

An Online Fast GC for Gasoline Blending: Experience to Date at One Refinery

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Talk Outline

Background

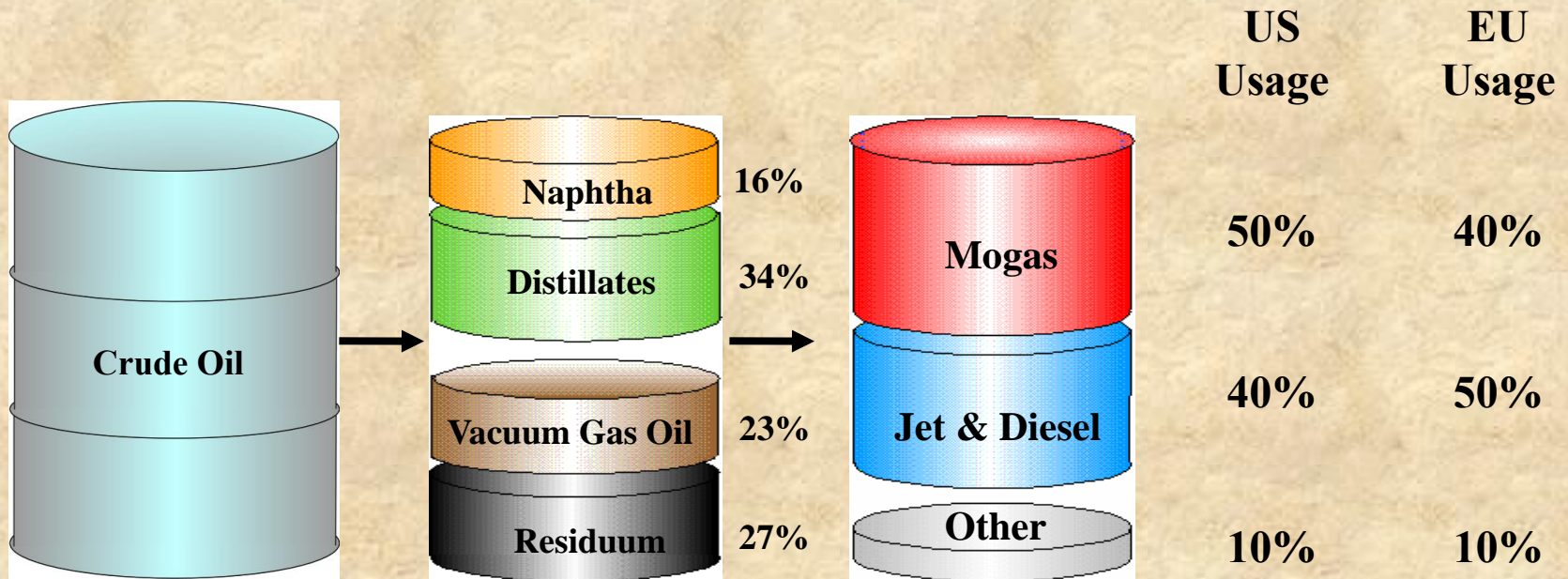
The System

Performance

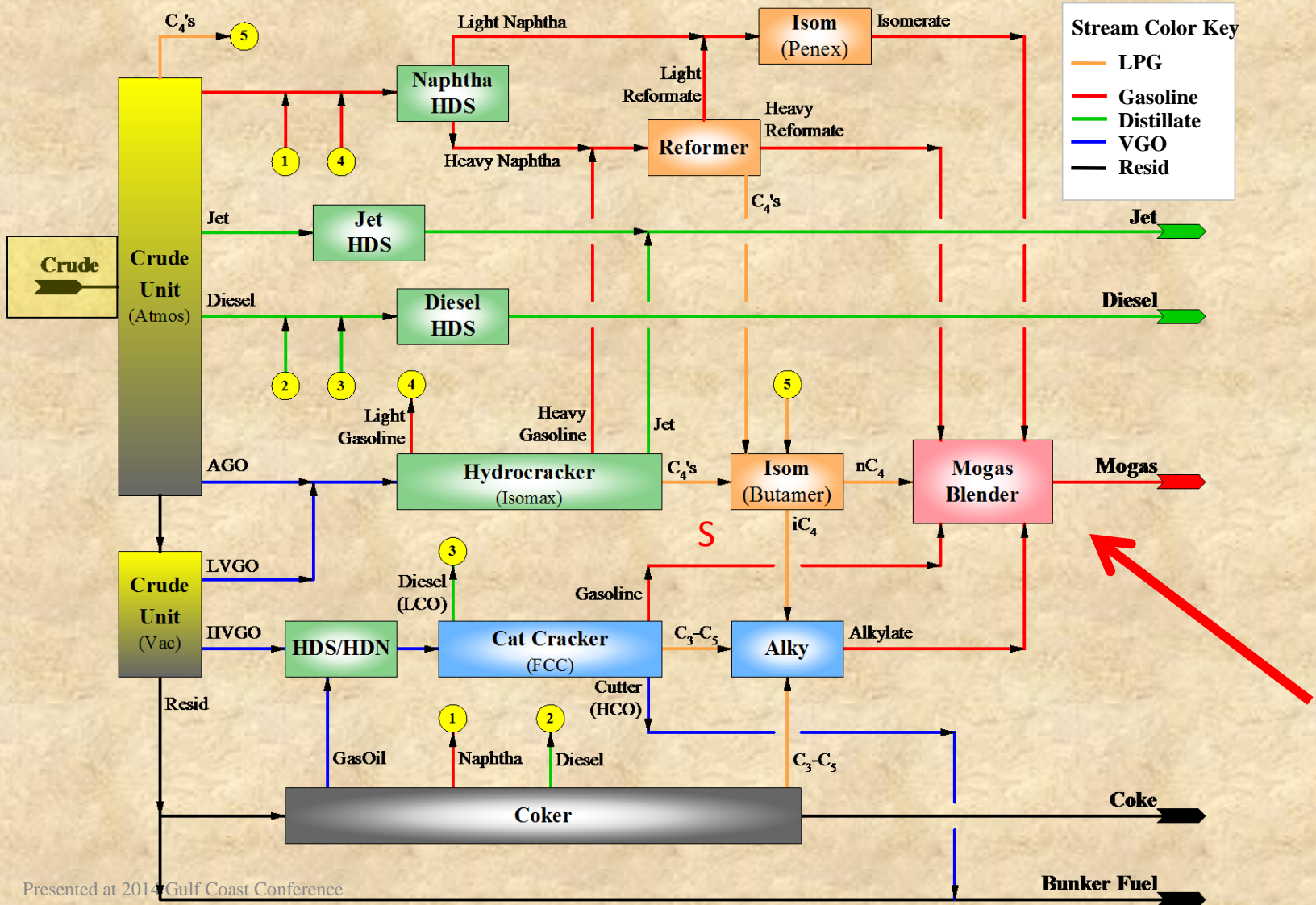
Challenges

Conclusion

Products from Crude Oil



Refinery Streams



The Compact, Fast System

A modular design is essential for the system to be usable and serviceable in the variety of potential applications area from lab, to process line, to field.

The system used in this work consists of:

