



Exploring the Fuel Properties effect on the T11

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July 28, 2020

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Overview of Dataset and Analysis Approach

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Overview of Dataset and Analysis Approach

Data Available for Analysis

- ▶ Selected Chartable T11 test results will available C of A data for chartable tests (n = 59)
- ▶ Operational variables analyzed:
 - *Average Power (APWR)*
 - *Average Front Exhaust Manifold Temp (APTRUFT)*
 - *Average Rear Exhaust Manifold Temp (APTRURT)*
 - *Average Tailpipe Temp (ATAILPT)*
 - *Average Exhaust CO2 (AECO2)*
- ▶ Pass/Fail variables analyzed:
 - *Soot(@12cSt)*
 - *Soot4*
 - *Soot5*
- ▶ Analysis Methods:
 - Mixed (forward/backward) stepwise regression analysis with $p \leq 0.10$
 - Partial Least Squares (PLS) with VIP pruning

Overview of Data and Analysis Approach

Independent variable data included in the analysis are listed below

- ▶ Lab and reference oil data coded with indicator variables {0,1}
- ▶ Operational variable analysis will include reference oil variables
- ▶ Pass/Fail Parameters analyzed results {Soot4, Soot(@12cSt), Soot5}

Ref Oils
RO_820-2
RO_820-3
RO_822-1
RO_822-2

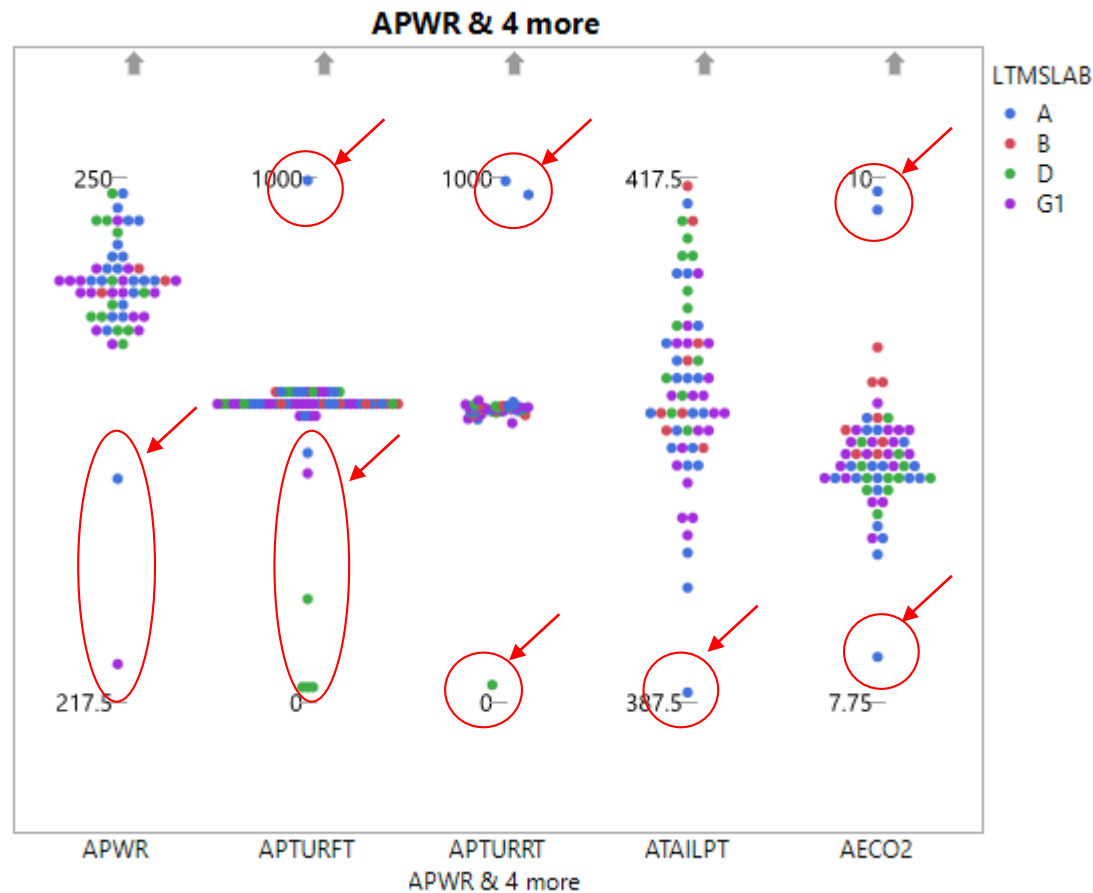
Lab Variables
Lab_A
Lab_B
Lab_D
Lab_F
Lab_G
Lab_G1

Fuel C of A Variables	
Fuel_Age	T60_PERCENT
AcidNUM	T70_PERCENT
POLYN_AROM	T80_PERCENT
SFC_AROM	T90_PERCENT
Bot_Sed_Water	T95_PERCENT
CARBON	EBP
HYDROGEN	LOSS
NET_HEAT_COMB_MJ-KG	RESIDUE
CETANE_INDEX	FLASH_Pt_PenskyMartens
CETANE_NUM	Oxid_STAB
IBP	PartMatter
T5_PERCENT	PourPoint
T10_PERCENT	SG
T20_PERCENT	API_Grav
T30_PERCENT	SULFUR_D5453
T40_PERCENT	KV40C
T50_PERCENT	

Overview of Data and Analysis Approach

Operational Data Review

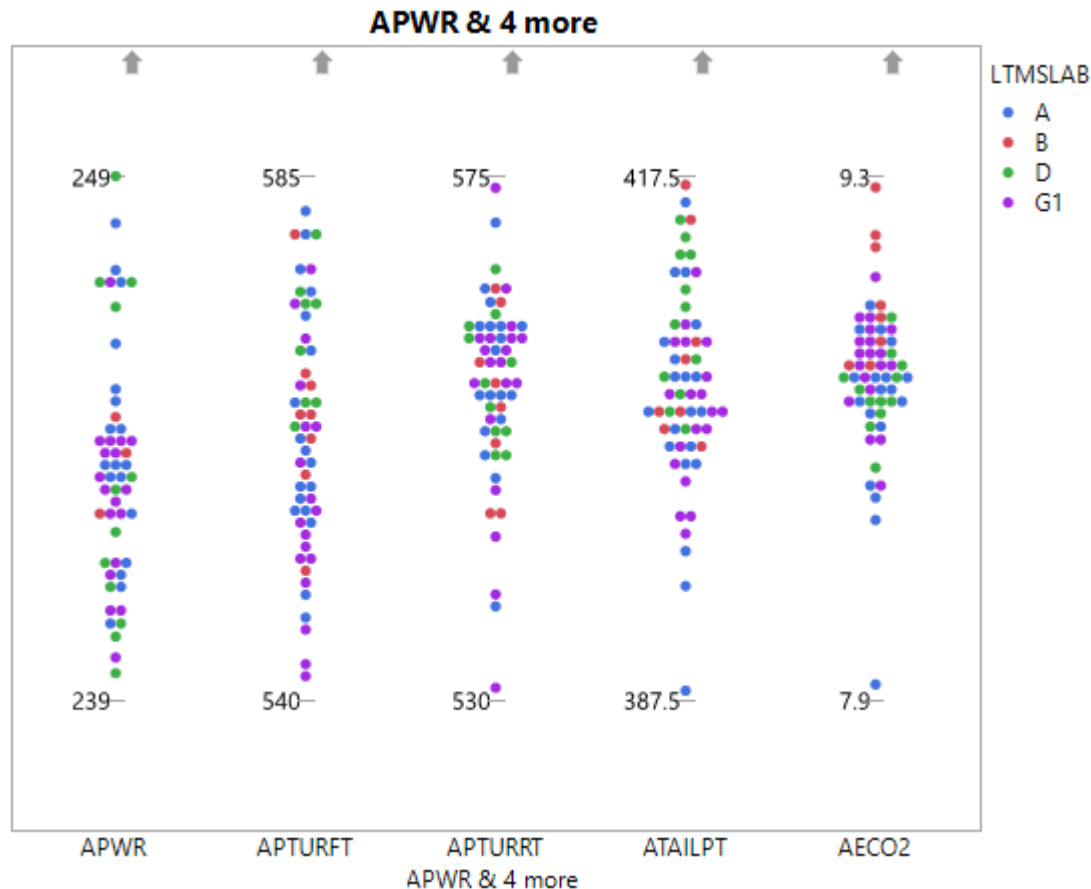
- ▲ A number of observations are suspected outliers and were removed from the data set



Overview of Data and Analysis Approach

Operational Data Review

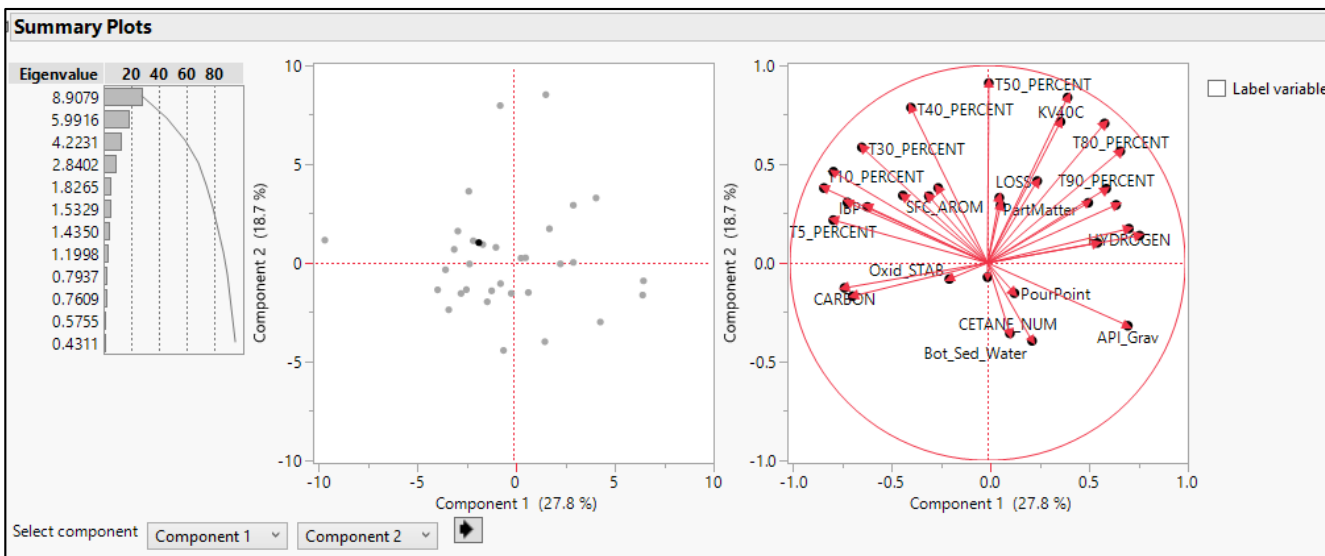
- Operational data with suspected outliers removed



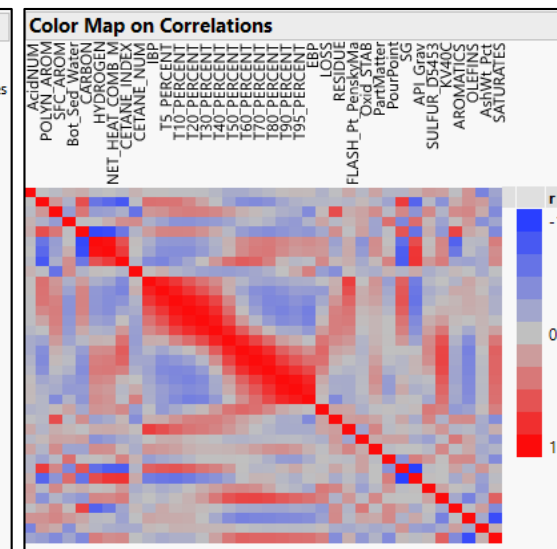
Overview of Data and Analysis Approach

Need to be cautious when interpreting analysis results - due to Multicollinearity

- Principal Component Analysis (PCA) and color map indicates collinear relationships between the fuel property variables
 - PCA indicates that 80% of the variation is explained in 7 Factors
 - Red/Blue colors in Correlation Map indicate high (r) correlations



PCA Summary



Correlation Map



Analysis of Operational Variable Data & Fuel Properties

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Analysis of Average Power Data

Predictive Modeling results:

- ▶ Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests some fuel parameters are statistically significant
 - Hydrogen, Cetane Num, T5_Percent, and Sulfur_D5453
- ▶ Partial Least Squares identifies similar results (*VIP pruning = 0.8*)

Stepwise Regression

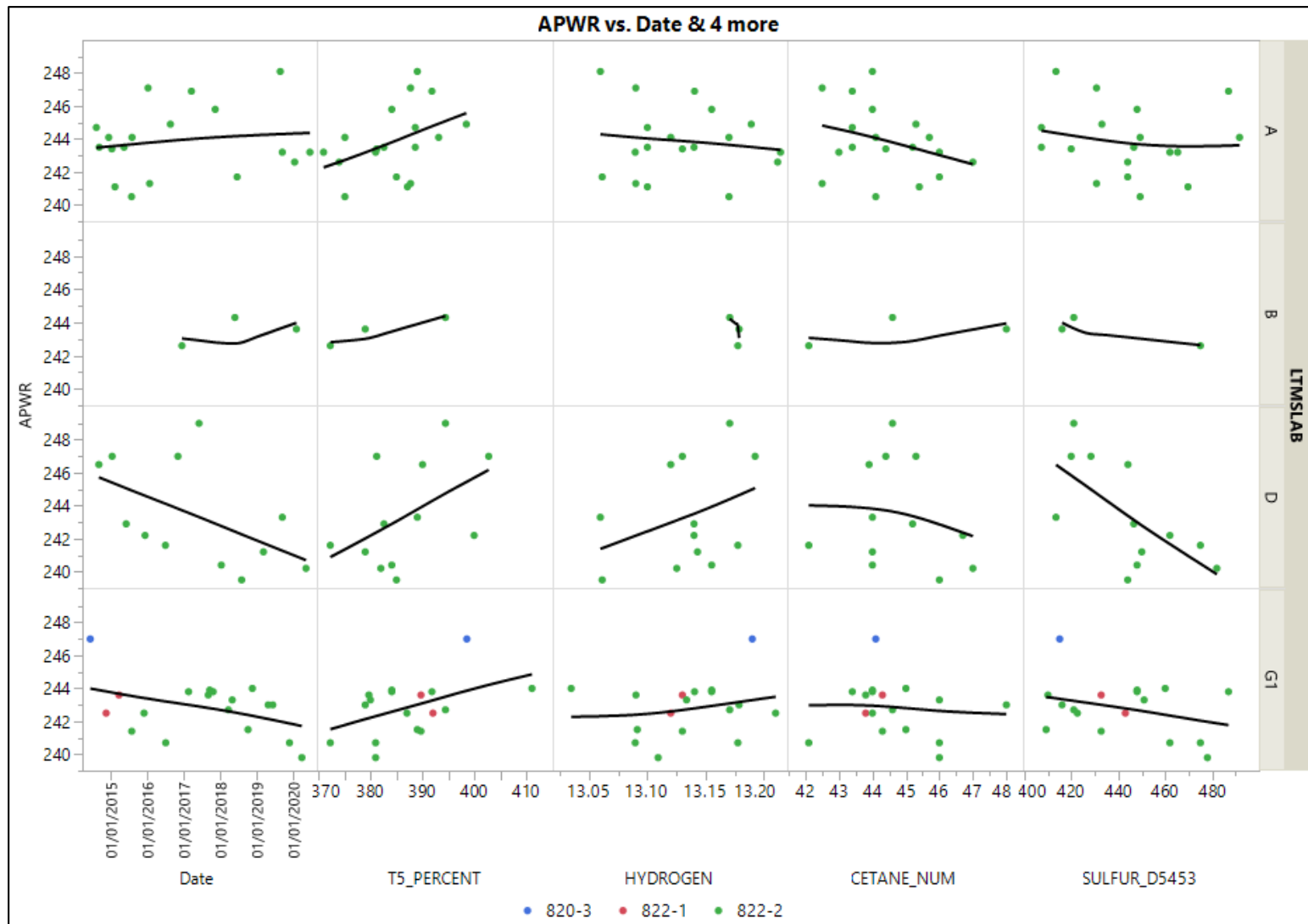
Response APWR				
Whole Model				
Actual by Predicted Plot				
Effect Summary				
Lack Of Fit				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.379693		
RSquare Adj		0.31077		
Root Mean Square Error		1.836109		
Mean of Response		243.3686		
Observations (or Sum Wgts)		51		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	92.86148	18.5723	5.5089
Error	45	151.70832	3.3713	Prob > F
C. Total	50	244.56980		0.0005*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	64.912392	86.06144	0.75	0.4546
Lab_G1	-1.104303	0.543374	-2.03	0.0480*
HYDROGEN	12.063054	6.177711	1.95	0.0571
CETANE_NUM	-0.313653	0.178004	-1.76	0.0849
T5_PERCENT	0.1196384	0.033075	3.62	0.0007*
SULFUR_D5453	-0.026569	0.011146	-2.38	0.0214*

Partial Least Squares

Model Coefficients for Centered and Scaled Data	
Coefficient	APWR
T5_PERCENT	0.0837
IBP	0.0800
T10_PERCENT	0.0754
T20_PERCENT	0.0522
FLASH_Pt_PenskyMartens	0.0498
RO_820-3	0.0487
Oxid_STAB	0.0436
T30_PERCENT	0.0414
SG	0.0358
Lab_A	0.0353
T40_PERCENT	0.0327
Intercept	0.0000
CETANE_INDEX	-0.0277
Bot_Sed_Water	-0.0295
API_Grav	-0.0366
CETANE_NUM	-0.0373
Lab_G1	-0.0383
PourPoint	-0.0489
SULFUR_D5453	-0.0677

Analysis of Average Power Data

 Plot of identified model related factors is shown below:



Analysis of Front Exhaust Manifold Temp Data

Predictive Modeling results:

- ▶ Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests some fuel parameters are statistically significant
 - Bot_Sed_Water, SpecificGravity
- ▶ Partial Least Squares identifies similar results (*VIP pruning = 0.8*)

Stepwise Regression

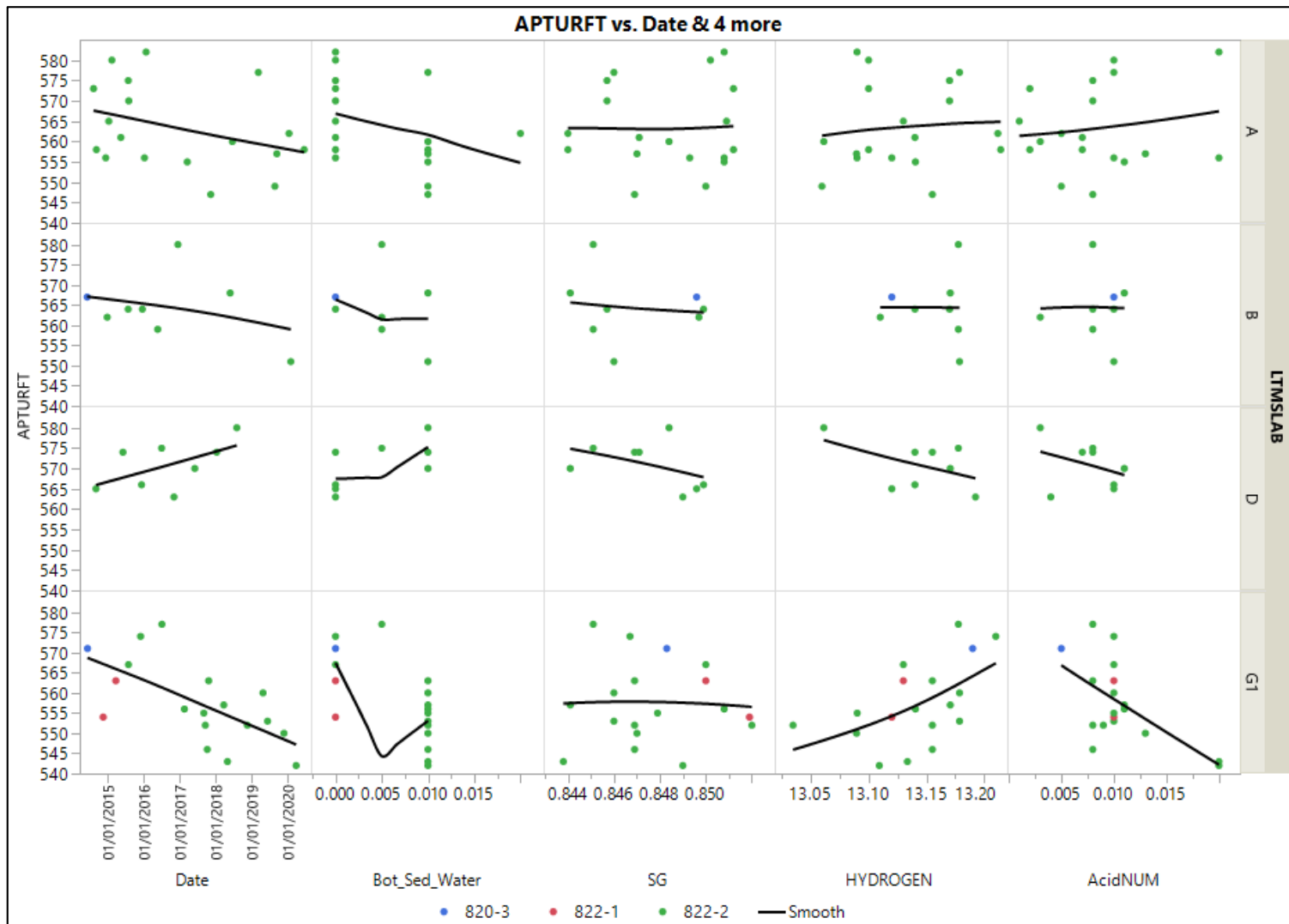
Response APTURFT				
Whole Model				
Actual by Predicted Plot				
Effect Summary				
Lack Of Fit				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.322115		
RSquare Adj		0.279747		
Root Mean Square Error		8.698603		
Mean of Response		562.6538		
Observations (or Sum Wgts)		52		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	3	1725.8162	575.272	7.6028
Error	48	3631.9530	75.666	Prob > F
C. Total	51	5357.7692		0.0003*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	1564.2924	482.7974	3.24	0.0022*
Lab_D	8.03019	3.374794	2.38	0.0214*
Bot_Sed_Water	-1004.526	266.3899	-3.77	0.0004*
SG	-1176.446	568.6267	-2.07	0.0440*

Partial Least Squares

Model Coefficients for Centered and Scaled Data		
Coefficient	APTURFT	
Lab_D	0.1446	
HYDROGEN	0.0771	
KV40C	0.0767	
NET_HEAT_COMB_MJ-KG	0.0709	
RO_820-3	0.0523	
CETANE_INDEX	0.0512	
Intercept	0.0000	
PourPoint	-0.0557	
Oxid_STAB	-0.0779	
POLYN_AROM	-0.0833	
CETANE_NUM	-0.0898	
CARBON	-0.0948	
AcidNUM	-0.1020	
Lab_G1	-0.1547	
Bot_Sed_Water	-0.1706	

Analysis of Front Exhaust Manifold Temp Data

Plot of identified model related factors is shown below:



Analysis of Rear Exhaust Manifold Temp Data

Predictive Modeling results:

- ▶ Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests one fuel parameter is statistically significant
 - Loss
- ▶ Partial Least Squares identifies similar results (*VIP pruning = 0.8*)

Stepwise Regression

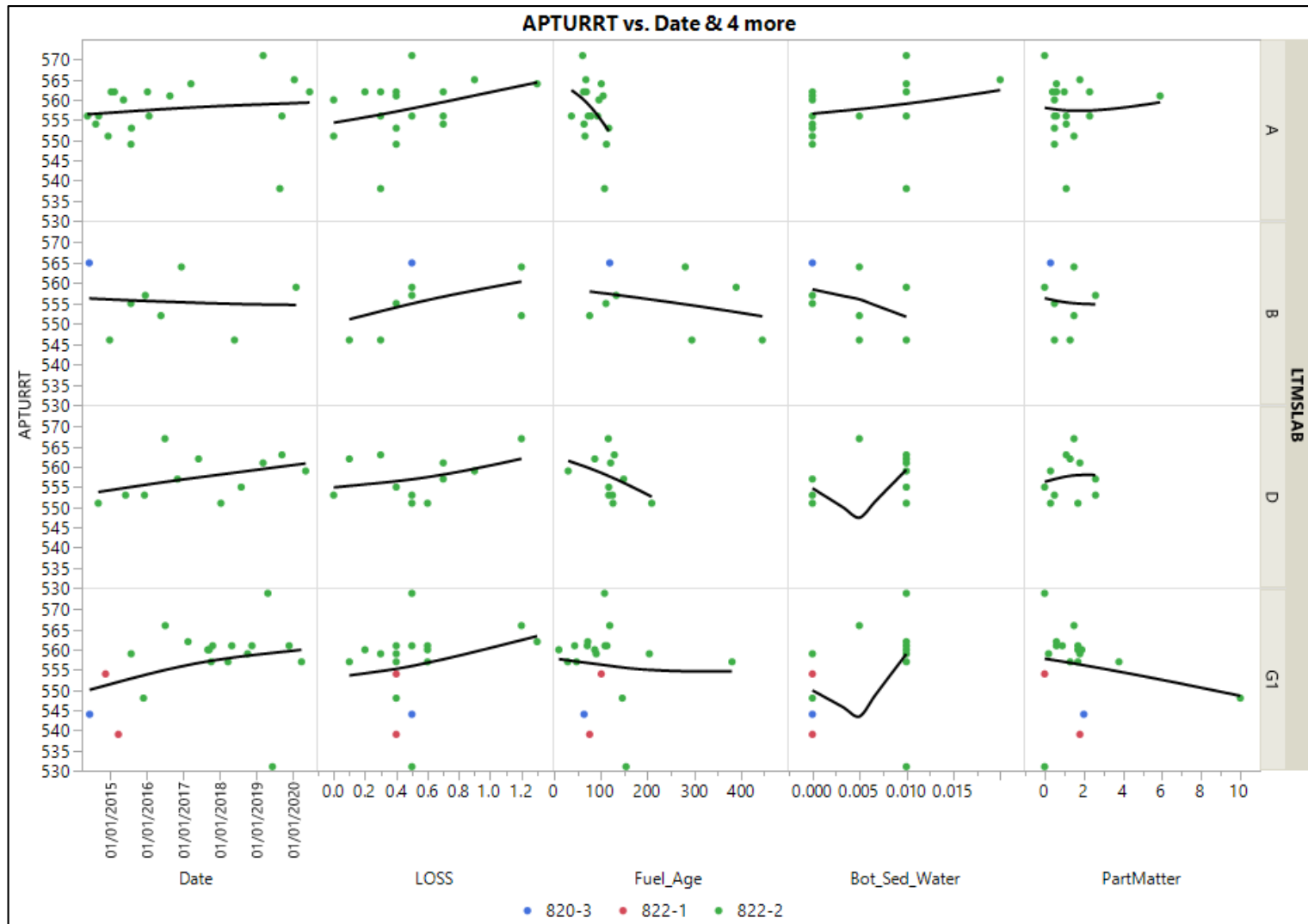
Response APTURRT				
Whole Model				
Actual by Predicted Plot				
Effect Summary				
Lack Of Fit				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.143476		
RSquare Adj		0.111155		
Root Mean Square Error		7.351449		
Mean of Response		556.875		
Observations (or Sum Wgts)		56		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	479.8033	239.902	4.4390
Error	53	2864.3217	54.044	Prob > F
C. Total	55	3344.1250		0.0165*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	553.74386	1.898451	291.68	<.0001*
RO_822-1	-9.95574	5.306479	-1.88	0.0661
LOSS	6.7796948	3.111704	2.18	0.0338*

Partial Least Squares

Model Coefficients for Centered and Scaled Data		
Coefficient	APTURRT	
LOSS	0.1424	
Bot_Sed_Water	0.1414	
FLASH_Pt_PenskyMartens	0.1150	
RO_822-2	0.1068	
AcidNUM	0.1034	
KV40C	0.0768	
SULFUR_D5453	0.0245	
T60_PERCENT	0.0090	
SG	0.0027	
T70_PERCENT	0.0021	
T80_PERCENT	0.0007	
Intercept	0.0000	
API_Grav	-0.0038	
CETANE_INDEX	-0.0085	
T20_PERCENT	-0.0153	
T10_PERCENT	-0.0265	
T5_PERCENT	-0.0496	
Oxid_STAB	-0.0808	
PartMatter	-0.1473	
RO_822-1	-0.1535	
Fuel_Age	-0.1891	

Analysis of Rear Exhaust Manifold Temp Data

 Plot of identified model related factors is shown below:



Analysis of Average Tailpipe Temperature

Predictive Modeling results:

- ▶ Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests one fuel parameter is statistically significant
 - KV40C
- ▶ Partial Least Squares identifies similar results (*VIP pruning = 0.8*)

Stepwise Regression

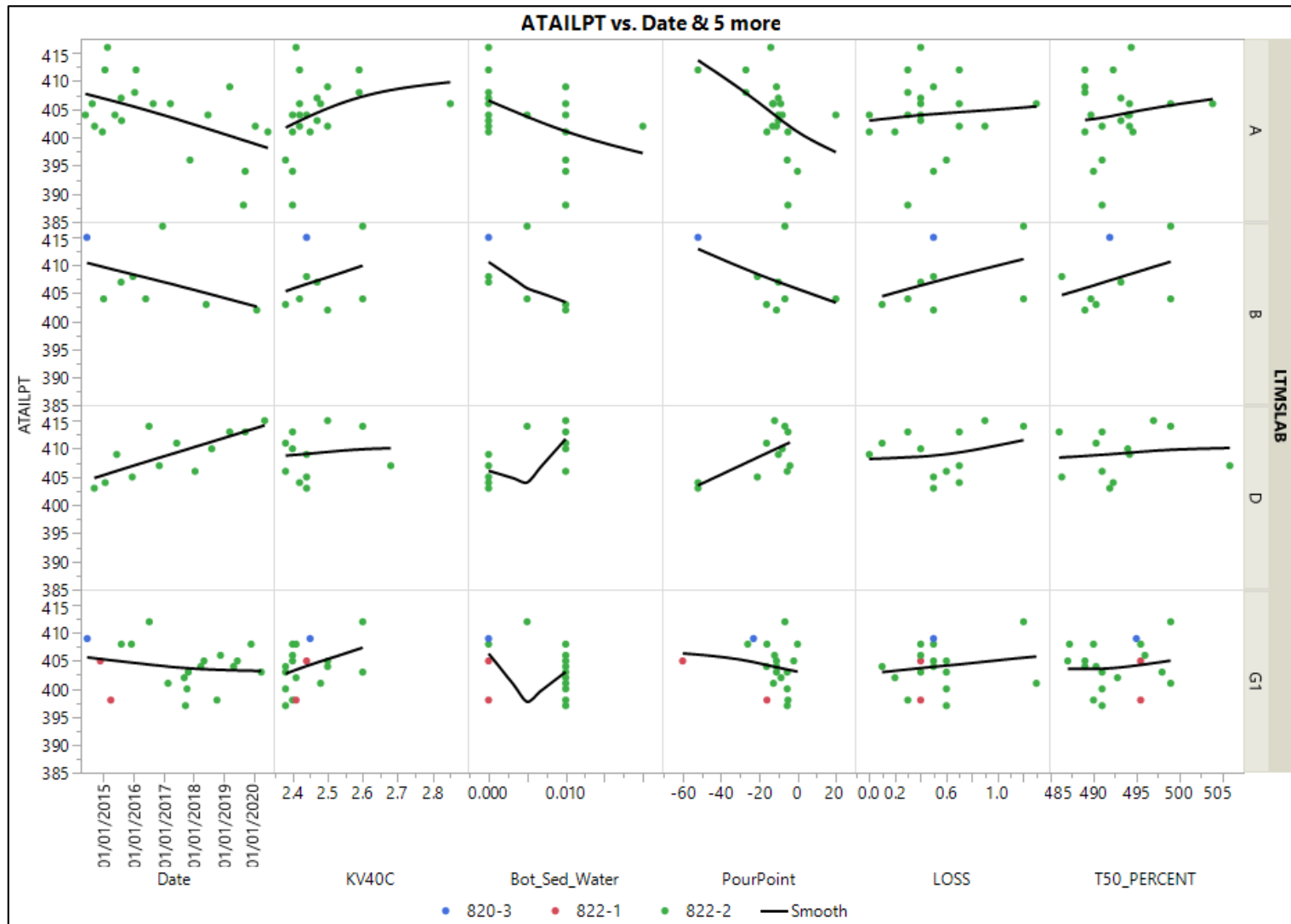
Response ATAILPT				
Whole Model				
Actual by Predicted Plot				
Effect Summary				
Lack Of Fit				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.256515		
RSquare Adj		0.215961		
Root Mean Square Error		4.884087		
Mean of Response		405.5424		
Observations (or Sum Wgts)		59		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	3	452.6574	150.886	6.3253
Error	55	1311.9867	23.854	Prob > F
C. Total	58	1764.6441		0.0009*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	361.15234	17.76237	20.33	<.0001*
RO_820-3	7.9741389	3.531141	2.26	0.0279*
Lab_D	4.9362284	1.586989	3.11	0.0030*
KV40C	17.535183	7.214405	2.43	0.0184*

Partial Least Squares

Model Coefficients for Centered and Scaled Data	
Coefficient	ATAILPT
Lab_D	0.1129
KV40C	0.0912
RO_820-3	0.0746
LOSS	0.0697
T50_PERCENT	0.0546
T60_PERCENT	0.0545
SULFUR_D5453	0.0484
Lab_B	0.0478
T70_PERCENT	0.0475
CETANE_INDEX	0.0462
T80_PERCENT	0.0442
T90_PERCENT	0.0380
Intercept	0.0000
RESIDUE	-0.0411
RO_822-1	-0.0467
POLYN_AROM	-0.0476
Oxid_STAB	-0.0650
Lab_G1	-0.0655
Lab_A	-0.0659
PourPoint	-0.0707
Bot_Sed_Water	-0.0919

Analysis of Average Tailpipe Temperature

Plot of identified model related factors is shown below:



Analysis of Average Exhaust CO2(%)

Predictive Modeling results:

- ▶ Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests some fuel parameters are statistically significant
 - Cetane_Index and Flash_Pt_PenskyMartens

Stepwise Regression

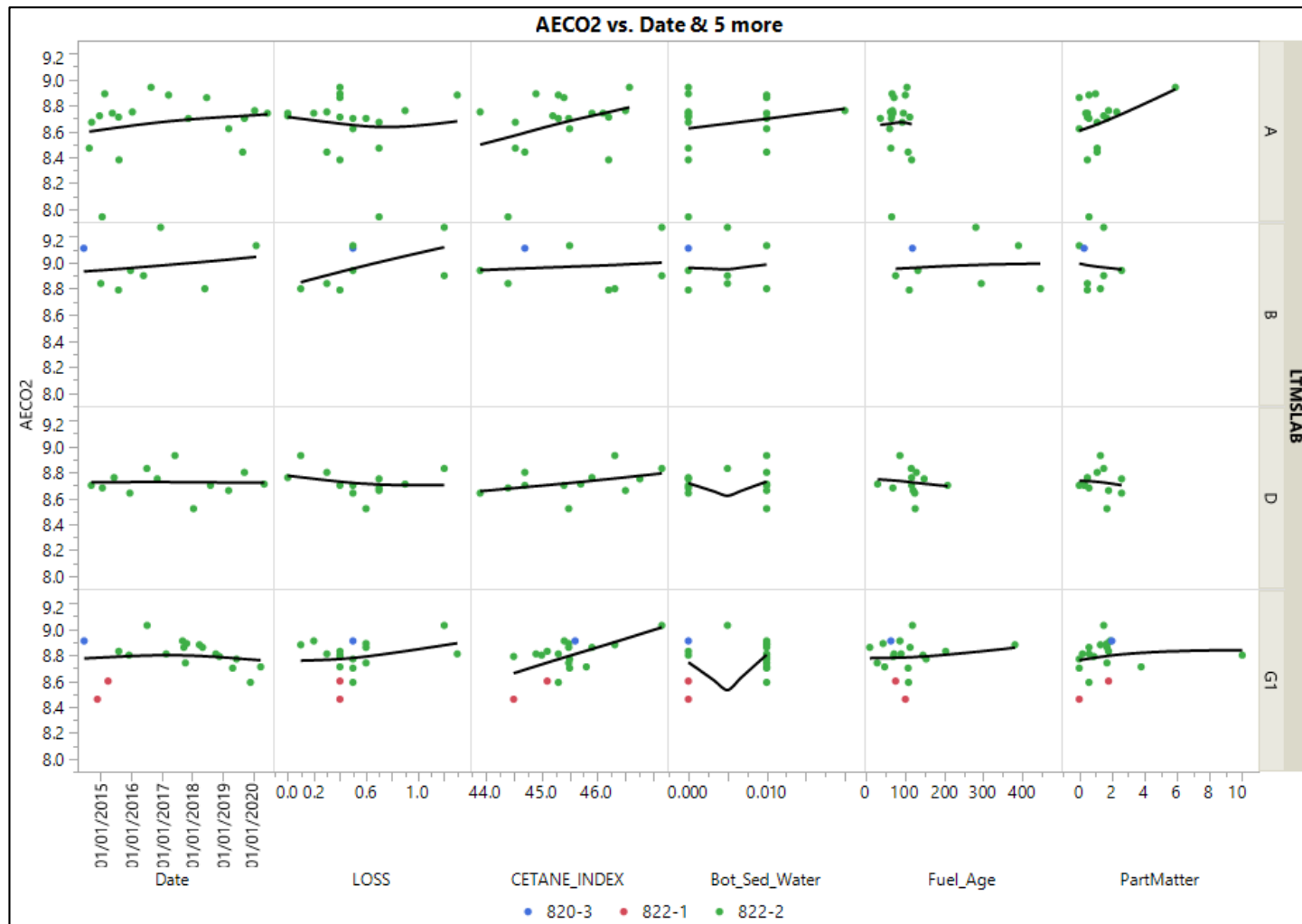
Response AECO2				
Whole Model				
Actual by Predicted Plot				
Effect Summary				
Lack Of Fit				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.418519		
RSquare Adj		0.361511		
Root Mean Square Error		0.157062		
Mean of Response		8.76		
Observations (or Sum Wgts)		57		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	0.9055083	0.181102	7.3414
Error	51	1.2580917	0.024668	Prob > F
C. Total	56	2.1636000		<.0001*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	5.0637115	1.247492	4.06	0.0002*
RO_822-1	-0.204799	0.120816	-1.70	0.0961
Lab_B	0.268237	0.062791	4.27	<.0001*
Lab_G1	0.1170561	0.04804	2.44	0.0184*
CETANE_INDEX	0.0589868	0.025503	2.31	0.0248*
FLASH_Pt_PenskyMartens	0.0065265	0.003756	1.74	0.0883

Partial Least Squares

Model Coefficients for Centered and Scaled Data	
Coefficient	AECO2
Lab_B	0.2571
RO_820-3	0.2260
KV40C	0.1869
AcidNUM	0.1563
PourPoint	0.1320
FLASH_Pt_PenskyMartens	0.1243
Fuel_Age	0.0960
SULFUR_D5453	0.0901
CETANE_INDEX	0.0731
HYDROGEN	0.0081
API_Grav	0.0003
Intercept	0.0000
POLYN_AROM	-0.0038
SG	-0.0059
NET_HEAT_COMB_MJ-KG	-0.0198
CARBON	-0.0403
EBP	-0.0610
T95_PERCENT	-0.0776
RO_822-1	-0.1258
Lab_A	-0.1704

Analysis of Average Exhaust CO2(%)

Plot of identified model related factors is shown below:



Analysis of Soot4

Predictive Modeling results:

- ▶ Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests some fuel parameters are statistically significant
 - AcidNum, SFC_Arom, Carbon, T10_Percent, and Loss

Stepwise Regression

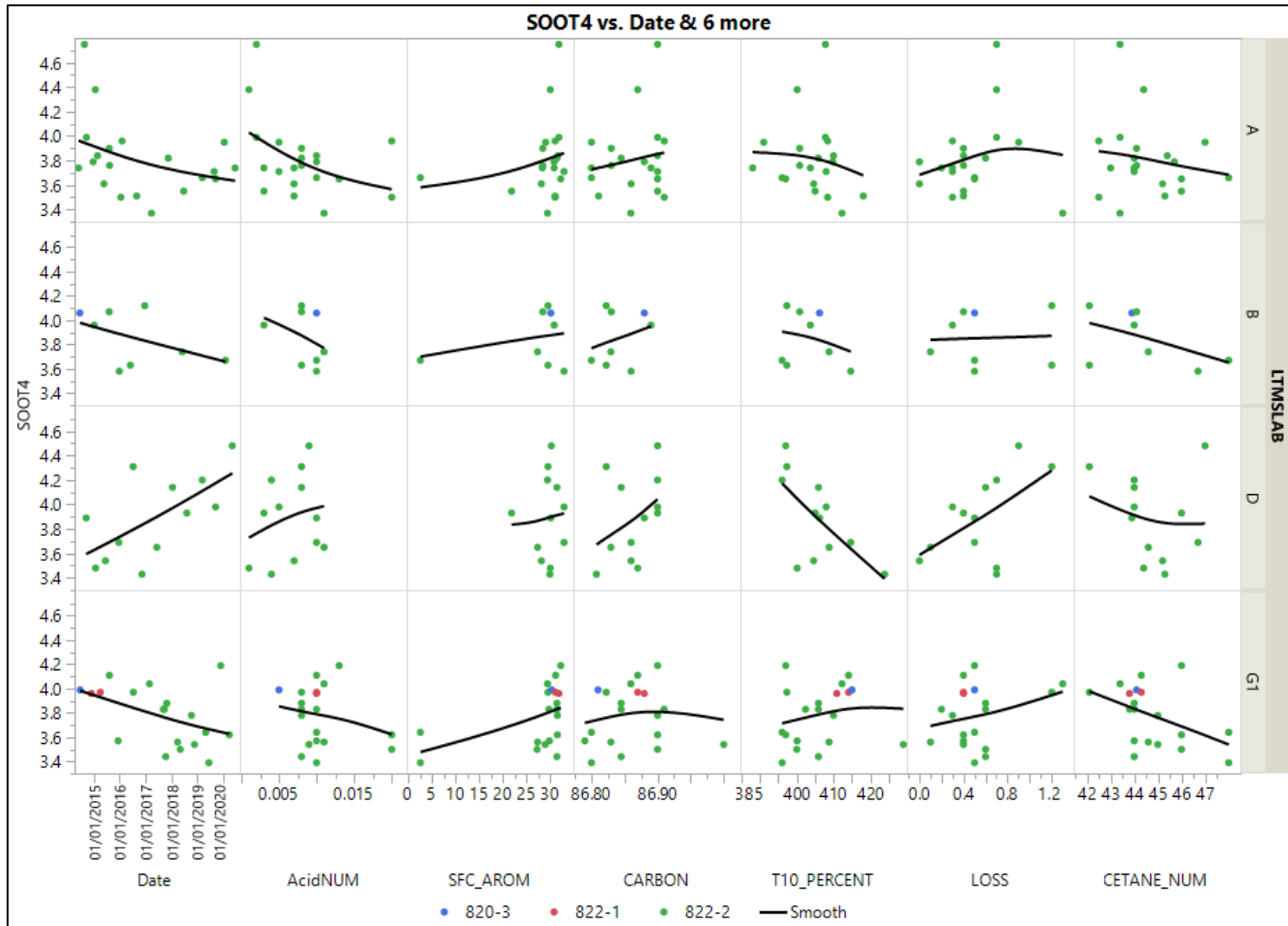
Response SOOT4				
Whole Model				
Actual by Predicted Plot				
Effect Summary				
Lack Of Fit				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.343975		
RSquare Adj		0.26828		
Root Mean Square Error		0.242007		
Mean of Response		3.822712		
Observations (or Sum Wgts)		59		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	6	1.5968589	0.266143	4.5442
Error	52	3.0455072	0.058567	Prob > F
C. Total	58	4.6423661		0.0009*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-148.2231	76.8204	-1.93	0.0591
RO_822-2	-0.272059	0.129744	-2.10	0.0409*
AcidNUM	-17.38483	7.575665	-2.29	0.0258*
SFC_AROM	0.0091064	0.005029	1.81	0.0759
CARBON	1.8132248	0.889526	2.04	0.0466*
T10_PERCENT	-0.013375	0.004717	-2.84	0.0065*
LOSS	0.2144388	0.106339	2.02	0.0489*

