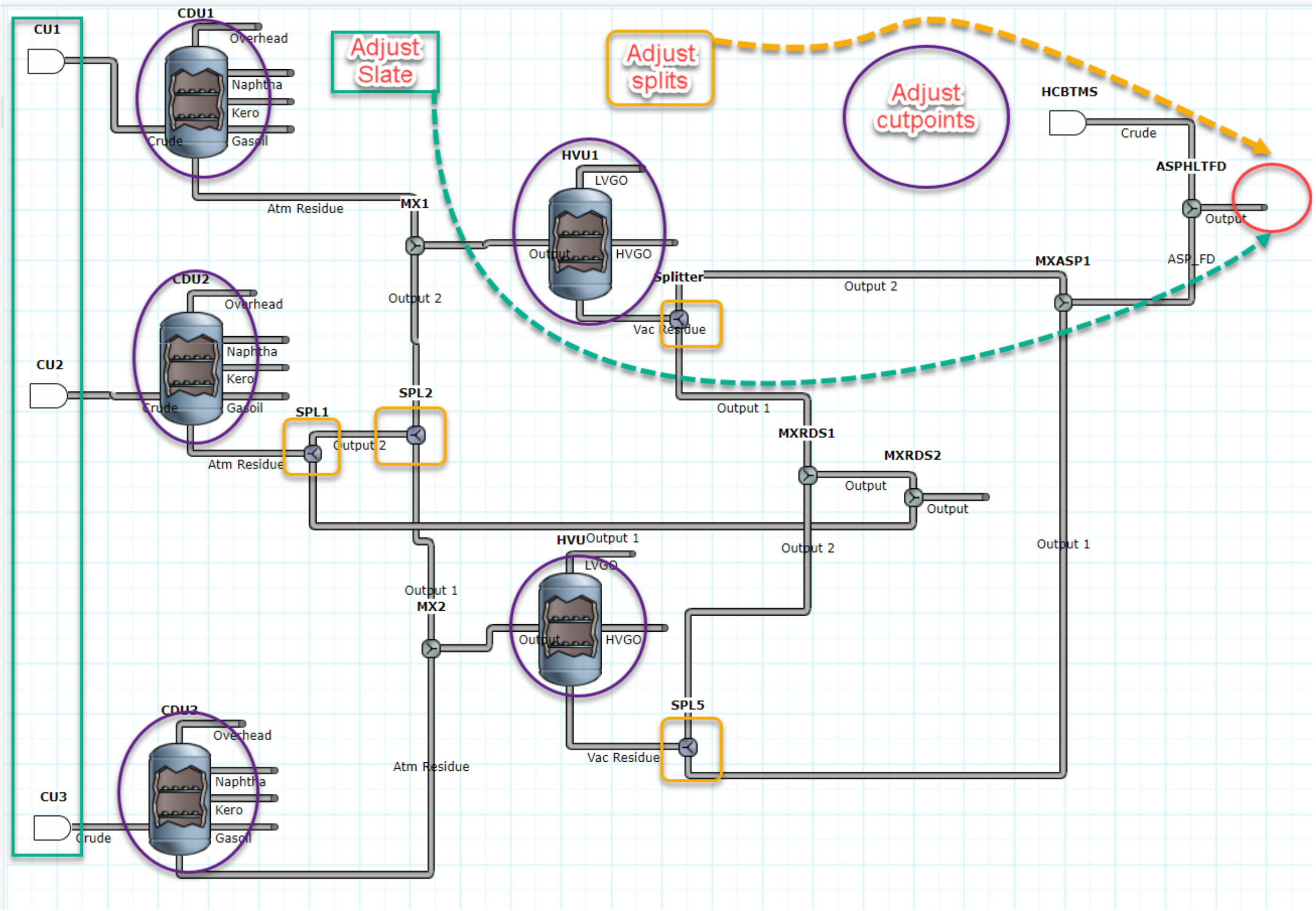
HCSplit	**HCProd**	**HCProd1**	0
		HCProd2	0
		HCProd3	1



Mixer (4)	**AR123**	**VDU1FD**
	HCProd1	
Mixer (6)	**AR23**	**VDU2FD**
	HCProd2	
MixASP	**VR2_ASP**	**ASPHALT_FD**
	VR1_ASP	
	HCProd3	

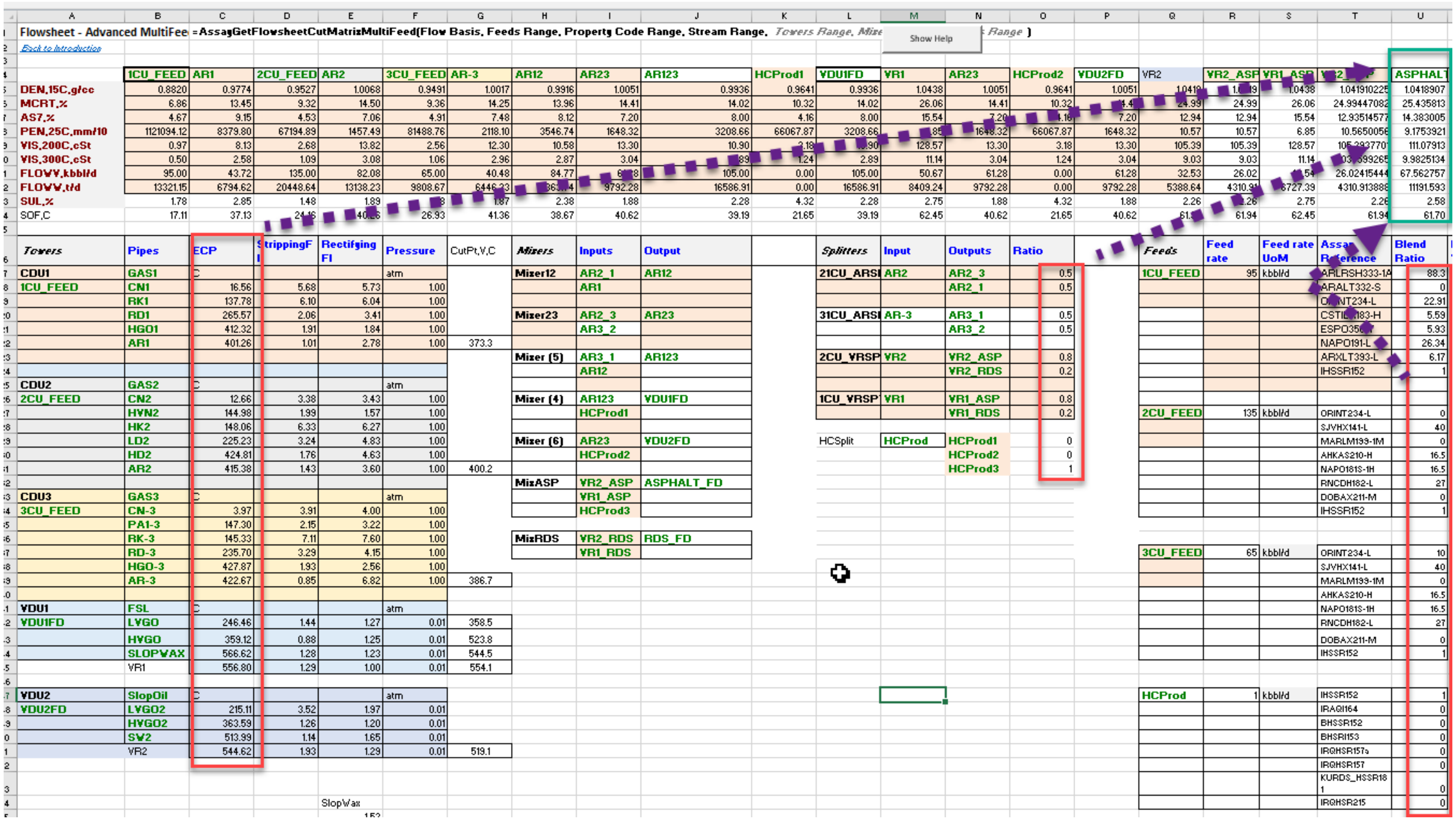
Asphalt Predictive Model using Spiral SDK

All the flowsheet elements are brought together in a single Excel workbook. Target setting using Goal Seek and Solver are easy to apply. Choosing the assay composition, cutpoints and split ratios to set asphalt feed properties and flow.



Asphalt Predictive Model using Spiral SDK

Here are the variables available.



Flowsheet - Advanced MultiFee =AssayGetFlowsheetCutMatrixMultiFeed(Flow Basis, Feeds Range, Property Code Range, Stream Range, *Towers Range, Mixe* | Show Help | *Range*)

Back to Introduction

	1CU_FEED	AR1	2CU_FEED	AR2	3CU_FEED	AR-3	AR12	AR23	AR123	HCProd1
DEN,15C,g/cc	0.8820	0.9774	0.9527	1.0068	0.9491	1.0017	0.9916	1.0051	0.9936	0.9641
MCRT,%	6.86	13.45	9.32	14.50	9.36	14.25	13.96	14.41	14.02	10.32
AS7,%	4.67	9.15	4.53	7.06	4.91	7.48	8.12	7.20	8.00	4.16
PEN,25C,mm/10	1121094.12	8379.80	67194.89	1457.49	81488.76	2118.10	3546.74	1648.32	3208.66	66067.87
VIS,200C,cSt	0.97	8.13	2.68	13.82	2.56	12.30	10.58	13.30	10.90	3.18
VIS,300C,cSt	0.50	2.58	1.09	3.08	1.06	2.96	2.87	3.04	2.89	1.24
FLOWV,kbbl/d	95.00	43.72	135.00	82.08	65.00	40.48	84.77	61.28	105.00	0.00
FLOWV,t/d	13321.15	6794.62	20448.64	13138.23	9808.67	6446.23	[illegible]	9792.28	16586.91	0.00
SUL,%	1.78	2.85	1.48	1.89	[illegible]	1.87	2.38	1.88	2.28	4.32
SOF,C	17.11	37.13	24.16	40.26	26.93	41.36	38.67	40.62	39.19	21.65