Falcon Analytical, Inc.'s

Calidus GC

Justice Laboratory Software's

Chromperfect 7 software

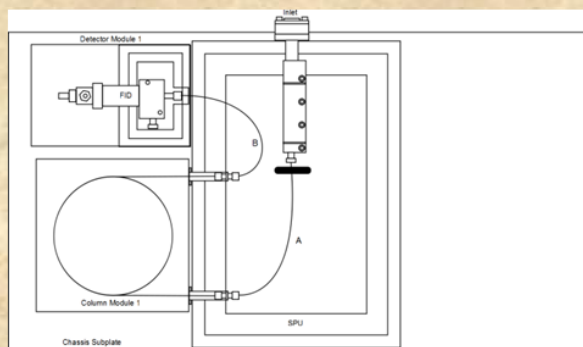
Infometrix Inc.'s

LineUp software

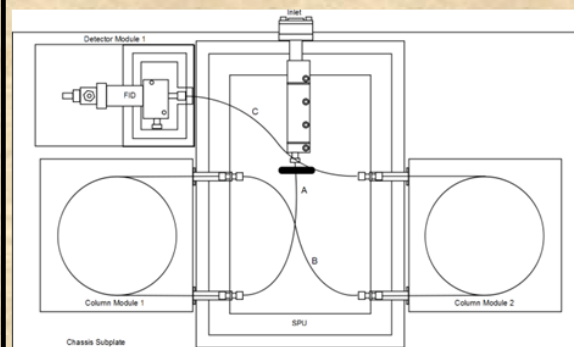
Modular Calidus GC

Single injector Configurations

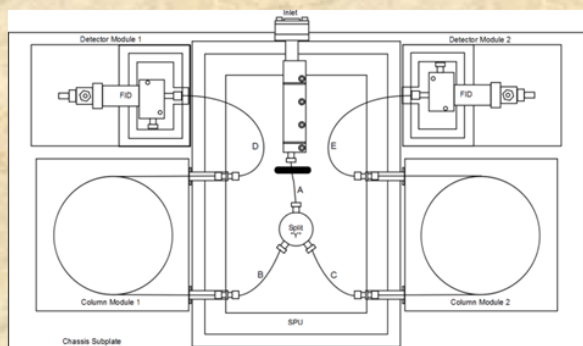
Single Injection in All Examples



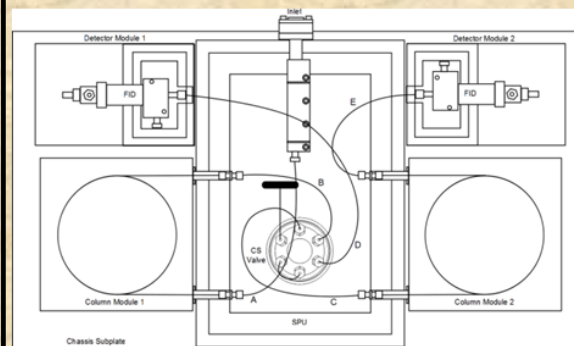
One Column, One Detector



Two Columns, One Detector
in Series Operation



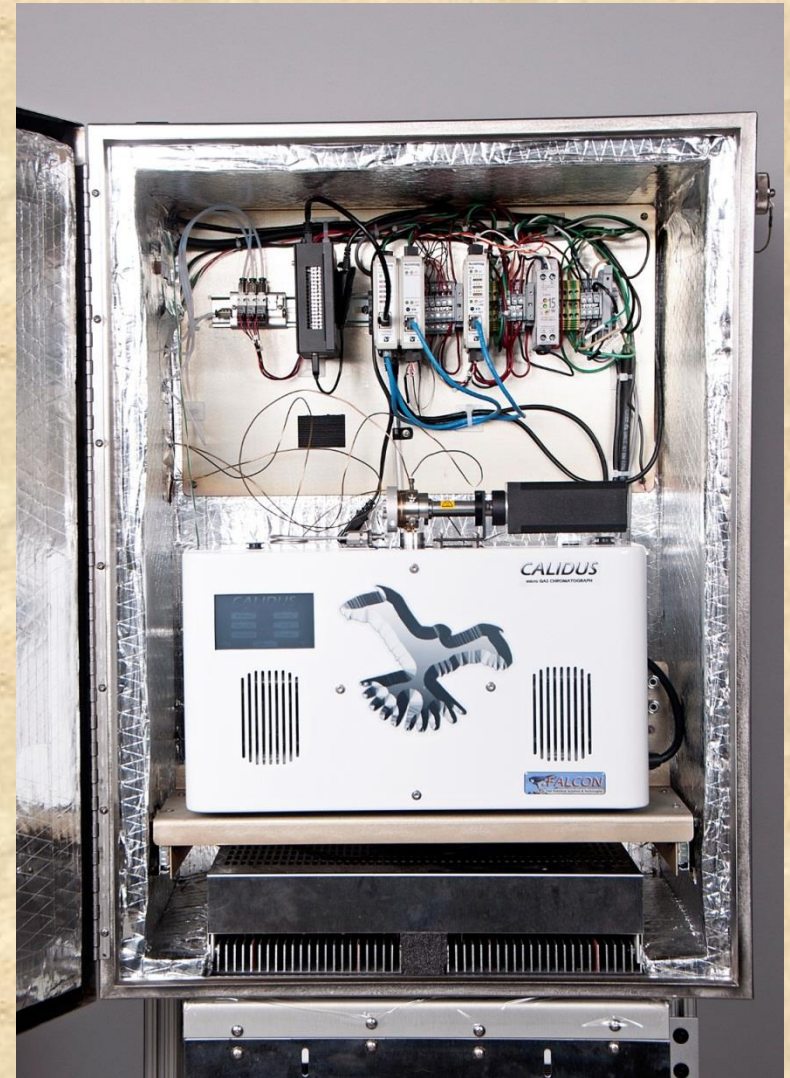
Two Columns, Two Detectors
in Parallel Operation