Partial Least Squares

Model Coefficients for Centered and Scaled Data	
Coefficient	SOOT4
LOSS	0.1604
SFC_AROM	0.1545
CARBON	0.0974
RO_820-3	0.0868
Lab_D	0.0861
POLYN_AROM	0.0707
T60_PERCENT	0.0422
T70_PERCENT	0.0380
Intercept	0.0000
IBP	-0.0426
HYDROGEN	-0.0575
T20_PERCENT	-0.0631
API_Grav	-0.0678
KV40C	-0.0681
PartMatter	-0.0735
T10_PERCENT	-0.0757
FLASH_Pt_PenskyMartens	-0.0850
T5_PERCENT	-0.0886
RO_822-2	-0.1070
CETANE_NUM	-0.1403
AcidNUM	-0.1485

Analysis of Soot4

Plot of identified model related factors is shown below:



Analysis of Soot(@12cSt)

Predictive Modeling results:

- Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests no fuel parameters are statistically significant

Stepwise Regression

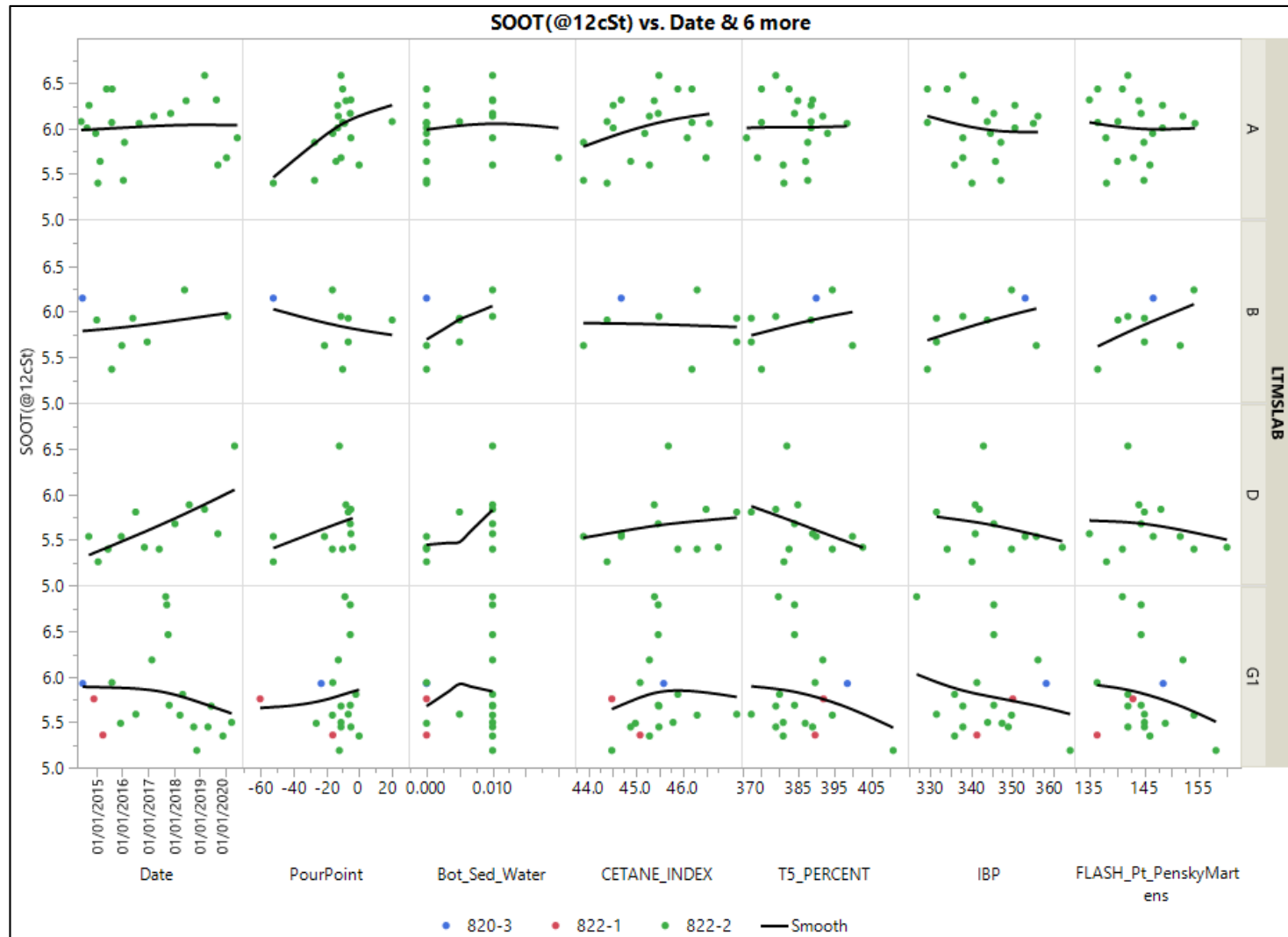
Response SOOT(@12cSt)				
Whole Model				
Regression Plot				
Actual by Predicted Plot				
Effect Summary				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.090594		
RSquare Adj		0.074639		
Root Mean Square Error		0.383538		
Mean of Response		5.850847		
Observations (or Sum Wgts)		59		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	0.8352787	0.835279	5.6783
Error	57	8.3847790	0.147101	Prob > F
C. Total	58	9.2200576		0.0205*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	5.765641	0.061415	93.88	<.0001*
Lab_A	0.251359	0.105484	2.38	0.0205*

Partial Least Squares

Model Coefficients for Centered and Scaled Data	
Coefficient	SOOT(@12cSt)
Lab_A	0.1321
PourPoint	0.0946
Bot_Sed_Water	0.0733
CETANE_INDEX	0.0408
RO_820-3	0.0393
Intercept	0.0000
POLYN_AROM	-0.0365
Fuel_Age	-0.0381
EBP	-0.0383
Lab_G1	-0.0421
T10_PERCENT	-0.0463
T95_PERCENT	-0.0500
AcidNUM	-0.0533
PartMatter	-0.0556
RO_822-1	-0.0605
FLASH_Pt_PenskyMartens	-0.0607
IBP	-0.0637
T5_PERCENT	-0.0653
Lab_D	-0.1085

Analysis of Soot(@12cSt)

Plot of identified model related factors is shown below:



Analysis of Soot5

Predictive Modeling results:

- Stepwise regression with mixed selection ($p \leq 0.10$)
 - Model suggests PourPoint parameter is statistically significant

Stepwise Regression

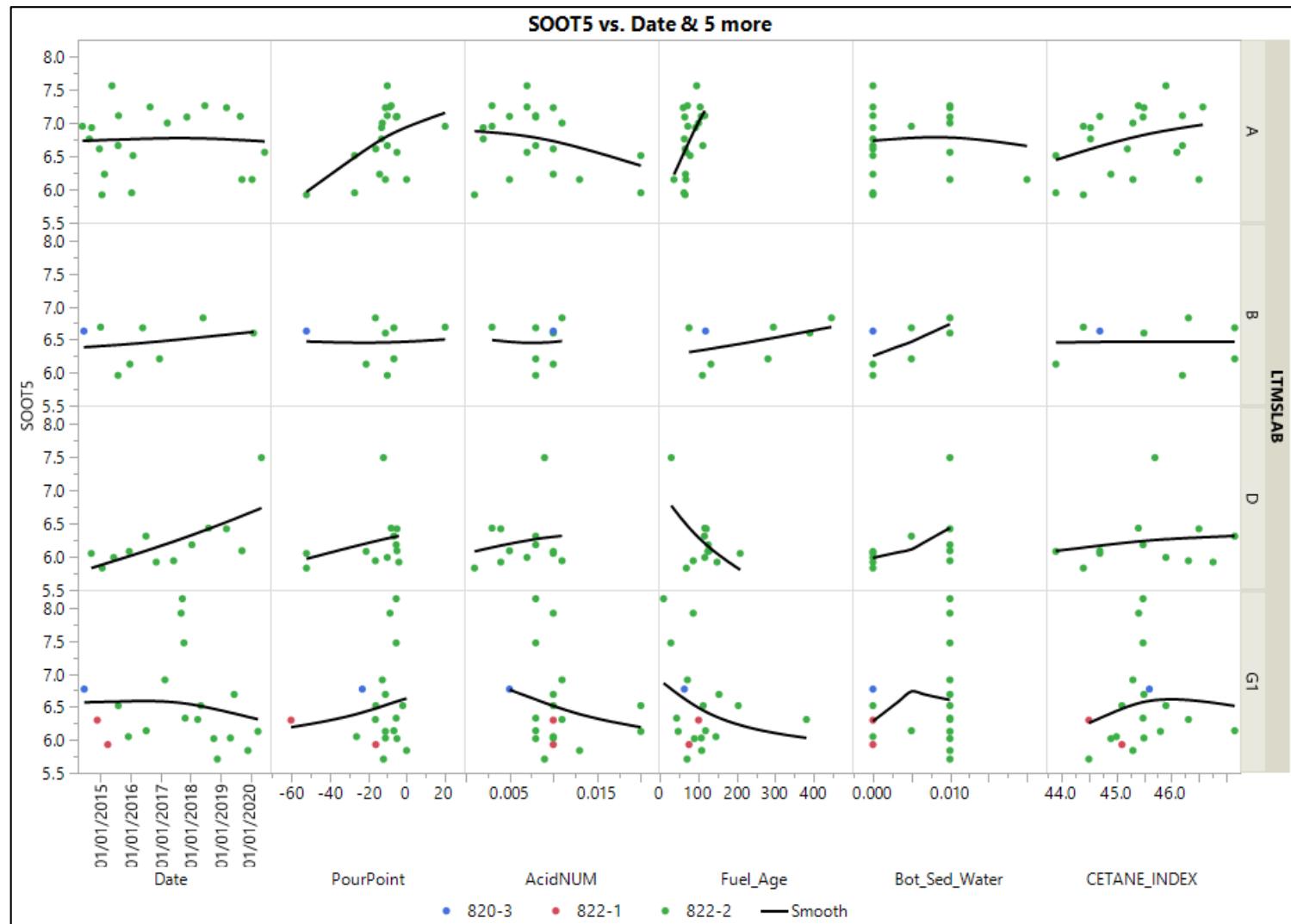
Response SOOT5				
Whole Model				
Actual by Predicted Plot				
Effect Summary				
Lack Of Fit				
Residual by Predicted Plot				
Summary of Fit				
RSquare		0.141125		
RSquare Adj		0.11045		
Root Mean Square Error		0.519637		
Mean of Response		6.528136		
Observations (or Sum Wgts)		59		
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	2.484625	1.24231	4.6008
Error	56	15.121270	0.27002	Prob > F
C. Total	58	17.605895		0.0141*
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	6.5420416	0.105864	61.80	<.0001*
Lab_A	0.3131729	0.143294	2.19	0.0330*
PourPoint	0.0089376	0.004609	1.94	0.0575

Partial Least Squares

Model Coefficients for Centered and Scaled Data		
Coefficient	SOOT5	
Lab_A	0.2036	
PourPoint	0.1326	
Bot_Sed_Water	0.0842	
CETANE_INDEX	0.0367	
Intercept	0.0000	
T5_PERCENT	-0.0043	
IBP	-0.0054	
FLASH_Pt_PenskyMartens	-0.0402	
EBP	-0.0760	
RO_822-1	-0.0799	
T95_PERCENT	-0.0873	
Fuel_Age	-0.0889	
AcidNUM	-0.1011	
Lab_D	-0.2073	

Analysis of Soot5

Plot of identified model related factors is shown below:



Analysis of T11 Fuel Property Data

****Caution** regarding interpreting analysis results:**

- ▲ Due to the multicollinearity relationships between fuel properties, follow-on designed experiments would be necessary to provide additional evidence to confirm conclusions found in this analysis

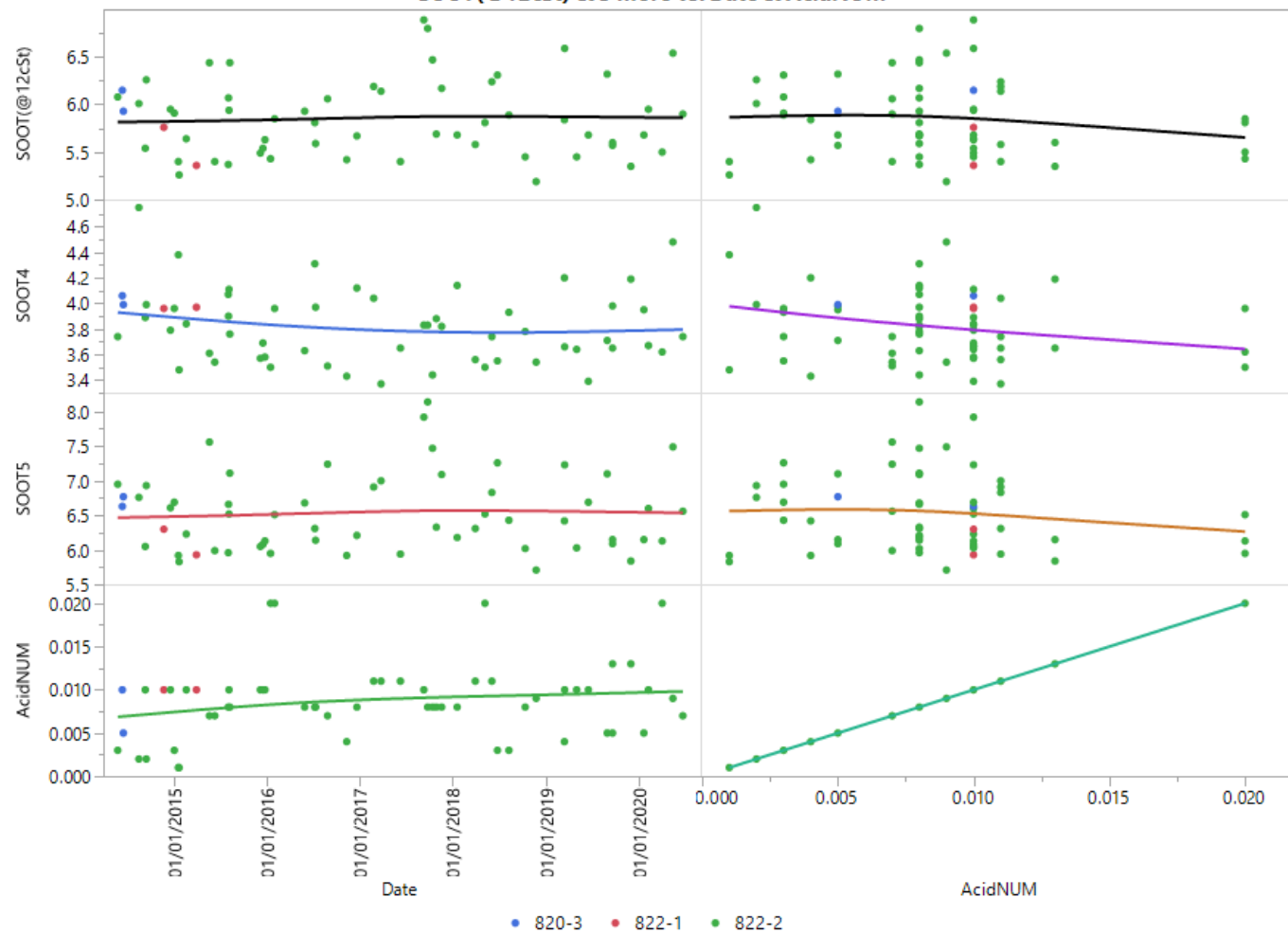


Plots of T11 Fuel Properties vs. Pass/Fail Parameter Data

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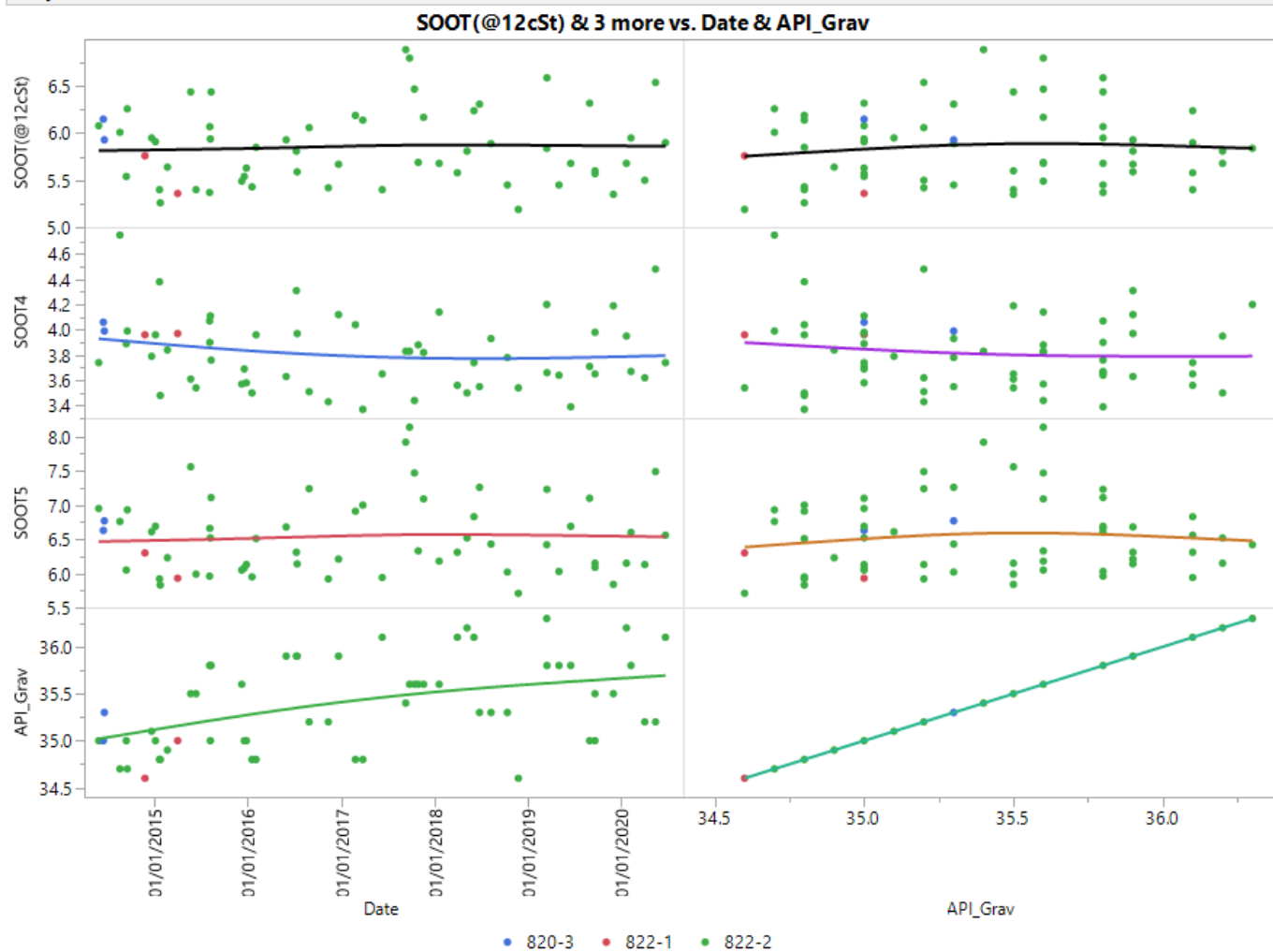
Graph Builder

SOOT(@12cSt) & 3 more vs. Date & AcidNUM



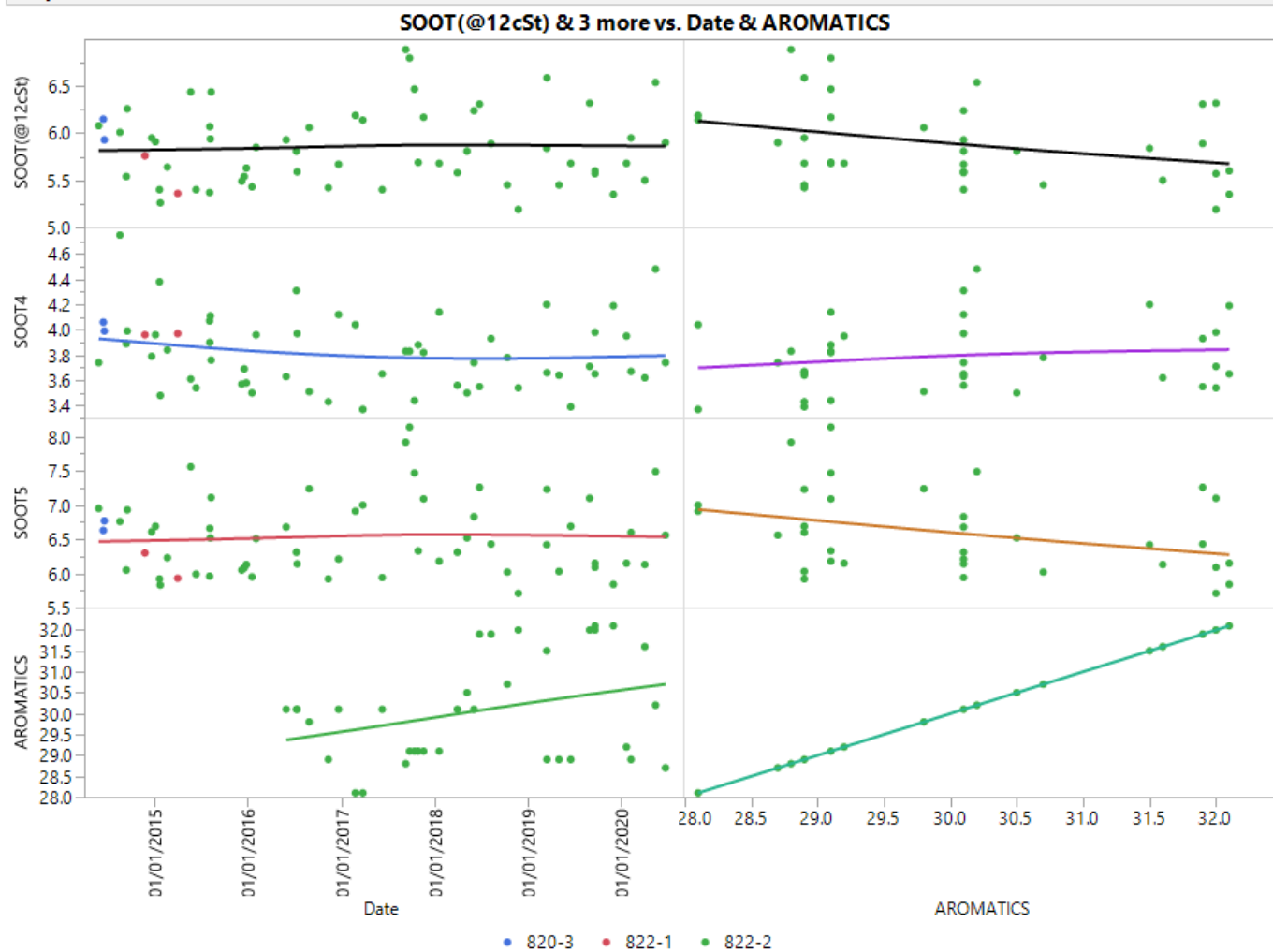
Where(178 rows excluded)

Graph Builder



Where(178 rows excluded)

Graph Builder



Where(178 rows excluded)

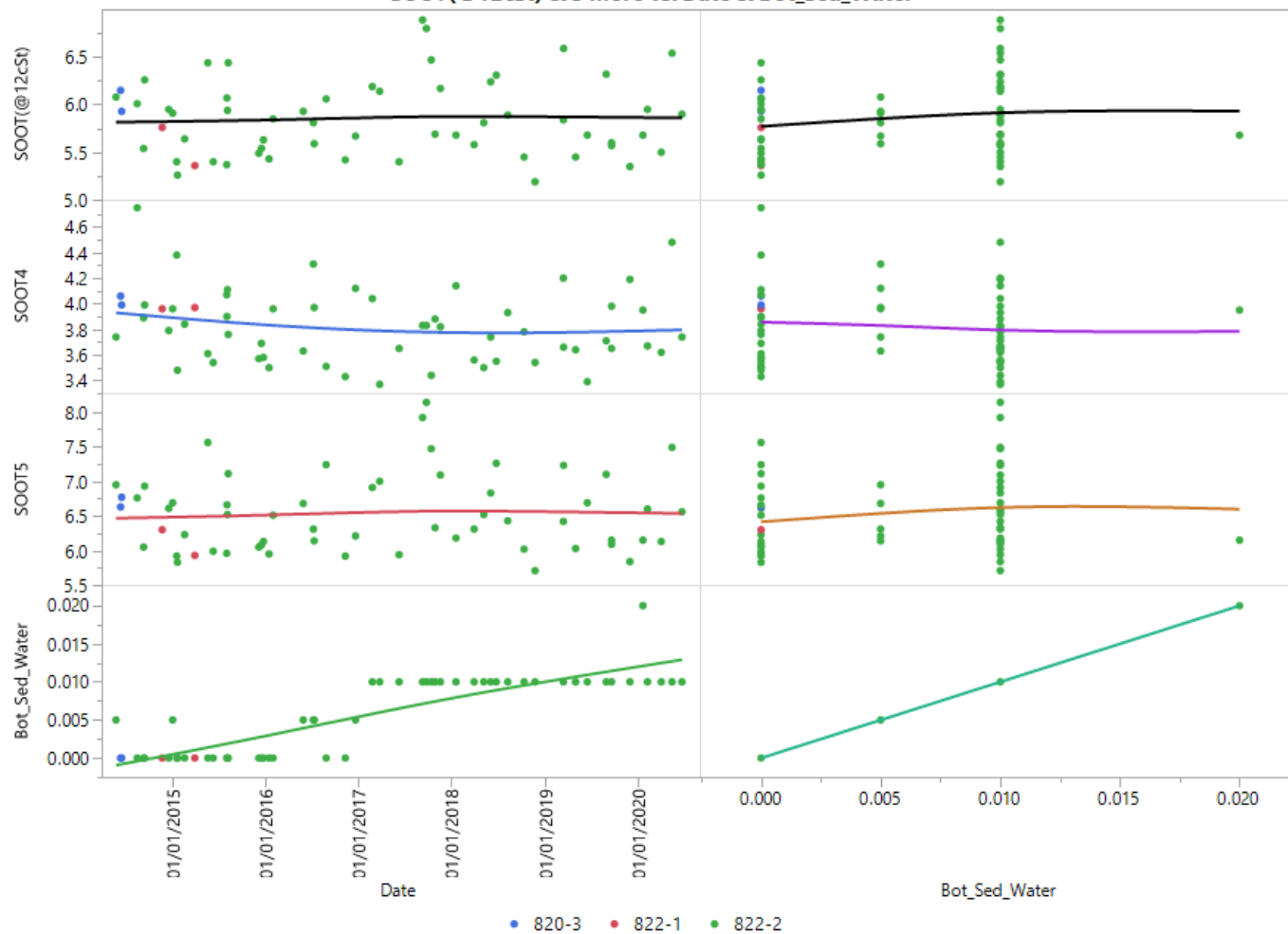
Graph Builder



Where(178 rows excluded)

Graph Builder

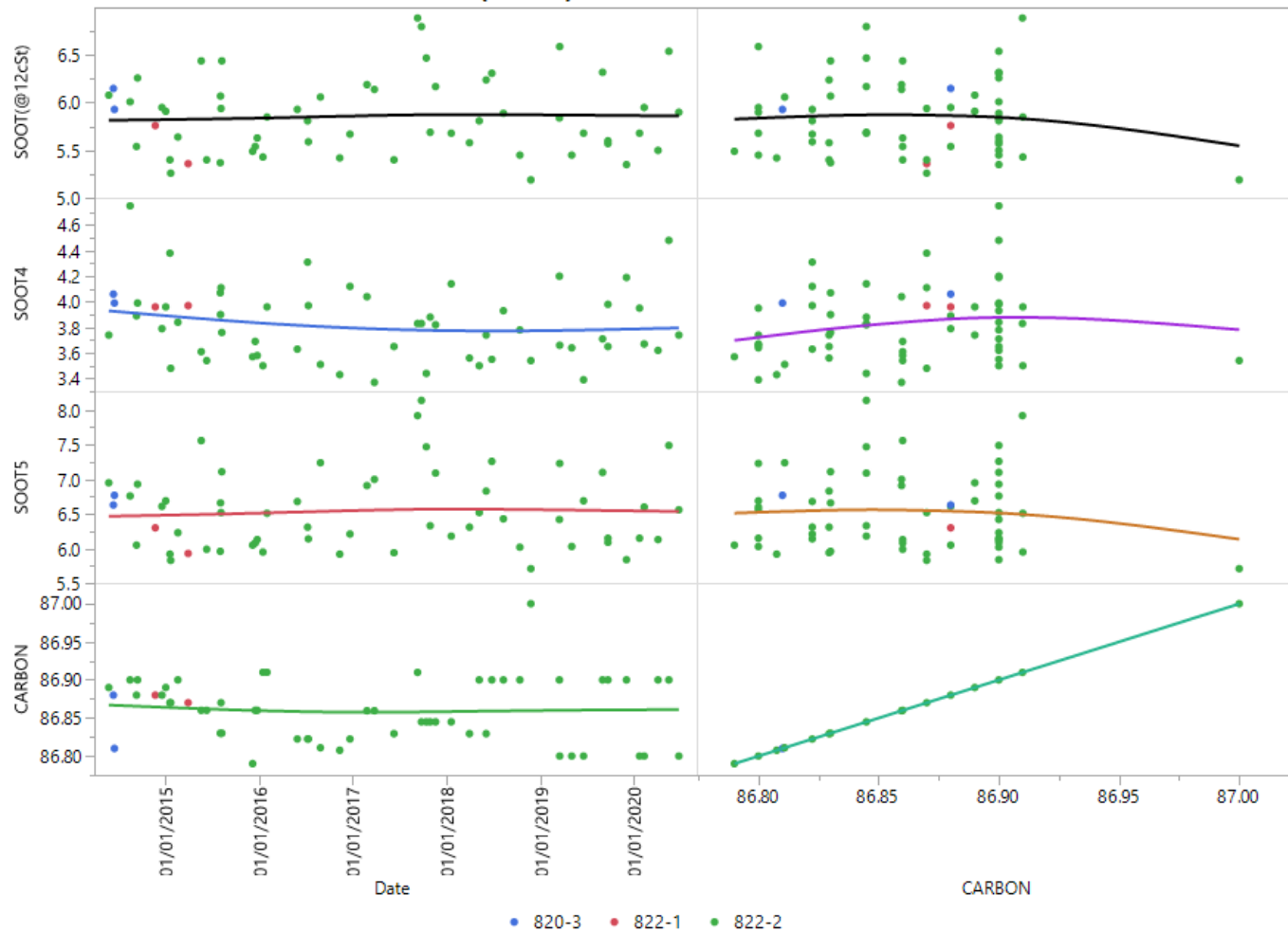
SOOT(@12cSt) & 3 more vs. Date & Bot_Sed_Water



Where(178 rows excluded)

Graph Builder

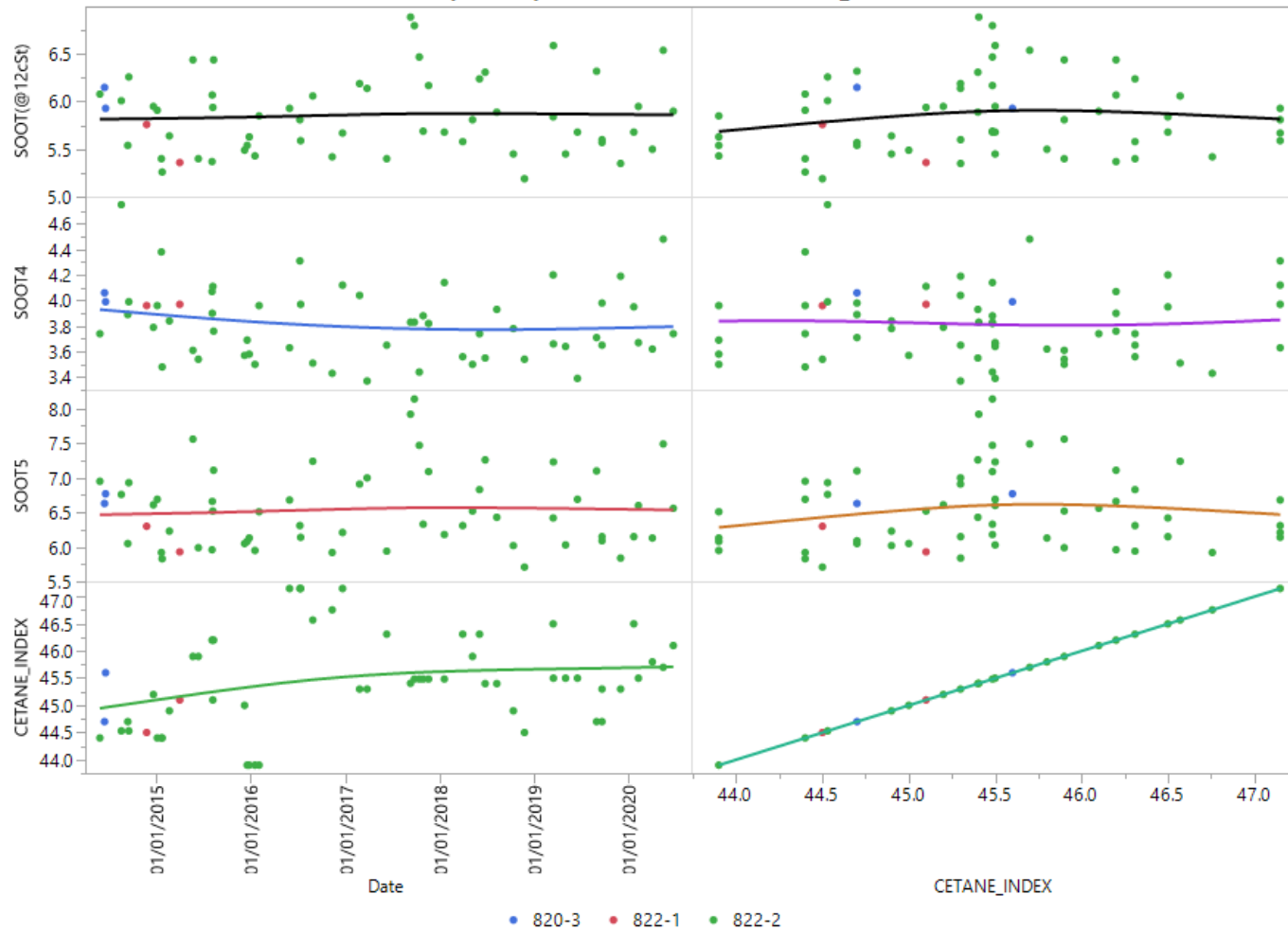
SOOT(@12cSt) & 3 more vs. Date & CARBON



Where(178 rows excluded)

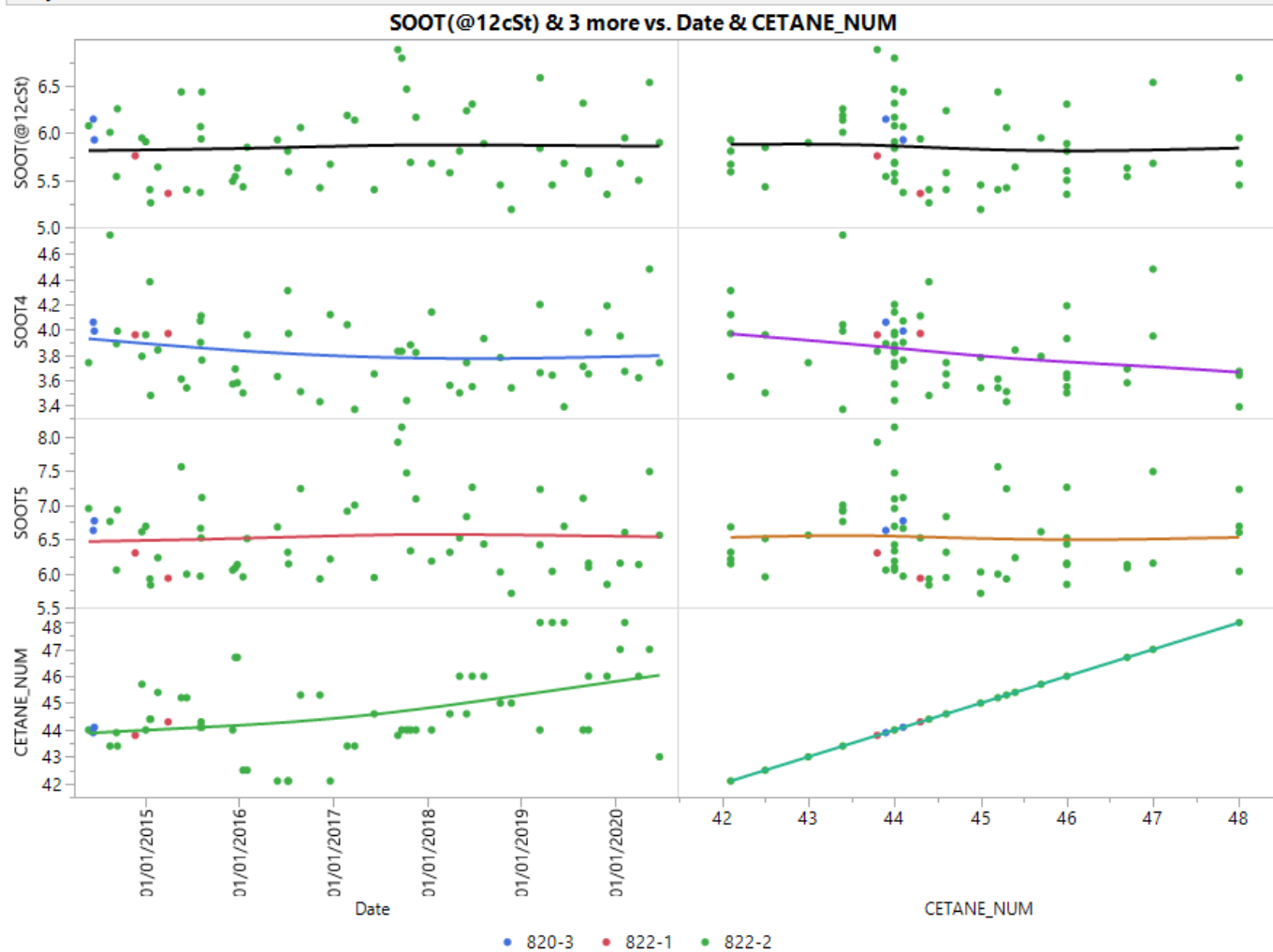
Graph Builder

SOOT(@12cSt) & 3 more vs. Date & CETANE_INDEX



Where(178 rows excluded)