	VDU1FD	VR1	AR23	HCProd2	VDU2FD	VR2	VR2_ASP	VR1_ASP	[illegible]	ASPHALT
DEN,15C,g/cc	0.9936	1.0438	1.0051	0.9641	1.0051	1.0419	1.0419	1.0438	1.041910225	1.0418907
MCRT,%	14.02	26.06	14.41	10.32	14.41	24.99	24.99	26.06	24.99447082	25.435813
AS7,%	8.00	15.54	7.20	4.16	7.20	12.94	12.94	15.54	12.93514577	14.383005
PEN,25C,mm/10	3208.66	6.85	1648.32	66067.87	1648.32	10.57	10.57	6.85	10.5650056	9.1753921
VIS,200C,cSt	10.90	128.57	13.30	3.18	13.30	105.39	105.39	128.57	105.2937701	111.07913
VIS,300C,cSt	2.89	11.14	3.04	1.24	3.04	9.03	9.03	11.14	[illegible]	9.9825134
FLOWV,kbbl/d	105.00	50.67	61.28	0.00	61.28	32.53	26.02	[illegible]	26.02415444	67.562757
FLOWV,t/d	16586.91	8409.24	9792.28	0.00	9792.28	5388.64	4310.91	6727.39	4310.913888	11191.593
SUL,%	2.28	2.75	1.88	4.32	1.88	2.26	2.26	2.75	2.26	2.58
SOF,C	39.19	62.45	40.62	21.65	40.62	61.94	61.94	62.45	61.94	61.70

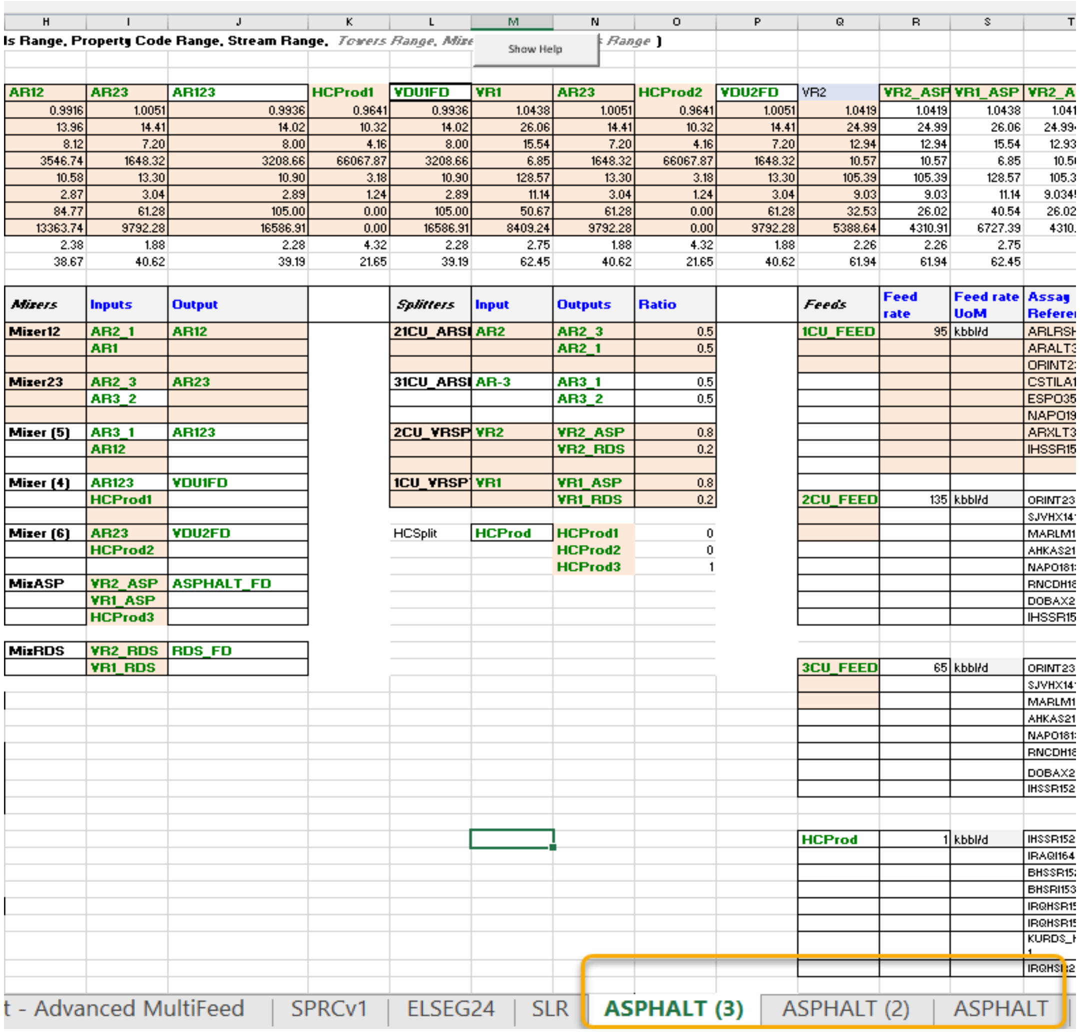
Towers	Pipes	ECP	StrippingFI	Rectifying FI	Pressure	CutPt,V,C
CDU1	GAS1	C			atm	
1CU_FEED	CN1	16.56	5.68	5.73	1.00	
	RK1	137.78	6.10	6.04	1.00	
	RD1	265.57	2.06	3.41	1.00	
	HGO1	412.32	1.91	1.84	1.00	
	AR1	401.26	1.01	2.78	1.00	373.3
CDU2	GAS2	C			atm	
2CU_FEED	CN2	12.66	3.38	3.43	1.00	
	HVN2	144.98	1.99	1.57	1.00	
	HK2	148.06	6.33	6.27	1.00	
	LD2	225.23	3.24	4.83	1.00	
	HD2	424.81	1.76	4.63	1.00	
	AR2	415.38	1.43	3.60	1.00	400.2
CDU3	GAS3	C			atm	
3CU_FEED	CN-3	3.97	3.91	4.00	1.00	
	PA1-3	147.30	2.15	3.22	1.00	
	RK-3	145.33	7.11	7.60	1.00	
	RD-3	235.70	3.29	4.15	1.00	
	HGO-3	427.87	1.93	2.56	1.00	
	AR-3	422.67	0.85	6.82	1.00	386.7
VDU1	FSL	C			atm	
VDU1FD	LVGO	246.46	1.44	1.27	0.01	358.5
	HVGO	359.12	0.88	1.25	0.01	523.8
	SLOPWAX	566.62	1.28	1.23	0.01	544.5
	VR1	556.80	1.29	1.00	0.01	554.1
VDU2	SlopOil	C			atm	
VDU2FD	LVGO2	215.11	3.52	1.97	0.01	
	HVGO2	363.59	1.26	1.20	0.01	
	SV2	513.99	1.14	1.65	0.01	
	VR2	544.62	1.93	1.29	0.01	519.1
				SlopWax		

Mixers	Inputs	Output
Mixer12	AR2_1	AR12
	AR1	
Mixer23	AR2_3	AR23
	AR3_2	
Mixer (5)	AR3_1	AR123
	AR12	
Mixer (4)	AR123	VDU1FD
	HCProd1	
Mixer (6)	AR23	VDU2FD
	HCProd2	
MixASP	VR2_ASP	ASPHALT_FD
	VR1_ASP	
	HCProd3	
MixRDS	VR2_RDS	RDS_FD
	VR1_RDS	

Splitters	Input	Outputs	Ratio
21CU_ARSI	AR2	AR2_3	0.5
		AR2_1	0.5
31CU_ARSI	AR-3	AR3_1	0.5
		AR3_2	0.5
2CU_VRSP	VR2	VR2_ASP	0.8
		VR2_RDS	0.2
1CU_VRSP	VR1	VR1_ASP	0.8
		VR1_RDS	0.2
HCSplit	HCProd	HCProd1	0
		HCProd2	0
		HCProd3	1

Feeds	Feed rate	Feed rate UoM	Assay Reference		Blend Ratio
1CU_FEED	95	kbbl/d	ARLRSH333-1A		88.3
			ARALT332-S		0
			ORINT234-L		22.91
			CSTI[illegible]183-H		5.59
			ESPO35[illegible]		5.93
			NAPO191-L		26.34
			ARXLT393-L		6.17
			IHSSR152		1
2CU_FEED	135	kbbl/d	ORINT234-L		0
			SJVHX141-L		40
			MARLM199-1M		0
			AHKAS210-H		16.5
			NAPO181S-1H		16.5
			RNCDH182-L		27
			DOBAX211-M		0
			IHSSR152		1
3CU_FEED	65	kbbl/d	ORINT234-L		10
			SJVHX141-L		40
			MARLM199-1M		0
			AHKAS210-H		16.5
			NAPO181S-1H		16.5
			RNCDH182-L		27
			DOBAX211-M		0
			IHSSR152		1
HCProd	1	kbbl/d	IHSSR152		1
			IRAQI164		0
			BHSSR152		0
			BHSRI153		0
			IRQHSR157a		0
			IRQHSR157		0
			KURDS_HSSR181		0
			IRQHSR215		0

Replication for Quick Scenarios



ls Range, Property Code Range, Stream Range, *Towers Range, Mixe* *Range*)

H	I	J	K	L	M	N	O	P	Q	R	S	T
AR12	**AR23**	**AR123**	**HCProd1**	**VDU1FD**	**VR1**	**AR23**	**HCProd2**	**VDU2FD**	VR2	**VR2_ASP**	**VR1_ASP**	**VR2_A**
0.9916	1.0051	0.9936	0.9641	0.9936	1.0438	1.0051	0.9641	1.0051	1.0419	1.0419	1.0438	1.041
13.96	14.41	14.02	10.32	14.02	26.06	14.41	10.32	14.41	24.99	24.99	26.06	24.99
8.12	7.20	8.00	4.16	8.00	15.54	7.20	4.16	7.20	12.94	12.94	15.54	12.93
3546.74	1648.32	3208.66	66067.87	3208.66	6.85	1648.32	66067.87	1648.32	10.57	10.57	6.85	10.5
10.58	13.30	10.90	3.18	10.90	128.57	13.30	3.18	13.30	105.39	105.39	128.57	105.3
2.87	3.04	2.89	1.24	2.89	11.14	3.04	1.24	3.04	9.03	9.03	11.14	9.034
84.77	61.28	105.00	0.00	105.00	50.67	61.28	0.00	61.28	32.53	26.02	40.54	26.02
13363.74	9792.28	16586.91	0.00	16586.91	8409.24	9792.28	0.00	9792.28	5388.64	4310.91	6727.39	4310.
2.38	1.88	2.28	4.32	2.28	2.75	1.88	4.32	1.88	2.26	2.26	2.75	
38.67	40.62	39.19	21.65	39.19	62.45	40.62	21.65	40.62	61.94	61.94	62.45	