Two Columns, Two Detectors
with Column Switching

TCD, FID, FPD and DBD* Detectors Available

Process GC Installation



Project Objective

Streams that Feed the Blender

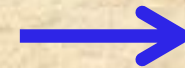
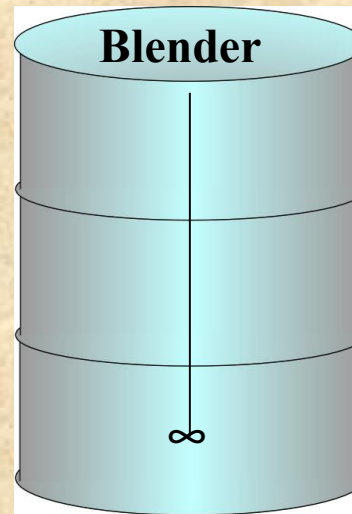
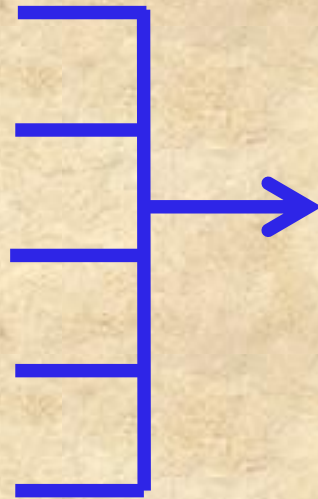
Straight Run Naptha