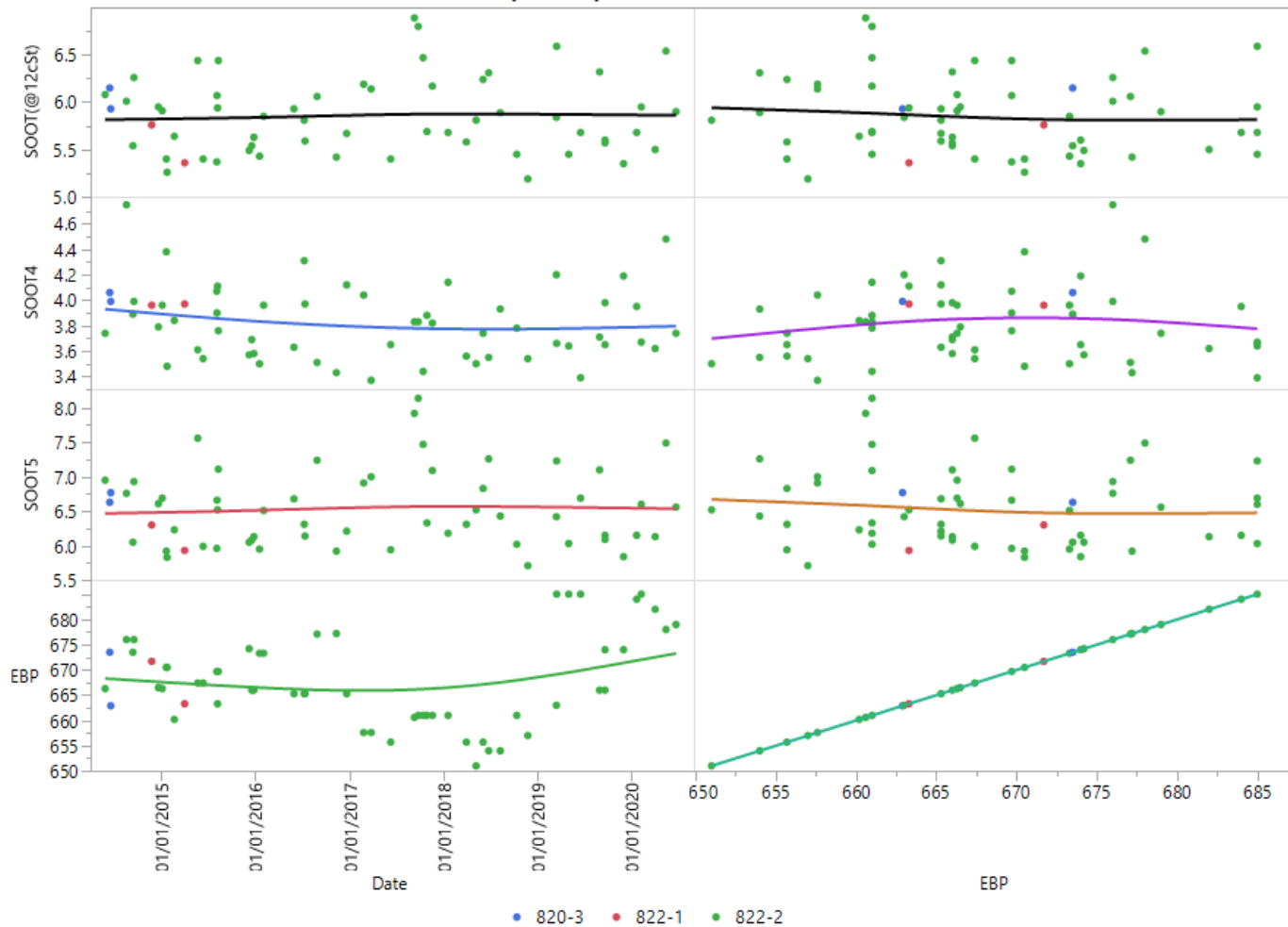
Graph Builder



Where(178 rows excluded)

Graph Builder

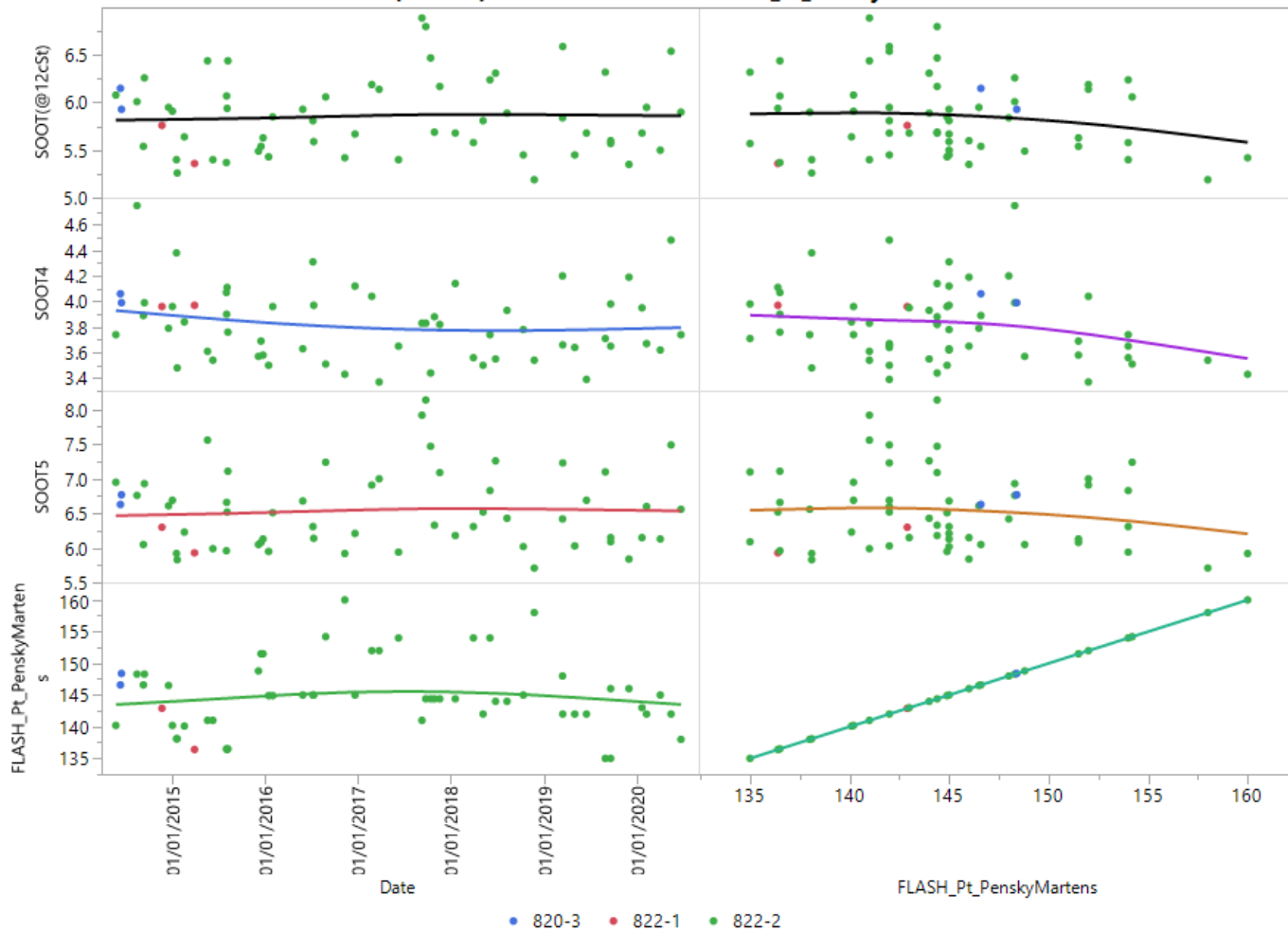
SOOT(@12cSt) & 3 more vs. Date & EBP



Where(178 rows excluded)

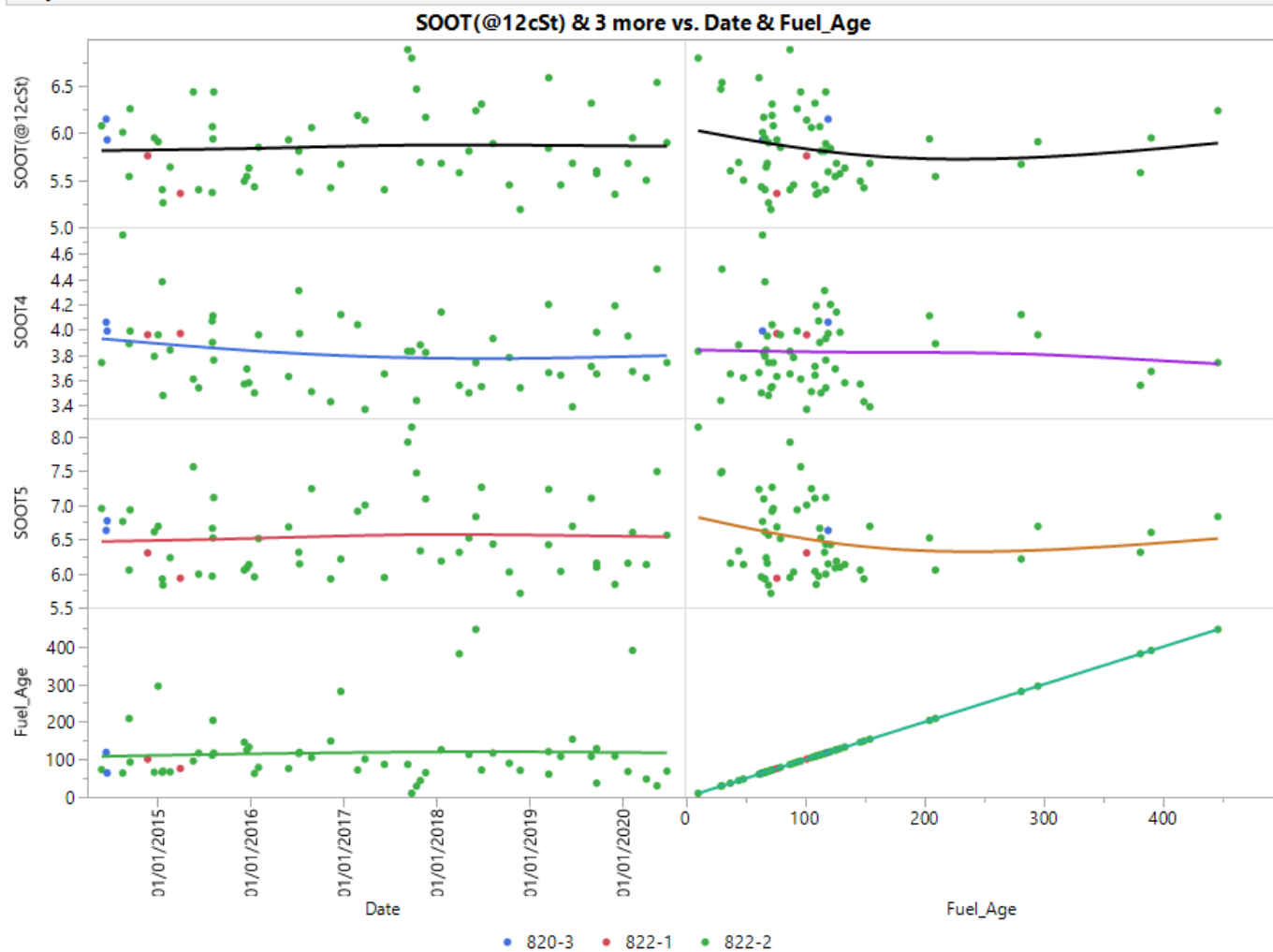
Graph Builder

SOOT(@12cSt) & 3 more vs. Date & FLASH_Pt_PenskyMartens



Where(178 rows excluded)

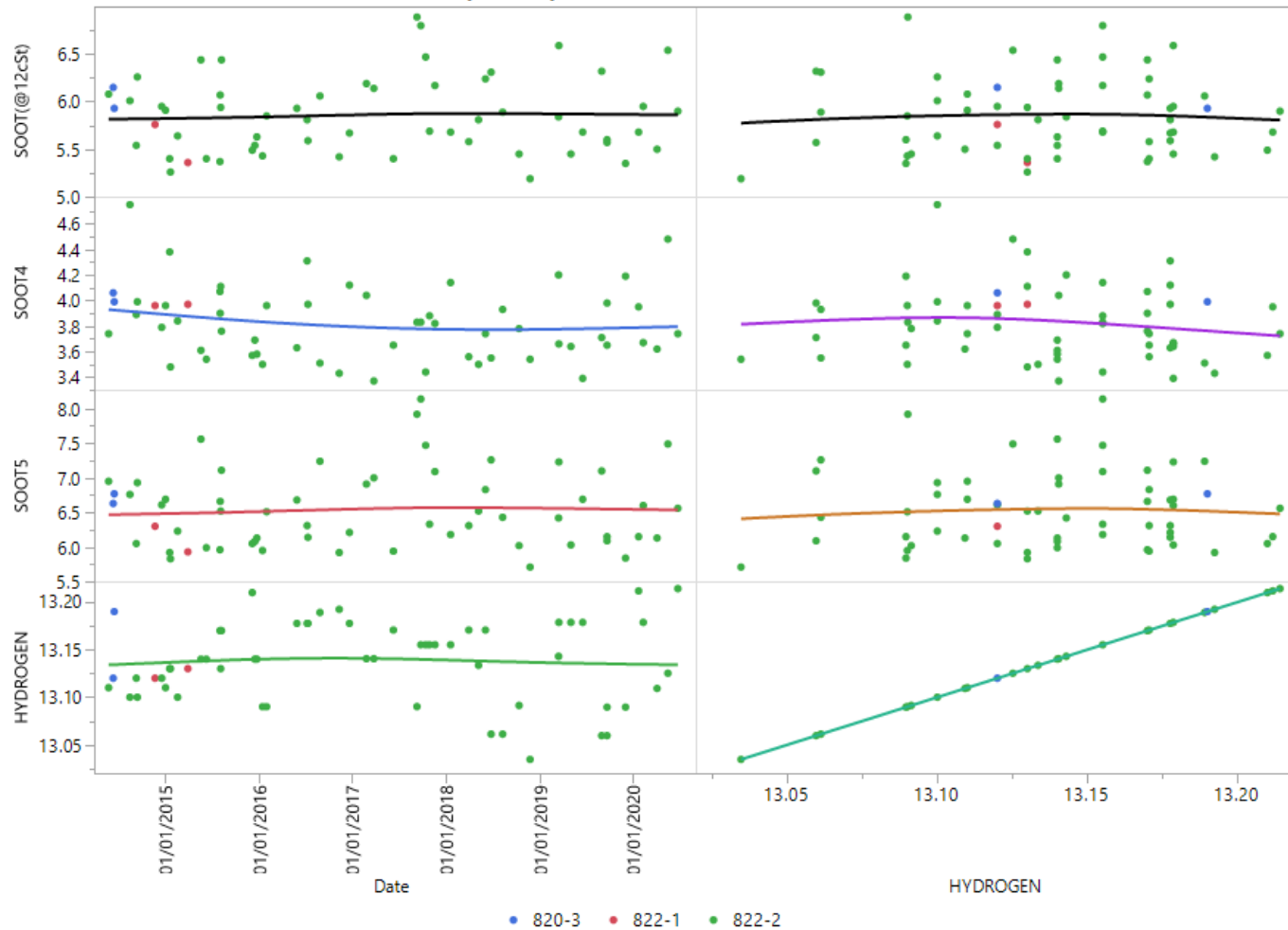
Graph Builder



Where(178 rows excluded)

Graph Builder

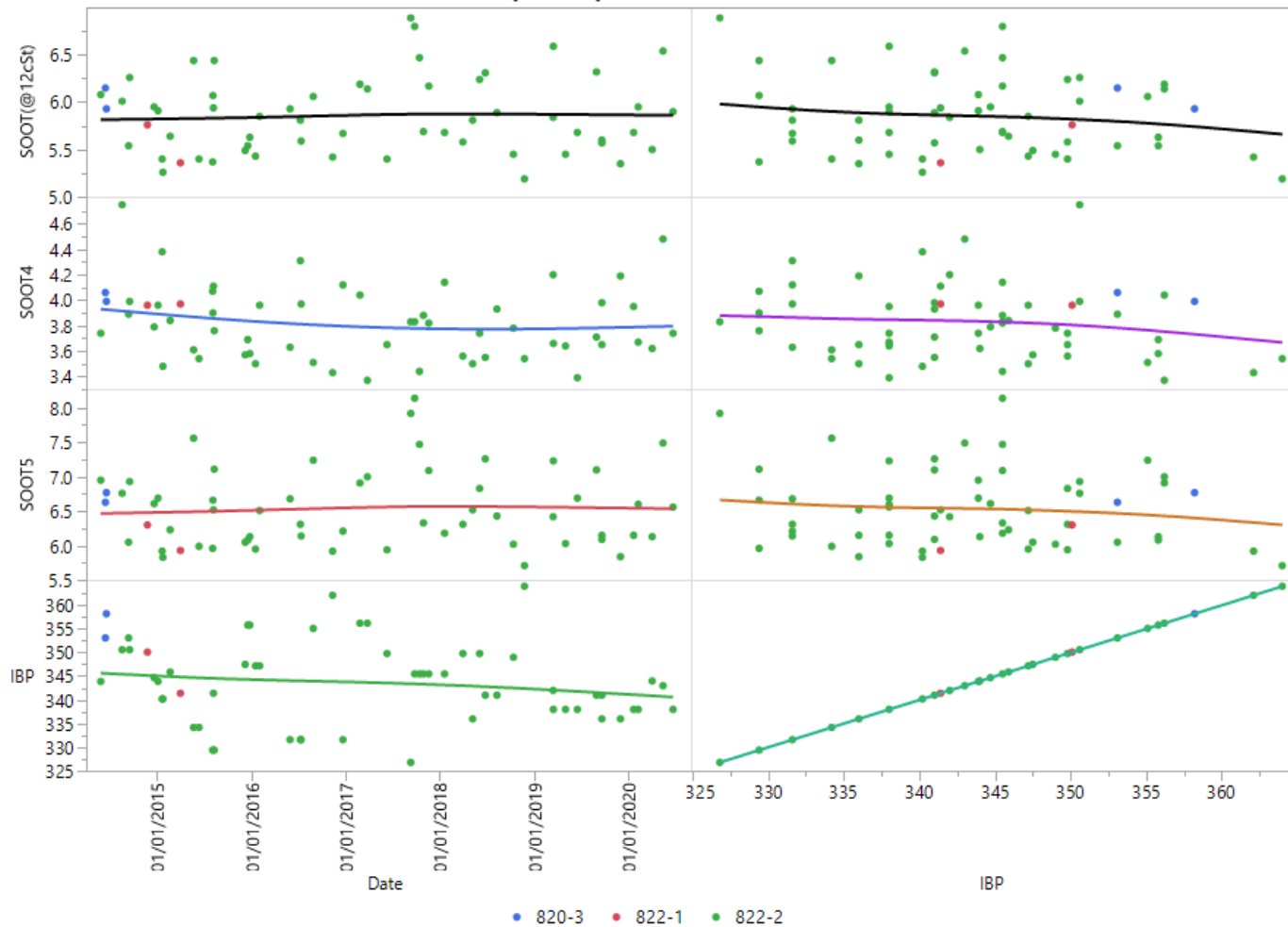
SOOT(@12cSt) & 3 more vs. Date & HYDROGEN



Where(178 rows excluded)

Graph Builder

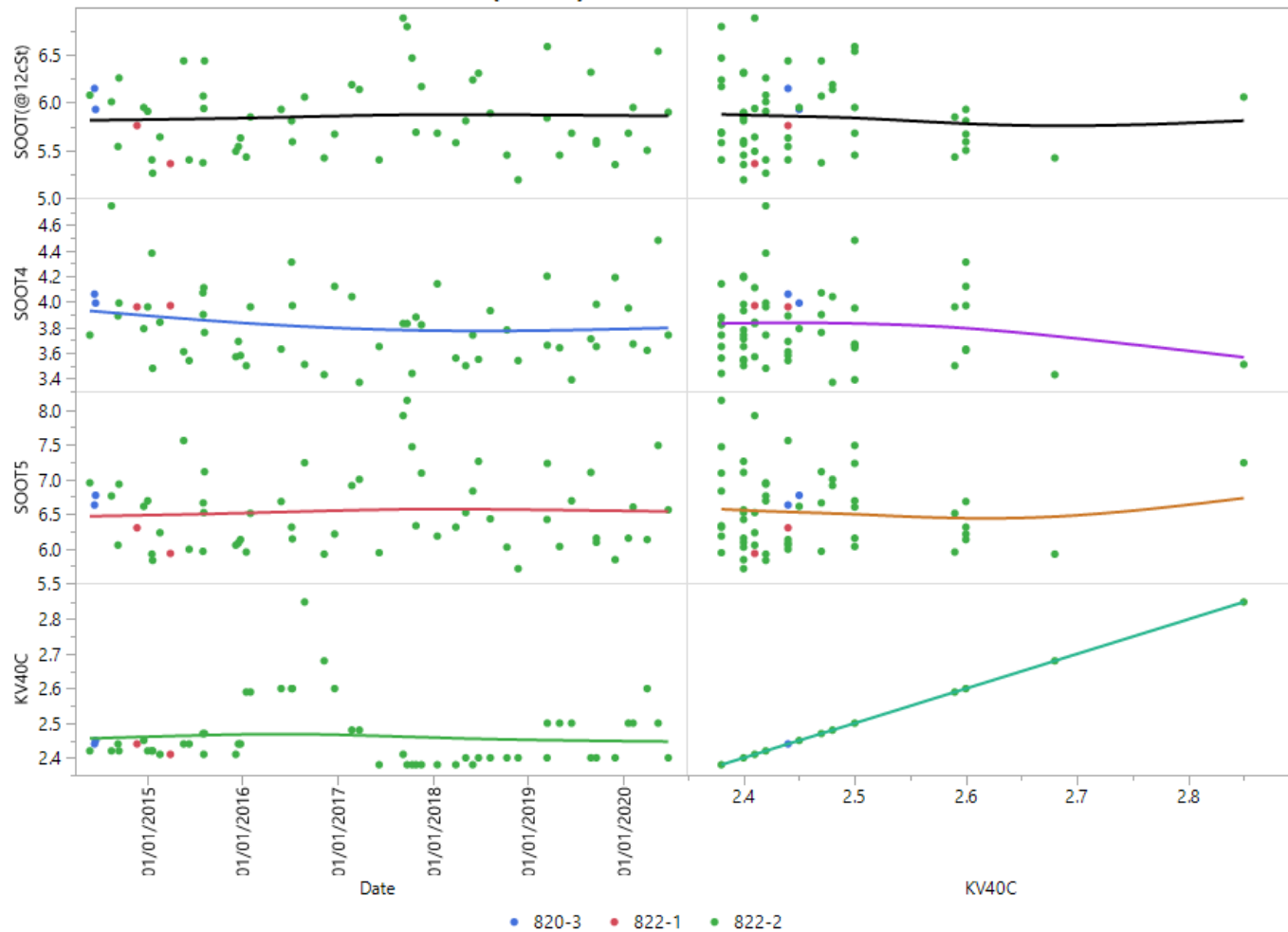
SOOT(@12cSt) & 3 more vs. Date & IBP



Where(178 rows excluded)

Graph Builder

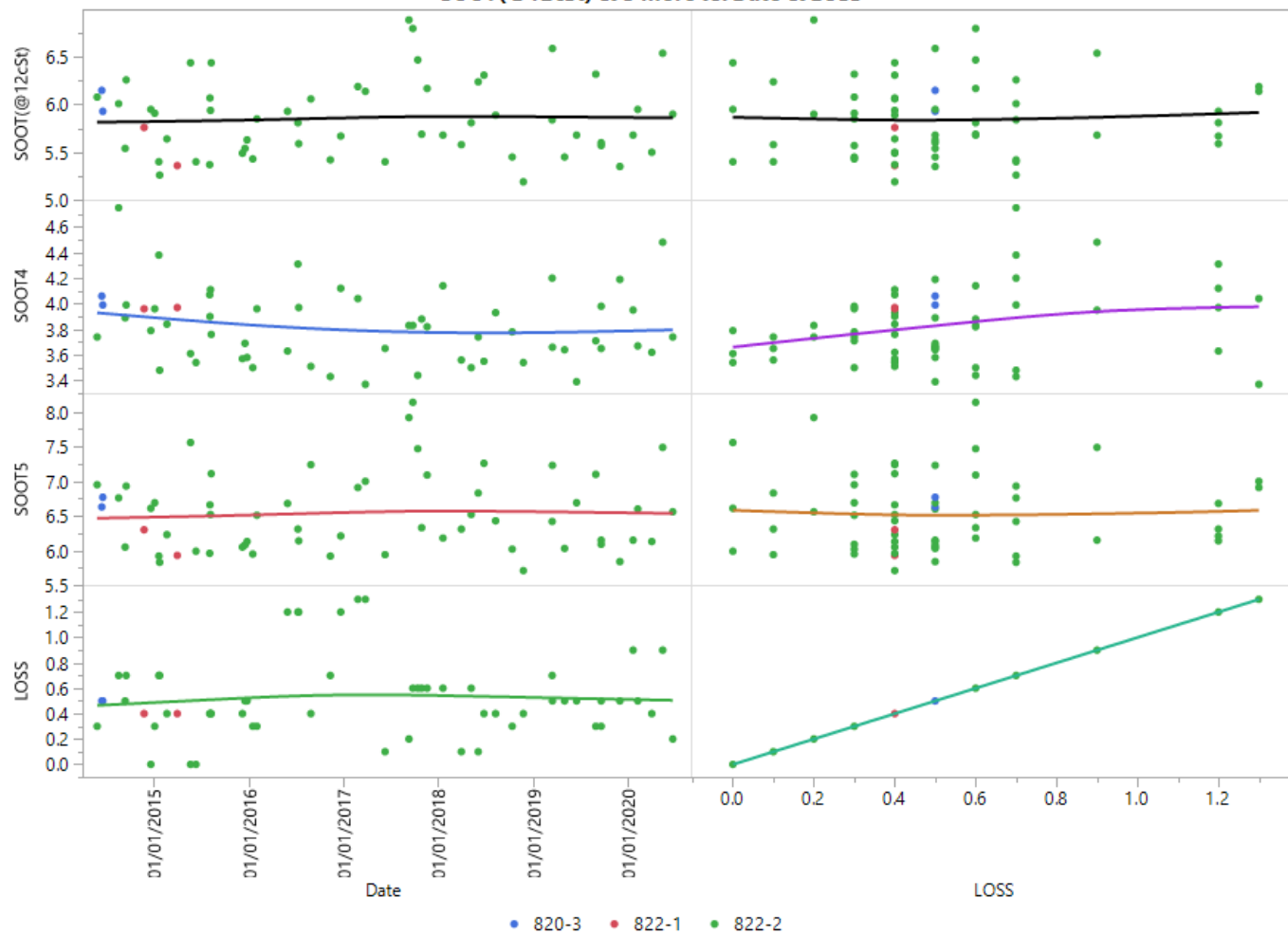
SOOT(@12cSt) & 3 more vs. Date & KV40C



Where(178 rows excluded)

Graph Builder

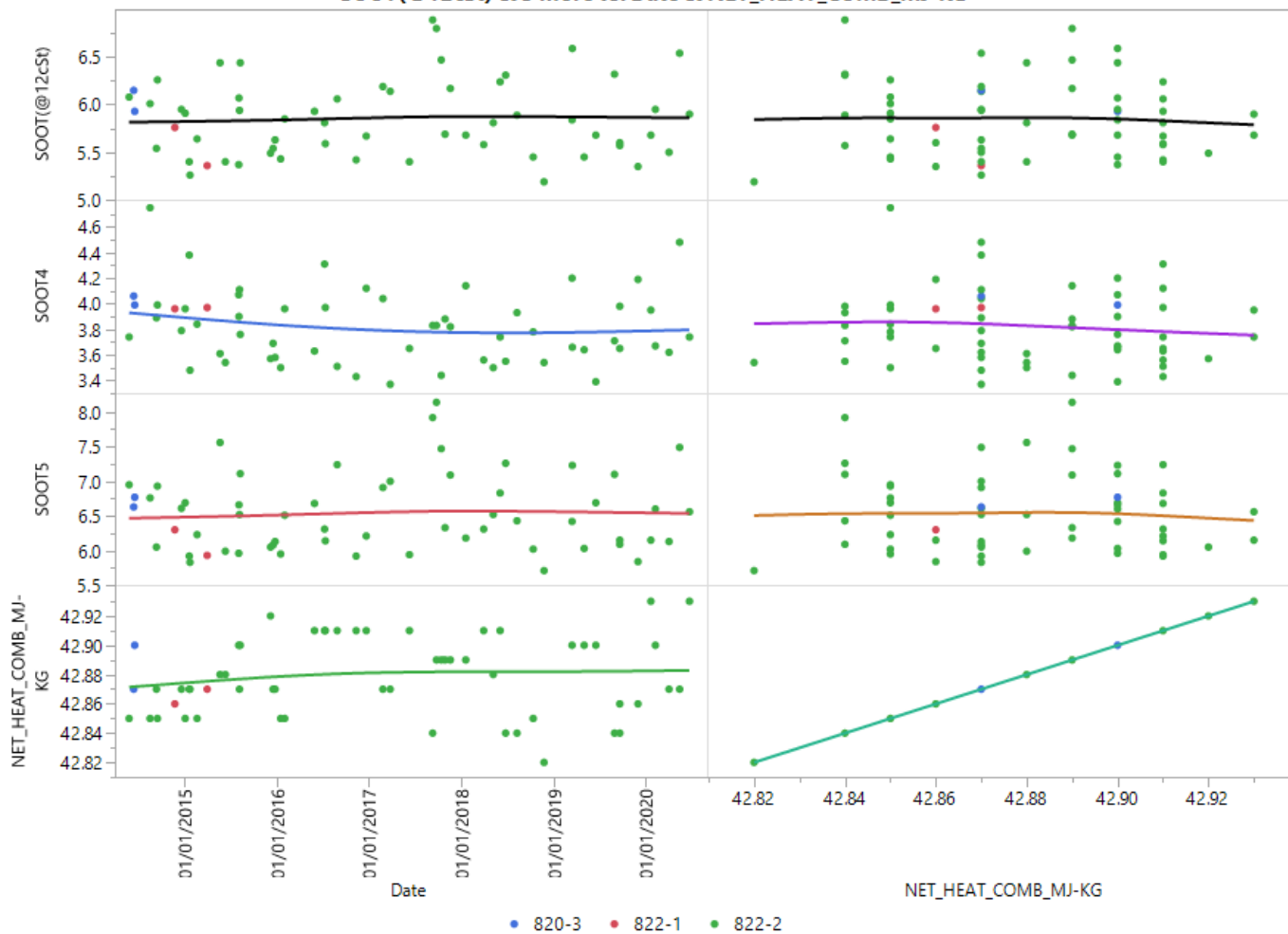
SOOT(@12cSt) & 3 more vs. Date & LOSS



Where(178 rows excluded)

Graph Builder

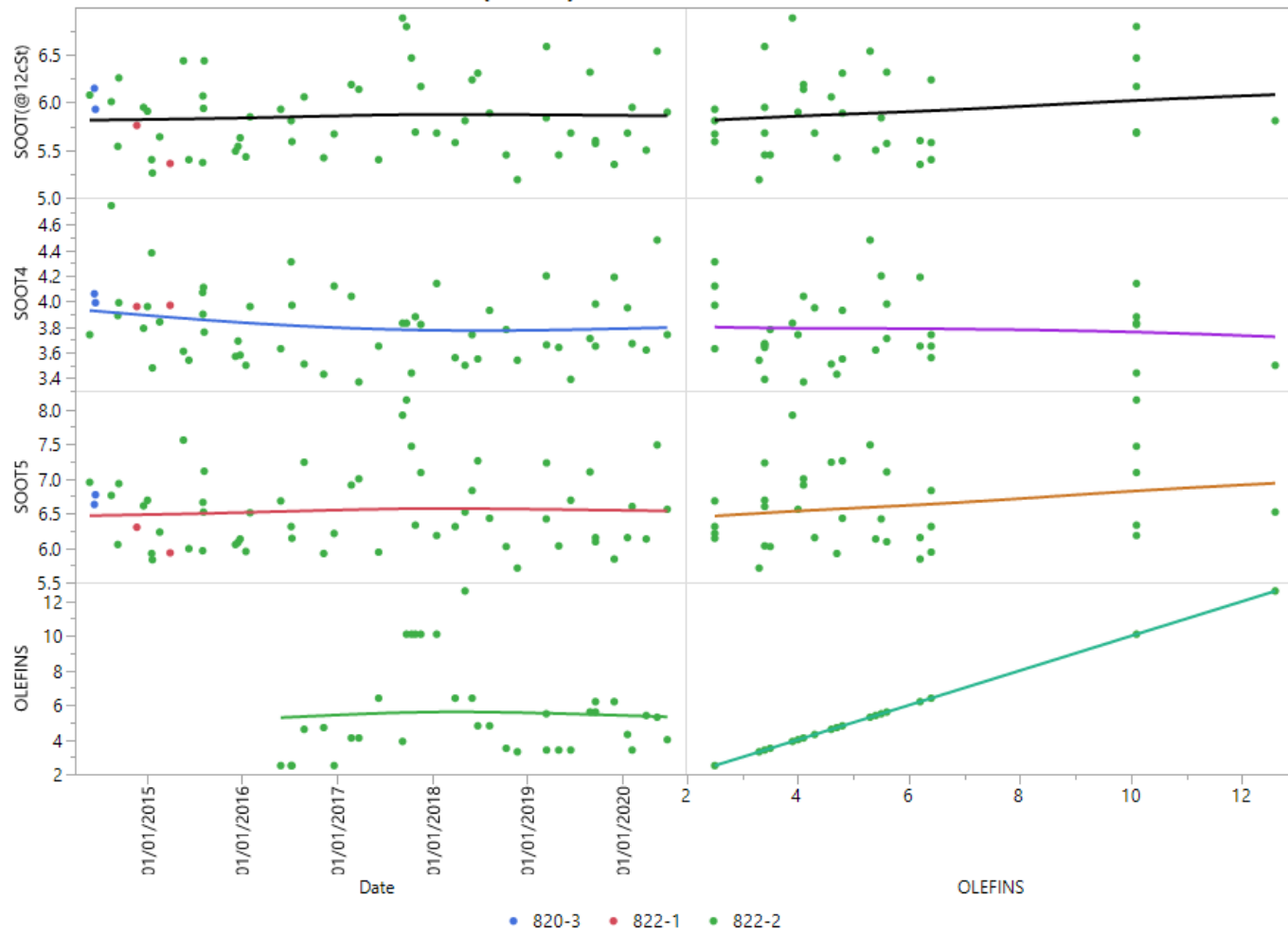
SOOT(@12cSt) & 3 more vs. Date & NET_HEAT_COMB_MJ-KG



Where(178 rows excluded)

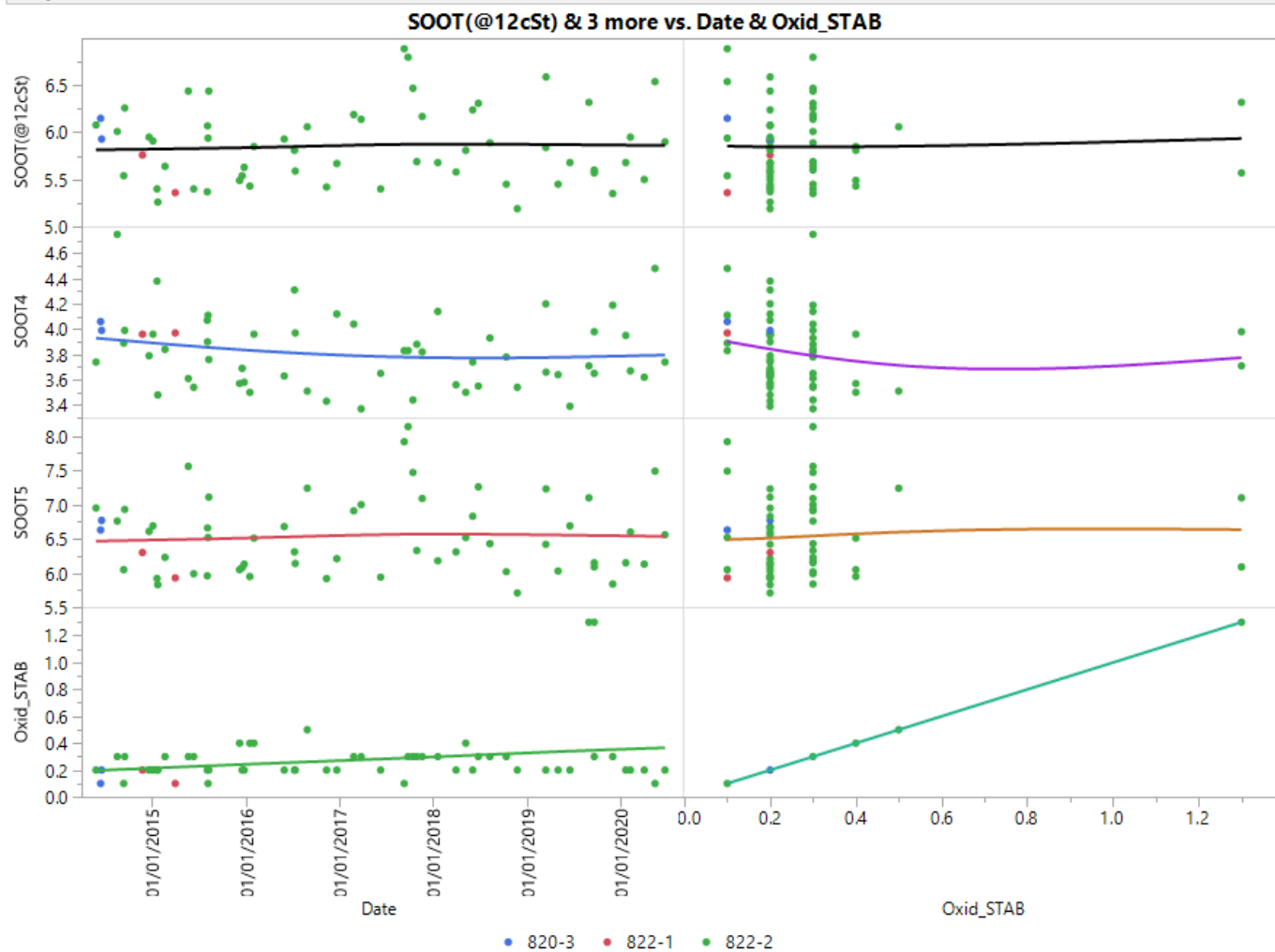
Graph Builder

SOOT(@12cSt) & 3 more vs. Date & OLEFINS



Where(178 rows excluded)

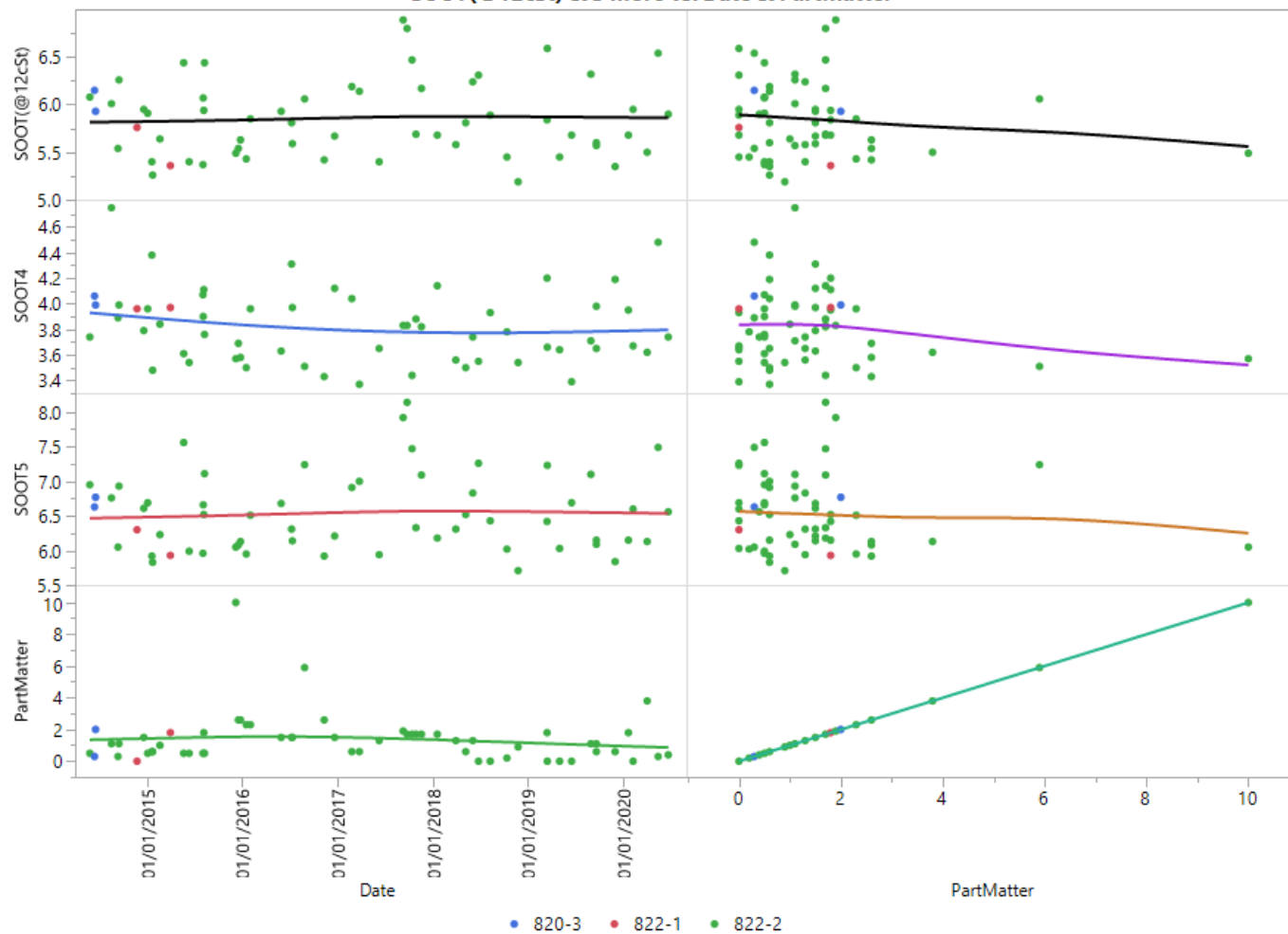
Graph Builder



Where(178 rows excluded)