Mixers	**Inputs**	**Output**
Mixer12	**AR2_1**	**AR12**
	AR1	
Mixer23	**AR2_3**	**AR23**
	AR3_2	
Mixer (5)	**AR3_1**	**AR123**
	AR12	
Mixer (4)	**AR123**	**VDU1FD**
	HCProd1	
Mixer (6)	**AR23**	**VDU2FD**
	HCProd2	
MixASP	**VR2_ASP**	**ASPHALT_FD**
	VR1_ASP	
	HCProd3	
MixRDS	**VR2_RDS**	**RDS_FD**
	VR1_RDS	

Splitters	**Input**	**Outputs**	**Ratio**
21CU_ARSI	**AR2**	**AR2_3**	0.5
		AR2_1	0.5
31CU_ARSI	**AR-3**	**AR3_1**	0.5
		AR3_2	0.5
2CU_VRSP	**VR2**	**VR2_ASP**	0.8
		VR2_RDS	0.2
1CU_VRSP	**VR1**	**VR1_ASP**	0.8
		VR1_RDS	0.2
HCSplit	**HCProd**	**HCProd1**	0
		HCProd2	0
		HCProd3	1

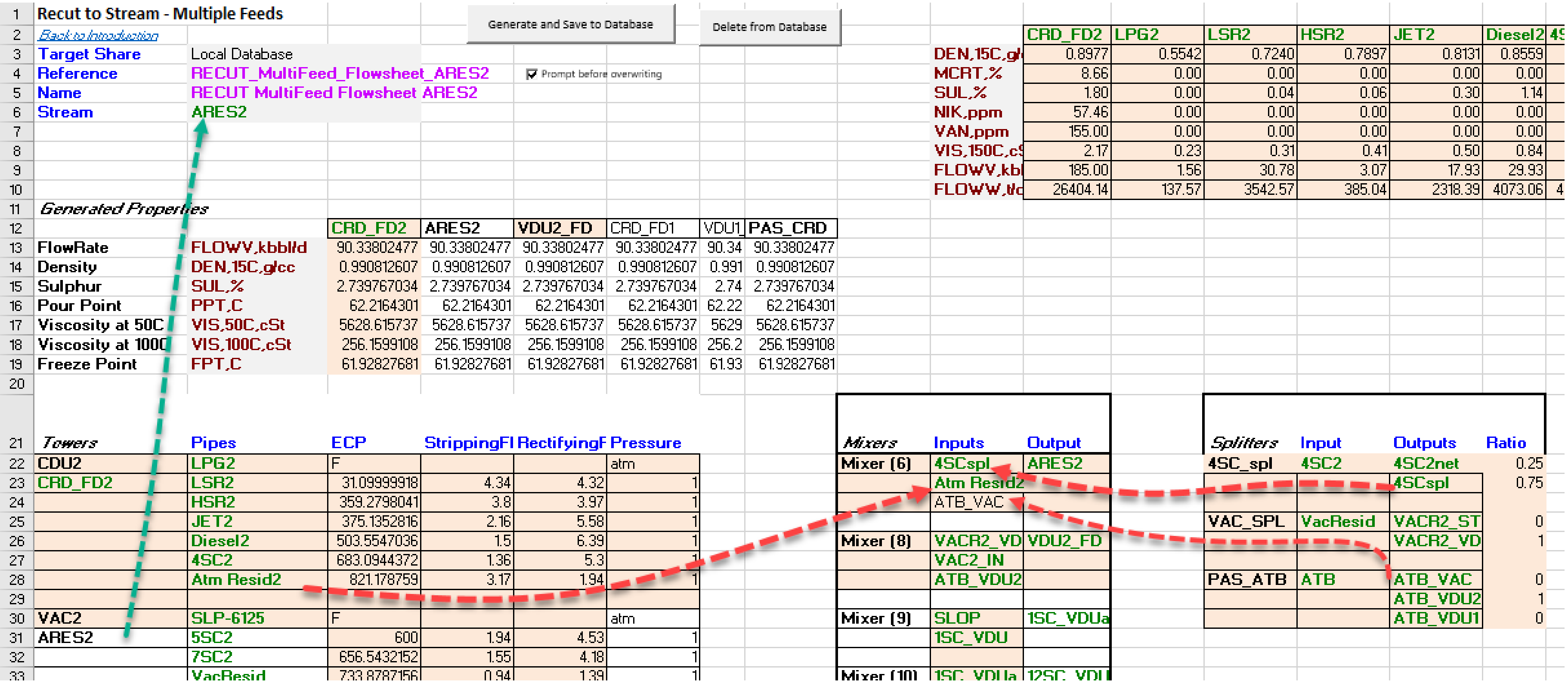
Feeds	**Feed rate**	**Feed rate UoM**	**Assay Referen**
1CU_FEED	95	kbbl/d	ARLRSH
			ARALT3
			ORINT2
			CSTILA1
			ESPO35
			NAPO19
			ARXLT3
			IHSSR15
2CU_FEED	135	kbbl/d	ORINT23
			SJVHX14
			MARLM1
			AHKAS21
			NAPO181
			RNCDH18
			DOBAX2
			IHSSR15
3CU_FEED	65	kbbl/d	ORINT23
			SJVHX14
			MARLM1
			AHKAS21
			NAPO181
			RNCDH18
			DOBAX2
			IHSSR152
HCProd	1	kbbl/d	IHSSR152
			IRAQI164
			BHSSR15
			BHSRI153
			IRQHSR15
			IRQHSR15
			KURDS_ 1
			IRQHSR2

Each worksheet can be replicated to create identical units, making case studies easy to set up.

Additional Functionality Worth Mentioning

Recut to Stream

Any stream on the flowsheet can be saved as an assay to the Local Share.



Recut to Stream - Multiple Feeds

Target Share	Local Database
Reference	RECUT_MultiFeed_Flowsheet_ARES2
Name	RECUT MultiFeed Flowsheet ARES2
Stream	ARES2

Generated Properties

		CRD_FD2	ARES2	VDU2_FD	CRD_FD1	VDU1_	PAS_CRD
FlowRate	FLOWV,kbbl/d	90.33802477	90.33802477	90.33802477	90.33802477	90.34	90.33802477
Density	DEN,15C,g/cc	0.990812607	0.990812607	0.990812607	0.990812607	0.991	0.990812607
Sulphur	SUL,%	2.739767034	2.739767034	2.739767034	2.739767034	2.74	2.739767034
Pour Point	PPT,C	62.2164301	62.2164301	62.2164301	62.2164301	62.22	62.2164301
Viscosity at 50C	VIS,50C,cSt	5628.615737	5628.615737	5628.615737	5628.615737	5629	5628.615737
Viscosity at 100C	VIS,100C,cSt	256.1599108	256.1599108	256.1599108	256.1599108	256.2	256.1599108
Freeze Point	FPT,C	61.92827681	61.92827681	61.92827681	61.92827681	61.93	61.92827681

	CRD_FD2	LPG2	LSR2	HSR2	JET2	Diesel2	4S
DEN,15C,g/	0.8977	0.5542	0.7240	0.7897	0.8131	0.8559	
MCRT,%	8.66	0.00	0.00	0.00	0.00	0.00	
SUL,%	1.80	0.00	0.04	0.06	0.30	1.14	
NIK,ppm	57.46	0.00	0.00	0.00	0.00	0.00	
VAN,ppm	155.00	0.00	0.00	0.00	0.00	0.00	
VIS,150C,c	2.17	0.23	0.31	0.41	0.50	0.84	
FLOWV,kb	185.00	1.56	30.78	3.07	17.93	29.93	
FLOWW,t/	26404.14	137.57	3542.57	385.04	2318.39	4073.06	4

Towers	Pipes	ECP	StrippingFl	RectifyingF	Pressure
CDU2	LPG2	F			atm
CRD_FD2	LSR2	31.09999918	4.34	4.32	1
	HSR2	359.2798041	3.8	3.97	1
	JET2	375.1352816	2.16	5.58	1
	Diesel2	503.5547036	1.5	6.39	1
	4SC2	683.0944372	1.36	5.3	1
	Atm Resid2	821.178759	3.17	1.94	1
VAC2	SLP-6125	F			atm
ARES2	5SC2	600	1.94	4.53	1
	7SC2	656.5432152	1.55	4.18	1
	VacResid	733.8787156	0.94	1.39	1

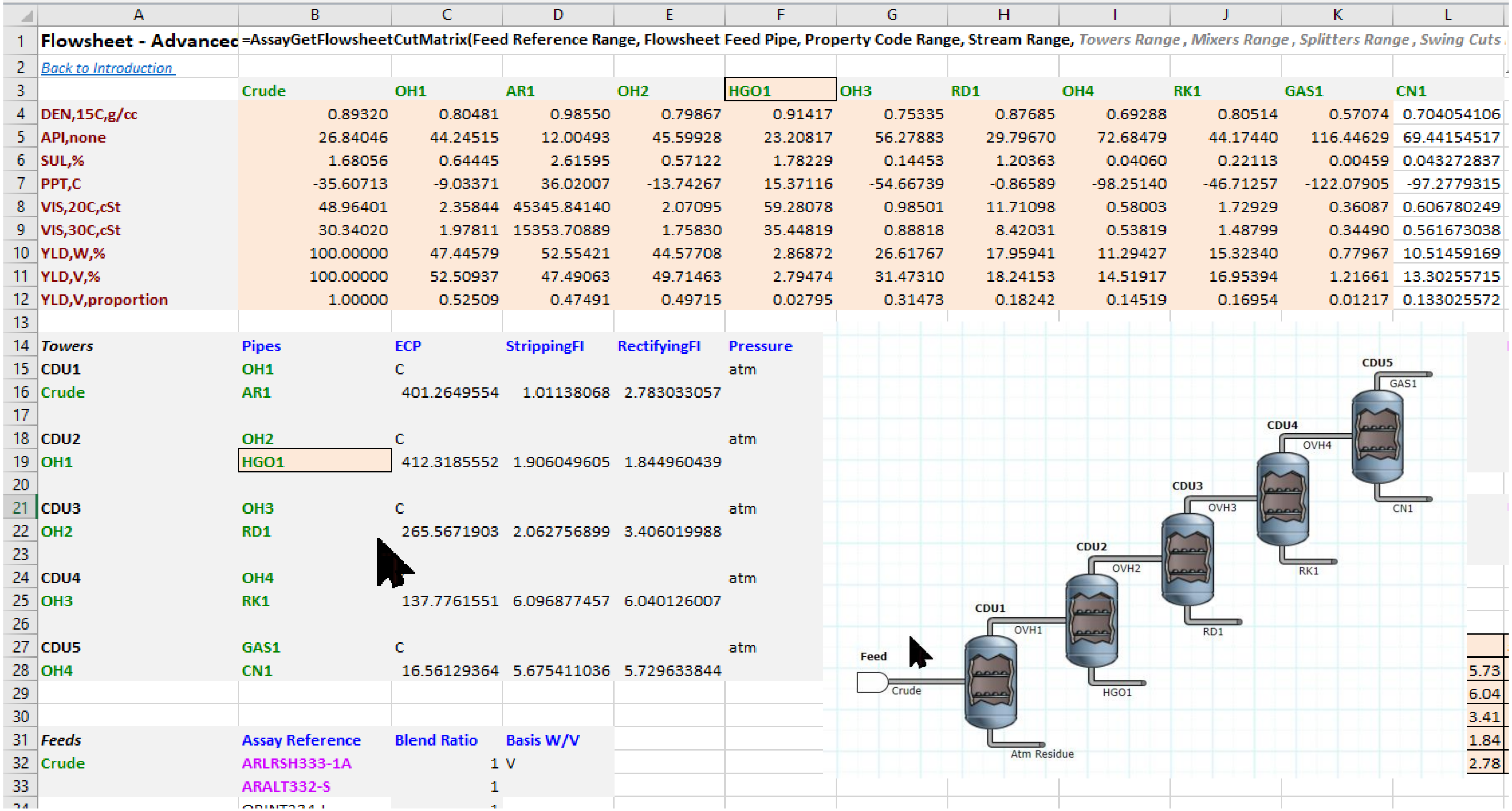
Mixers	Inputs	Output
Mixer (6)	4SCspl	ARES2
	Atm Resid2	
	ATB_VAC	
Mixer (8)	VACR2_VD	VDU2_FD
	VAC2_IN	
	ATB_VDU2	
Mixer (9)	SLOP	1SC_VDUa
	1SC_VDU	
Mixer (10)	1SC_VDUa	12SC_VDU