Alkylate

FCC Gasoline

Reformate

Isomerate



**Motor
Gasoline**

ASTM D86 Distillation

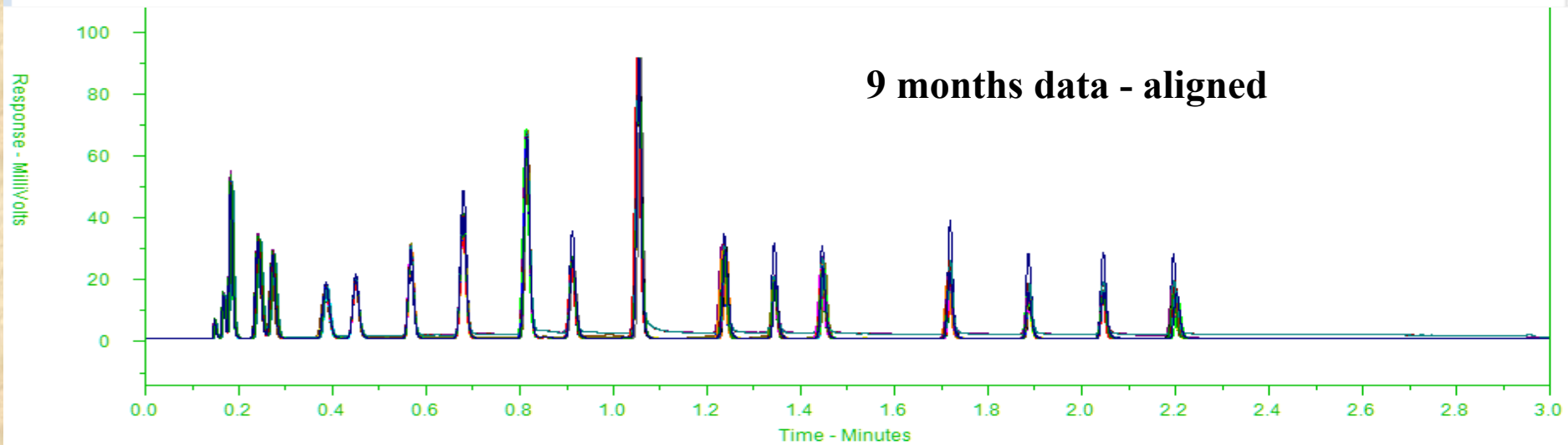
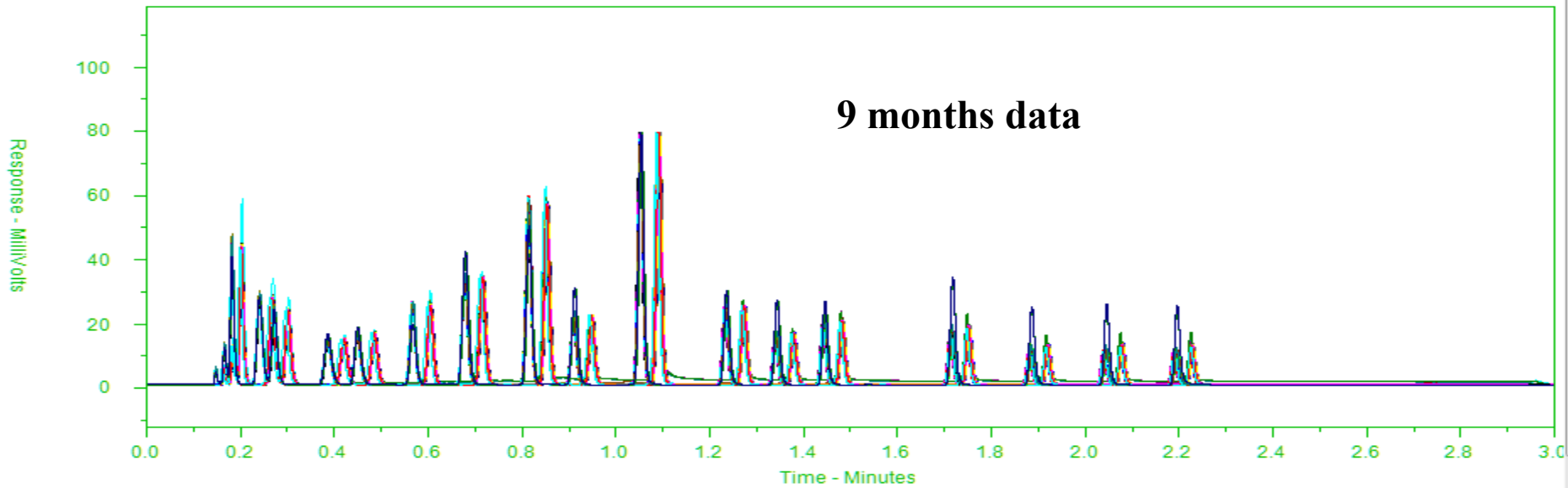
- Physical distillation under standard conditions
- First approval of method – tentative in 1921, published in 1930
- Current version updated in 2012
- Frequently used in product specifications with custody transfer implications
- Automated systems available for both lab and on-line applications