Graph Builder

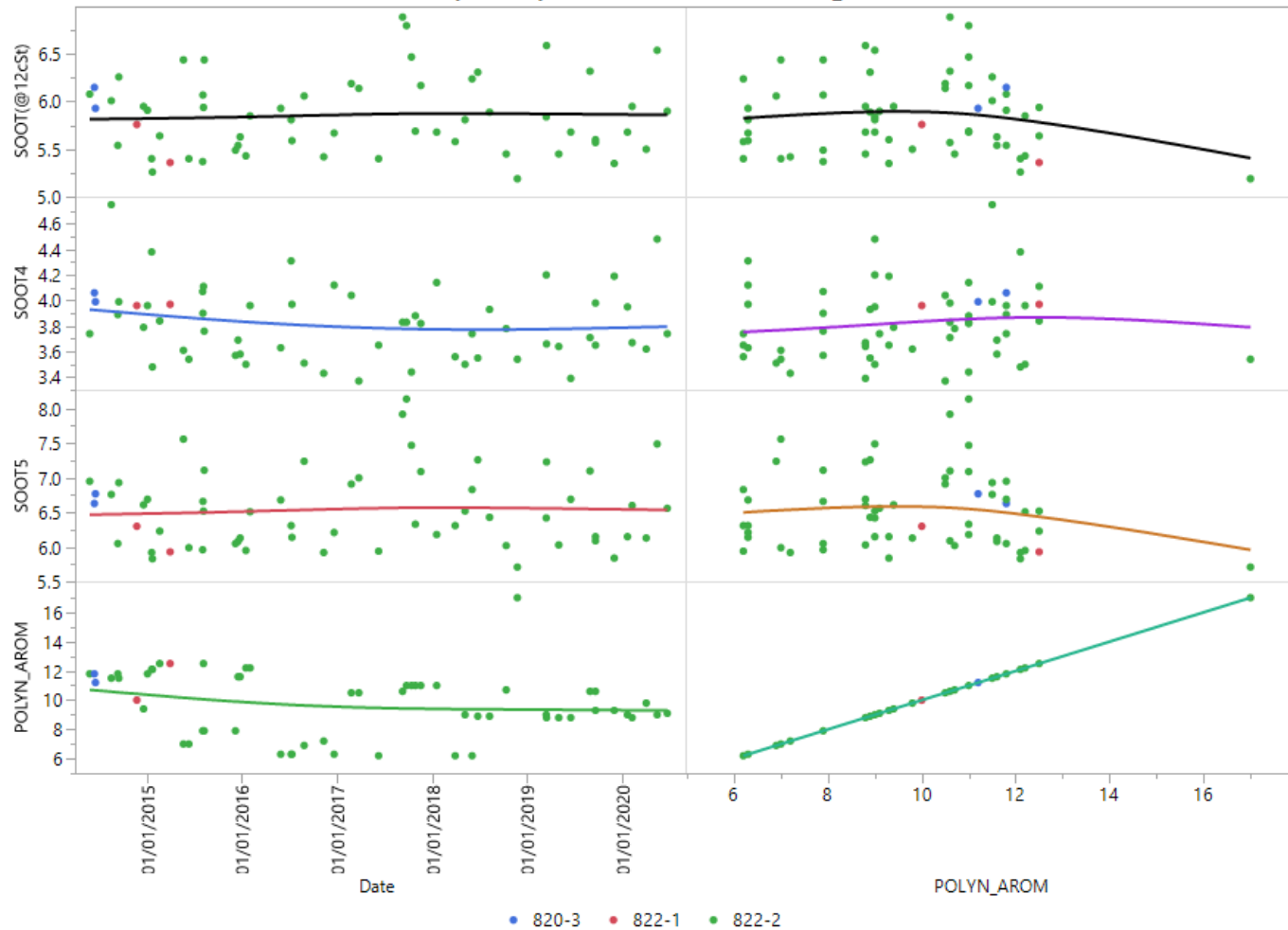
SOOT(@12cSt) & 3 more vs. Date & PartMatter



Where(178 rows excluded)

Graph Builder

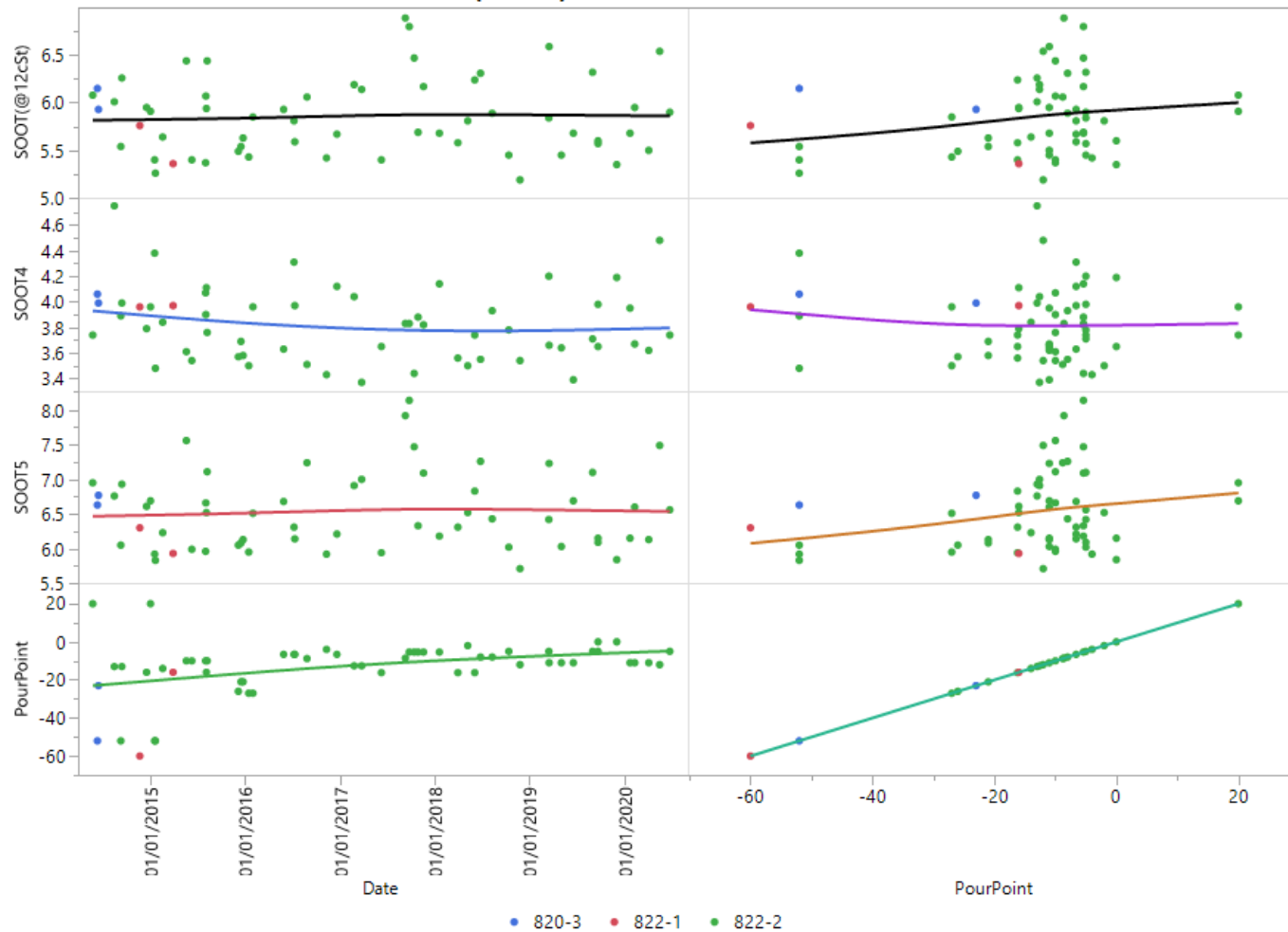
SOOT(@12cSt) & 3 more vs. Date & POLYN_AROM



Where(178 rows excluded)

Graph Builder

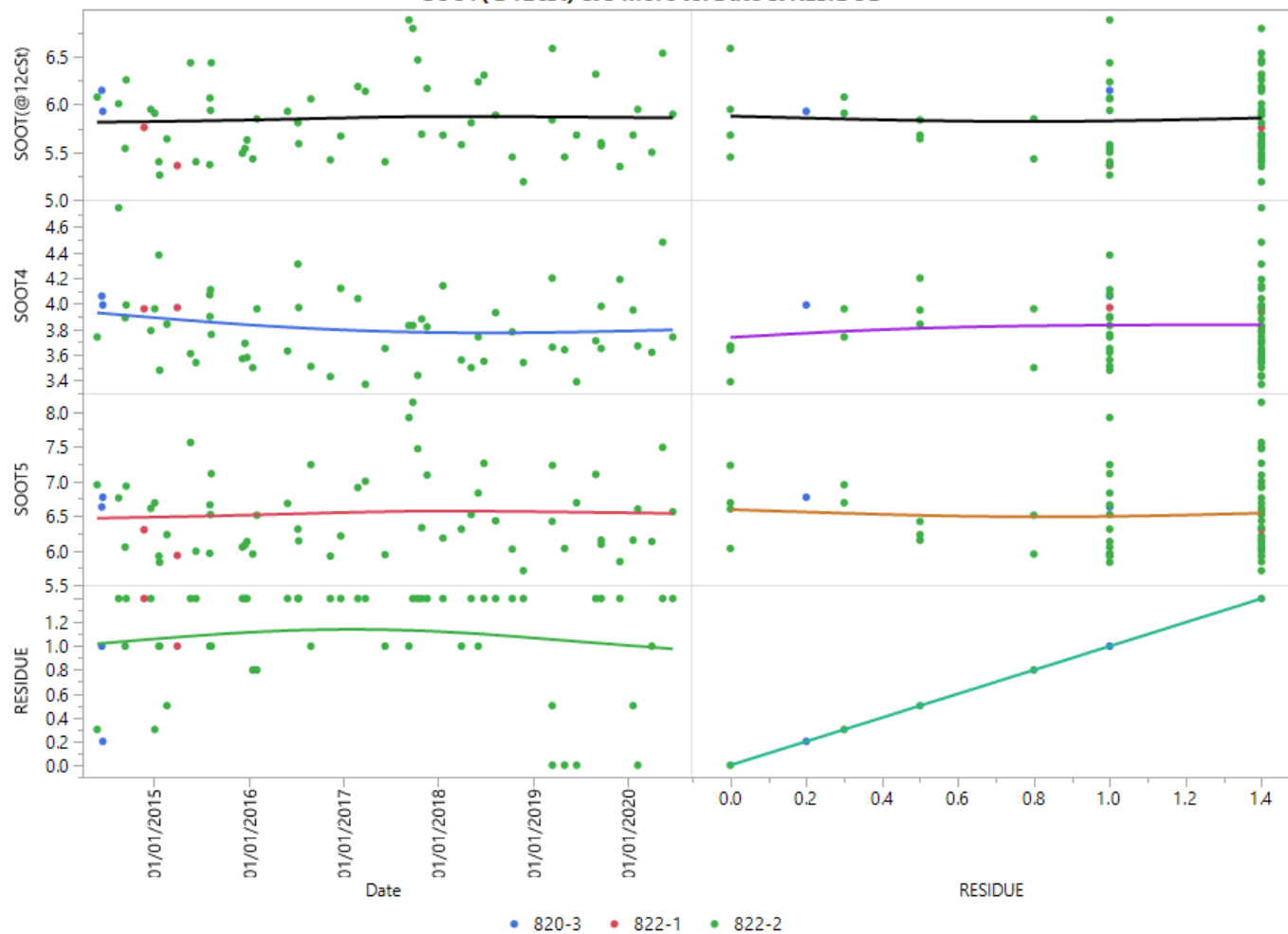
SOOT(@12cSt) & 3 more vs. Date & PourPoint



Where(178 rows excluded)

Graph Builder

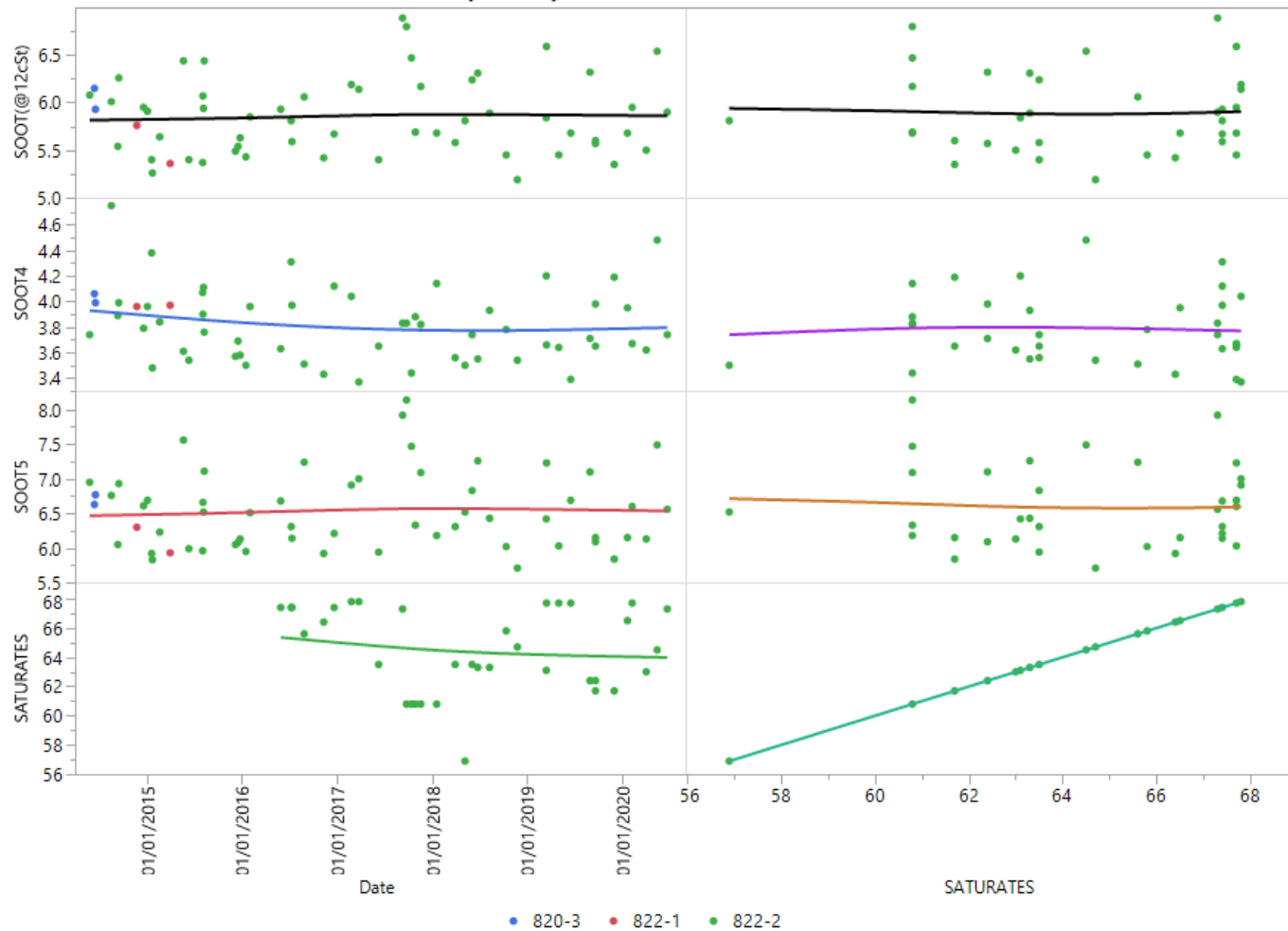
SOOT(@12cSt) & 3 more vs. Date & RESIDUE



Where(178 rows excluded)

Graph Builder

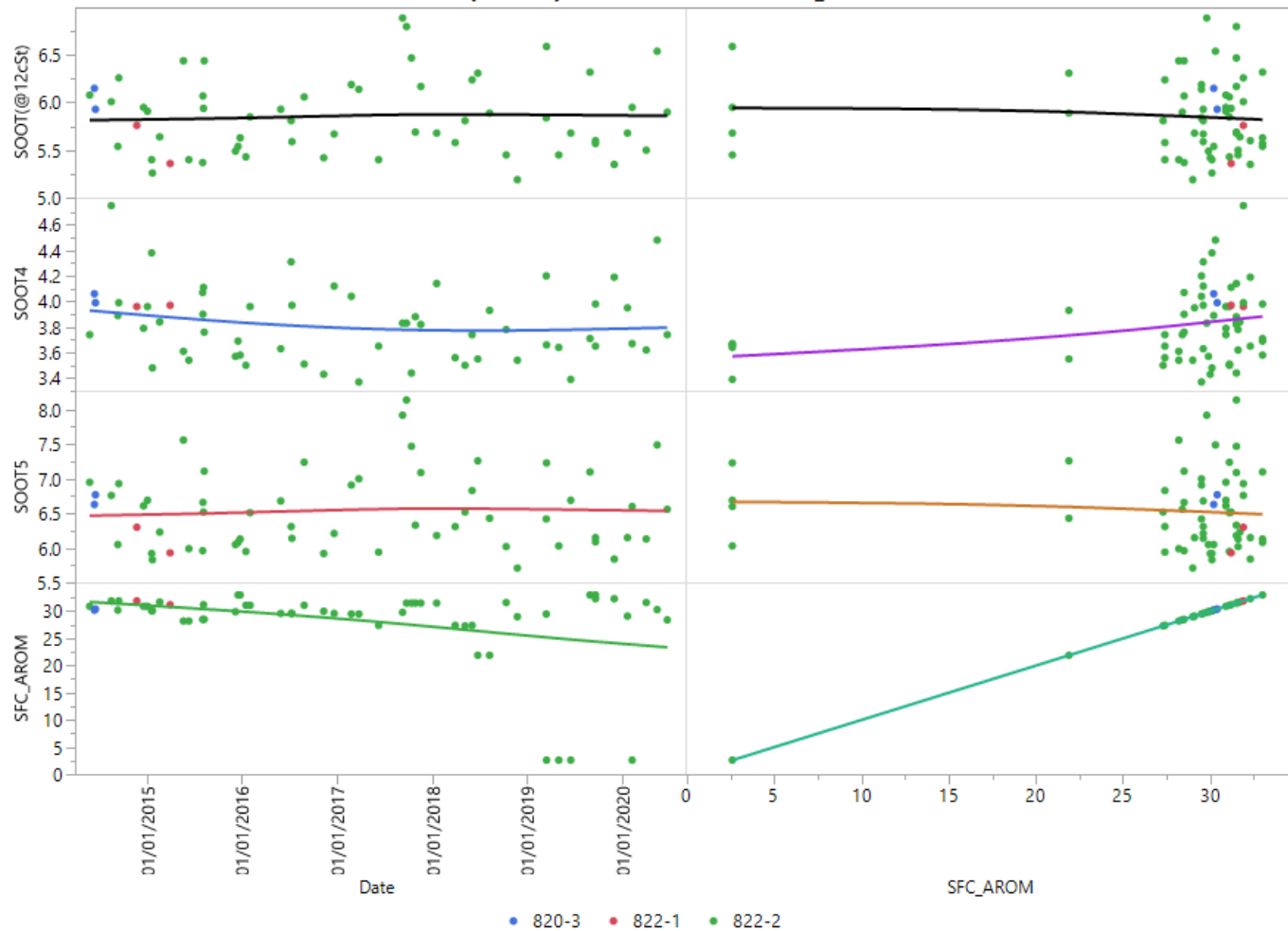
SOOT(@12cSt) & 3 more vs. Date & SATURATES



Where(178 rows excluded)

Graph Builder

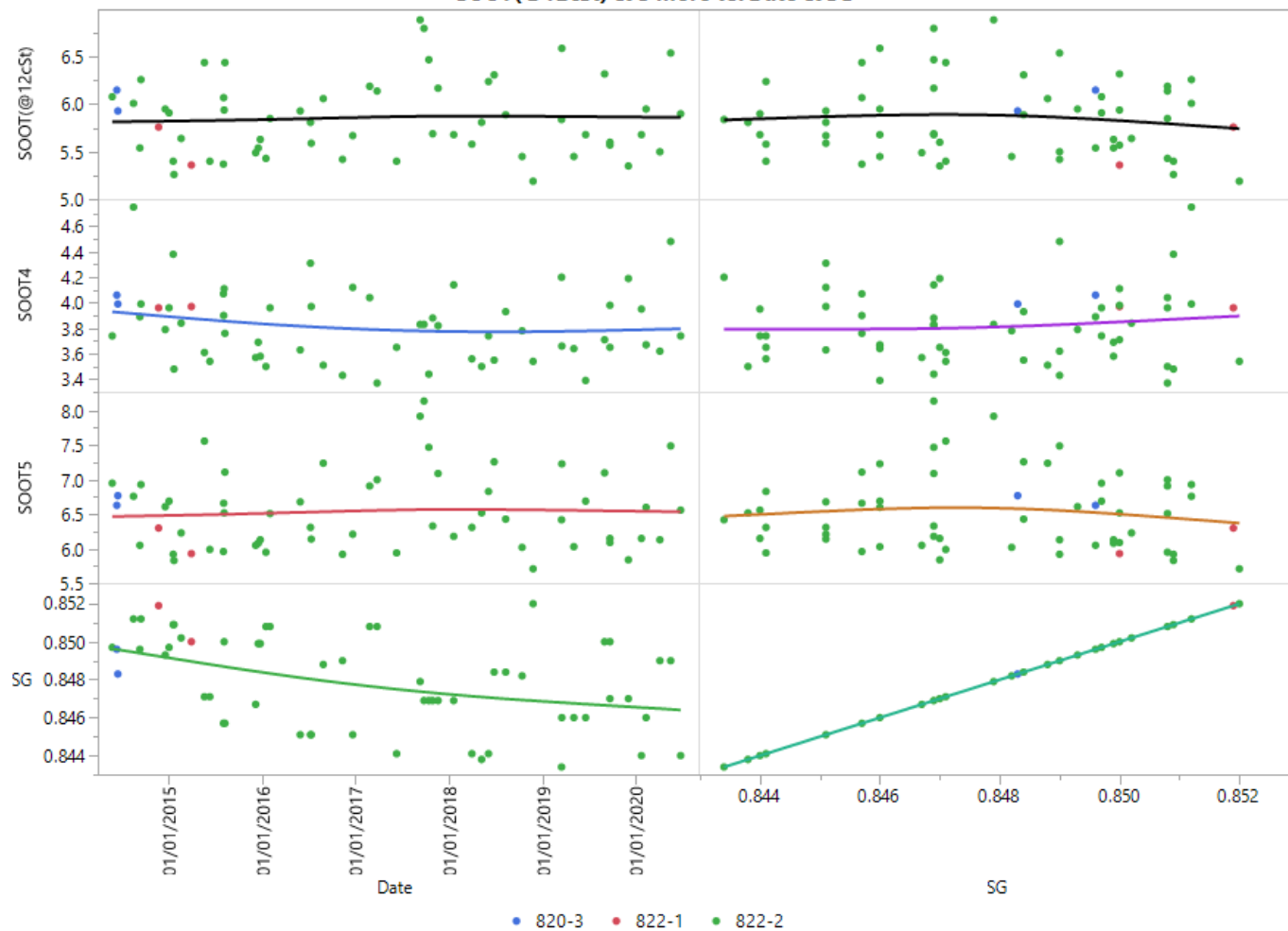
SOOT(@12cSt) & 3 more vs. Date & SFC_AROM



Where(178 rows excluded)

Graph Builder

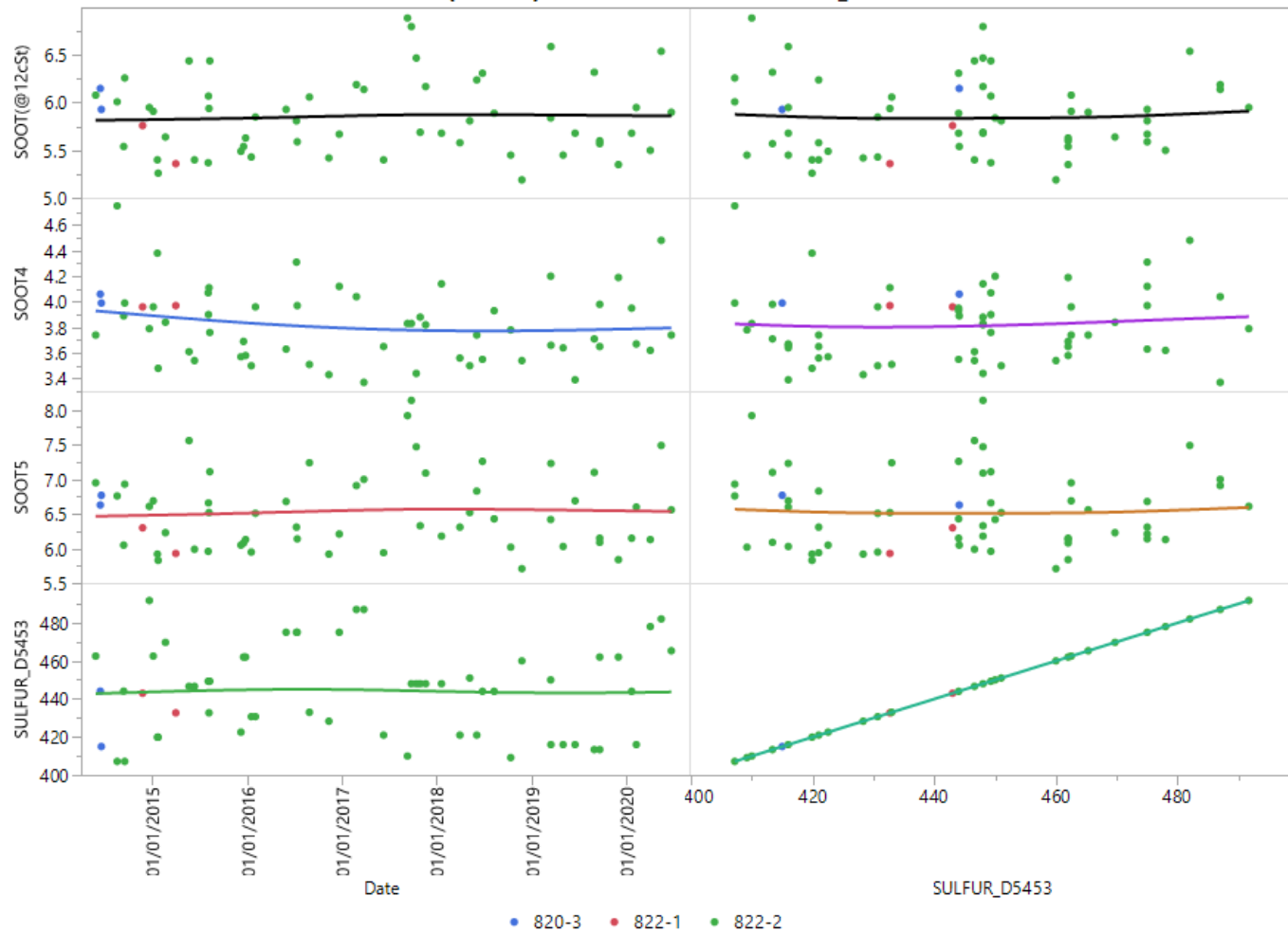
SOOT(@12cSt) & 3 more vs. Date & SG



Where(178 rows excluded)

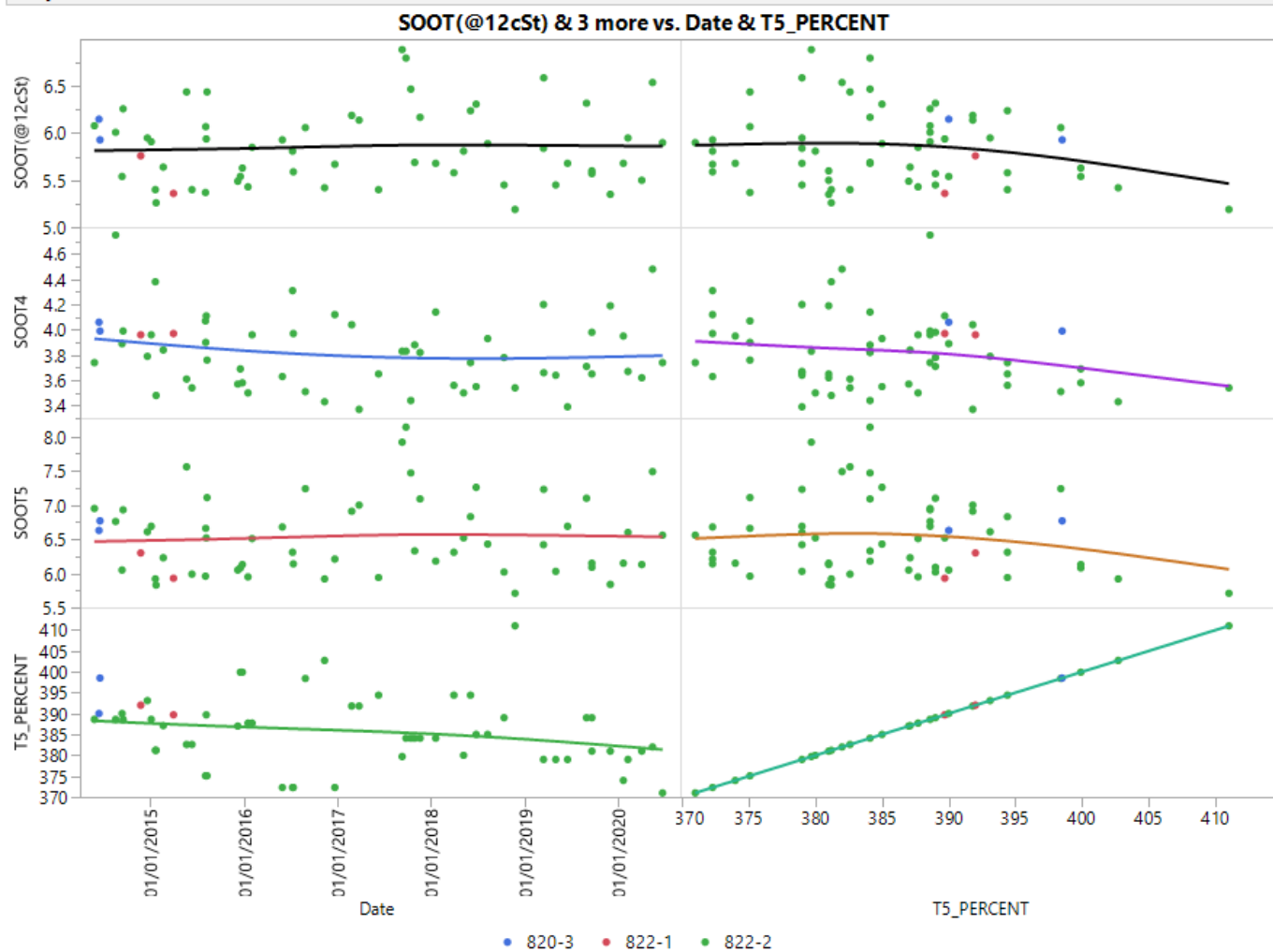
Graph Builder

SOOT(@12cSt) & 3 more vs. Date & SULFUR_D5453



Where(178 rows excluded)

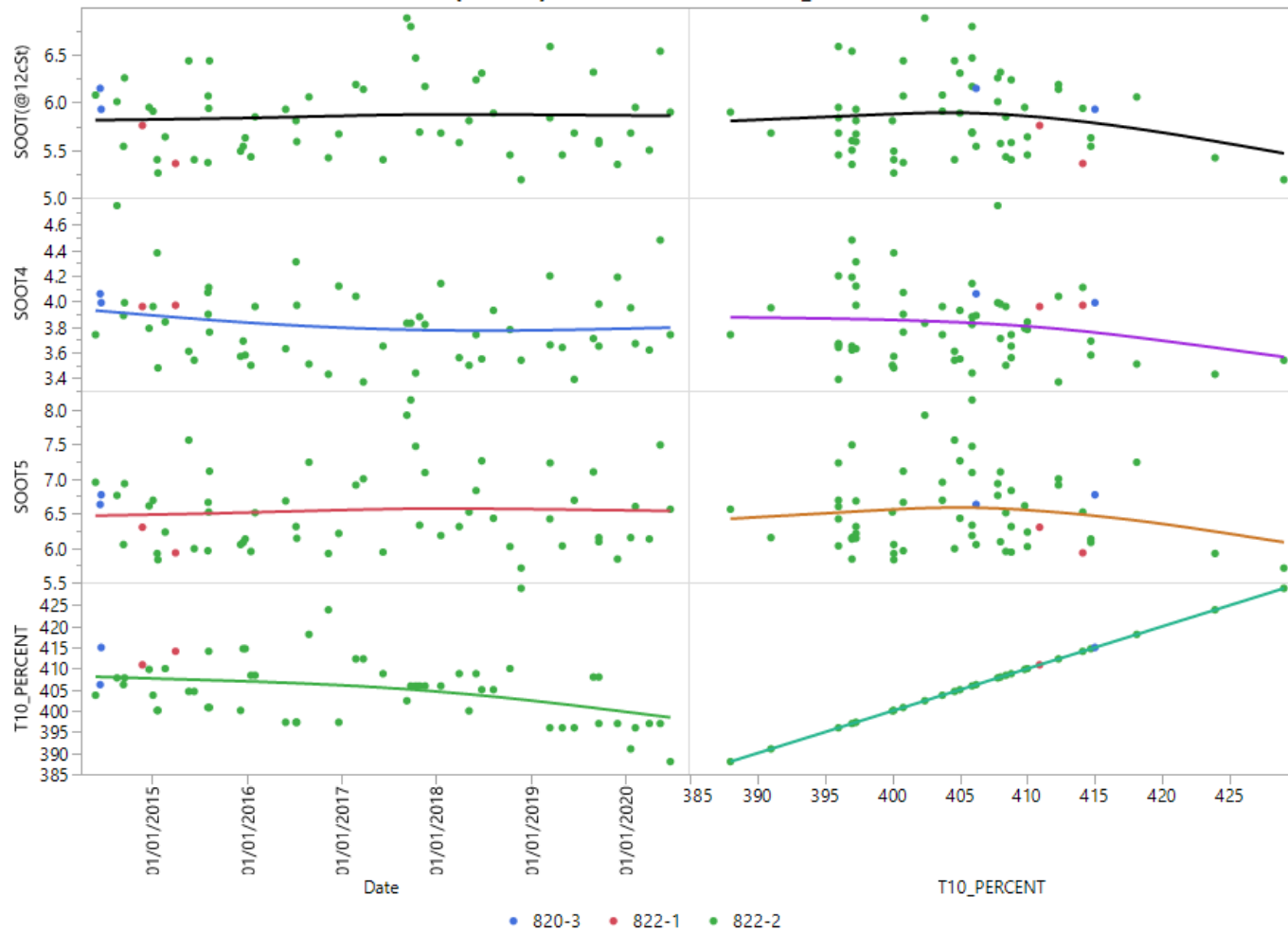
Graph Builder



Where(178 rows excluded)

Graph Builder

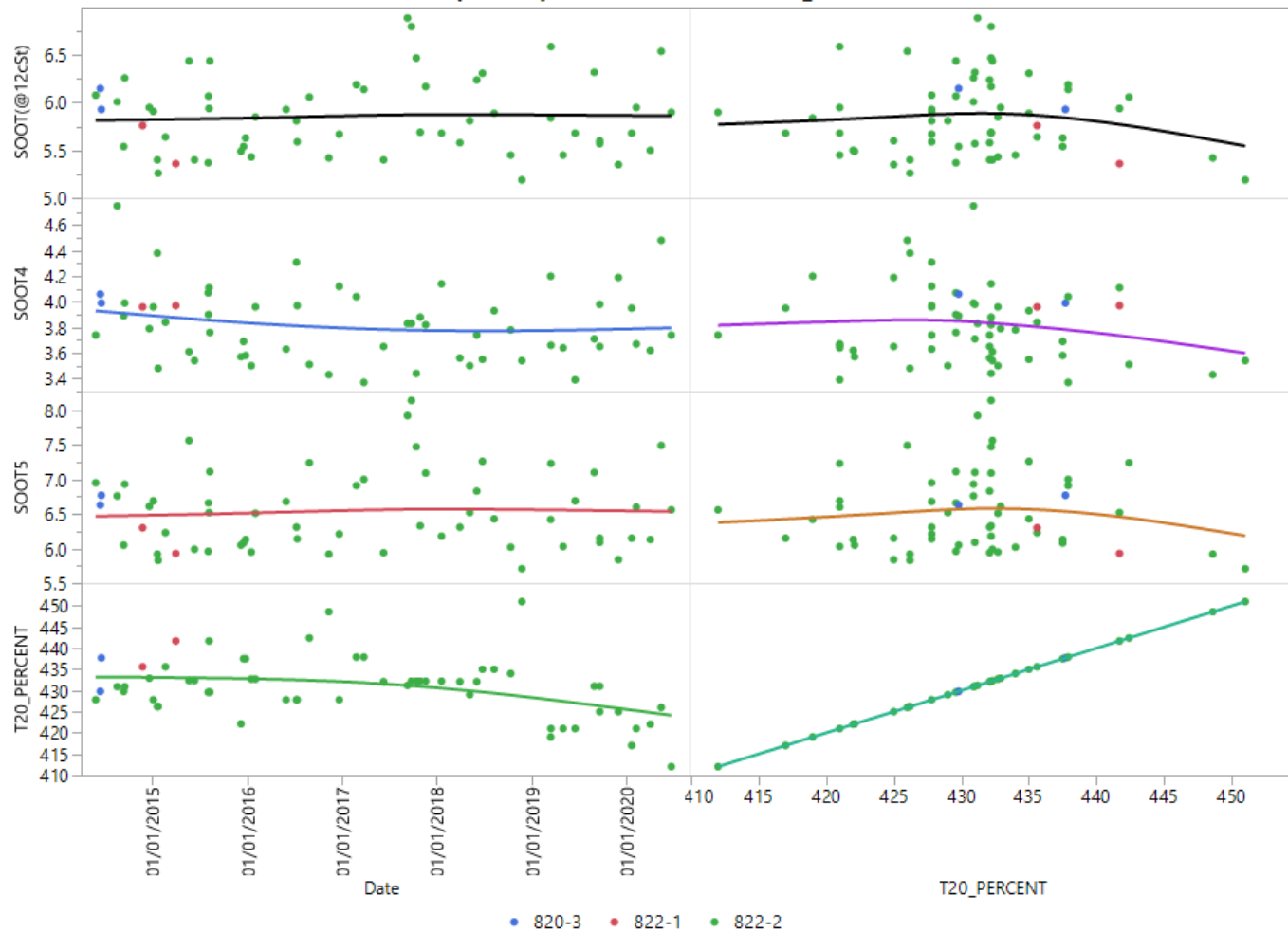
SOOT(@12cSt) & 3 more vs. Date & T10_PERCENT



Where(178 rows excluded)

Graph Builder

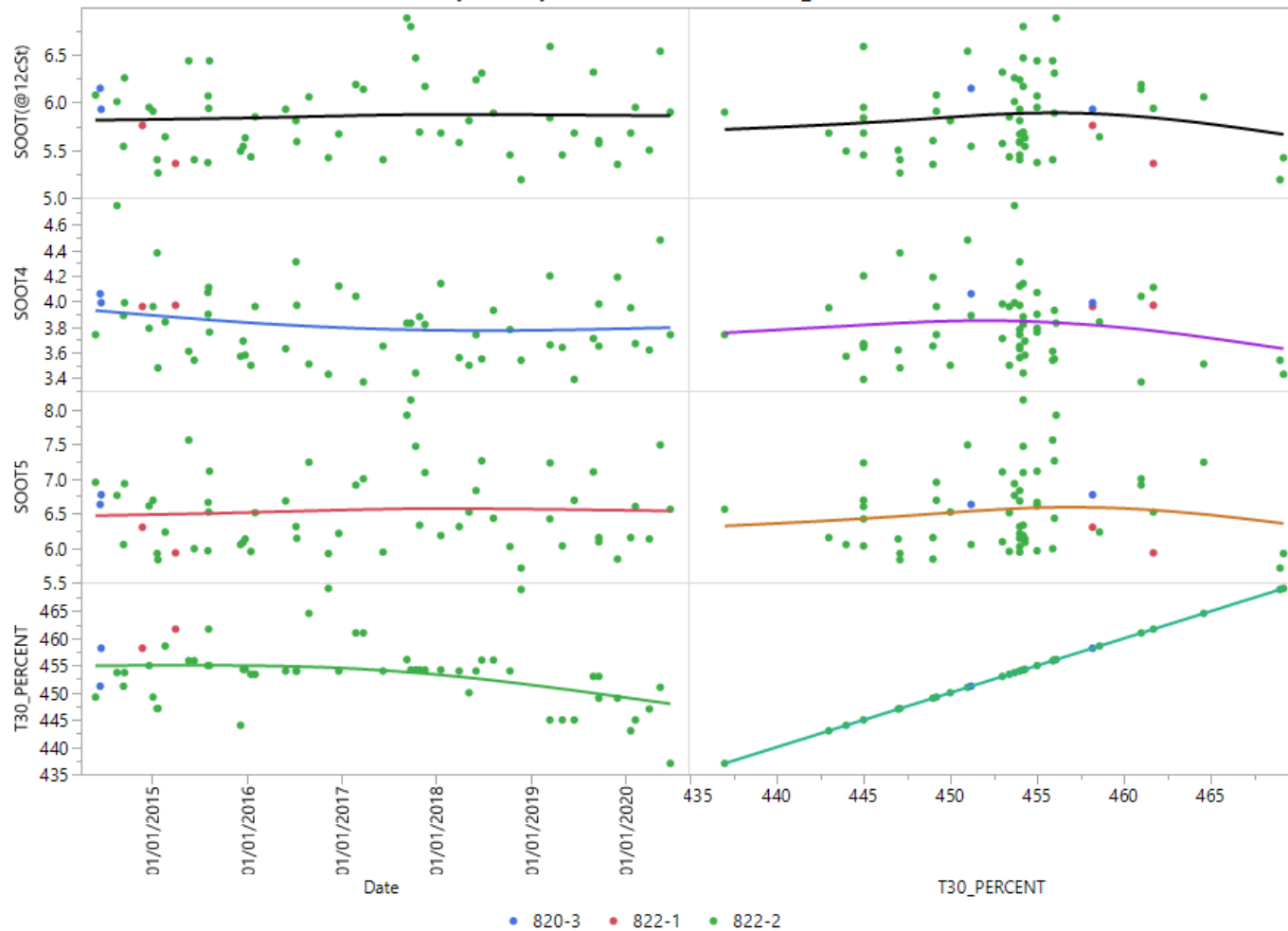
SOOT(@12cSt) & 3 more vs. Date & T20_PERCENT



Where(178 rows excluded)