Splitters	Input	Outputs	Ratio
4SC_spl	4SC2	4SC2net	0.25
		4SCspl	0.75
VAC_SPL	VacResid	VACR2_ST	0
		VACR2_VD	1
PAS_ATB	ATB	ATB_VAC	0
		ATB_VDU2	1
		ATB_VDU1	0

Additional Functionality Worth Mentioning

Series of Binaries to initialize rigorous column flowrates

Liquid product and produced with over head flow and composition

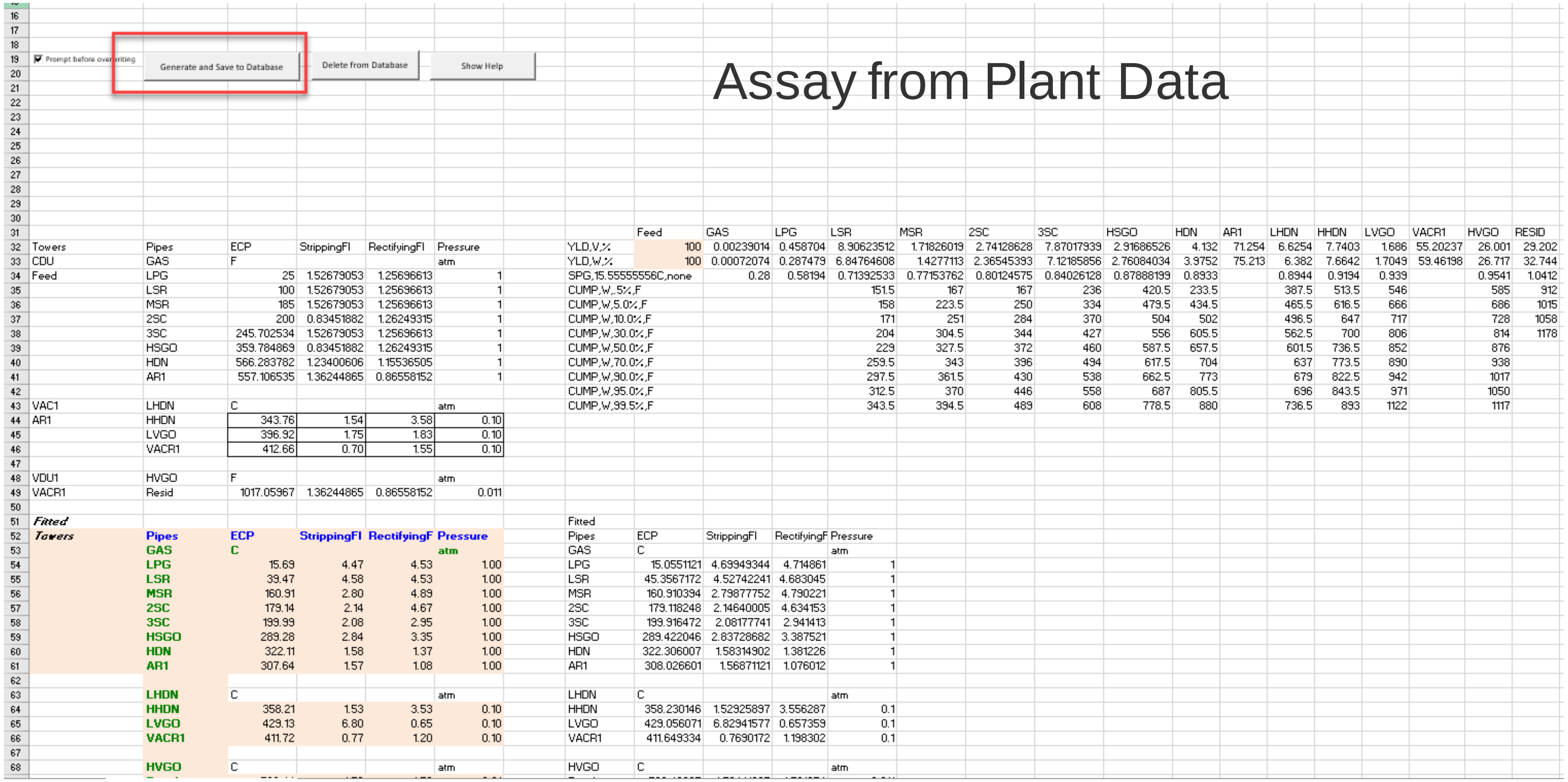


	A	B	C	D	E	F	G	H	I	J	K	L
1	**Flowsheet - Advancec**	=AssayGetFlowsheetCutMatrix(Feed Reference Range, Flowsheet Feed Pipe, Property Code Range, Stream Range, *Towers Range , Mixers Range , Splitters Range , Swing Cuts*										
2	*Back to Introduction*											
3		Crude	OH1	AR1	OH2	HGO1	OH3	RD1	OH4	RK1	GAS1	CN1
4	DEN,15C,g/cc	0.89320	0.80481	0.98550	0.79867	0.91417	0.75335	0.87685	0.69288	0.80514	0.57074	0.704054106
5	API,none	26.84046	44.24515	12.00493	45.59928	23.20817	56.27883	29.79670	72.68479	44.17440	116.44629	69.44154517
6	SUL,%	1.68056	0.64445	2.61595	0.57122	1.78229	0.14453	1.20363	0.04060	0.22113	0.00459	0.043272837
7	PPT,C	-35.60713	-9.03371	36.02007	-13.74267	15.37116	-54.66739	-0.86589	-98.25140	-46.71257	-122.07905	-97.2779315
8	VIS,20C,cSt	48.96401	2.35844	45345.84140	2.07095	59.28078	0.98501	11.71098	0.58003	1.72929	0.36087	0.606780249
9	VIS,30C,cSt	30.34020	1.97811	15353.70889	1.75830	35.44819	0.88818	8.42031	0.53819	1.48799	0.34490	0.561673038
10	YLD,W,%	100.00000	47.44579	52.55421	44.57708	2.86872	26.61767	17.95941	11.29427	15.32340	0.77967	10.51459169
11	YLD,V,%	100.00000	52.50937	47.49063	49.71463	2.79474	31.47310	18.24153	14.51917	16.95394	1.21661	13.30255715
12	YLD,V,proportion	1.00000	0.52509	0.47491	0.49715	0.02795	0.31473	0.18242	0.14519	0.16954	0.01217	0.133025572
13												
14	*Towers*	Pipes	ECP	StrippingFl	RectifyingFl	Pressure						
15	CDU1	OH1	C			atm						
16	Crude	AR1	401.2649554	1.01138068	2.783033057							
17												
18	CDU2	OH2	C			atm						
19	OH1	HGO1	412.3185552	1.906049605	1.844960439							
20												
21	CDU3	OH3	C			atm						
22	OH2	RD1	265.5671903	2.062756899	3.406019988							
23												
24	CDU4	OH4				atm						
25	OH3	RK1	137.7761551	6.096877457	6.040126007							
26												
27	CDU5	GAS1	C			atm						
28	OH4	CN1	16.56129364	5.675411036	5.729633844								5.73
29												6.04
30												3.41
31	*Feeds*	Assay Reference	Blend Ratio	Basis W/V								1.84
32	Crude	ARLRSH333-1A	1	V								2.78
33		ARALT332-S	1									

Additional Functionality Worth Mentioning

Creating Assays from Scheduler’s Plant Data and Scheduler’s Blend

Assay from Plant Data



☑ Prompt before overwriting

Towers	Pipes	ECP	StrippingFl	RectifyingFl	Pressure
CDU	GAS	F			atm
Feed	LPG	25	1.52679053	1.25696613	1
	LSR	100	1.52679053	1.25696613	1
	MSR	185	1.52679053	1.25696613	1
	2SC	200	0.83451882	1.26249315	1
	3SC	245.702534	1.52679053	1.25696613	1
	HSGO	359.784869	0.83451882	1.26249315	1
	HDN	566.283782	1.23400606	1.15536505	1
	AR1	557.106535	1.36244865	0.86558152	1
VAC1	LHDN	C			atm
AR1	HHDN	343.76	1.54	3.58	0.10
	LVGO	396.92	1.75	1.83	0.10
	VACR1	412.66	0.70	1.55	0.10
VDU1	HVGO	F			atm
VACR1	Resid	1017.05967	1.36244865	0.86558152	0.011