Graph Builder

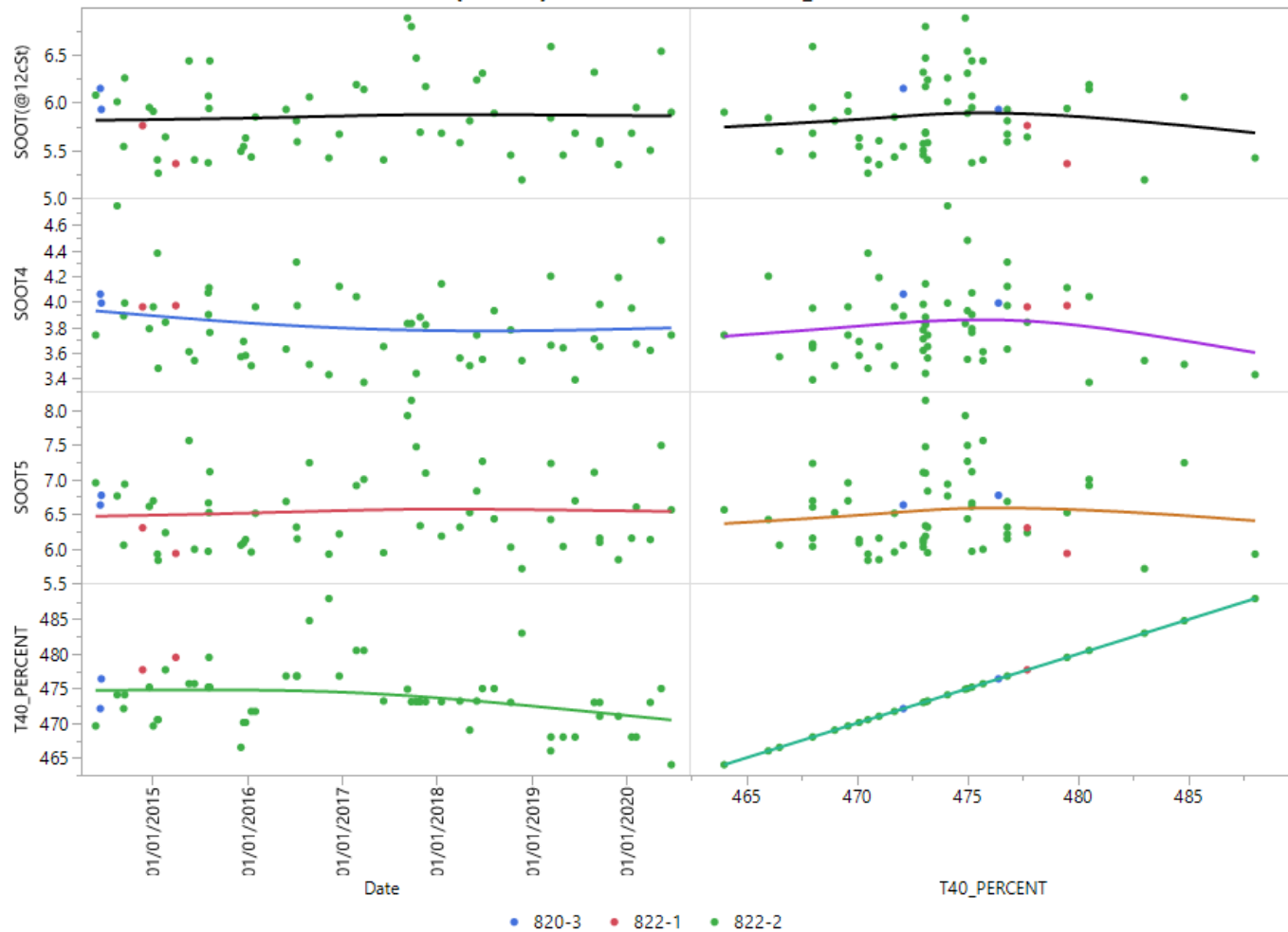
SOOT(@12cSt) & 3 more vs. Date & T30_PERCENT



Where(178 rows excluded)

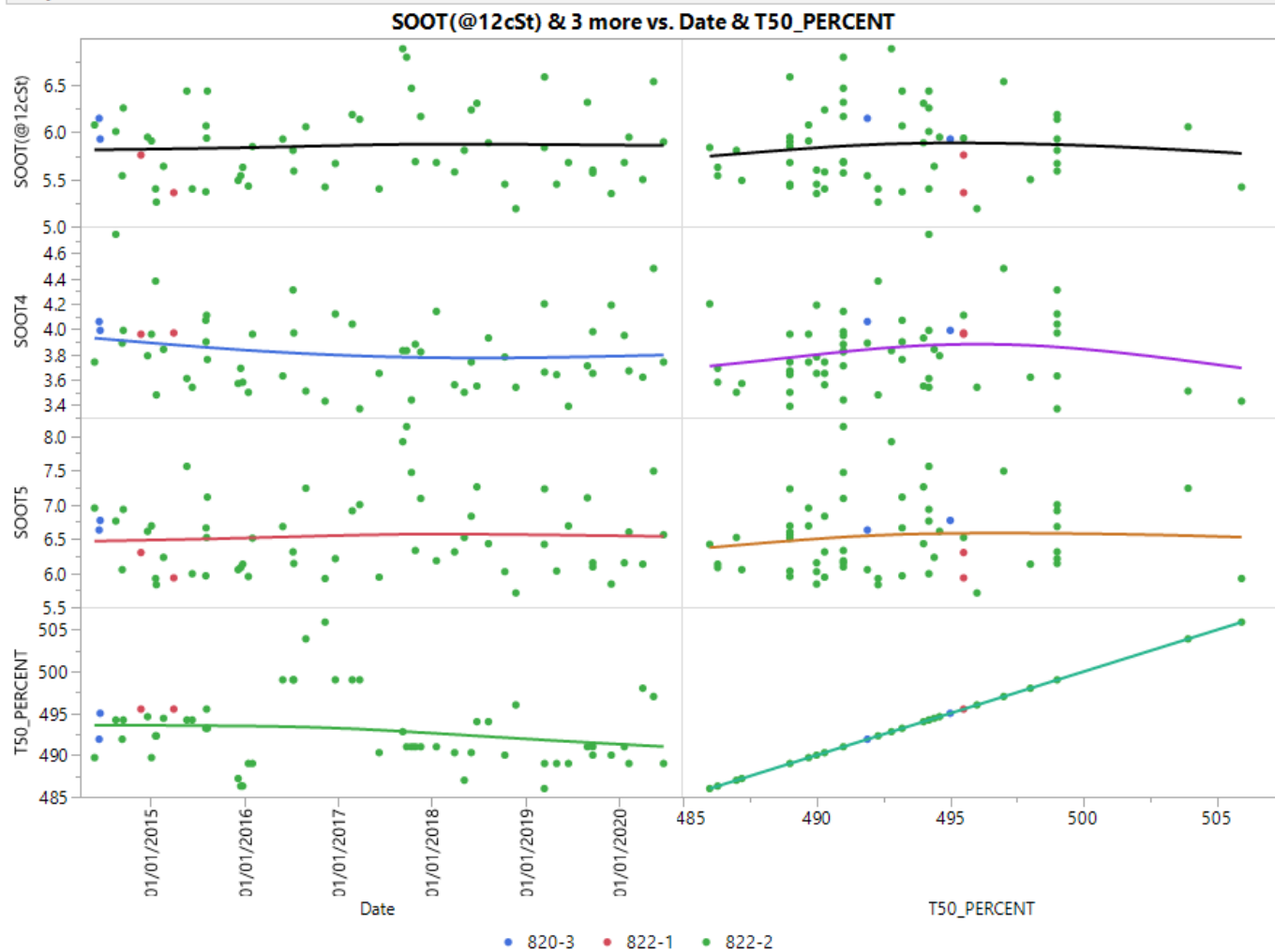
Graph Builder

SOOT(@12cSt) & 3 more vs. Date & T40_PERCENT



Where(178 rows excluded)

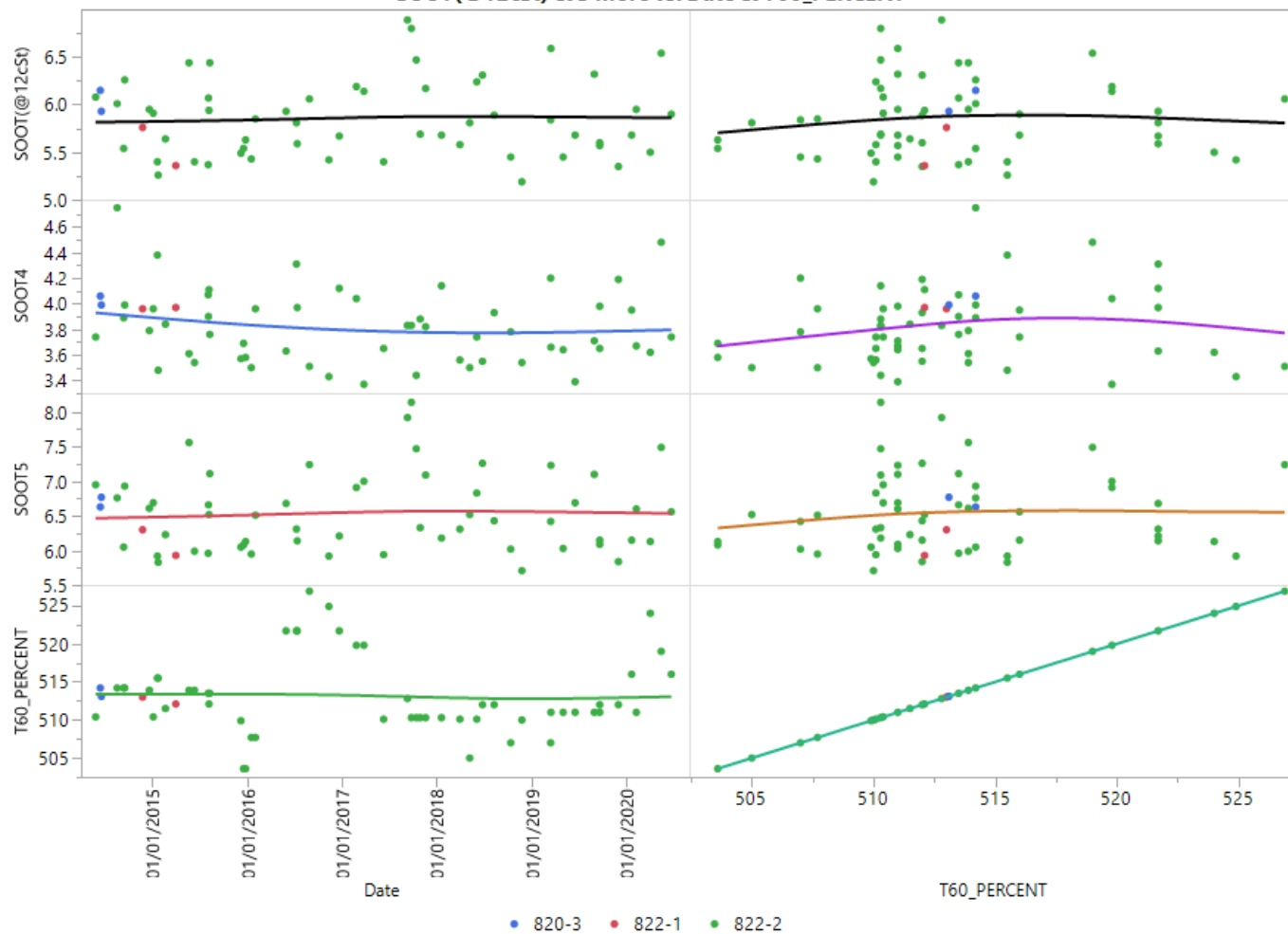
Graph Builder



Where(178 rows excluded)

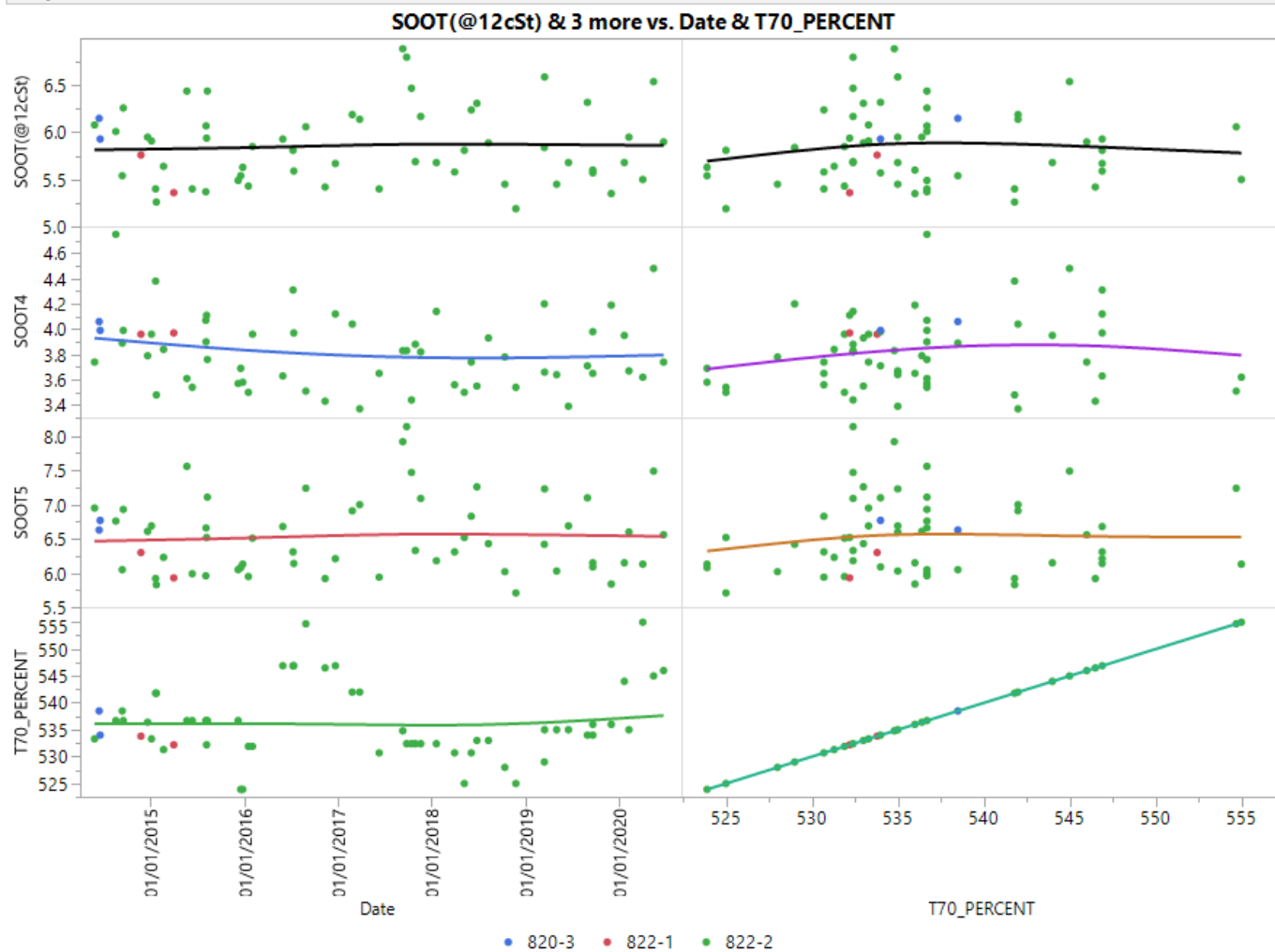
Graph Builder

SOOT(@12cSt) & 3 more vs. Date & T60_PERCENT



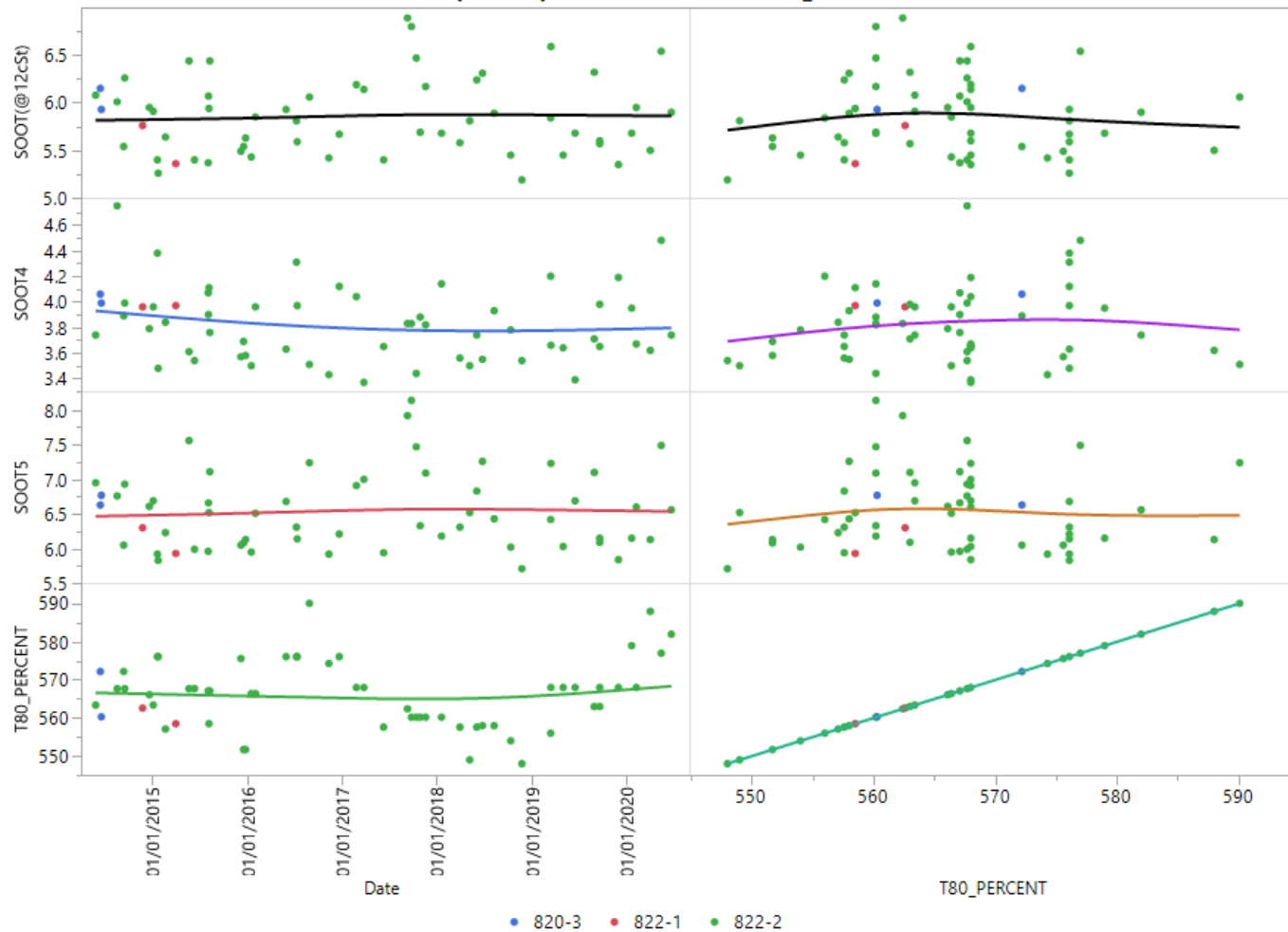
Where(178 rows excluded)

Graph Builder



Graph Builder

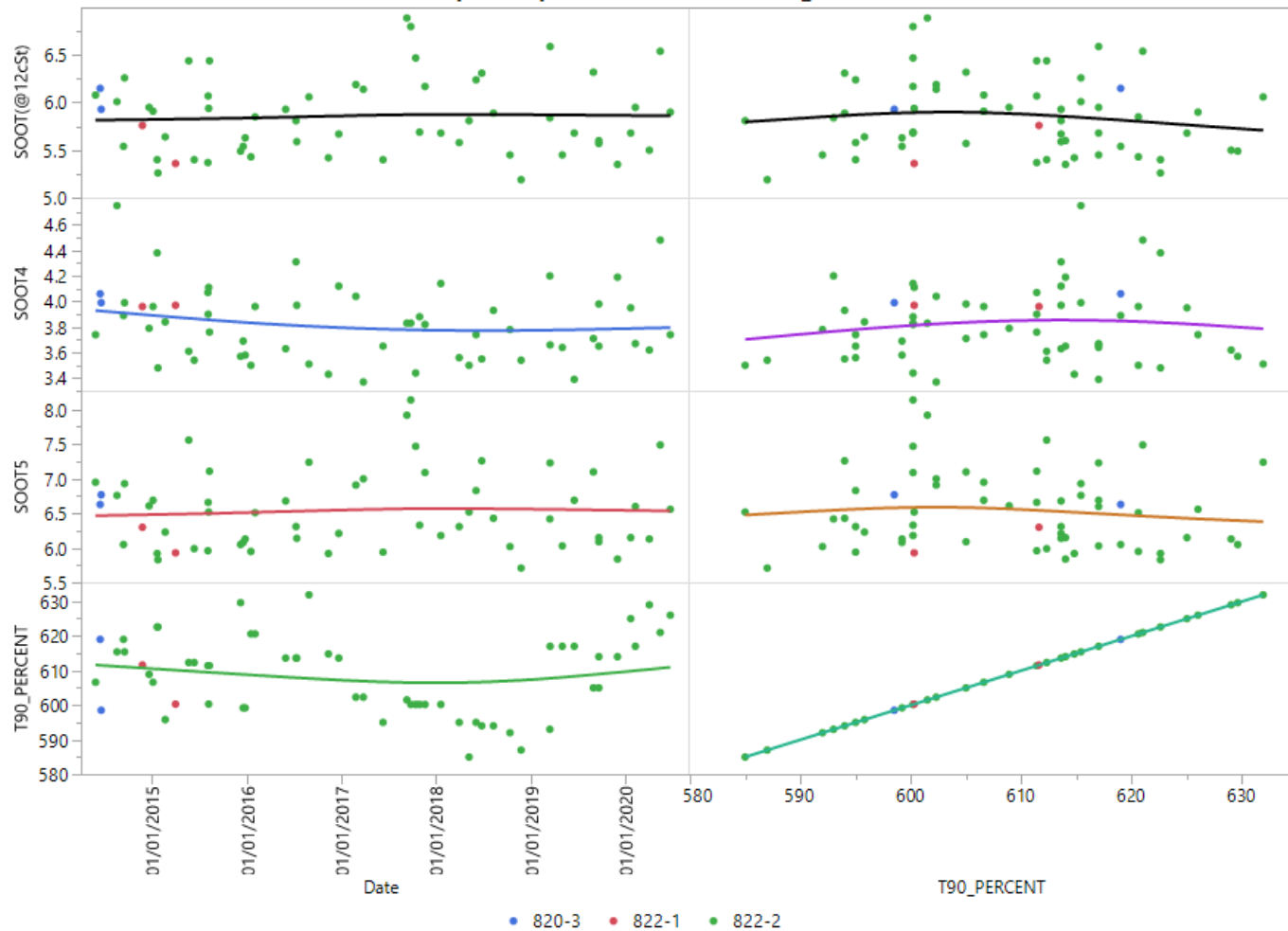
SOOT(@12cSt) & 3 more vs. Date & T80_PERCENT



Where(178 rows excluded)

Graph Builder

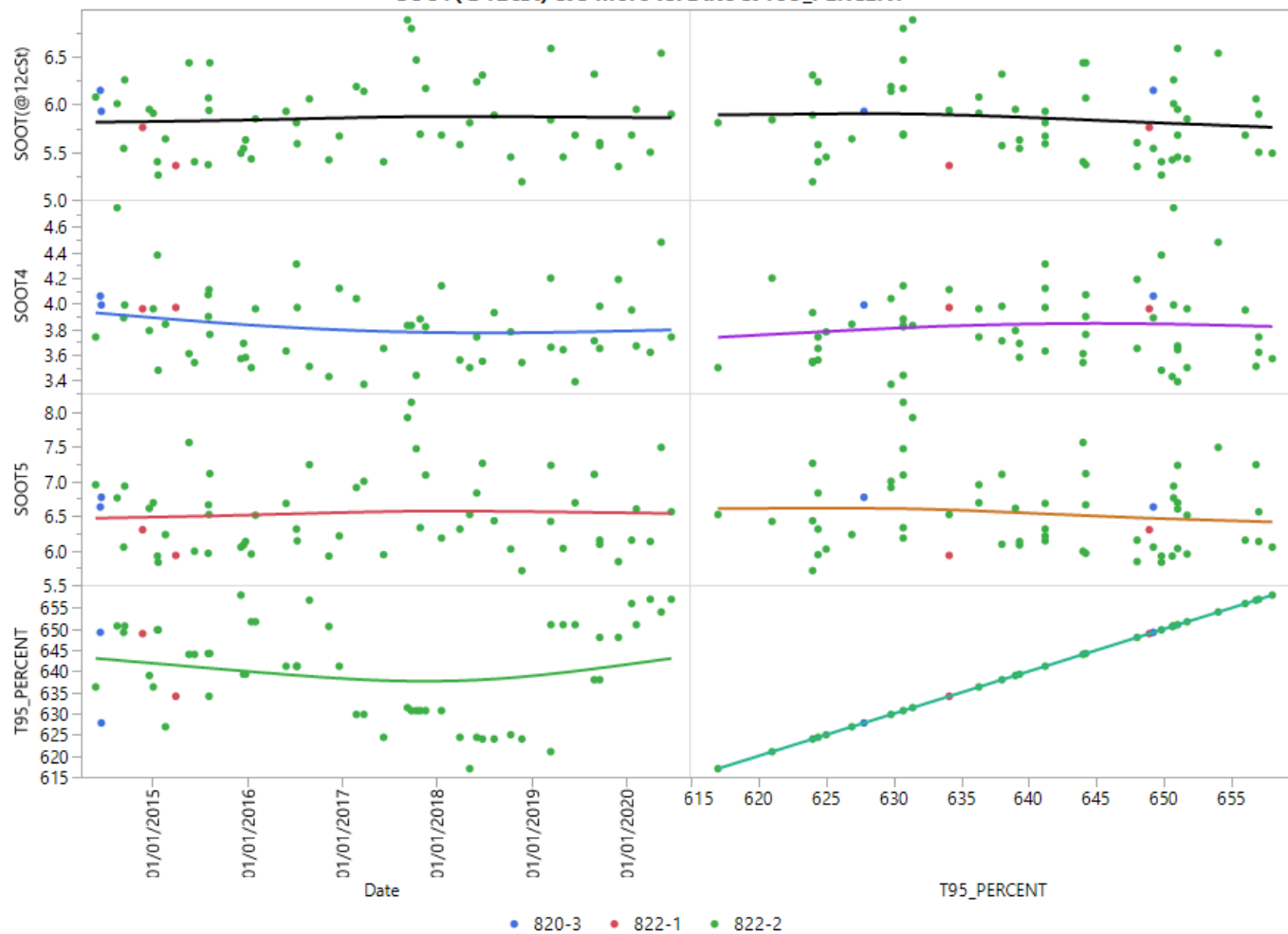
SOOT(@12cSt) & 3 more vs. Date & T90_PERCENT



Where(178 rows excluded)

Graph Builder

SOOT(@12cSt) & 3 more vs. Date & T95_PERCENT



Where(178 rows excluded)

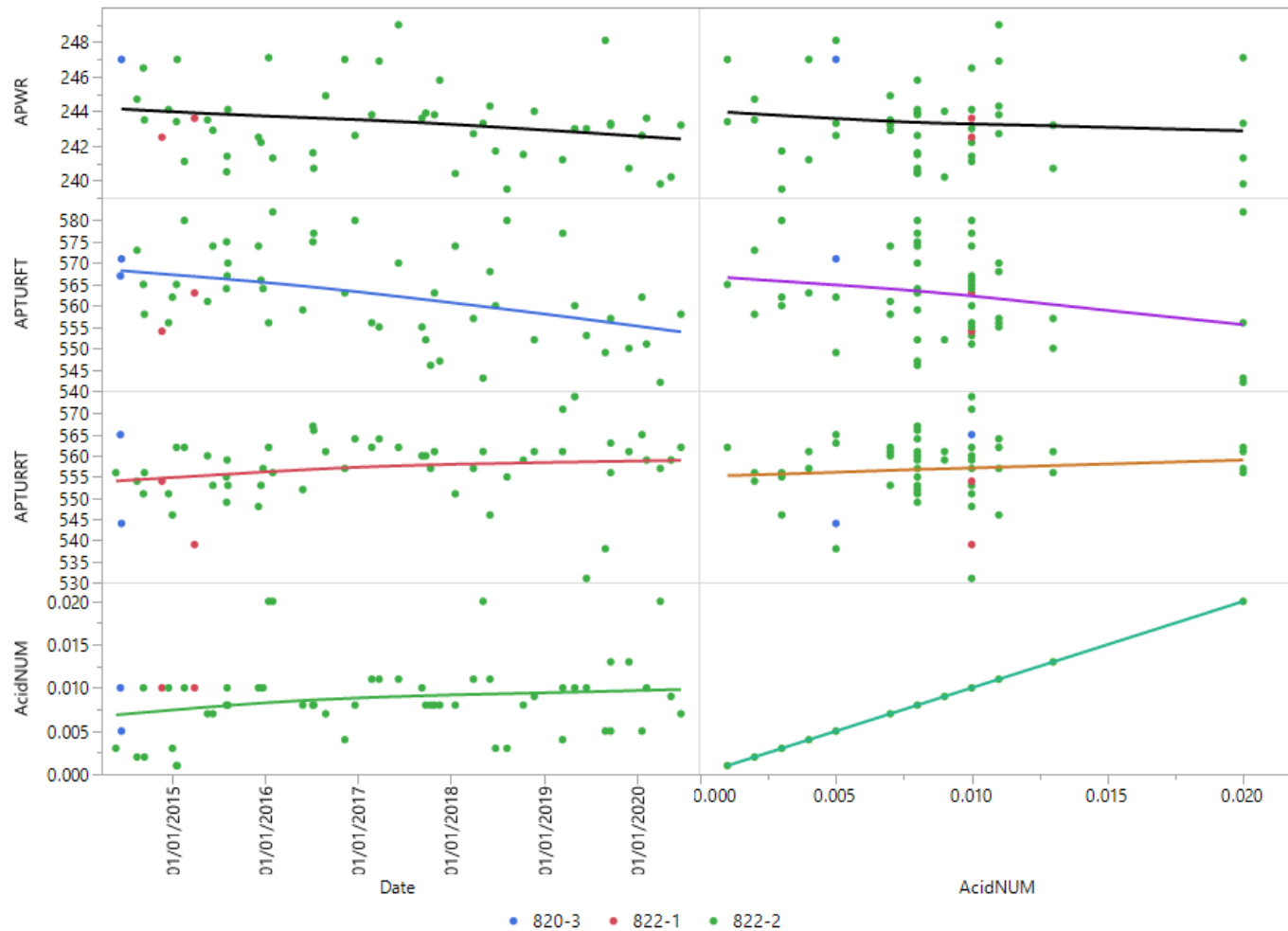


Plots of T11 Fuel Properties vs. Operational Variable Data

Passion for Solutions®

Graph Builder

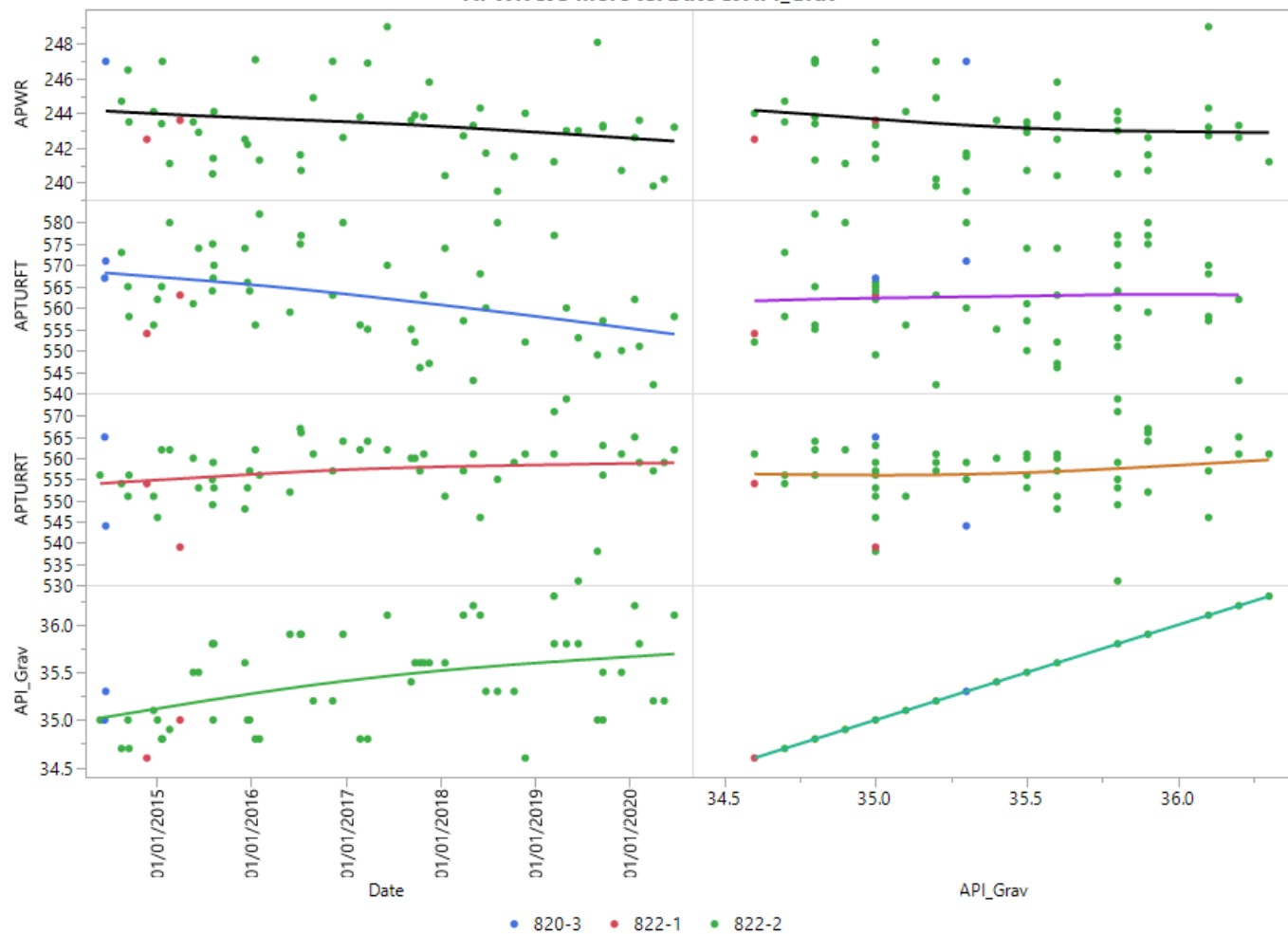
APWR & 3 more vs. Date & AcidNUM



Where(178 rows excluded)

Graph Builder

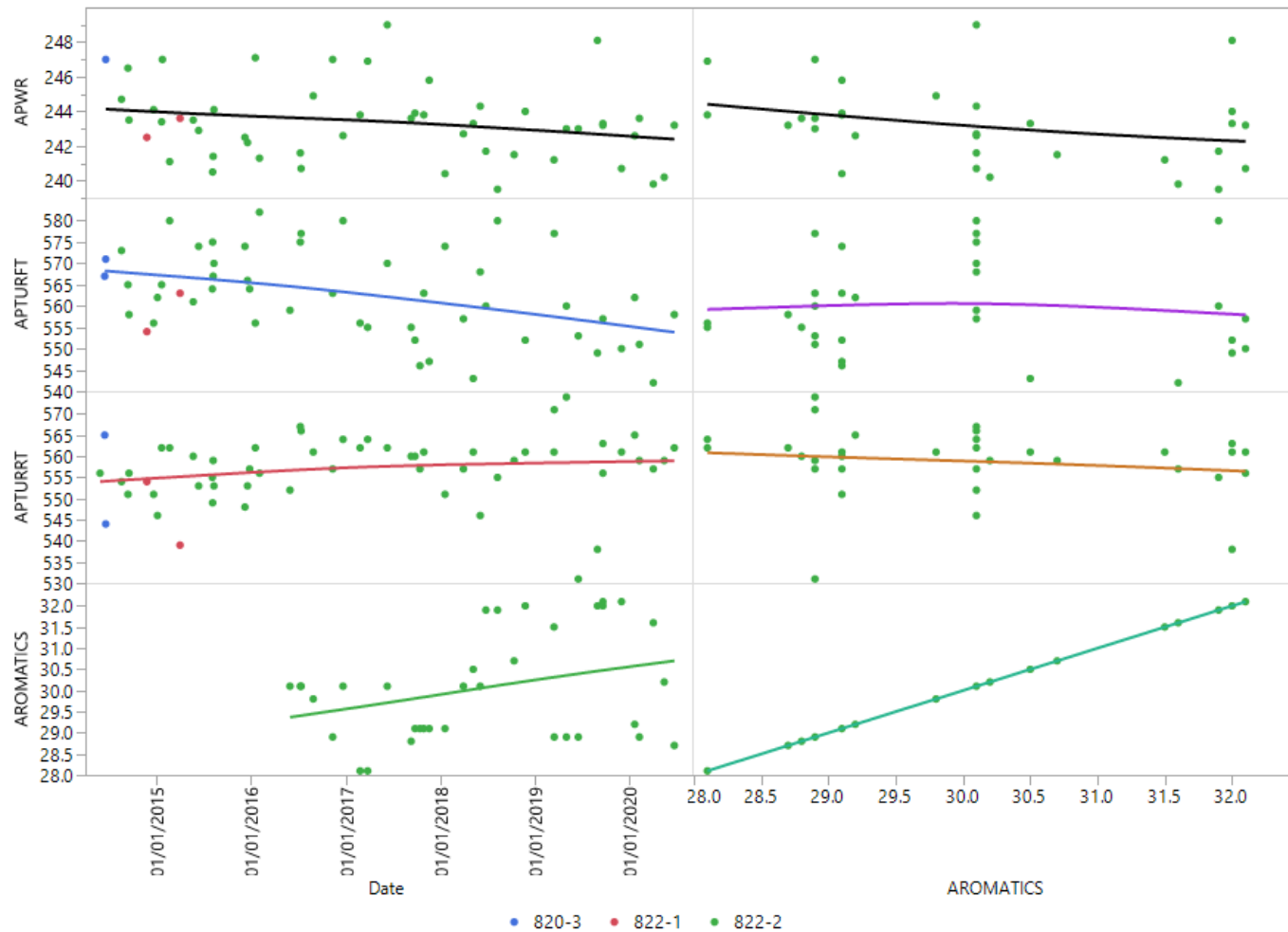
APWR & 3 more vs. Date & API_Grav



Where(178 rows excluded)

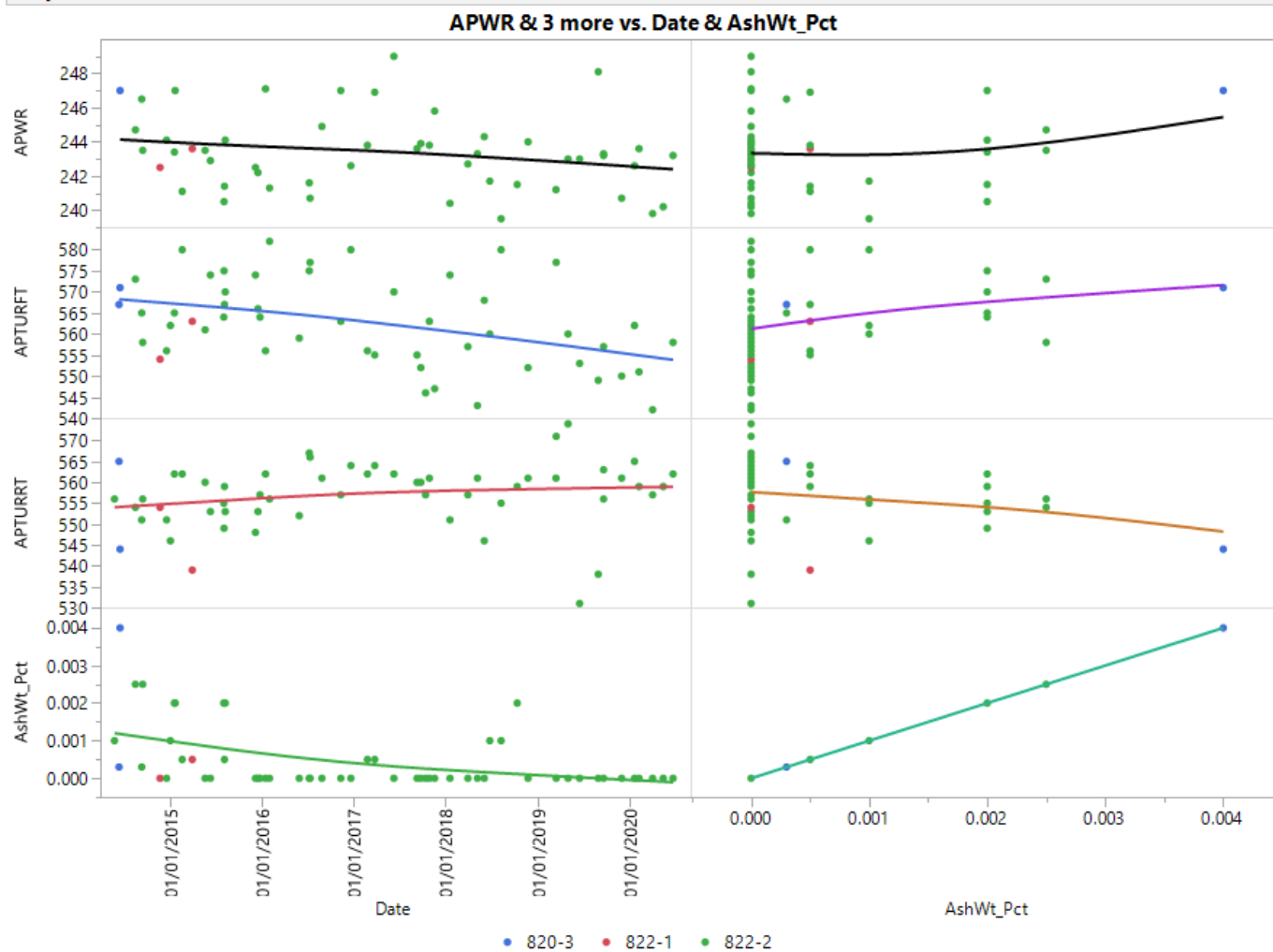
Graph Builder

APWR & 3 more vs. Date & AROMATICS



Where(178 rows excluded)