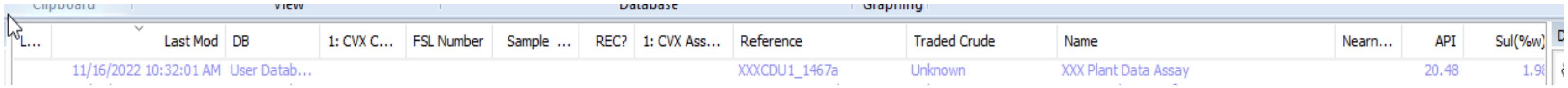
	Feed	GAS	LPG	LSR	MSR	2SC	3SC	HSGO	HDN	AR1	LHDN	HHDN	LVGO	VACR1	HVGO	RESID
YLD,V,%	100	0.00239014	0.458704	8.90623512	1.71826019	2.74128628	7.87017939	2.91686526	4.132	71.254	6.6254	7.7403	1.686	55.20237	26.001	29.202
YLD,W,%	100	0.00072074	0.287479	6.84764608	1.4277113	2.36545393	7.12185856	2.76084034	3.9752	75.213	6.382	7.6642	1.7049	59.46198	26.717	32.744
SPG,15.55555556C,none		0.28	0.58194	0.71392533	0.77153762	0.80124575	0.84026128	0.87888199	0.8933		0.8944	0.9194	0.939		0.9541	1.0412
CUMP,W,.5%,F				151.5	167	167	236	420.5	233.5		387.5	513.5	546		585	912
CUMP,W,5.0%,F				158	223.5	250	334	479.5	434.5		465.5	616.5	666		686	1015
CUMP,W,10.0%,F				171	251	284	370	504	502		496.5	647	717		728	1058
CUMP,W,30.0%,F				204	304.5	344	427	556	605.5		562.5	700	806		814	1178
CUMP,W,50.0%,F				229	327.5	372	460	587.5	657.5		601.5	736.5	852		876	
CUMP,W,70.0%,F				259.5	343	396	494	617.5	704		637	773.5	890		938	
CUMP,W,90.0%,F				297.5	361.5	430	538	662.5	773		679	822.5	942		1017	
CUMP,W,95.0%,F				312.5	370	446	558	687	805.5		696	843.5	971		1050	
CUMP,W,99.5%,F				343.5	394.5	489	608	778.5	880		736.5	893	1122		1117	

Fitted

Towers	**Pipes**	**ECP**	**StrippingFl**	**RectifyingF**	**Pressure**
	GAS	**C**			**atm**
	LPG	15.69	4.47	4.53	1.00
	LSR	39.47	4.58	4.53	1.00
	MSR	160.91	2.80	4.89	1.00
	2SC	179.14	2.14	4.67	1.00
	3SC	199.99	2.08	2.95	1.00
	HSGO	289.28	2.84	3.35	1.00
	HDN	322.11	1.58	1.37	1.00
	AR1	307.64	1.57	1.08	1.00
	LHDN	C			atm
	HHDN	358.21	1.53	3.53	0.10
	LVGO	429.13	6.80	0.65	0.10
	VACR1	411.72	0.77	1.20	0.10
	HVGO	C			atm

Fitted

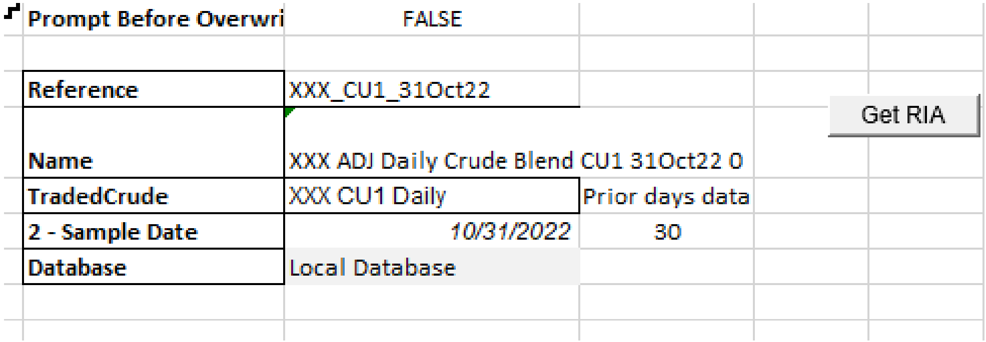
Pipes	ECP	StrippingFl	RectifyingF	Pressure
GAS	C			atm
LPG	15.0551121	4.69949344	4.714861	1
LSR	45.3567172	4.52742241	4.683045	1
MSR	160.910394	2.79877752	4.790221	1
2SC	179.118248	2.14640005	4.634153	1
3SC	199.916472	2.08177741	2.941413	1
HSGO	289.422046	2.83728682	3.387521	1
HDN	322.306007	1.58314902	1.381226	1
AR1	308.026601	1.56871121	1.076012	1
LHDN	C			atm
HHDN	358.230146	1.52925897	3.556287	0.1
LVGO	429.056071	6.82941577	0.657359	0.1
VACR1	411.649334	0.7690172	1.198302	0.1
HVGO	C			atm



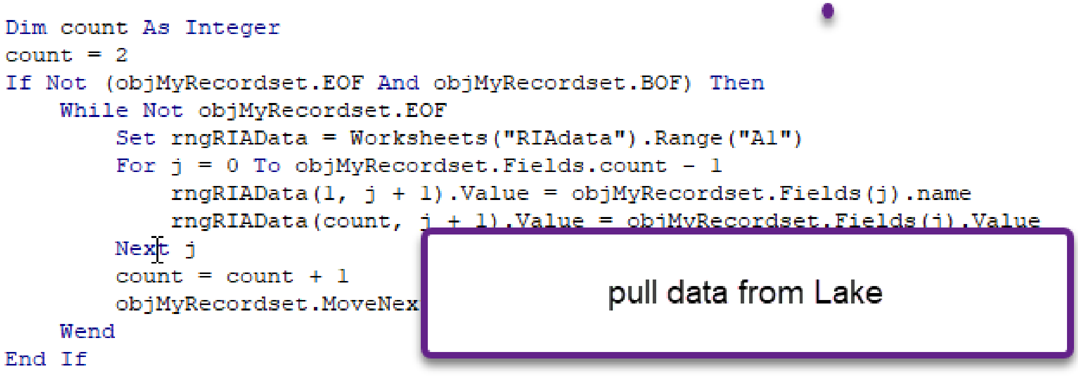
L…	Last Mod	DB	1: CVX C…	FSL Number	Sample …	REC?	1: CVX Ass…	Reference	Traded Crude	Name	Nearn…	API	Sul(%w)
	11/16/2022 10:32:01 AM	User Datab…						XXXCDU1_1467a	Unknown	XXX Plant Data Assay		20.48	1.9

Additional Functionality Worth Mentioning

Creating Assays from Scheduler’s Plant Data and Scheduler’s Blend

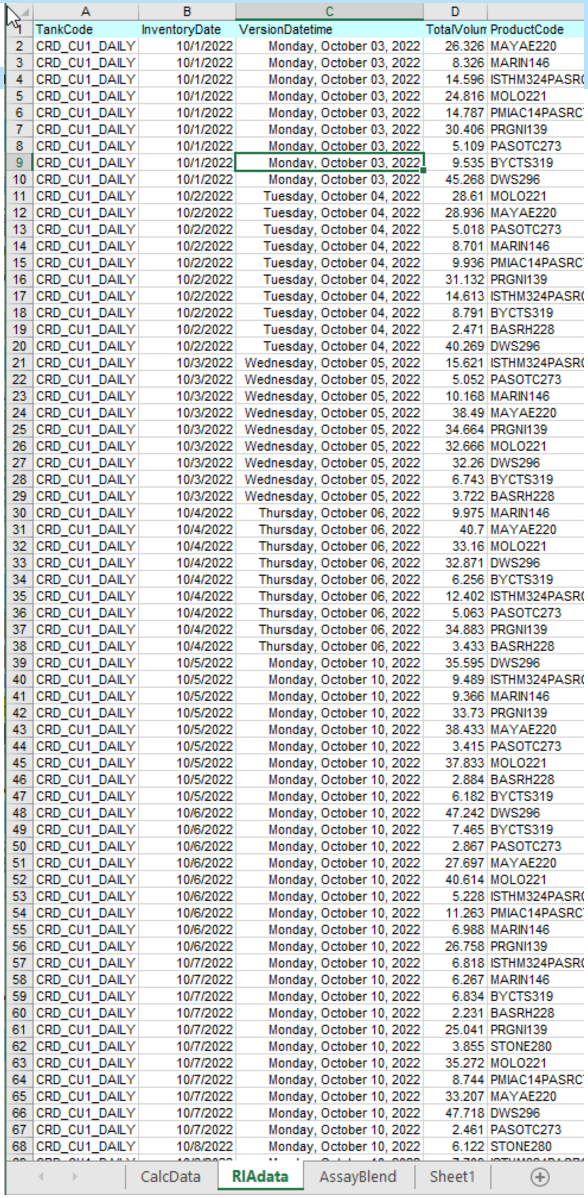


Prompt Before Overwri	FALSE		
Reference	XXX_CU1_31Oct22		
Name	XXX ADJ Daily Crude Blend CU1 31Oct22 0		
TradedCrude	XXX CU1 Daily	Prior days data	
2 - Sample Date	*10/31/2022*	30	
Database	Local Database		



```
Dim count As Integer
count = 2
If Not (objMyRecordset.EOF And objMyRecordset.BOF) Then
    While Not objMyRecordset.EOF
        Set rngRIAData = Worksheets("RIAdata").Range("A1")
        For j = 0 To objMyRecordset.Fields.count - 1
            rngRIAData(1, j + 1).Value = objMyRecordset.Fields(j).name
            rngRIAData(count, j + 1).Value = objMyRecordset.Fields(j).Value
        Next j
        count = count + 1
        objMyRecordset.MoveNex
    Wend
End If
```