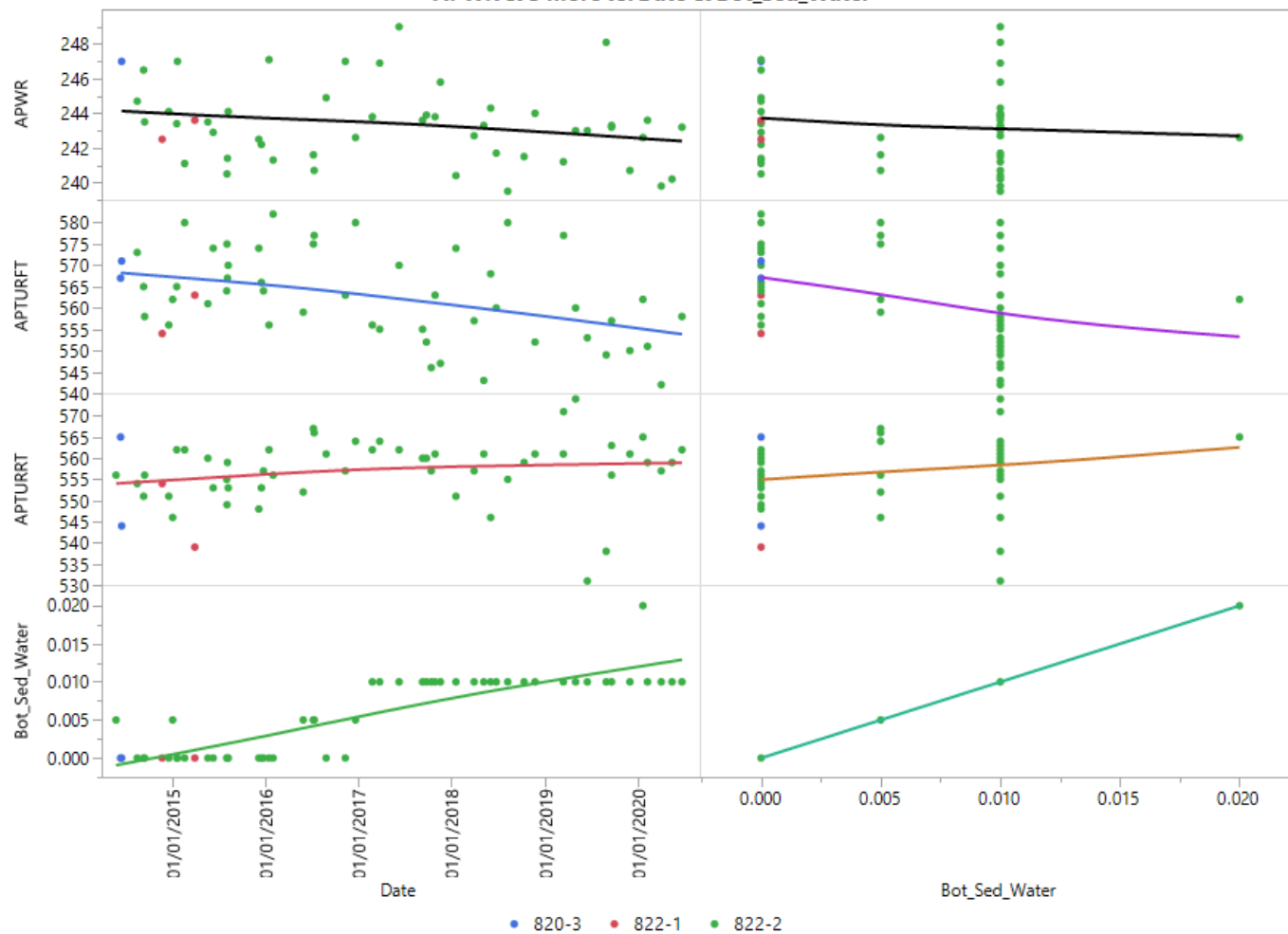
Graph Builder



Where(178 rows excluded)

Graph Builder

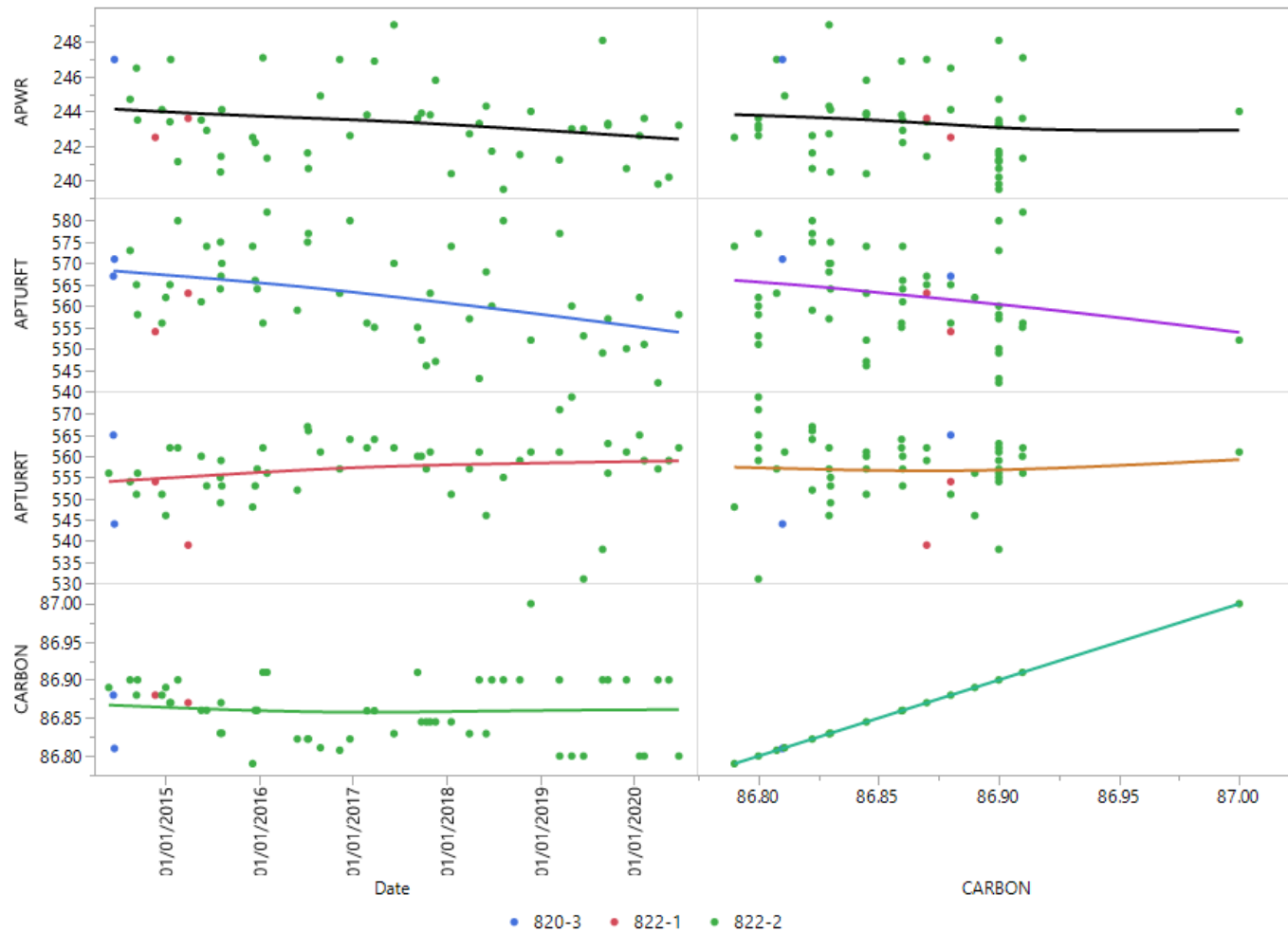
APWR & 3 more vs. Date & Bot_Sed_Water



Where(178 rows excluded)

Graph Builder

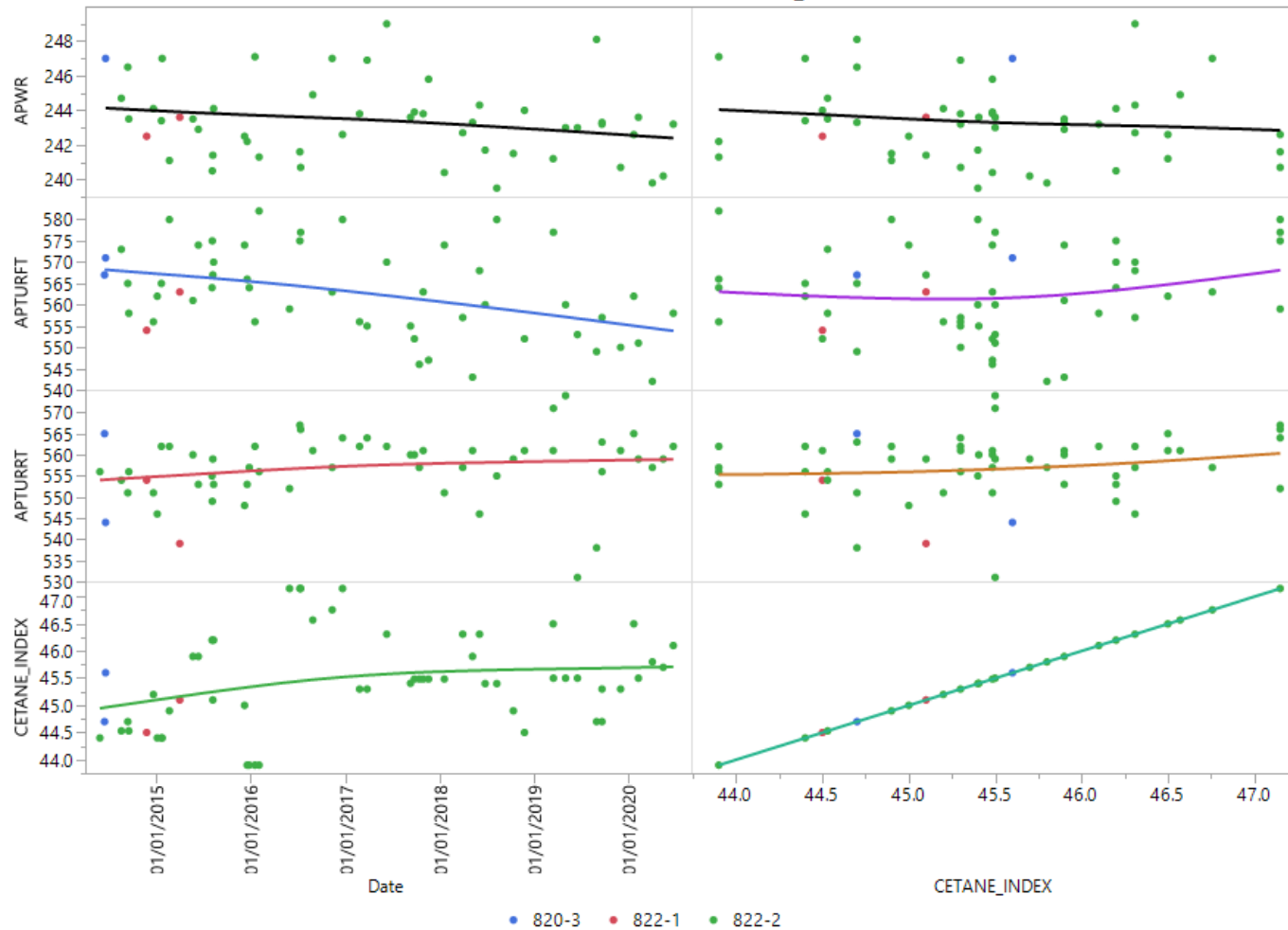
APWR & 3 more vs. Date & CARBON



Where(178 rows excluded)

Graph Builder

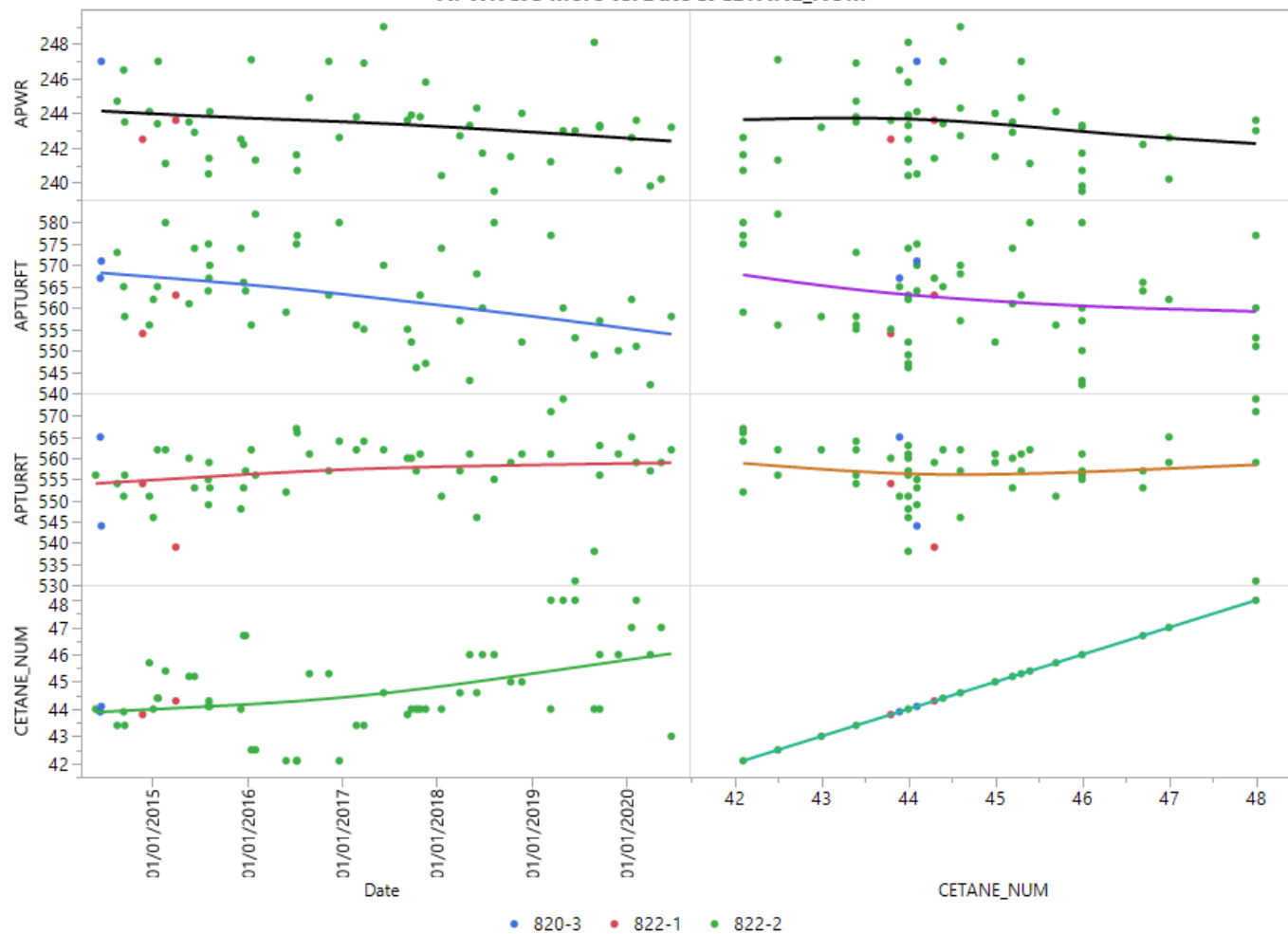
APWR & 3 more vs. Date & CETANE_INDEX



Where(178 rows excluded)

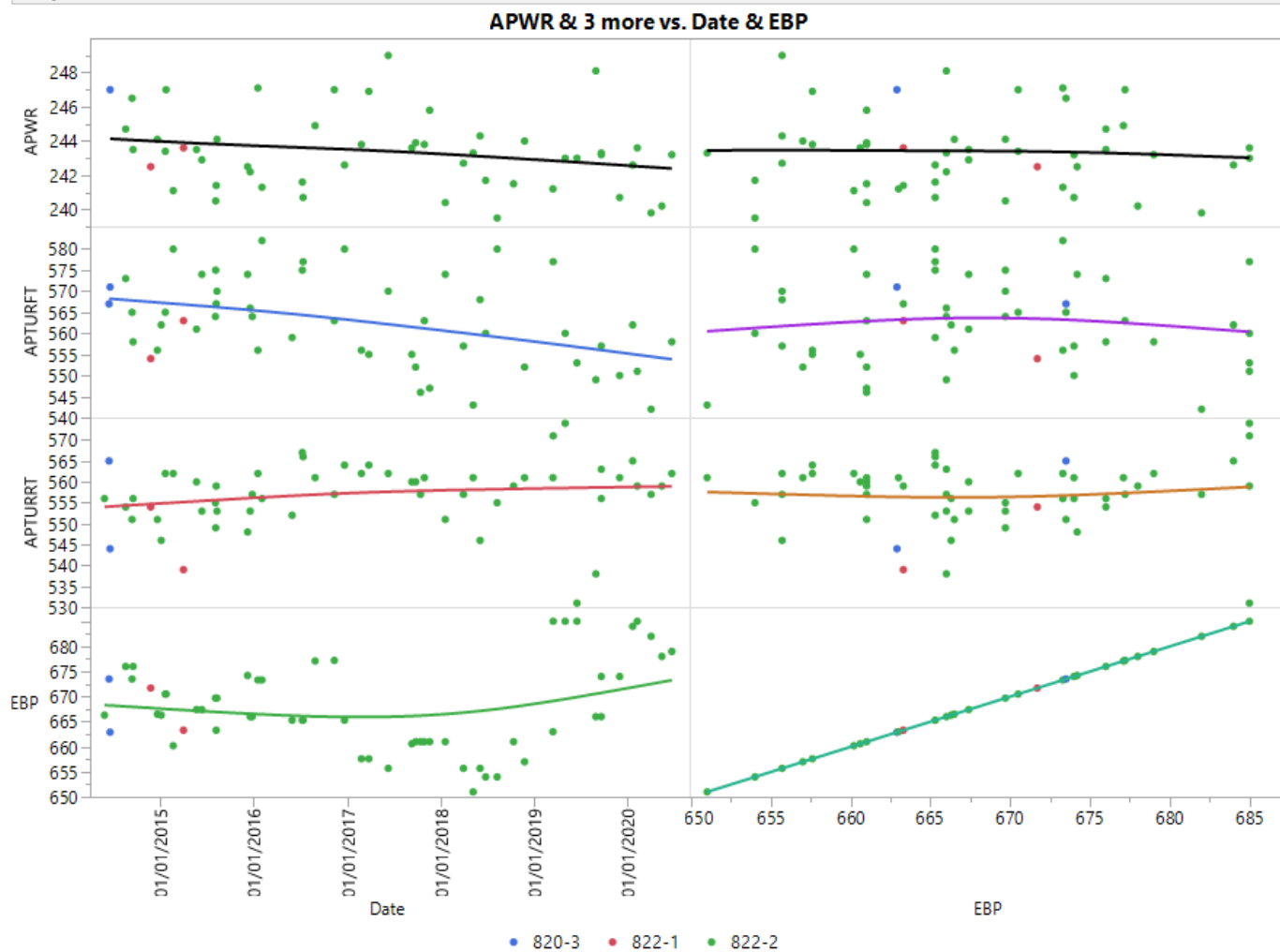
Graph Builder

APWR & 3 more vs. Date & CETANE_NUM



Where(178 rows excluded)

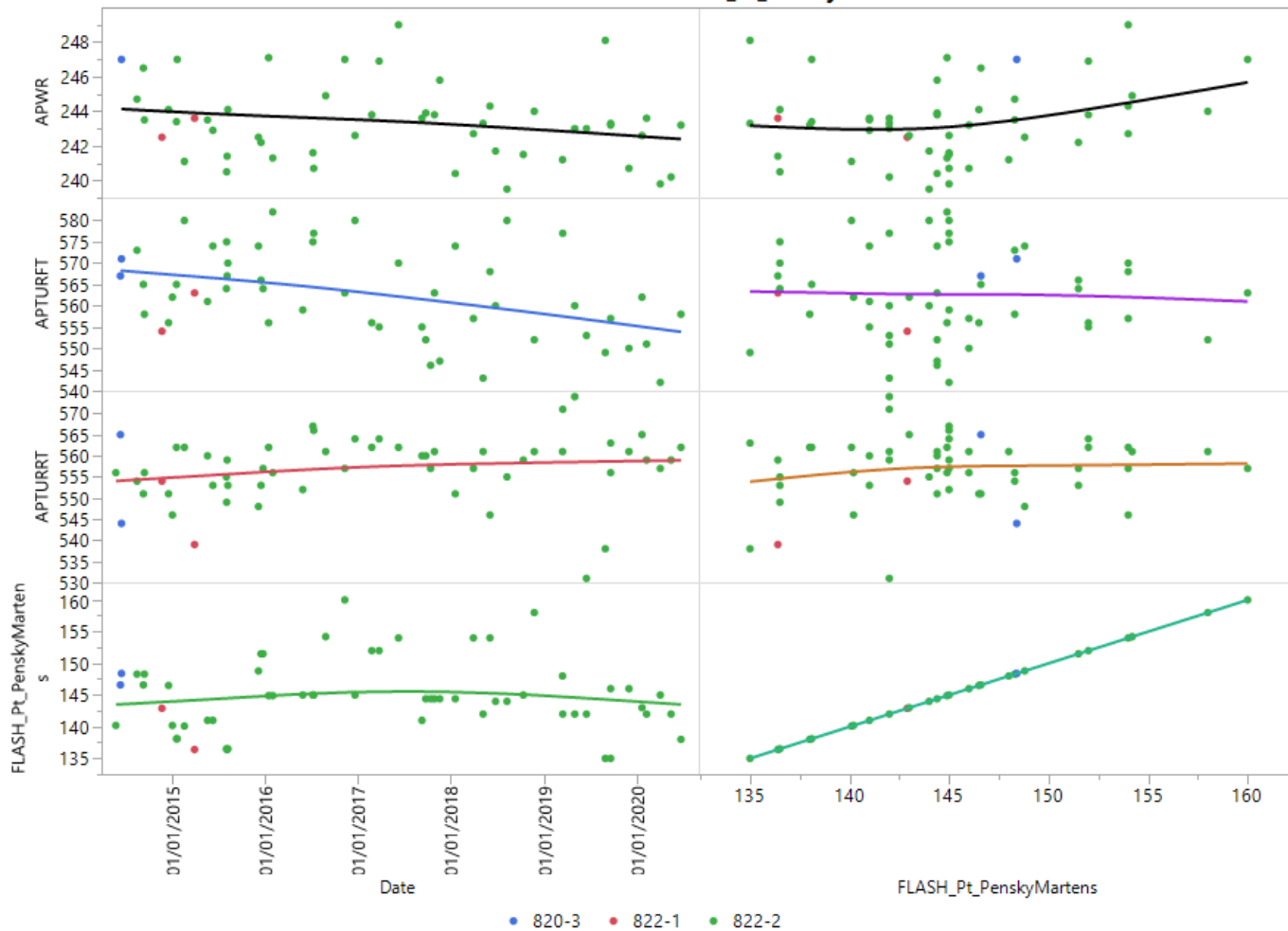
Graph Builder



Where(178 rows excluded)

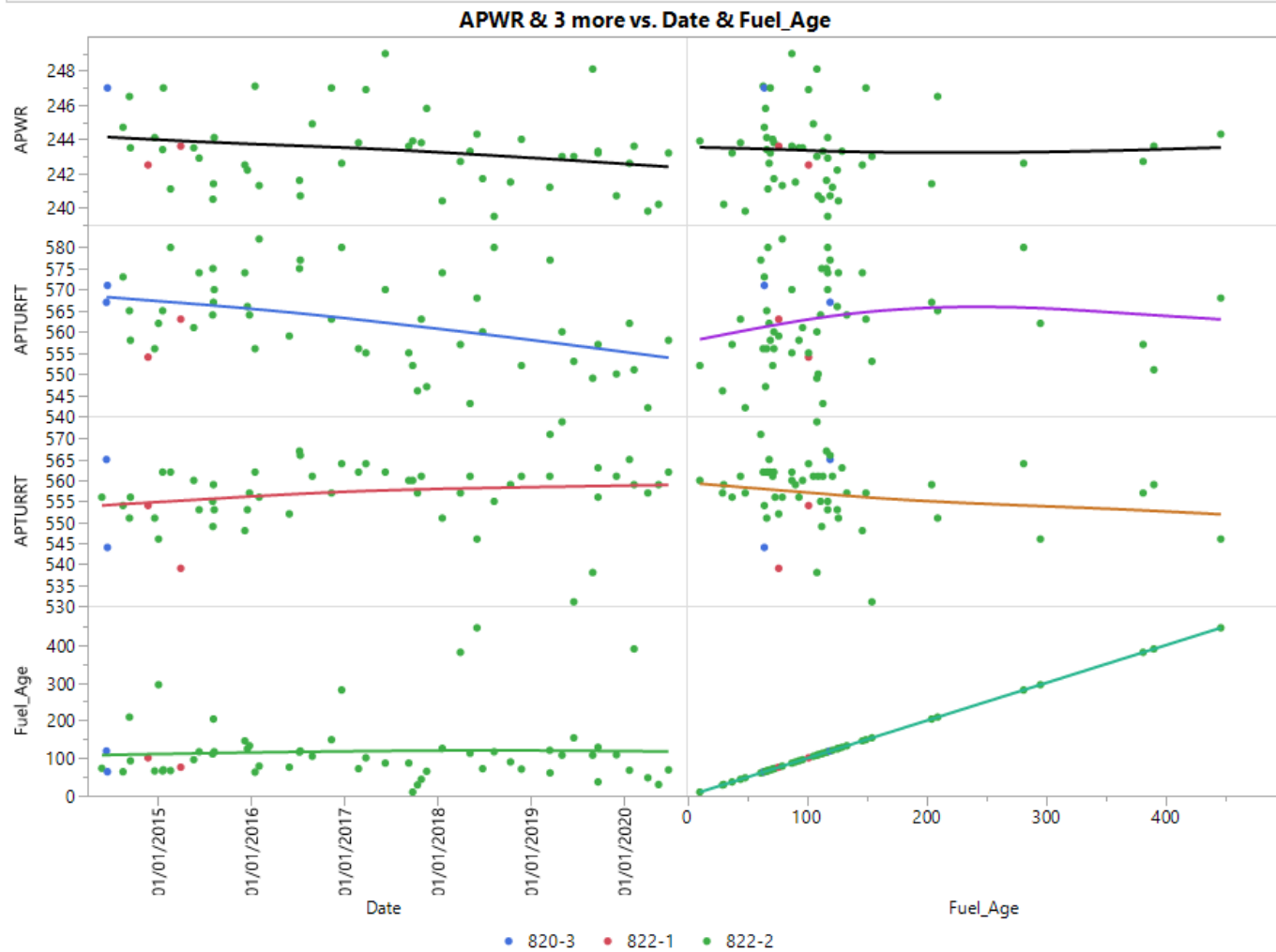
Graph Builder

APWR & 3 more vs. Date & FLASH_Pt_PenskyMartens



Where(178 rows excluded)

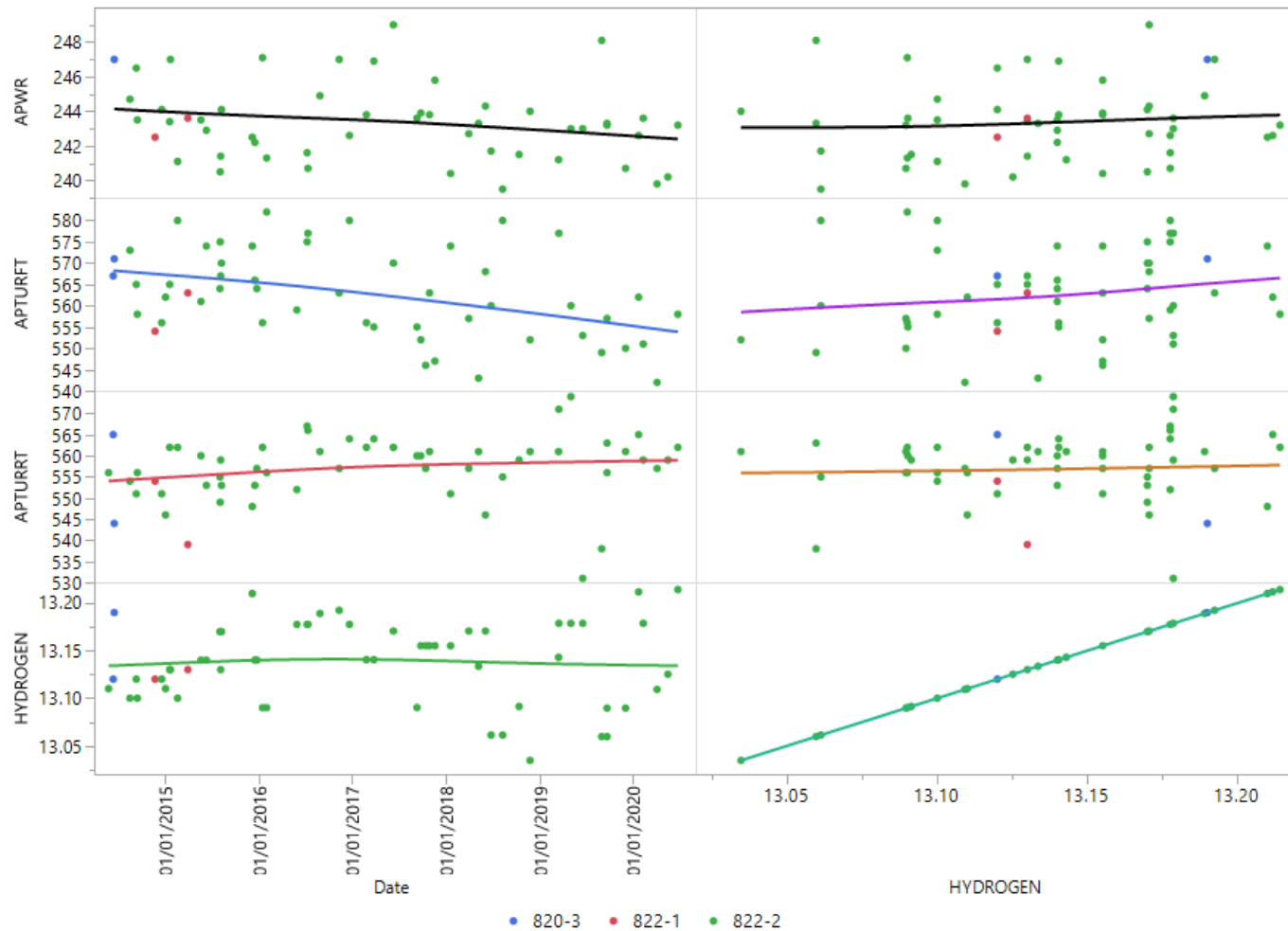
Graph Builder



Where(178 rows excluded)

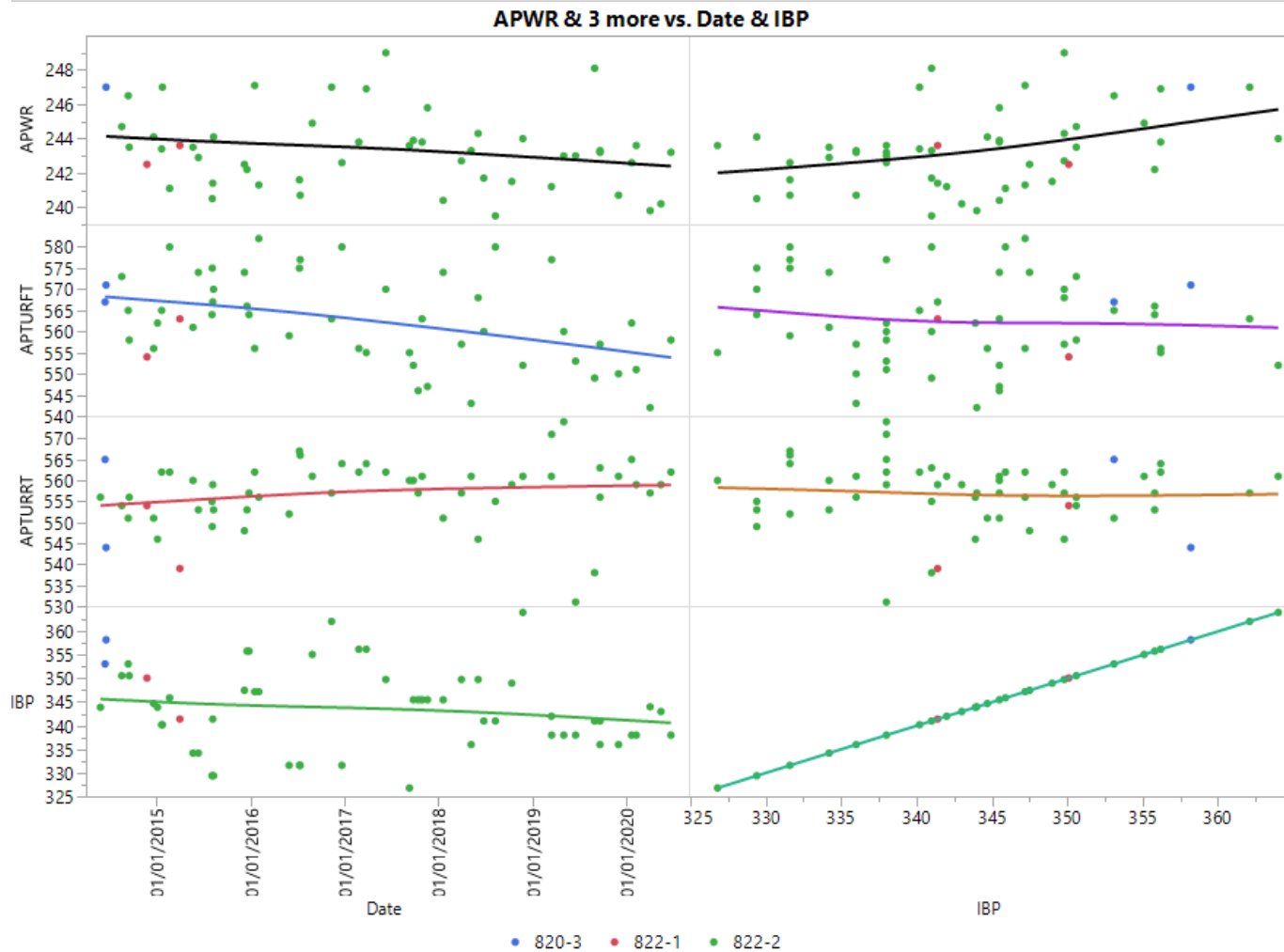
Graph Builder

APWR & 3 more vs. Date & HYDROGEN



Where(178 rows excluded)

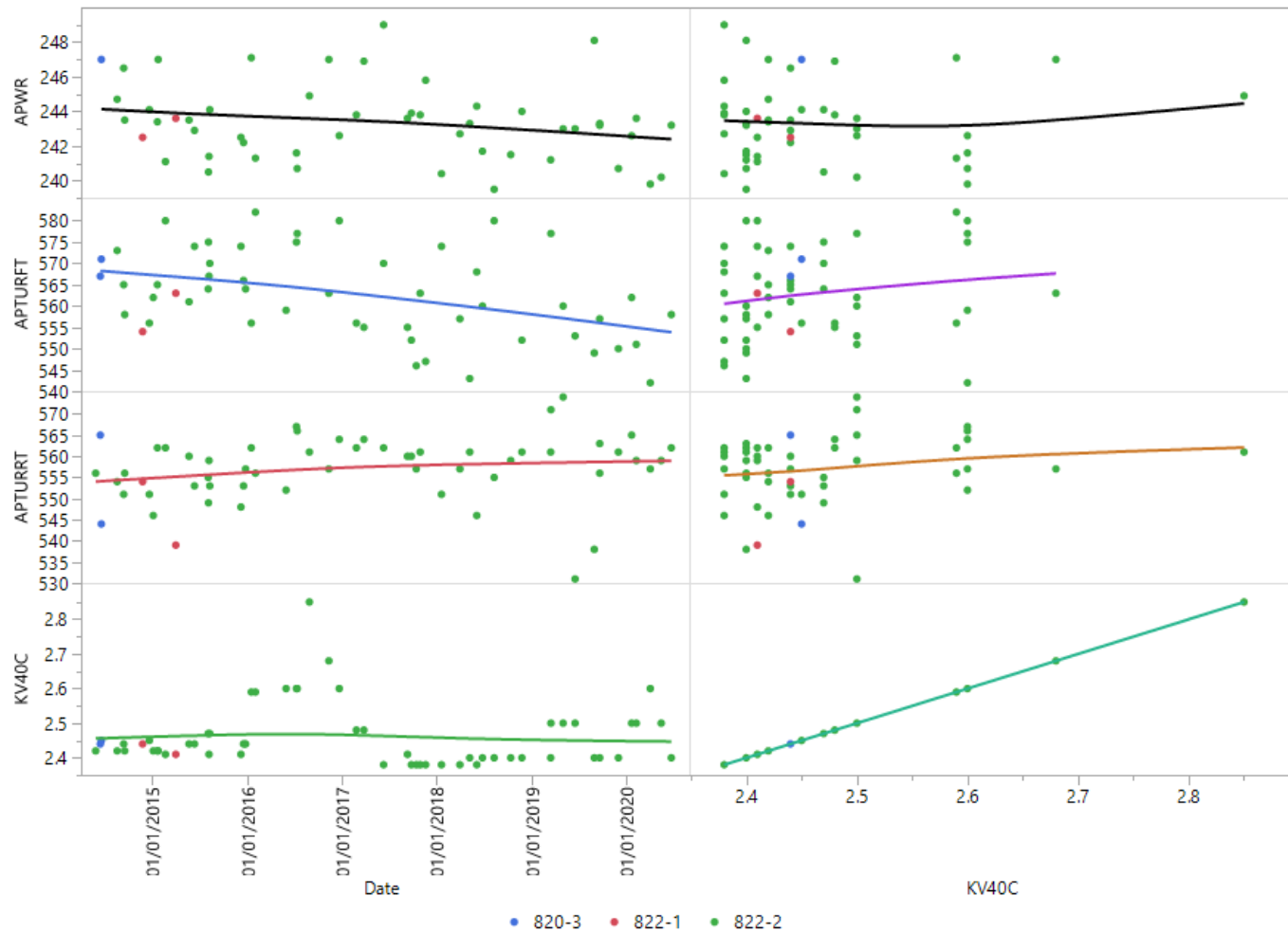
Graph Builder



Where(178 rows excluded)

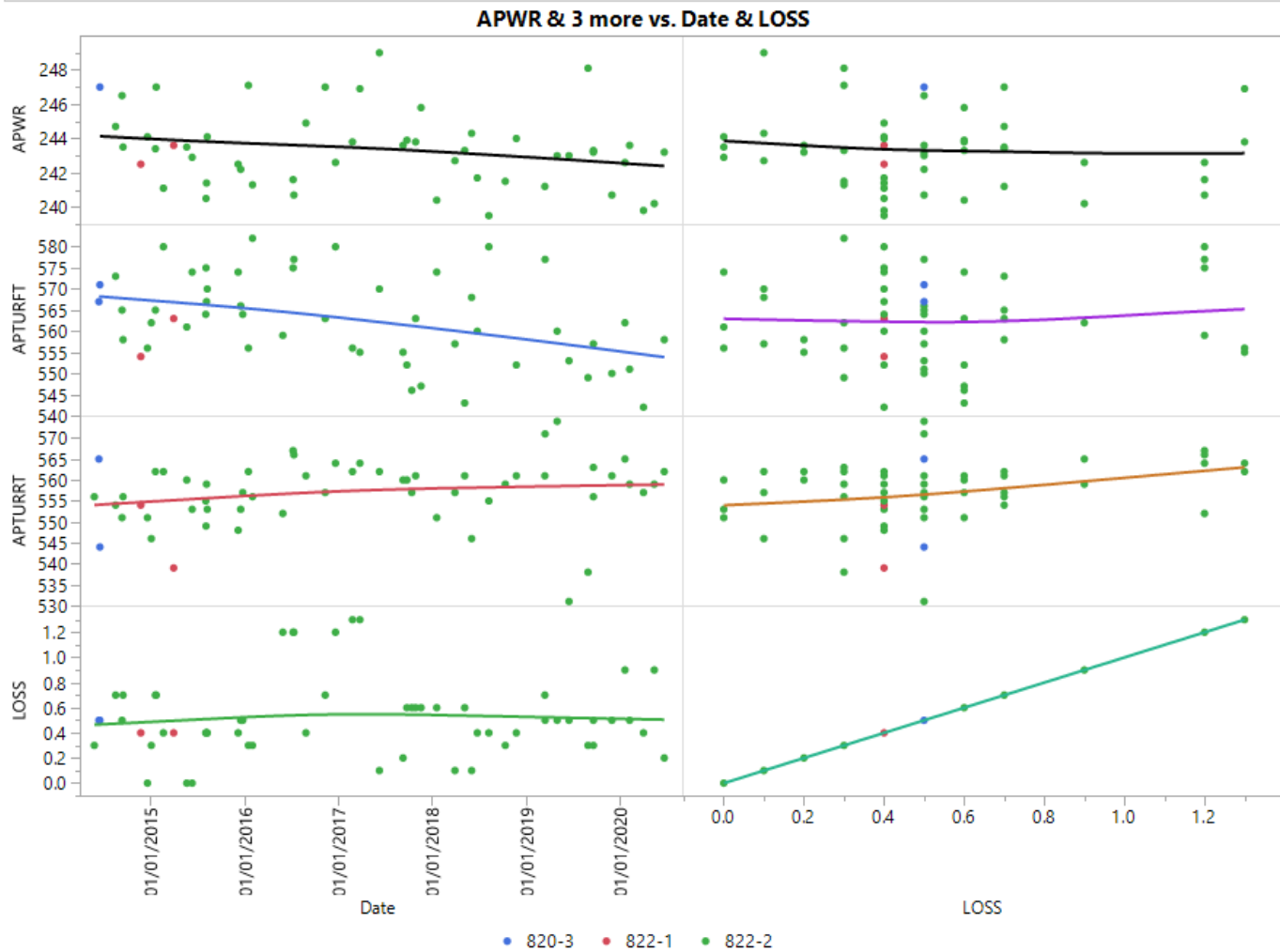
Graph Builder

APWR & 3 more vs. Date & KV40C



Where(178 rows excluded)