pull data from Lake



	A	B	C	D	
1	TankCode	InventoryDate	VersionDatetime	TotalVolun	ProductCode
2	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	26.326	MAYAE220
3	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	8.326	MARIN146
4	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	14.596	ISTHM324PASR
5	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	24.816	MOLO221
6	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	14.787	PMIAC14PASRC
7	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	30.406	PRGNI139
8	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	5.109	PASOTC273
9	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	9.535	BYCTS319
10	CRD_CU1_DAILY	10/1/2022	Monday, October 03, 2022	45.268	DWS296
11	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	28.61	MOLO221
12	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	28.936	MAYAE220
13	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	5.018	PASOTC273
14	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	8.701	MARIN146
15	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	9.936	PMIAC14PASRC
16	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	31.132	PRGNI139
17	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	14.613	ISTHM324PASR
18	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	8.791	BYCTS319
19	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	2.471	BASRH228
20	CRD_CU1_DAILY	10/2/2022	Tuesday, October 04, 2022	40.269	DWS296
21	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	15.621	ISTHM324PASR
22	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	5.052	PASOTC273
23	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	10.168	MARIN146
24	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	38.49	MAYAE220
25	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	34.664	PRGNI139
26	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	32.666	MOLO221
27	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	32.26	DWS296
28	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	6.743	BYCTS319
29	CRD_CU1_DAILY	10/3/2022	Wednesday, October 05, 2022	3.722	BASRH228
30	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	9.975	MARIN146
31	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	40.7	MAYAE220
32	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	33.16	MOLO221
33	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	32.871	DWS296
34	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	6.256	BYCTS319
35	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	12.402	ISTHM324PASR
36	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	5.063	PASOTC273
37	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	34.883	PRGNI139
38	CRD_CU1_DAILY	10/4/2022	Thursday, October 06, 2022	3.433	BASRH228
39	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	35.595	DWS296
40	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	9.489	ISTHM324PASR
41	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	9.366	MARIN146
42	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	33.73	PRGNI139
43	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	38.433	MAYAE220
44	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	3.415	PASOTC273
45	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	37.833	MOLO221
46	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	2.884	BASRH228
47	CRD_CU1_DAILY	10/5/2022	Monday, October 10, 2022	6.182	BYCTS319
48	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	47.242	DWS296
49	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	7.465	BYCTS319
50	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	2.867	PASOTC273
51	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	27.697	MAYAE220
52	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	40.614	MOLO221
53	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	5.228	ISTHM324PASR
54	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	11.263	PMIAC14PASRC
55	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	6.988	MARIN146
56	CRD_CU1_DAILY	10/6/2022	Monday, October 10, 2022	26.758	PRGNI139
57	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	6.818	ISTHM324PASR
58	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	6.267	MARIN146
59	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	6.834	BYCTS319
60	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	2.231	BASRH228
61	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	25.041	PRGNI139
62	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	3.855	STONE280
63	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	35.272	MOLO221
64	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	8.744	PMIAC14PASRC
65	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	33.207	MAYAE220
66	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	47.718	DWS296
67	CRD_CU1_DAILY	10/7/2022	Monday, October 10, 2022	2.461	PASOTC273
68	CRD_CU1_DAILY	10/8/2022	Monday, October 10, 2022	6.122	STONE280

Additional Functionality Worth Mentioning

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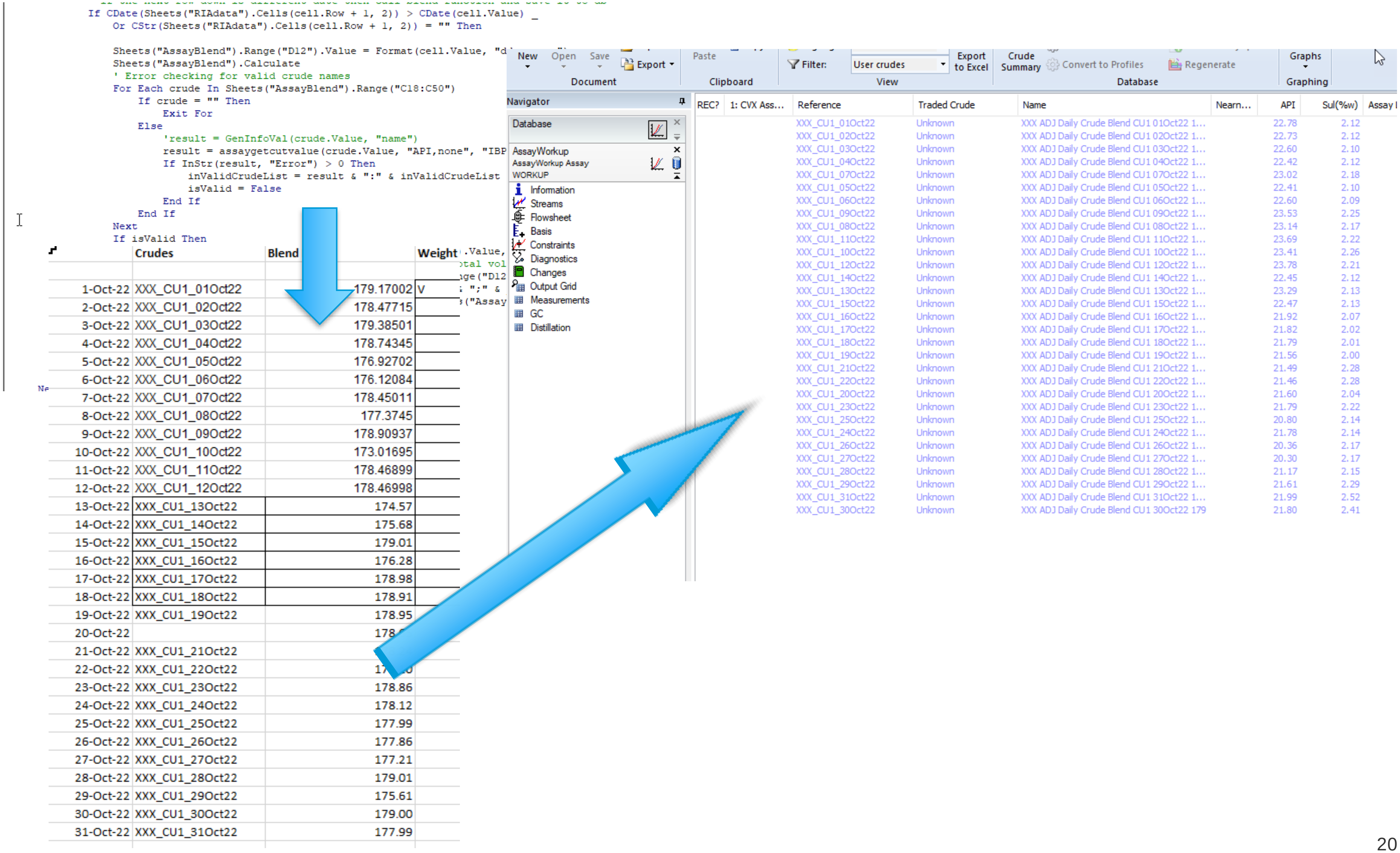


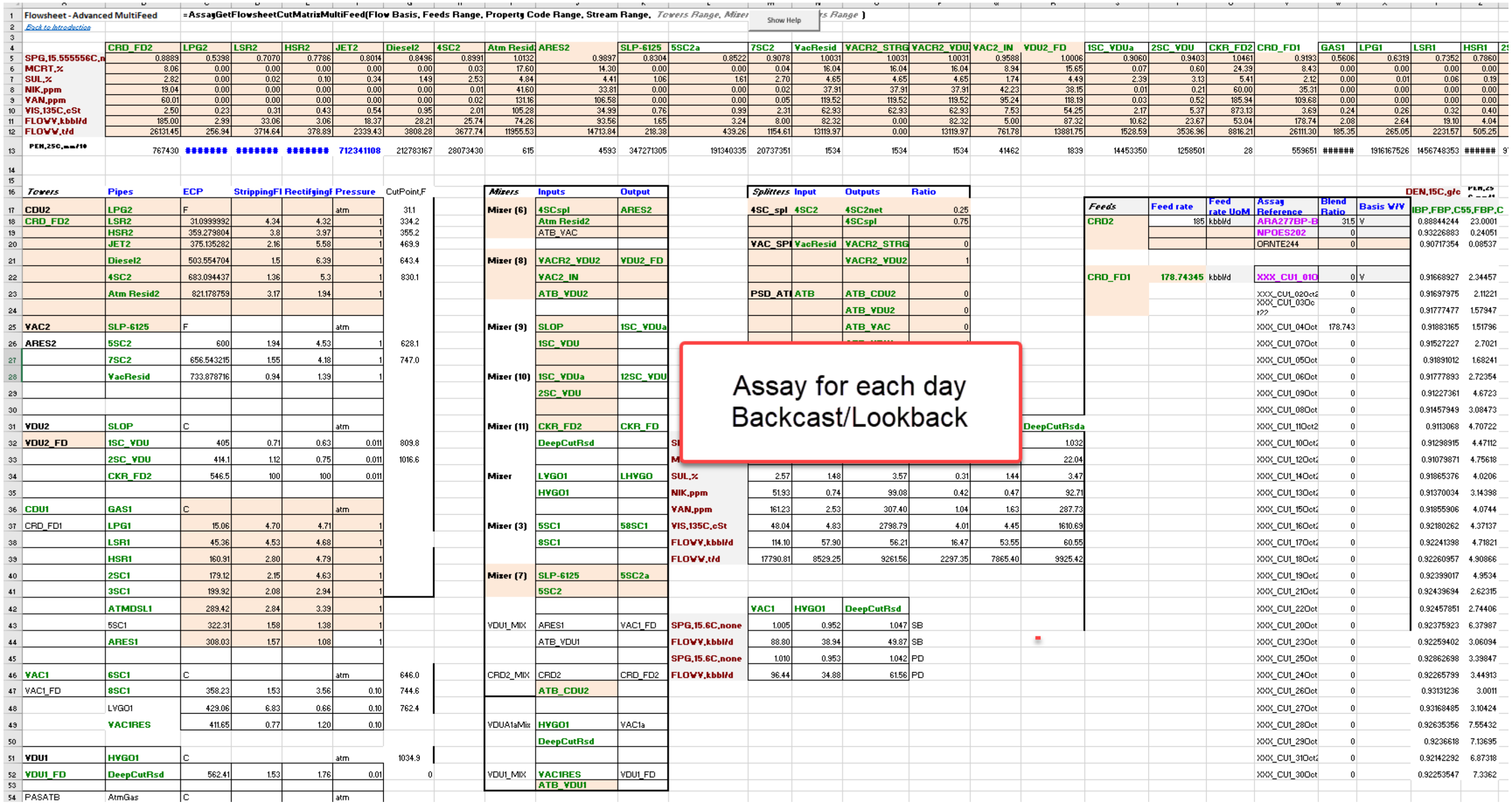
```
        If CDate(Sheets("RIAdata").Cells(cell.Row + 1, 2)) > CDate(cell.Value) _
            Or CStr(Sheets("RIAdata").Cells(cell.Row + 1, 2)) = "" Then

            Sheets("AssayBlend").Range("D12").Value = Format(cell.Value, "d
            Sheets("AssayBlend").Calculate
            ' Error checking for valid crude names
            For Each crude In Sheets("AssayBlend").Range("C18:C50")
                If crude = "" Then
                    Exit For
                Else
                    'result = GenInfoVal(crude.Value, "name")
                    result = assaygetcutvalue(crude.Value, "API,none", "IBP
                    If InStr(result, "Error") > 0 Then
                        inValidCrudeList = result & ":" & inValidCrudeList
                        isValid = False
                    End If
                End If
            Next
            If isValid Then
```

	Crudes	Blend	Weight
1-Oct-22	XXX_CU1_01Oct22	179.17002	V
2-Oct-22	XXX_CU1_02Oct22	178.47715	
3-Oct-22	XXX_CU1_03Oct22	179.38501	
4-Oct-22	XXX_CU1_04Oct22	178.74345	
5-Oct-22	XXX_CU1_05Oct22	176.92702	
6-Oct-22	XXX_CU1_06Oct22	176.12084	
7-Oct-22	XXX_CU1_07Oct22	178.45011	
8-Oct-22	XXX_CU1_08Oct22	177.3745	
9-Oct-22	XXX_CU1_09Oct22	178.90937	
10-Oct-22	XXX_CU1_10Oct22	173.01695	
11-Oct-22	XXX_CU1_11Oct22	178.46899	
12-Oct-22	XXX_CU1_12Oct22	178.46998	
13-Oct-22	XXX_CU1_13Oct22	174.57	
14-Oct-22	XXX_CU1_14Oct22	175.68	
15-Oct-22	XXX_CU1_15Oct22	179.01	
16-Oct-22	XXX_CU1_16Oct22	176.28	
17-Oct-22	XXX_CU1_17Oct22	178.98	
18-Oct-22	XXX_CU1_18Oct22	178.91	
19-Oct-22	XXX_CU1_19Oct22	178.95	
20-Oct-22		178.[illegible]	
21-Oct-22	XXX_CU1_21Oct22	[illegible]	
22-Oct-22	XXX_CU1_22Oct22	17[illegible]	
23-Oct-22	XXX_CU1_23Oct22	178.86	
24-Oct-22	XXX_CU1_24Oct22	178.12	
25-Oct-22	XXX_CU1_25Oct22	177.99	
26-Oct-22	XXX_CU1_26Oct22	177.86	
27-Oct-22	XXX_CU1_27Oct22	177.21	
28-Oct-22	XXX_CU1_28Oct22	179.01	
29-Oct-22	XXX_CU1_29Oct22	175.61	
30-Oct-22	XXX_CU1_30Oct22	179.00	
31-Oct-22	XXX_CU1_31Oct22	177.99	

REC?	1: CVX Ass...	Reference	Traded Crude	Name	Nearn...	API	Sul(%w)	Assay I
		XXX_CU1_01Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 01Oct22 1...		22.78	2.12	
		XXX_CU1_02Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 02Oct22 1...		22.73	2.12	
		XXX_CU1_03Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 03Oct22 1...		22.60	2.10	
		XXX_CU1_04Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 04Oct22 1...		22.42	2.12	
		XXX_CU1_07Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 07Oct22 1...		23.02	2.18	
		XXX_CU1_05Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 05Oct22 1...		22.41	2.10	
		XXX_CU1_06Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 06Oct22 1...		22.60	2.09	
		XXX_CU1_09Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 09Oct22 1...		23.53	2.25	
		XXX_CU1_08Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 08Oct22 1...		23.14	2.17	
		XXX_CU1_11Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 11Oct22 1...		23.69	2.22	
		XXX_CU1_10Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 10Oct22 1...		23.41	2.26	
		XXX_CU1_12Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 12Oct22 1...		23.78	2.21	
		XXX_CU1_14Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 14Oct22 1...		22.45	2.12	
		XXX_CU1_13Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 13Oct22 1...		23.29	2.13	
		XXX_CU1_15Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 15Oct22 1...		22.47	2.13	
		XXX_CU1_16Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 16Oct22 1...		21.92	2.07	
		XXX_CU1_17Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 17Oct22 1...		21.82	2.02	
		XXX_CU1_18Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 18Oct22 1...		21.79	2.01	
		XXX_CU1_19Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 19Oct22 1...		21.56	2.00	
		XXX_CU1_21Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 21Oct22 1...		21.49	2.28	
		XXX_CU1_22Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 22Oct22 1...		21.46	2.28	
		XXX_CU1_20Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 20Oct22 1...		21.60	2.04	
		XXX_CU1_23Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 23Oct22 1...		21.79	2.22	
		XXX_CU1_25Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 25Oct22 1...		20.80	2.14	
		XXX_CU1_24Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 24Oct22 1...		21.78	2.14	
		XXX_CU1_26Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 26Oct22 1...		20.36	2.17	
		XXX_CU1_27Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 27Oct22 1...		20.30	2.17	
		XXX_CU1_28Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 28Oct22 1...		21.17	2.15	
		XXX_CU1_29Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 29Oct22 1...		21.61	2.29	
		XXX_CU1_31Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 31Oct22 1...		21.99	2.52	
		XXX_CU1_30Oct22	Unknown	XXX ADJ Daily Crude Blend CU1 30Oct22 179		21.80	2.41	

Additional Functionality Worth Mentioning

Assay for each day, compare to PI data for Backcast



Flowsheet - Advanced MultiFeed =AssayGetFlowsheetCutMatrixMultiFeed(Flow Basis, Feeds Range, Property Code Range, Stream Range, *Towers Range, Mixer* … *rs Range*)

Show Help

Back to Introduction

	CRD_FD2	LPG2	LSR2	HSR2	JET2	Diesel2	4SC2	Atm Resid2	ARES2	SLP-6125	5SC2a	7SC2
SPG,15.555556C,n	0.8889	0.5398	0.7070	0.7786	0.8014	0.8496	0.8991	1.0132	0.9897	0.8304	0.8522	0.9078
MCRT,%	8.06	0.00	0.00	0.00	0.00	0.00	0.03	17.60	14.30	0.00	0.00	0.04
SUL,%	2.82	0.00	0.02	0.10	0.34	1.49	2.53	4.84	4.41	1.06	1.61	2.70
NIK,ppm	19.04	0.00	0.00	0.00	0.00	0.00	0.01	41.60	33.81	0.00	0.00	0.02
VAN,ppm	60.01	0.00	0.00	0.00	0.00	0.00	0.02	131.16	106.58	0.00	0.00	0.05
VIS,135C,cSt	2.50	0.23	0.31	0.43	0.54	0.95	2.01	105.28	34.99	0.76	0.99	2.31
FLOWV,kbbl/d	185.00	2.99	33.06	3.06	18.37	28.21	25.74	74.26	93.56	1.65	3.24	8.00
FLOWV,t/d	26131.45	256.94	3714.64	378.89	2339.43	3808.28	3677.74	11955.53	14713.84	218.38	439.26	1154.61
PEN,25C,mm/10	767430	#######	#######	#######	712341108	212783167	28073430	615	4593	347271305	191340335	20737351

	VacResid	VACR2_STRG	VACR2_VDU	VAC2_IN	VDU2_FD	1SC_VDUa	2SC_VDU	CKR_FD2	CRD_FD1	GAS1	LPG1	LSR1	HSR1	2S
SPG,15.555556C,n	1.0031	1.0031	1.0031	0.9588	1.0006	0.9060	0.9403	1.0461	0.9193	0.5606	0.6319	0.7352	0.7860	
MCRT,%	16.04	16.04	16.04	8.94	15.65	0.07	0.60	24.39	8.43	0.00	0.00	0.00	0.00	
SUL,%	4.65	4.65	4.65	1.74	4.49	2.39	3.13	5.41	2.12	0.00	0.01	0.06	0.19	
NIK,ppm	37.91	37.91	37.91	42.23	38.15	0.01	0.21	60.00	35.31	0.00	0.00	0.00	0.00	
VAN,ppm	119.52	119.52	119.52	95.24	118.19	0.03	0.52	185.94	109.68	0.00	0.00	0.00	0.00	
VIS,135C,cSt	62.93	62.93	62.93	7.53	54.25	2.17	5.37	873.13	3.69	0.24	0.26	0.32	0.40	
FLOWV,kbbl/d	82.32	0.00	82.32	5.00	87.32	10.62	23.67	53.04	178.74	2.08	2.64	19.10	4.04	
FLOWV,t/d	13119.97	0.00	13119.97	761.78	13881.75	1528.59	3536.96	8816.21	26111.30	185.35	265.05	2231.57	505.25	
PEN,25C,mm/10	1534	1534	1534	41462	1839	14453350	1258501	28	559651	######	1916167526	1456748353	######	9

Towers	Pipes	ECP	StrippingFl	RectifyingF	Pressure	CutPoint,F
CDU2	LPG2	F			atm	31.1
CRD_FD2	LSR2	31.0999992	4.34	4.32	1	334.2
	HSR2	359.279804	3.8	3.97	1	355.2
	JET2	375.135282	2.16	5.58	1	469.9
	Diesel2	503.554704	1.5	6.39	1	643.4
	4SC2	683.094437	1.36	5.3	1	830.1
	Atm Resid2	821.178759	3.17	1.94	1	
VAC2	SLP-6125	F			atm	
ARES2	5SC2	600	1.94	4.53	1	628.1
	7SC2	656.543215	1.55	4.18	1	747.0
	VacResid	733.878716	0.94	1.39	1	
VDU2	SLOP	C			atm	
VDU2_FD	1SC_VDU	405	0.71	0.63	0.011	809.8
	2SC_VDU	414.1	1.12	0.75	0.011	1016.6
	CKR_FD2	546.5	100	100	0.011	
CDU1	GAS1	C			atm	
CRD_FD1	LPG1	15.06	4.70	4.71	1	
	LSR1	45.36	4.53	4.68	1	
	HSR1	160.91	2.80	4.79	1	
	2SC1	179.12	2.15	4.63	1	
	3SC1	199.92	2.08	2.94	1	
	ATMDSL1	289.42	2.84	3.39	1	
	5SC1	322.31	1.58	1.38	1	
	ARES1	308.03	1.57	1.08	1	
VAC1	6SC1	C			atm	646.0
VAC1_FD	8SC1	358.23	1.53	3.56	0.10	744.6
	LVGO1	429.06	6.83	0.66	0.10	762.4
	VAC1RES	411.65	0.77	1.20	0.10	
VDU1	HVGO1	C			atm	1034.9
VDU1_FD	DeepCutRsd	562.41	1.53	1.76	0.01	0
PASATB	AtmGas	C			atm	