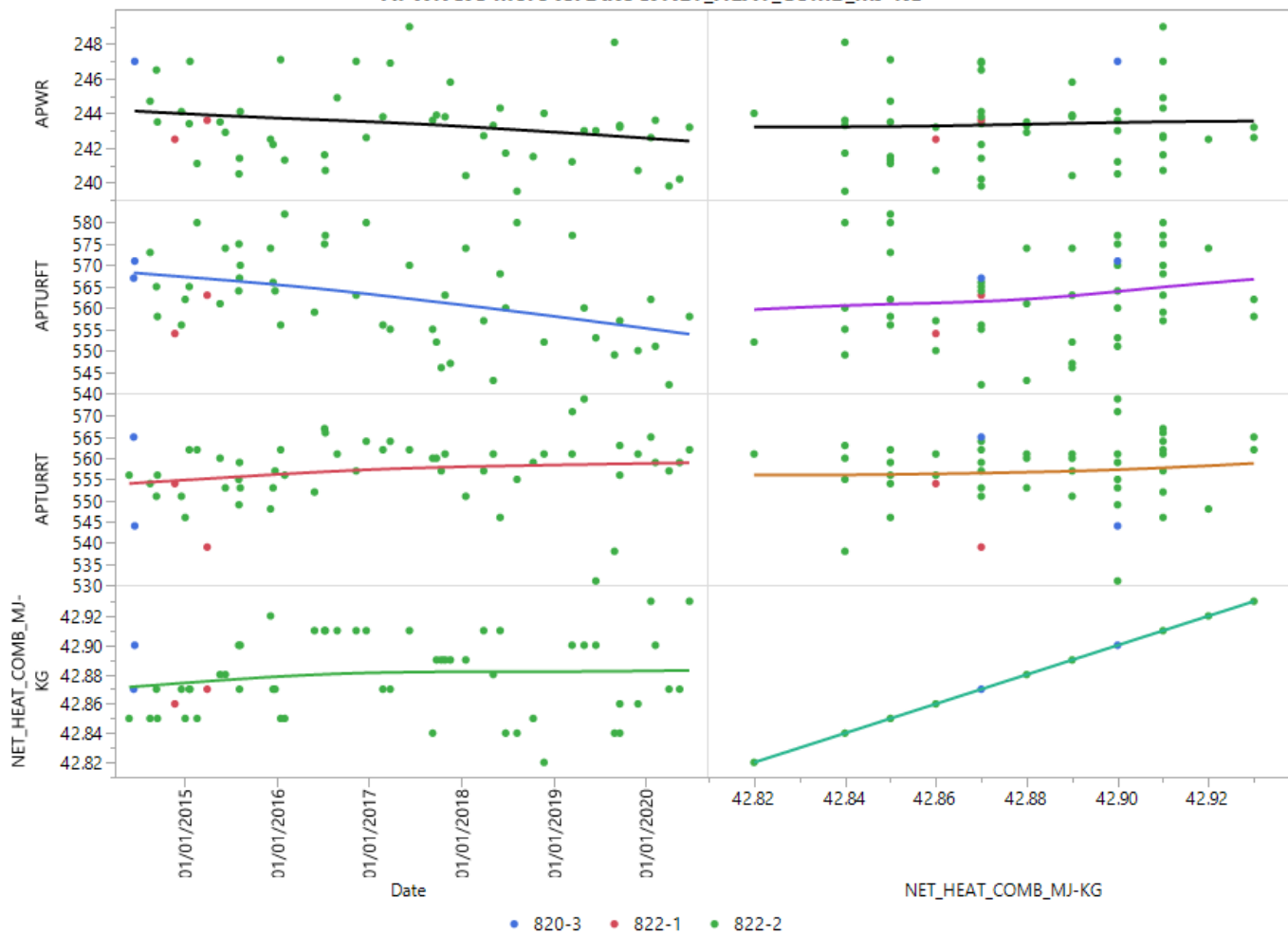
Graph Builder



Where(178 rows excluded)

Graph Builder

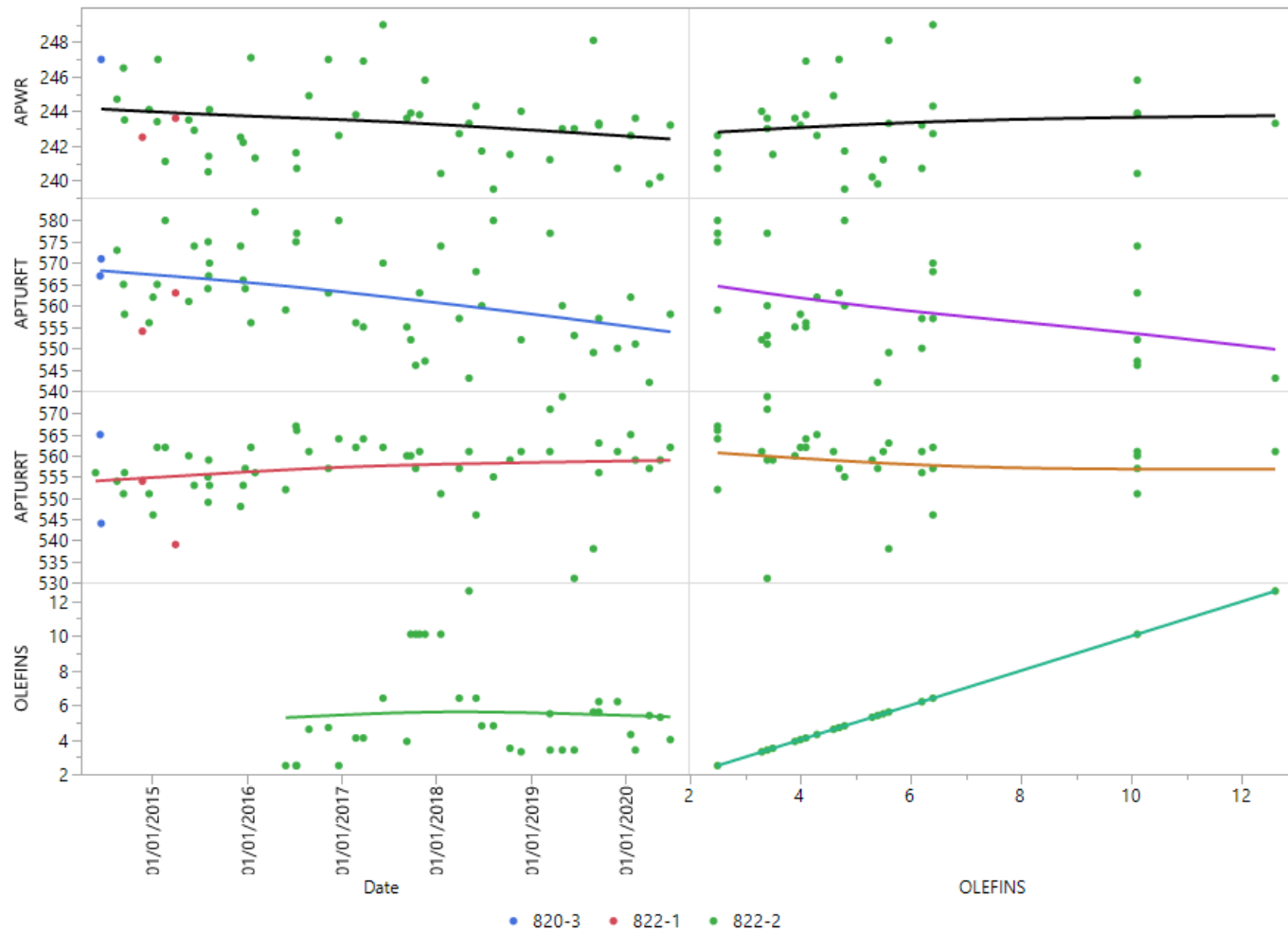
APWR & 3 more vs. Date & NET_HEAT_COMB_MJ-KG



Where(178 rows excluded)

Graph Builder

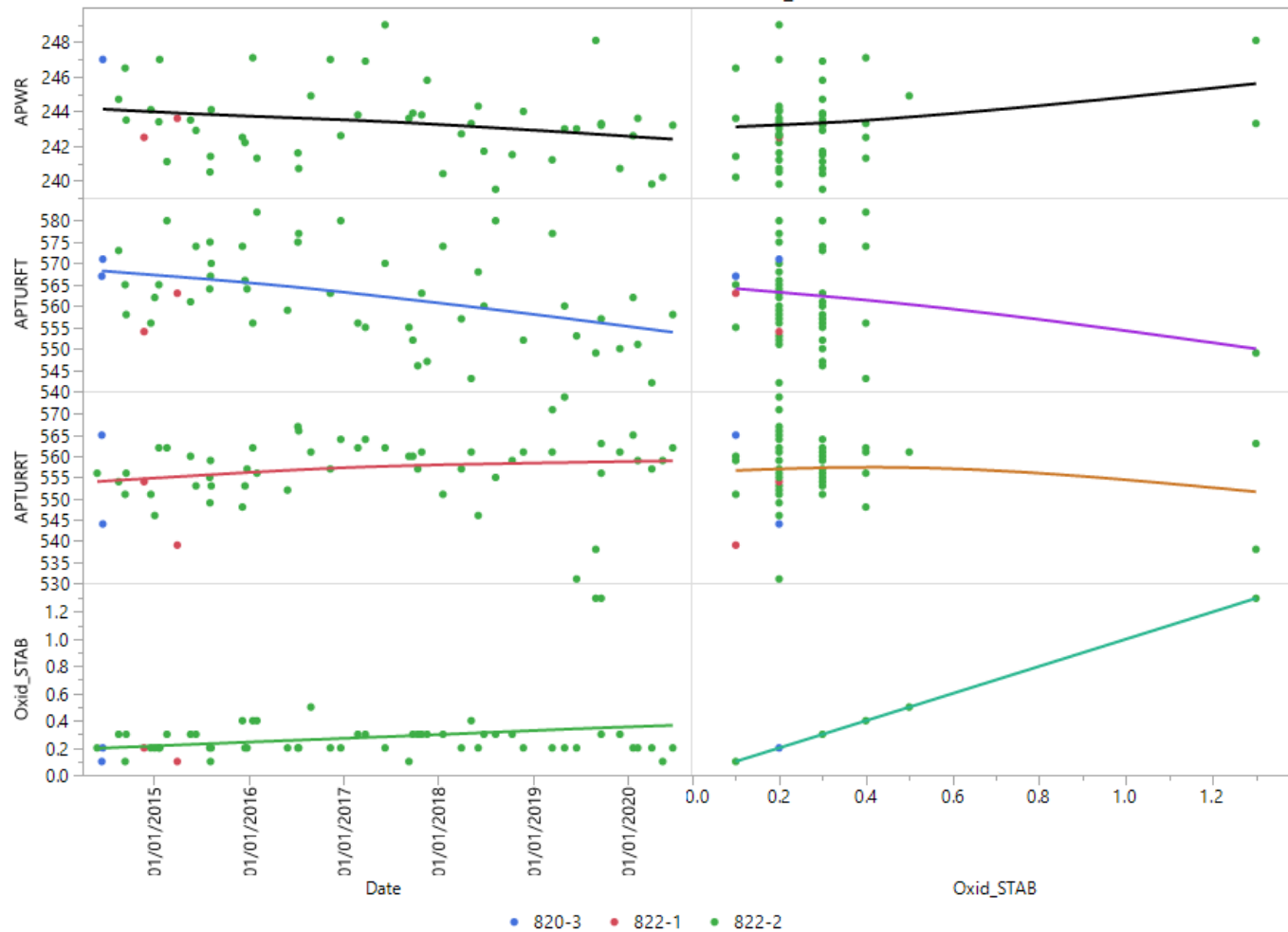
APWR & 3 more vs. Date & OLEFINS



Where(178 rows excluded)

Graph Builder

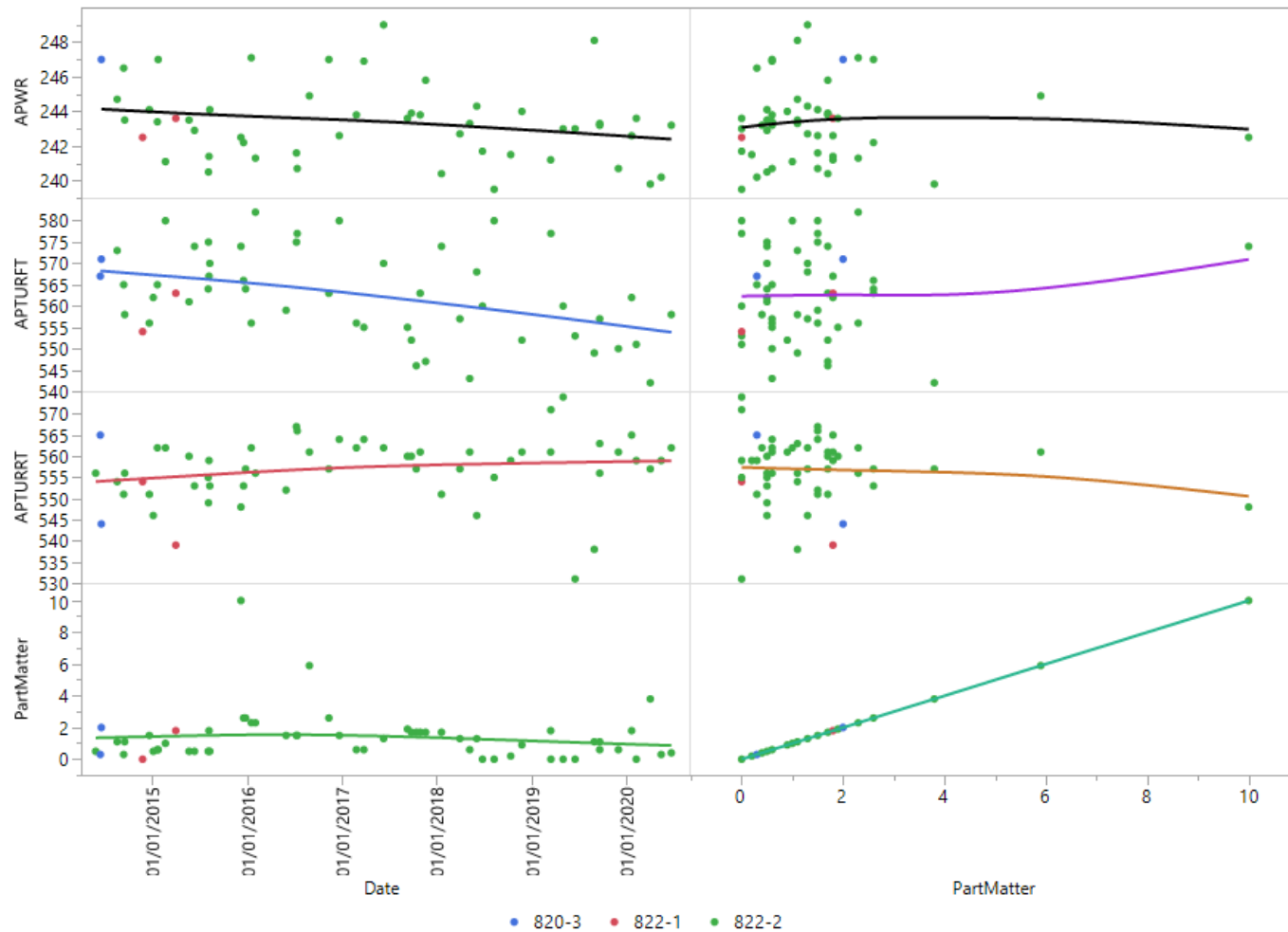
APWR & 3 more vs. Date & Oxid_STAB



Where(178 rows excluded)

Graph Builder

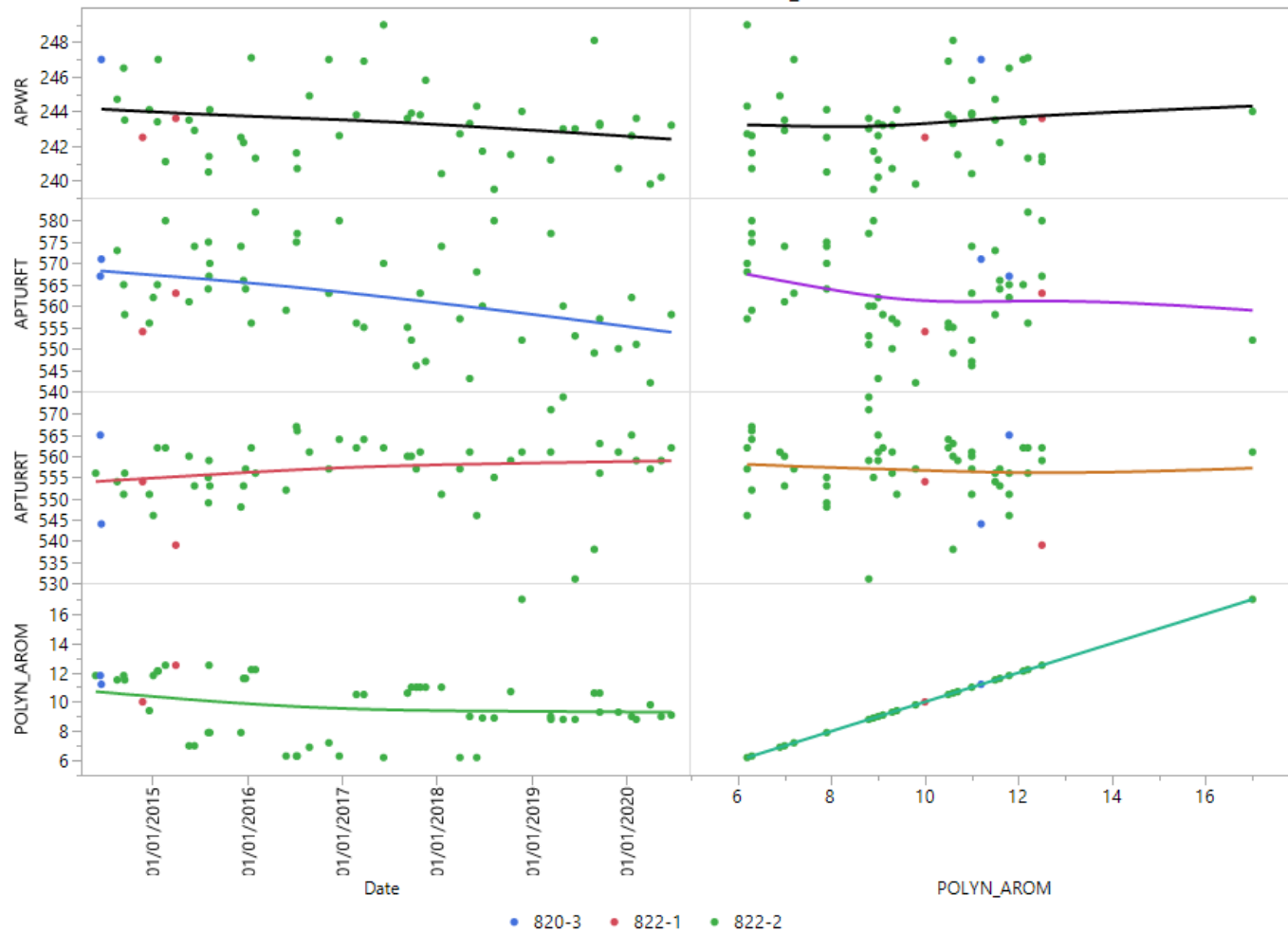
APWR & 3 more vs. Date & PartMatter



Where(178 rows excluded)

Graph Builder

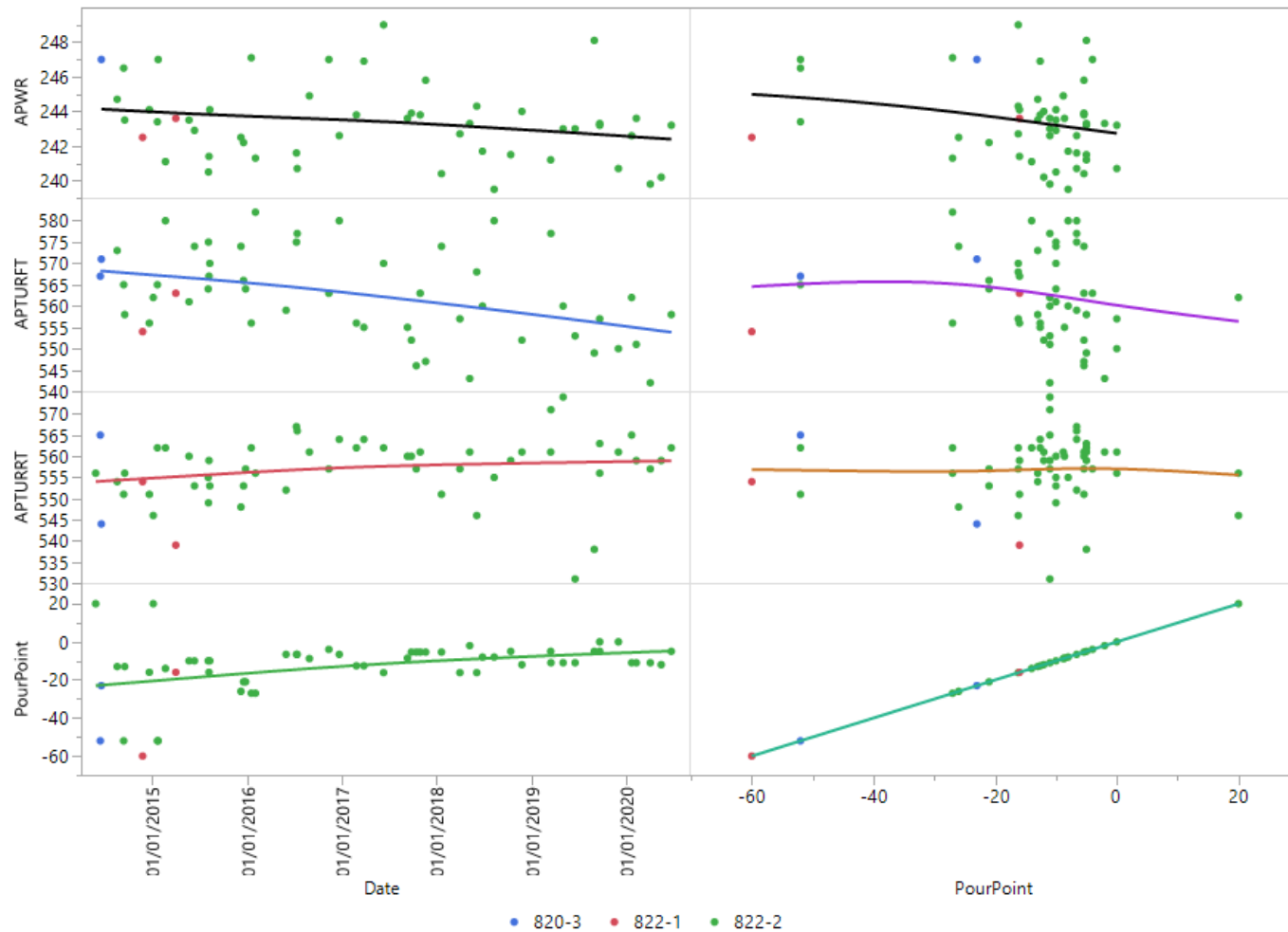
APWR & 3 more vs. Date & POLYN_AROM



Where(178 rows excluded)

Graph Builder

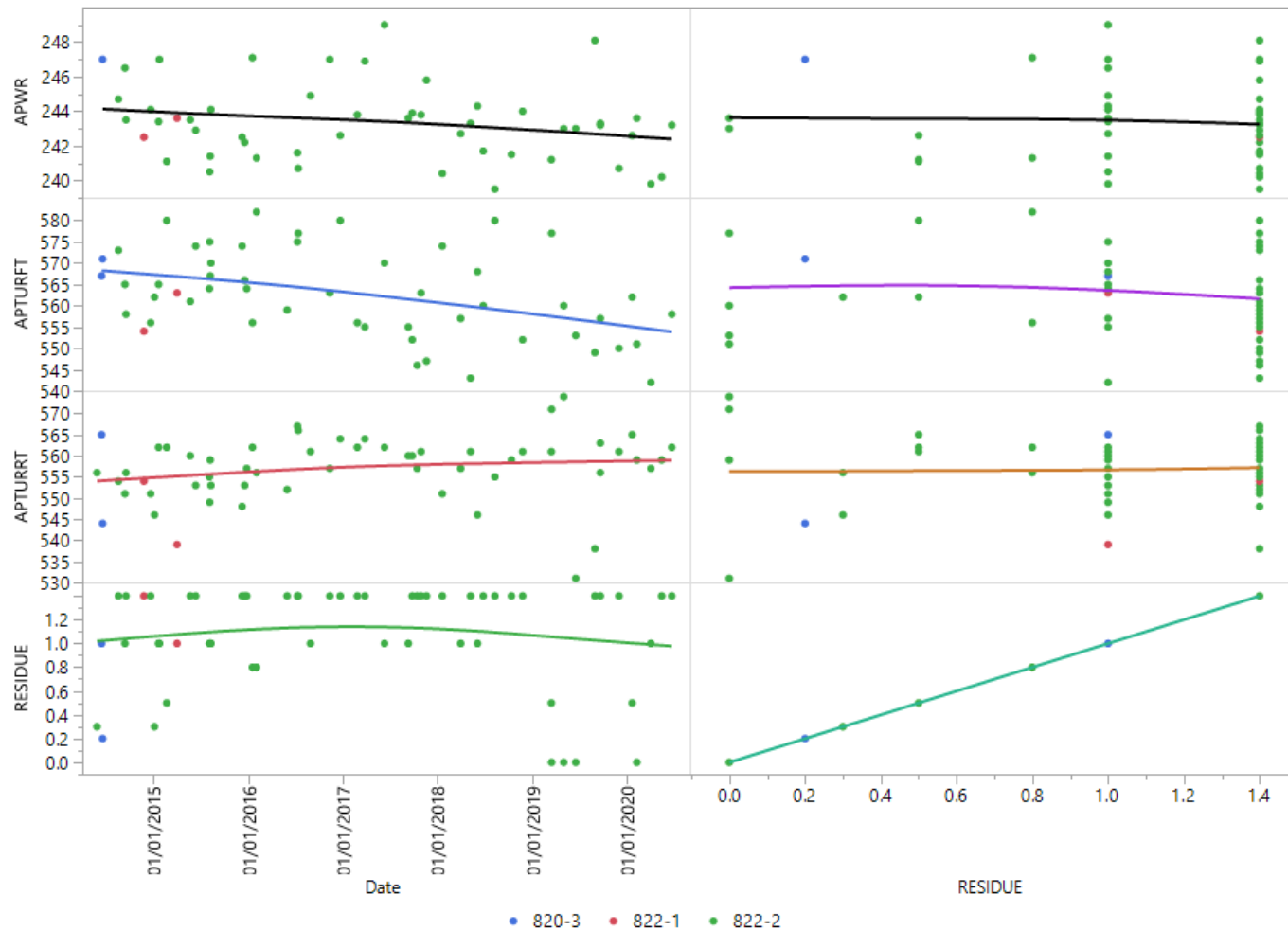
APWR & 3 more vs. Date & PourPoint



Where(178 rows excluded)

Graph Builder

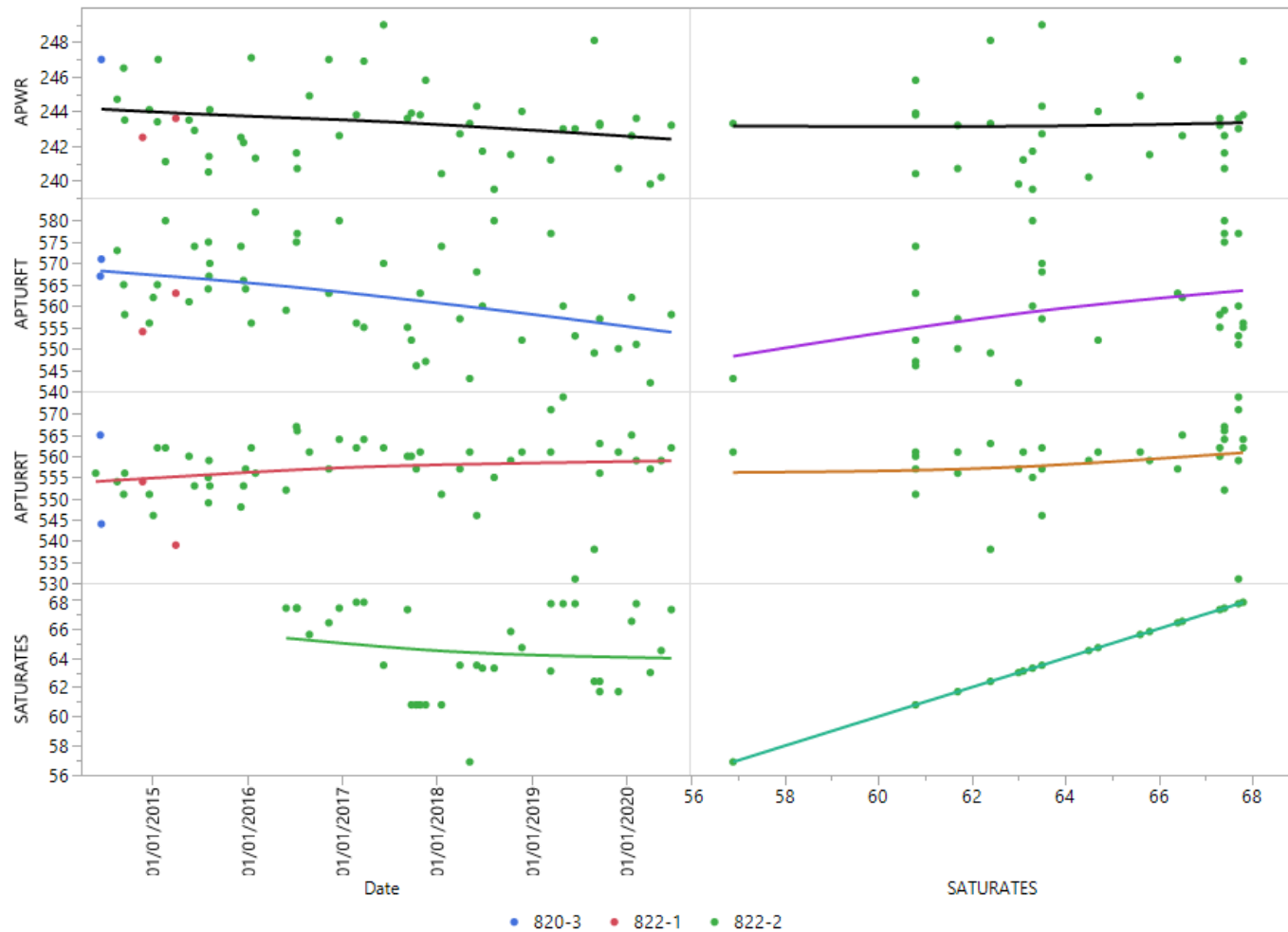
APWR & 3 more vs. Date & RESIDUE



Where(178 rows excluded)

Graph Builder

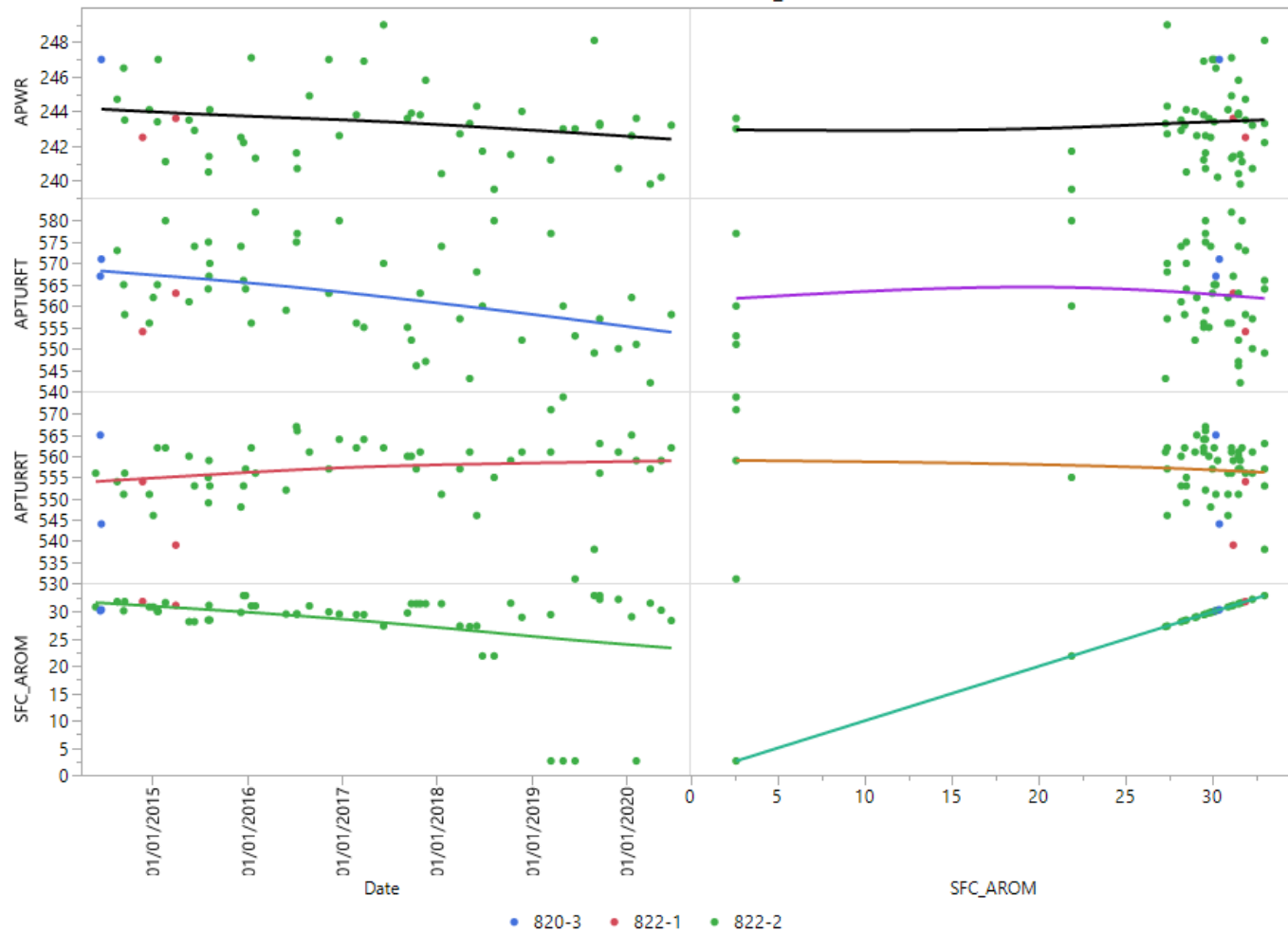
APWR & 3 more vs. Date & SATURATES



Where(178 rows excluded)

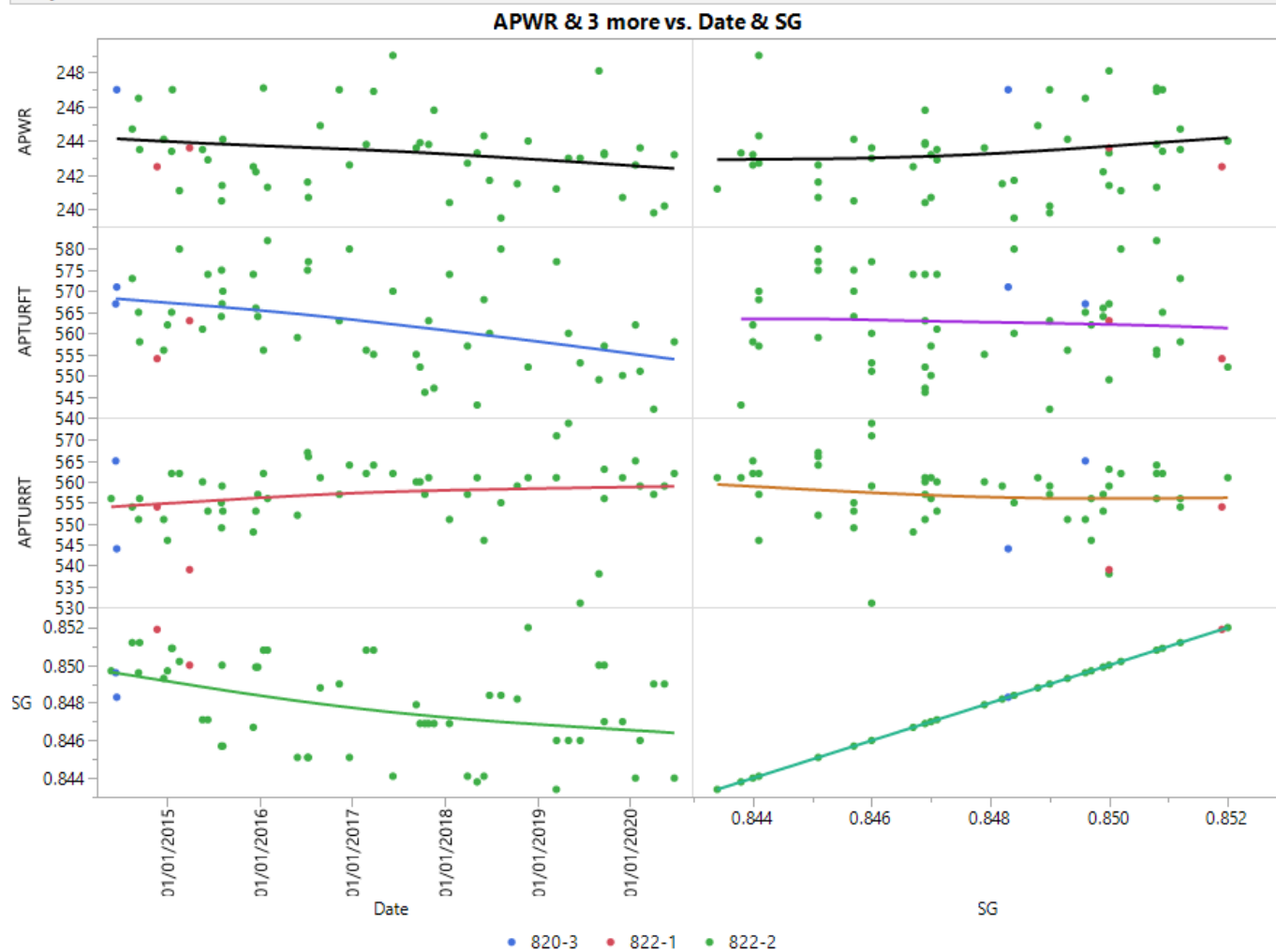
Graph Builder

APWR & 3 more vs. Date & SFC_AROM



Where(178 rows excluded)

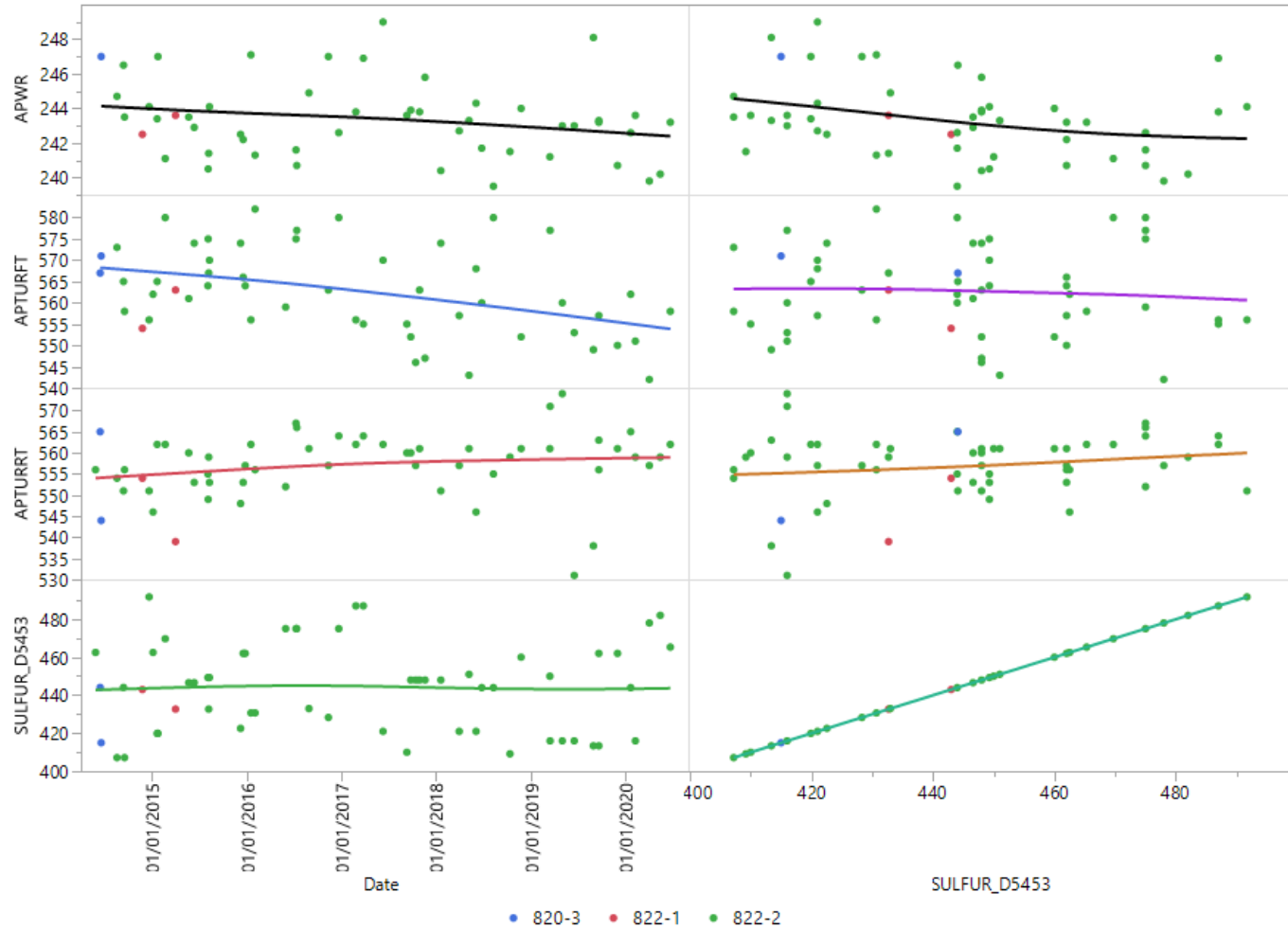
Graph Builder



Where(178 rows excluded)

Graph Builder

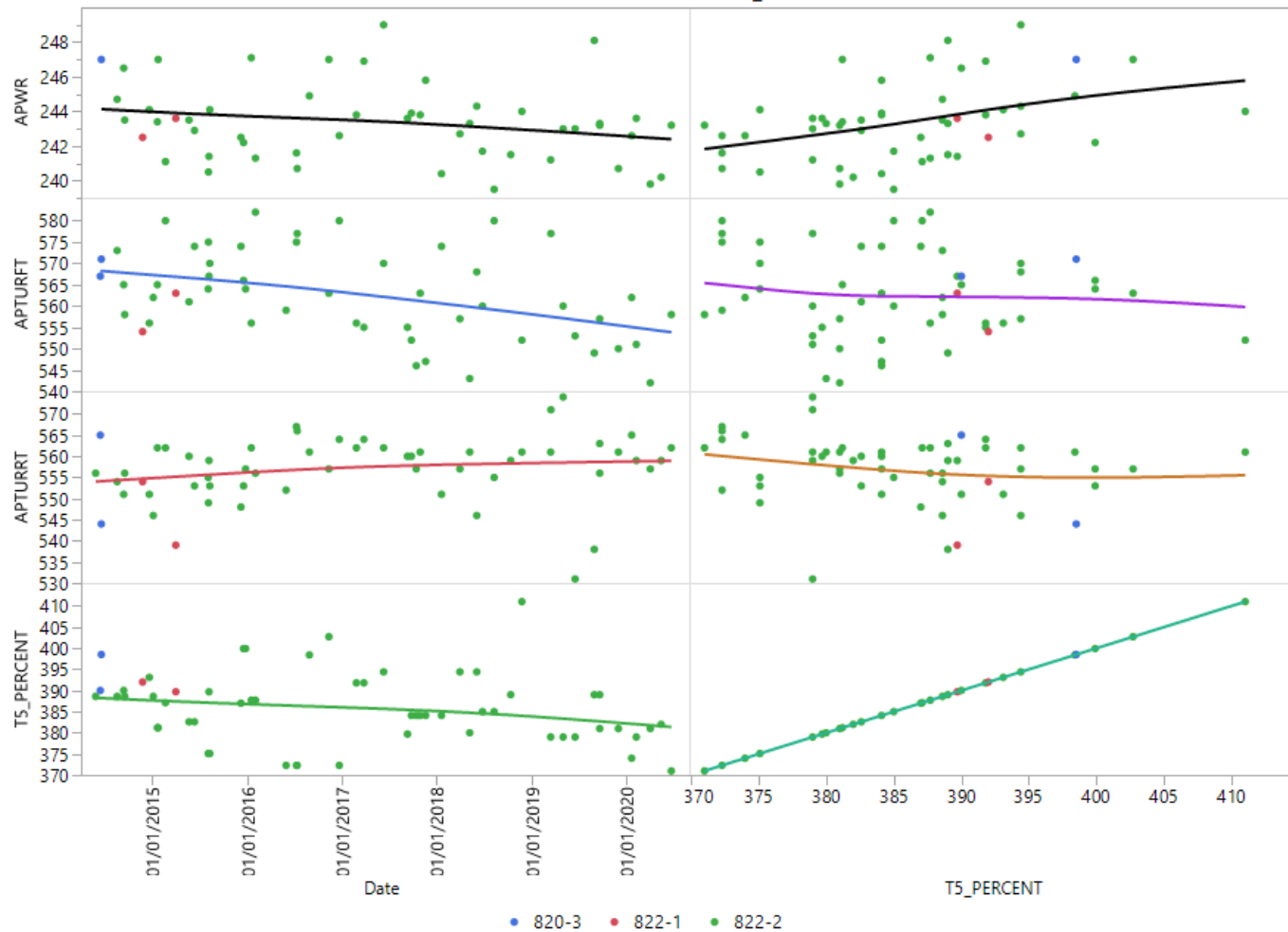
APWR & 3 more vs. Date & SULFUR_D5453



Where(178 rows excluded)

Graph Builder

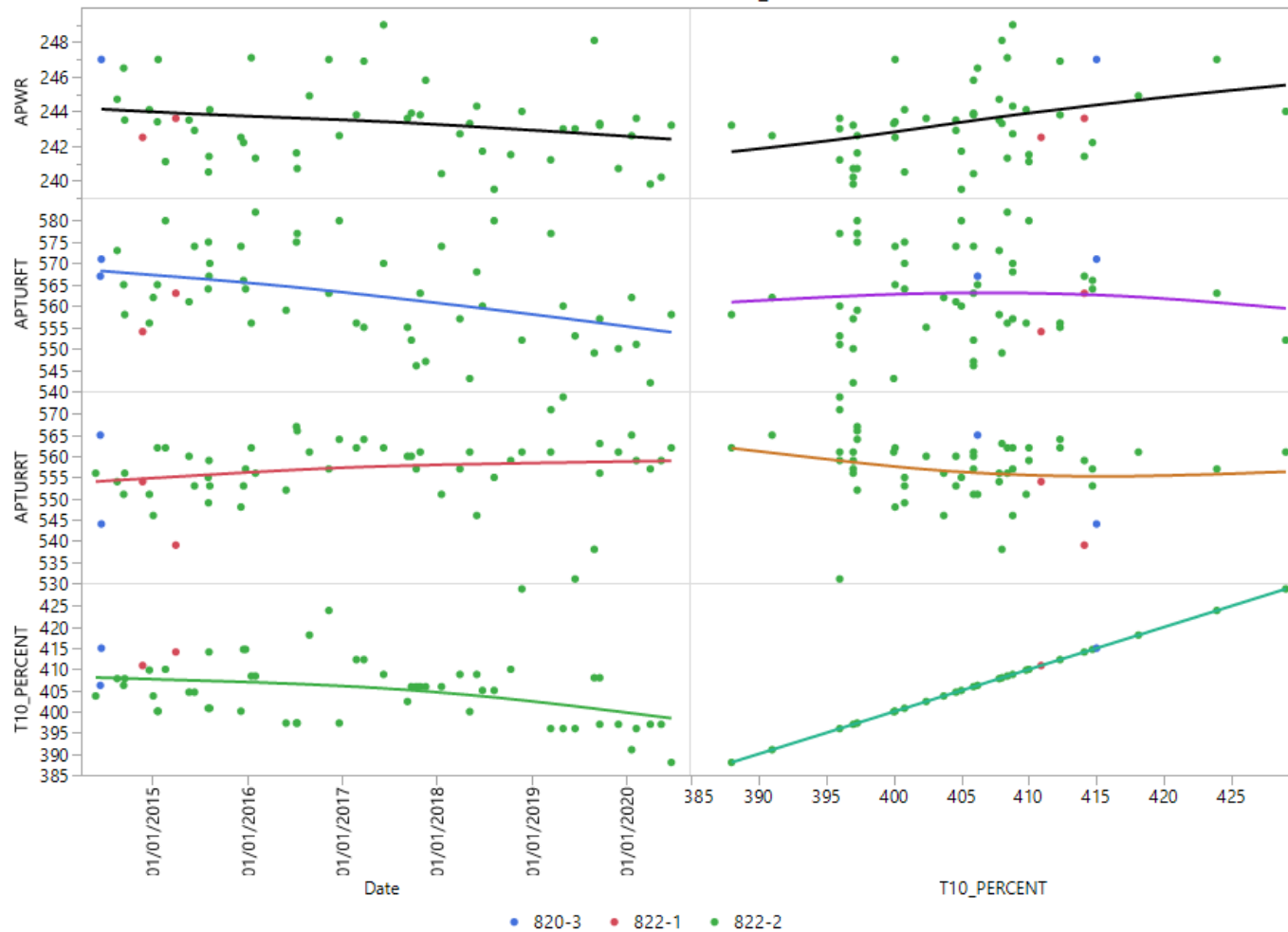
APWR & 3 more vs. Date & T5_PERCENT



Where(178 rows excluded)

Graph Builder

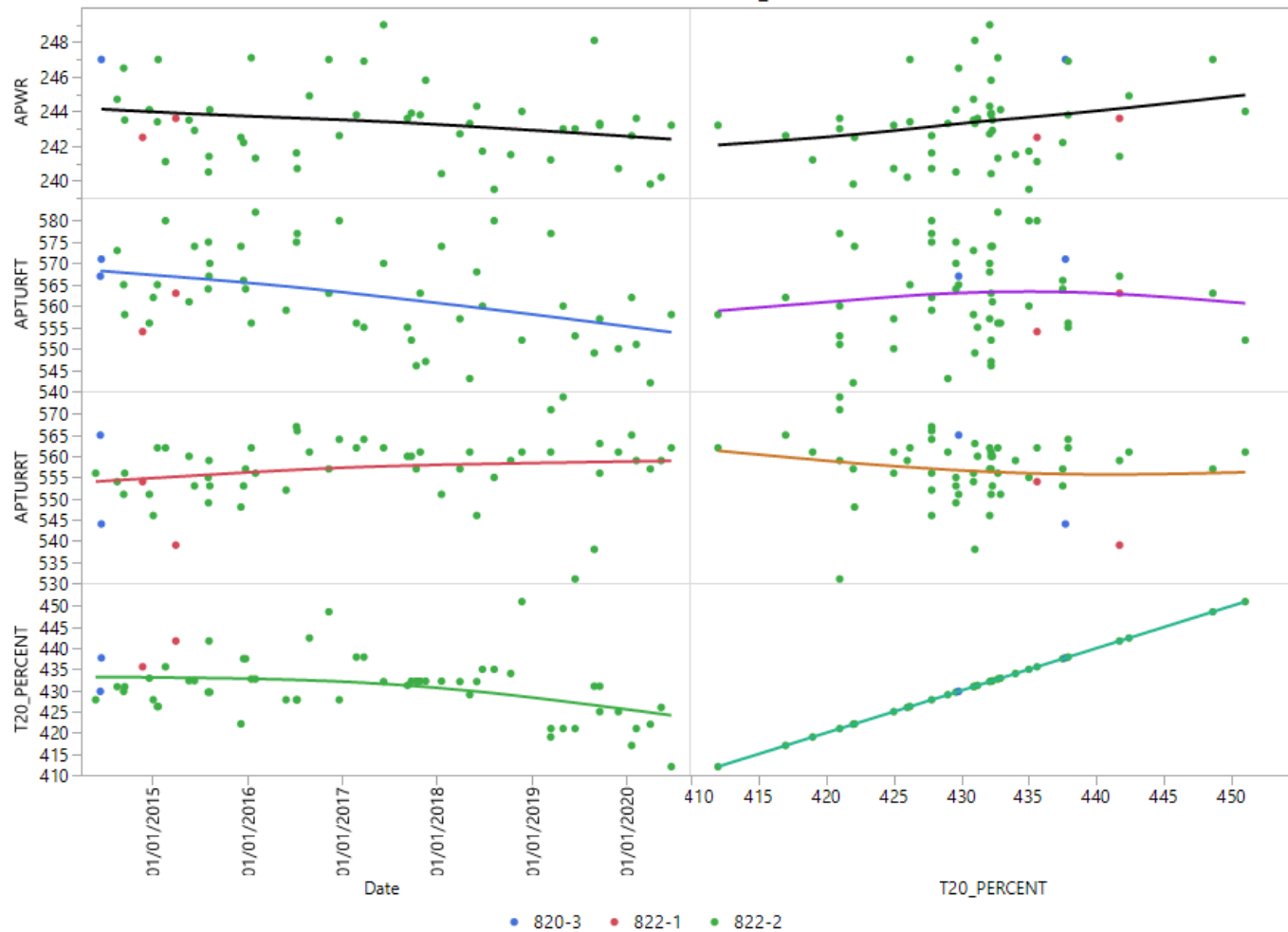
APWR & 3 more vs. Date & T10_PERCENT



Where(178 rows excluded)

Graph Builder

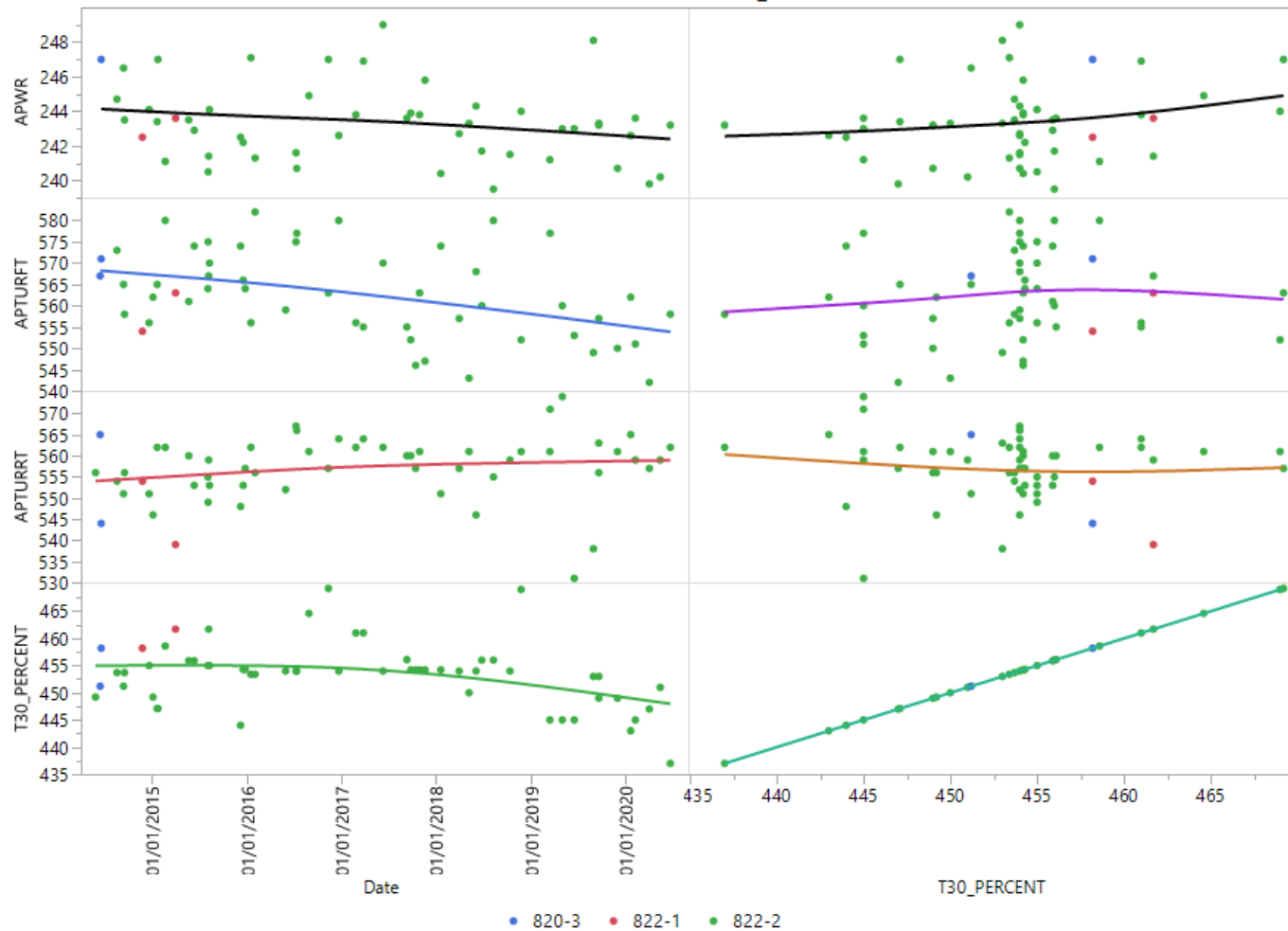
APWR & 3 more vs. Date & T20_PERCENT



Where(178 rows excluded)

Graph Builder

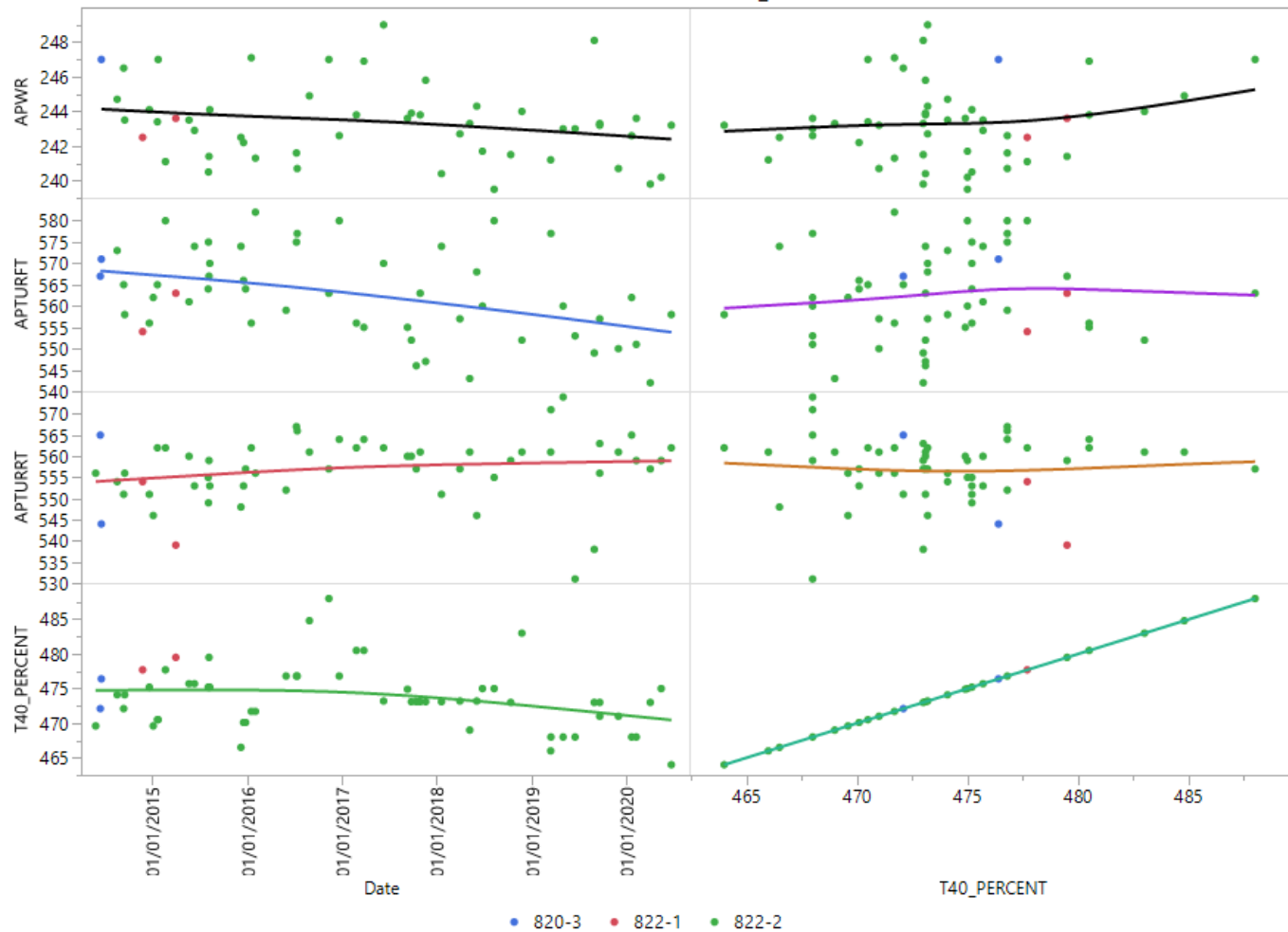
APWR & 3 more vs. Date & T30_PERCENT



Where(178 rows excluded)

Graph Builder

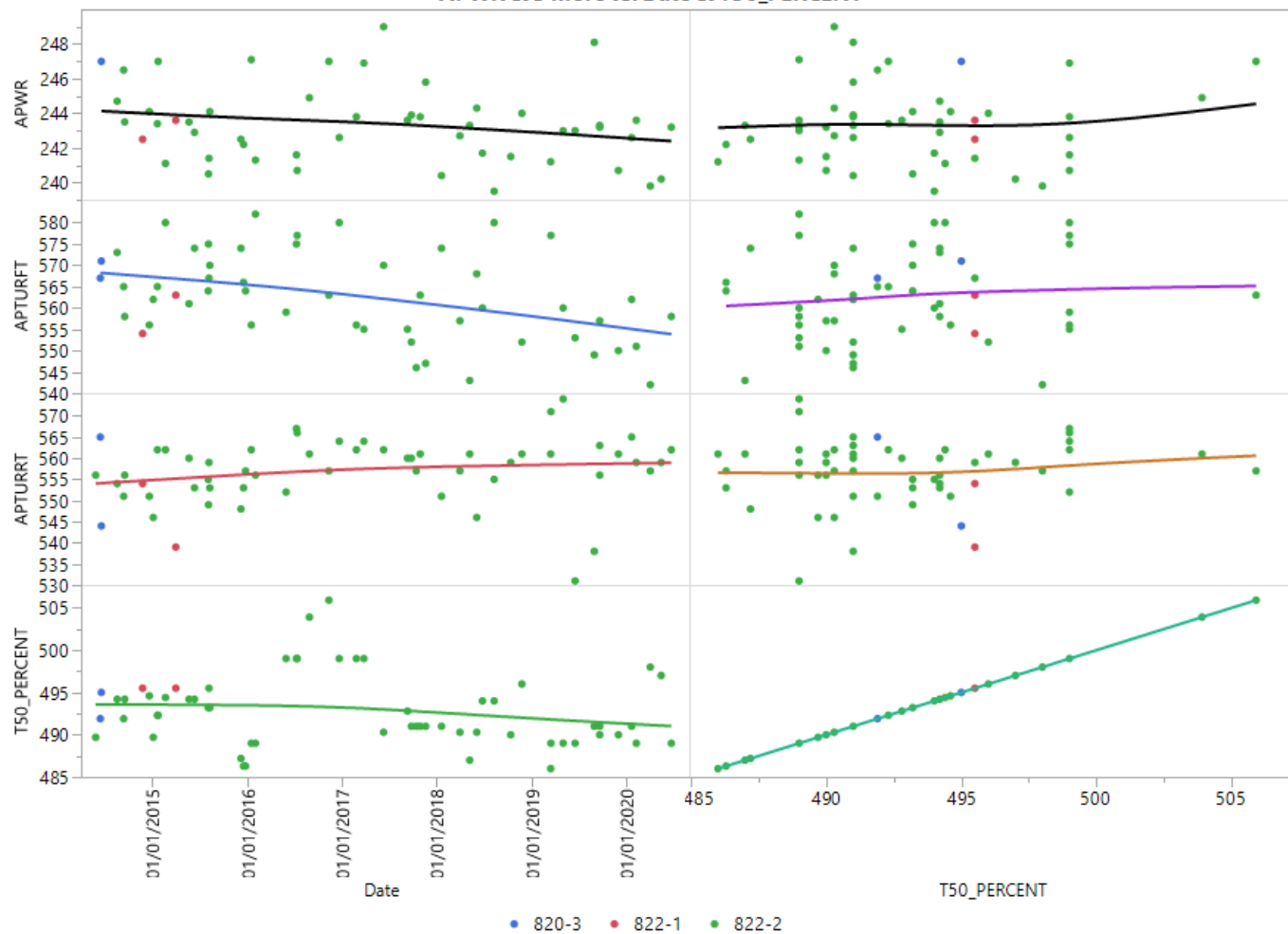
APWR & 3 more vs. Date & T40_PERCENT



Where(178 rows excluded)

Graph Builder

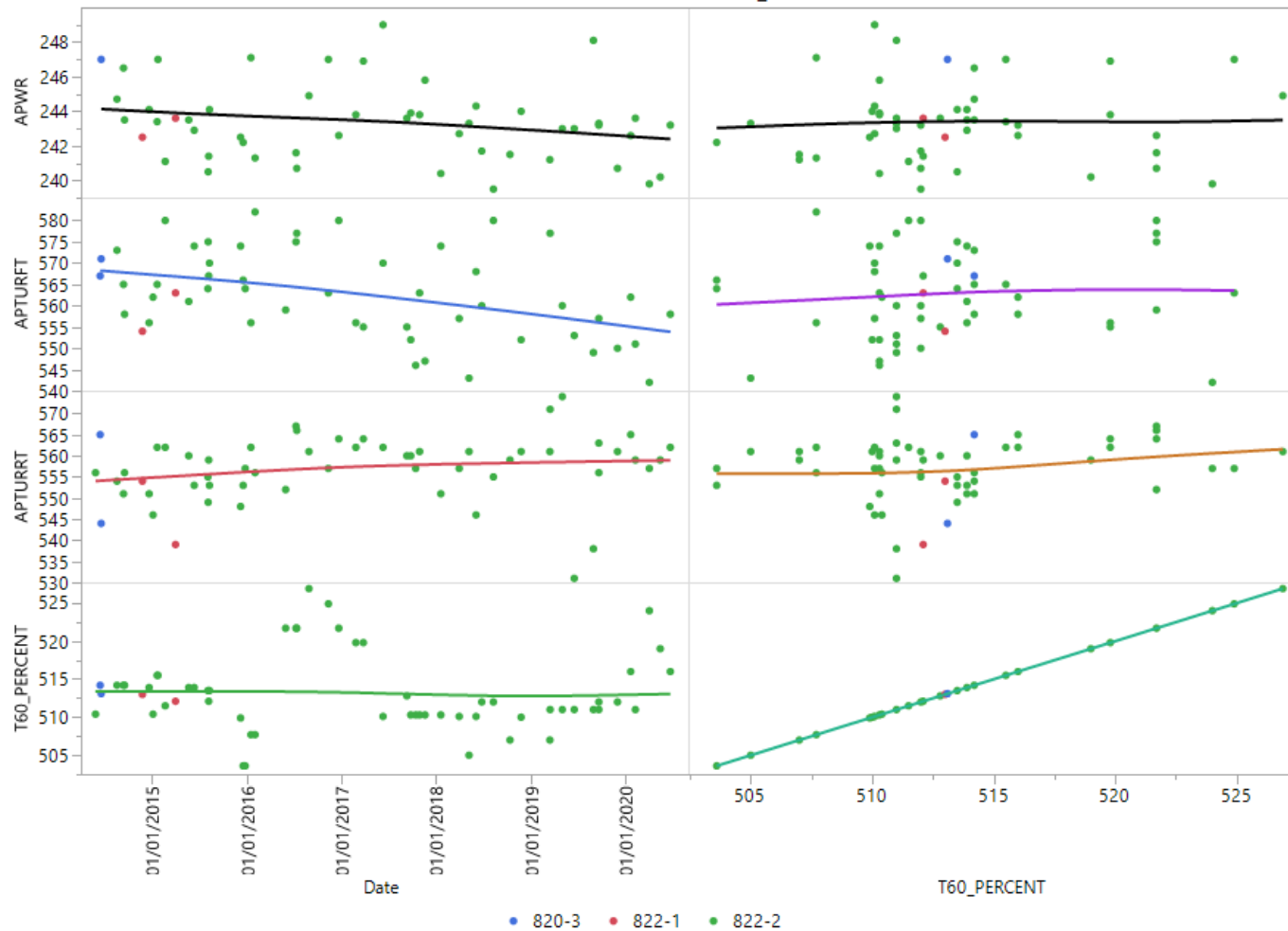
APWR & 3 more vs. Date & T50_PERCENT



Where(178 rows excluded)

Graph Builder

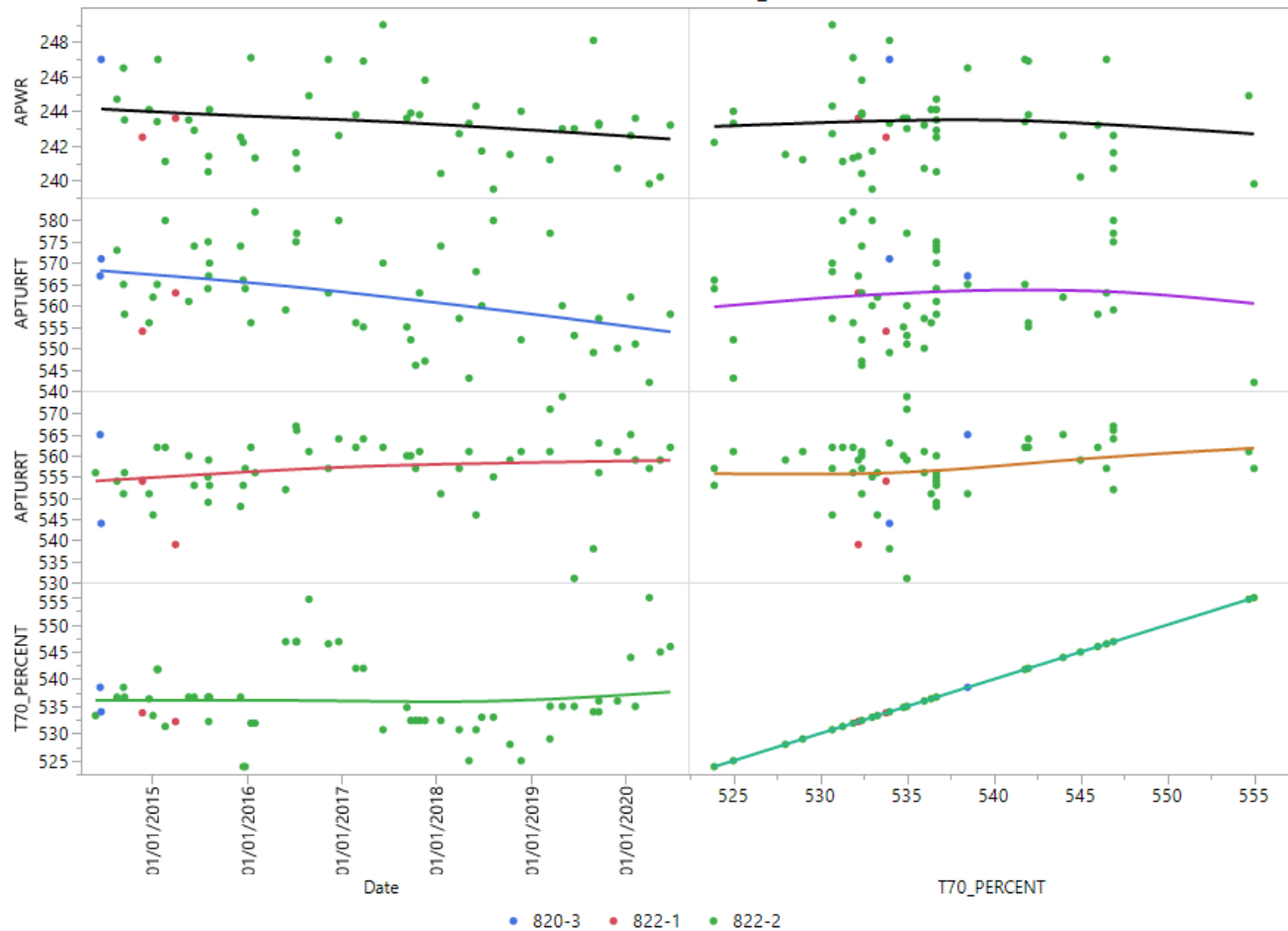
APWR & 3 more vs. Date & T60_PERCENT



Where(178 rows excluded)

Graph Builder

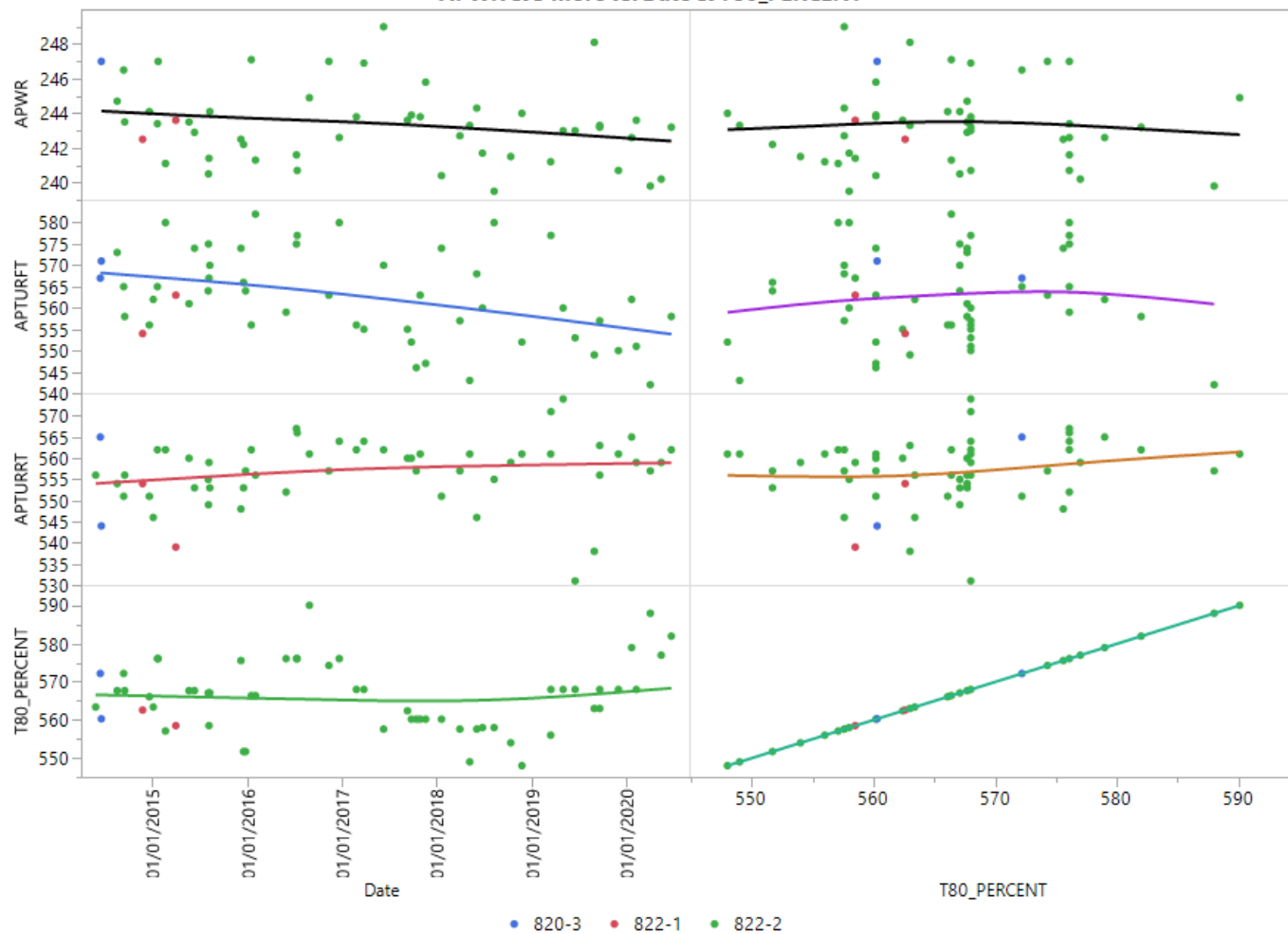
APWR & 3 more vs. Date & T70_PERCENT



Where(178 rows excluded)

Graph Builder

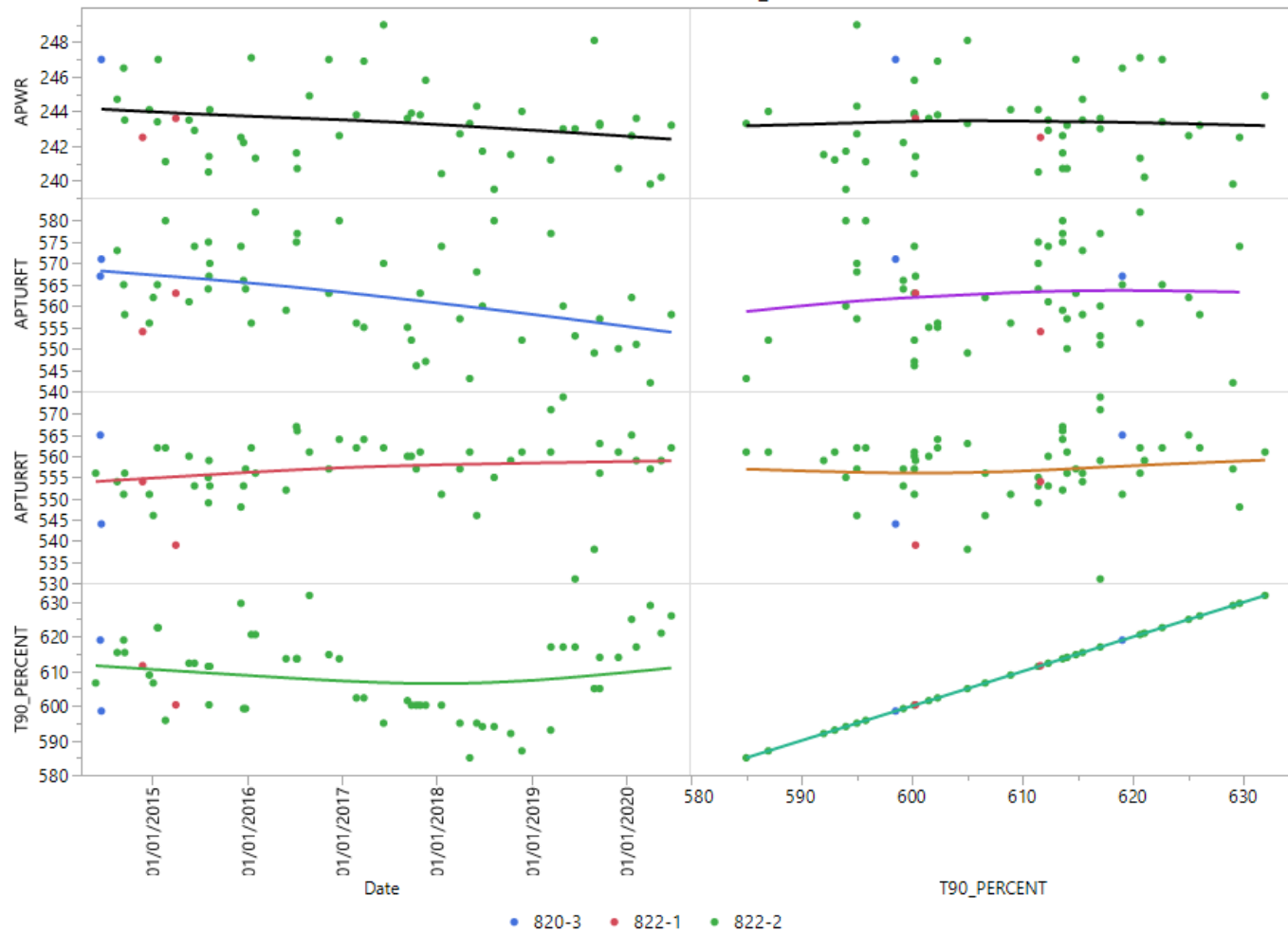
APWR & 3 more vs. Date & T80_PERCENT



Where(178 rows excluded)

Graph Builder

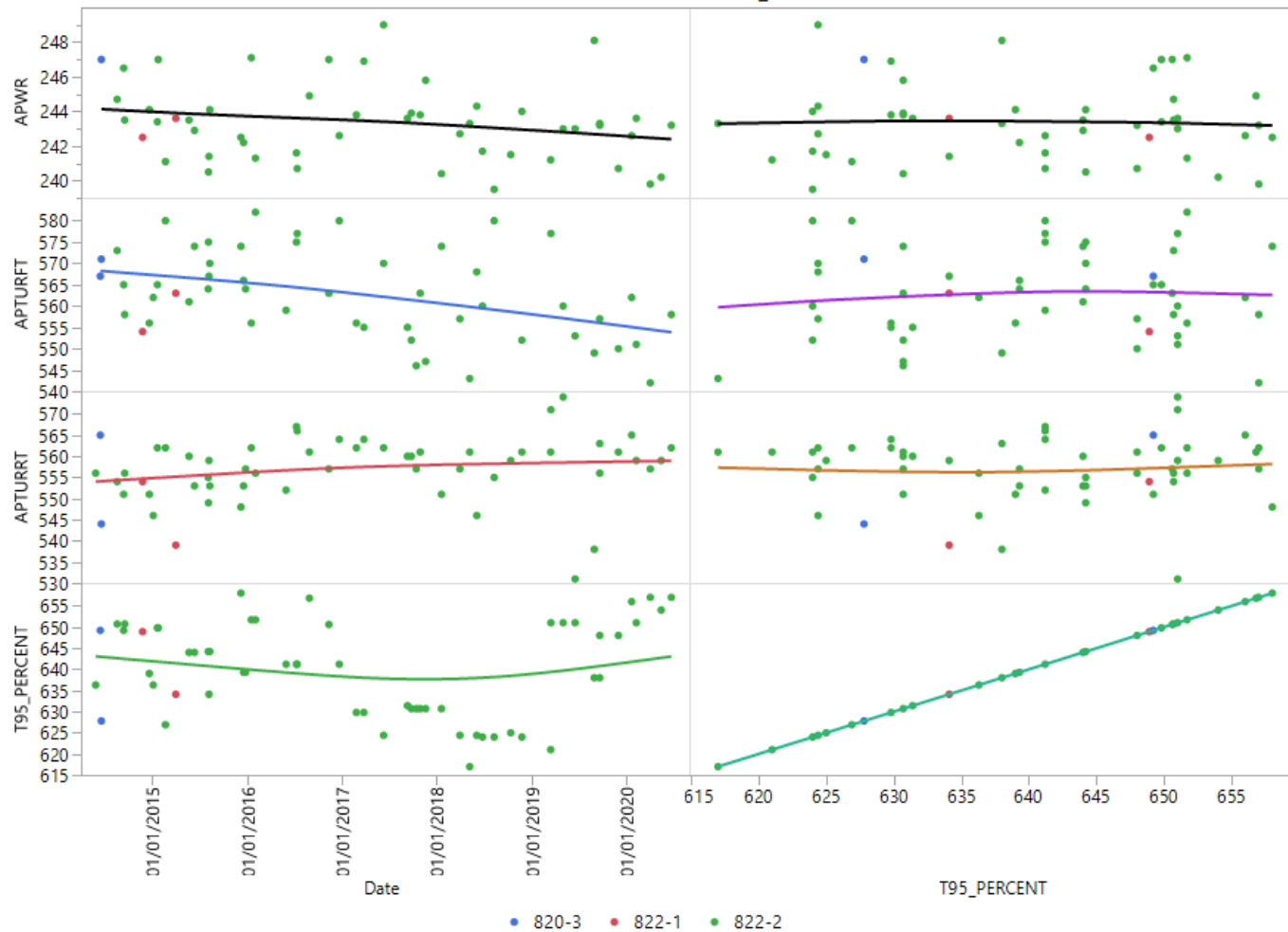
APWR & 3 more vs. Date & T90_PERCENT



Where(178 rows excluded)

Graph Builder

APWR & 3 more vs. Date & T95_PERCENT



Where(178 rows excluded)