Mixers	Inputs	Output
Mixer (6)	4SCspl	ARES2
	Atm Resid2	
	ATB_VAC	
Mixer (8)	VACR2_VDU2	VDU2_FD
	VAC2_IN	
	ATB_VDU2	
Mixer (9)	SLOP	1SC_VDUa
	1SC_VDU	
Mixer (10)	1SC_VDUa	12SC_VDU
	2SC_VDU	
Mixer (11)	CKR_FD2	CKR_FD
	DeepCutRsd	
Mixer	LVGO1	LHVGO
	HVGO1	
Mixer (3)	5SC1	58SC1
	8SC1	
Mixer (7)	SLP-6125	5SC2a
	5SC2	
VDU1_MIX	ARES1	VAC1_FD
	ATB_VDU1	
CRD2_MIX	CRD2	CRD_FD2
	ATB_CDU2	
VDUA1aMix	HVGO1	VAC1a
	DeepCutRsd	
VDU1_MIX	VAC1RES	VDU1_FD
	ATB_VDU1	

Splitters	Input	Outputs	Ratio
4SC_spl	4SC2	4SC2net	0.25
		4SCspl	0.75
VAC_SPl	VacResid	VACR2_STRG	0
		VACR2_VDU2	1
PSD_ATI	ATB	ATB_CDU2	0
		ATB_VDU2	0
		ATB_VAC	0

						DeepCutRsda
SI						1.032
M						22.04
SUL,%	2.57	1.48	3.57	0.31	1.44	3.47
NIK,ppm	51.93	0.74	99.08	0.42	0.47	92.71
VAN,ppm	161.23	2.53	307.40	1.04	1.63	287.73
VIS,135C,cSt	48.04	4.83	2798.79	4.01	4.45	1610.69
FLOWV,kbbl/d	114.10	57.90	56.21	16.47	53.55	60.55
FLOWV,t/d	17790.81	8529.25	9261.56	2297.35	7865.40	9925.42

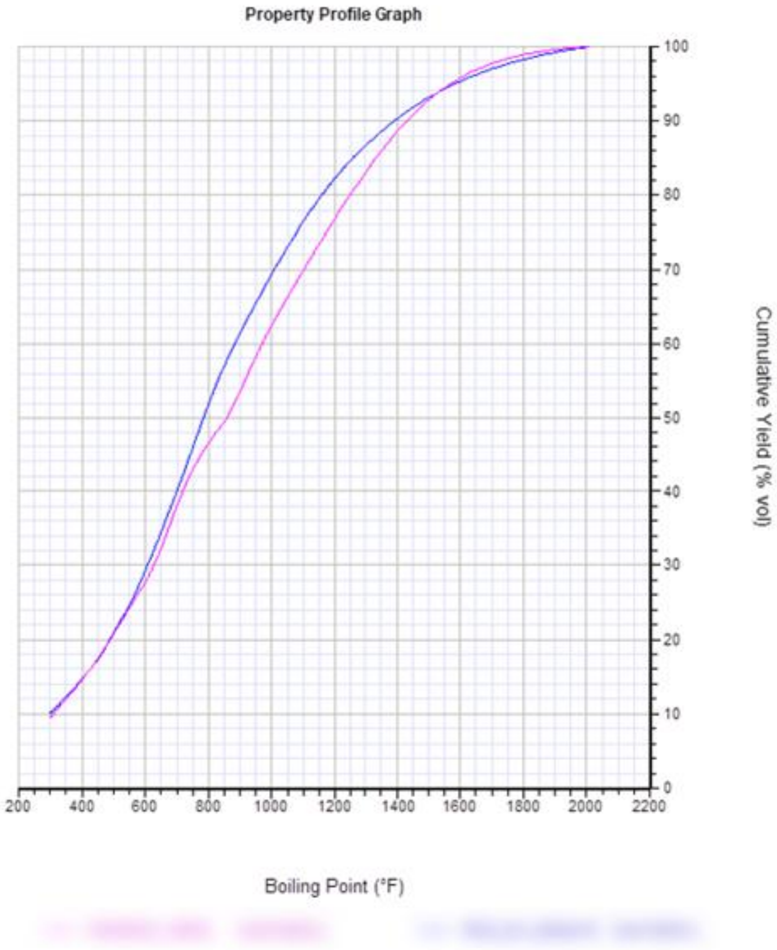
	VAC1	HVGO1	DeepCutRsd	
SPG,15.6C,none	1.005	0.952	1.047	SB
FLOWV,kbbl/d	88.80	38.94	49.87	SB
SPG,15.6C,none	1.010	0.953	1.042	PD
FLOWV,kbbl/d	96.44	34.88	61.56	PD

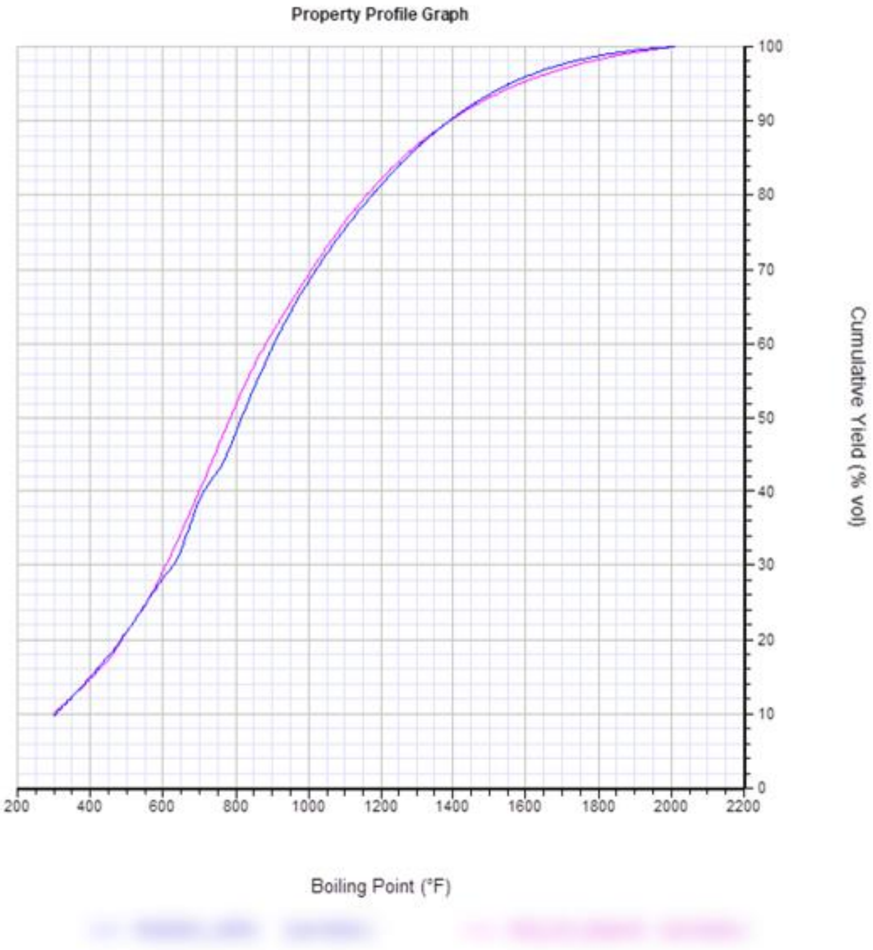
Feeds	Feed rate	Feed rate UoM	Assay Reference	Blend Ratio	Basis V/V	DEN,15C,g/c IBP,FBP,C55,FBP,C	PEN,25
CRD2	185	kbbl/d	ARA277BP-B	31.5	V	0.88844244	23.0001
			NPOES202	0		0.93226883	0.24051
			ORNTE244	0		0.90717354	0.08537
CRD_FD1	178.74345	kbbl/d	XXX_CU1_01O	0	V	0.91668927	2.34457
			XXX_CU1_02Oct2	0		0.91697975	2.11221
			XXX_CU1_03Oct22	0		0.91777477	1.57947
			XXX_CU1_04Oct	178.743		0.91883165	1.51796
			XXX_CU1_07Oct	0		0.91527227	2.7021
			XXX_CU1_05Oct	0		0.91891012	1.68241
			XXX_CU1_06Oct	0		0.91777893	2.72354
			XXX_CU1_09Oct	0		0.91227361	4.6723
			XXX_CU1_08Oct	0		0.91457949	3.08473
			XXX_CU1_11Oct2	0		0.9113068	4.70722
			XXX_CU1_10Oct2	0		0.91298915	4.47112
			XXX_CU1_12Oct2	0		0.91079871	4.75618
			XXX_CU1_14Oct2	0		0.91865376	4.0206
			XXX_CU1_13Oct2	0		0.91370034	3.14398
			XXX_CU1_15Oct2	0		0.91855906	4.0744
			XXX_CU1_16Oct2	0		0.92180262	4.37137
			XXX_CU1_17Oct2	0		0.92241398	4.71821
			XXX_CU1_18Oct2	0		0.92260957	4.90866
			XXX_CU1_19Oct2	0		0.92399017	4.9534
			XXX_CU1_21Oct2	0		0.92439694	2.62315
			XXX_CU1_22Oct	0		0.92457851	2.74406
			XXX_CU1_20Oct	0		0.92375923	6.37987
			XXX_CU1_23Oct	0		0.92259402	3.06094
			XXX_CU1_25Oct	0		0.92862698	3.39847
			XXX_CU1_24Oct	0		0.92265799	3.44913
			XXX_CU1_26Oct	0		0.93131236	3.0011
			XXX_CU1_27Oct	0		0.93168485	3.10424
			XXX_CU1_28Oct	0		0.92635356	7.55432
			XXX_CU1_29Oct	0		0.9236618	7.13695
			XXX_CU1_31Oct2	0		0.92142292	6.87318
			XXX_CU1_30Oct	0		0.92253547	7.3362

Assay for each day
Backcast/Lookback

Additional Functionality Worth Mentioning

…and check the mass balance on your crude unit by comparing PD to SB. Check blend back density to feed density





Summary

- Create complex distillation models with unlimited oil injection, distillation and splitting
- On the fly column calibration with plant data to create ECP, Stripper and Rectifying Indexes
- Optimization using Solver with Asphalt properties and flow rate as the objective function
- Other use cases include:
    - Recut any stream to the Assay database
    - Use of the SwingCut Calculator on any pair of streams for LP linearization
    - Full database functions including Blend Analysis, Blending, and Measured Values and Assay Workup w Flowsheet
    - Calculate Overheads from each section for PROII initialization

OIL & GAS

Chevron

Challenge

- How to model and simulate complex crude oil routings thru multiple columns and splitters and get the optimal product mix for asphalt feed.

Solution

- Aveva's new SDK tools allow for unlimited complexity in stream topology whilst maintaining the integrity of Spiral Assay and its fractionation technology.

Benefits

- Using legacy tools would've meant at least 5 weeks to set up the fractionation paths and hand blending formulae in Excel. This Asphalt model was built in half a day with another 2 days spend collecting data for column calibration with plant data.
- 5 weeks vs 3 days

AVEVA