D86 compared to Fast GC

	D86 Analyzer	Falcon Calidus GC
Analysis Time, min	~ 45 min (on-line) ~ 15 min (lab mini)	< 4 min
Sample size, mL	100 mL (on-line) ~ 6 ml	< 1 uL (on-line) ~ 1 mL (lab)
Repeatability	1.0-1.2 °C (@50% toluene)	1.05-1.3 °C (ASTM D7798)
Reproducibility	1.8-2.9 °C	n/a (ASTM D7798)
Measurement units	Vol%	Weight%

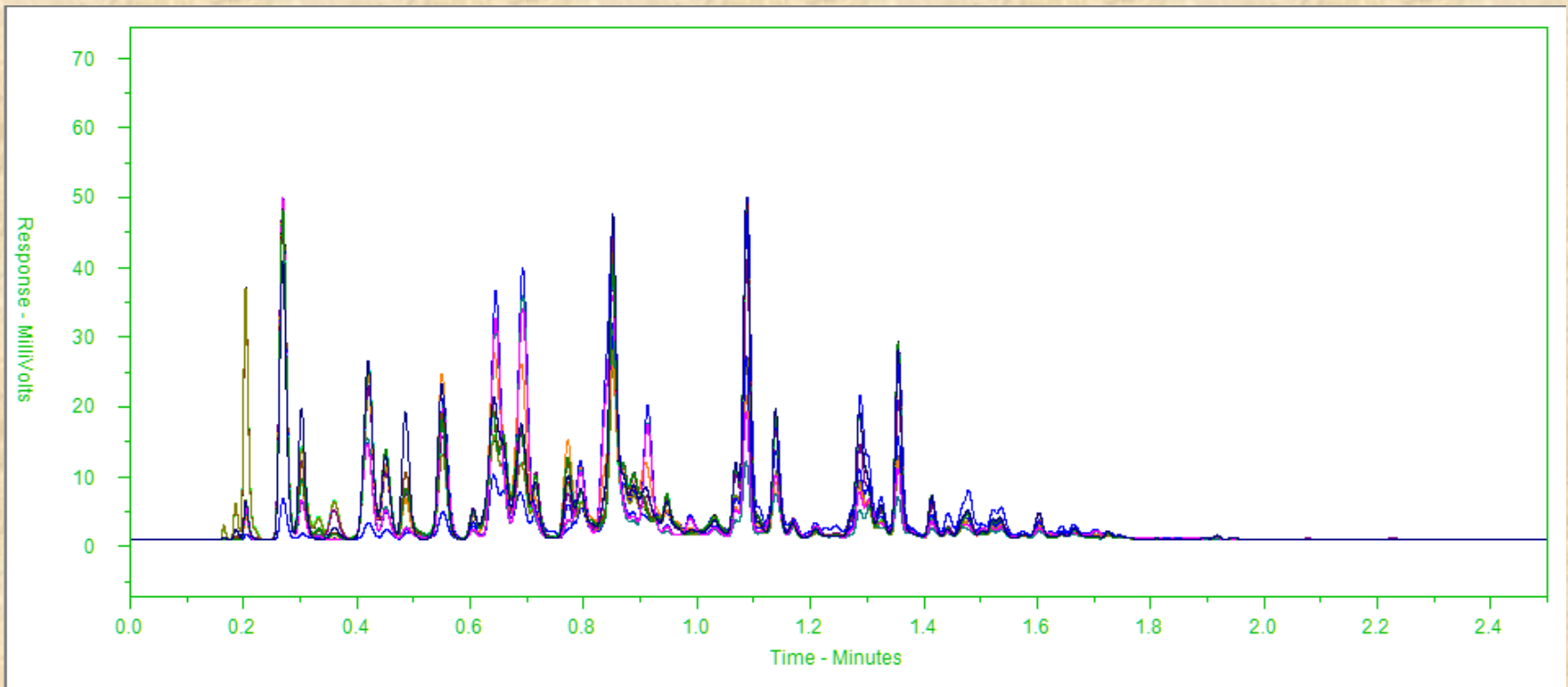
GCs tend to give lower IBPs and higher FBPs than D-86 analyzers.

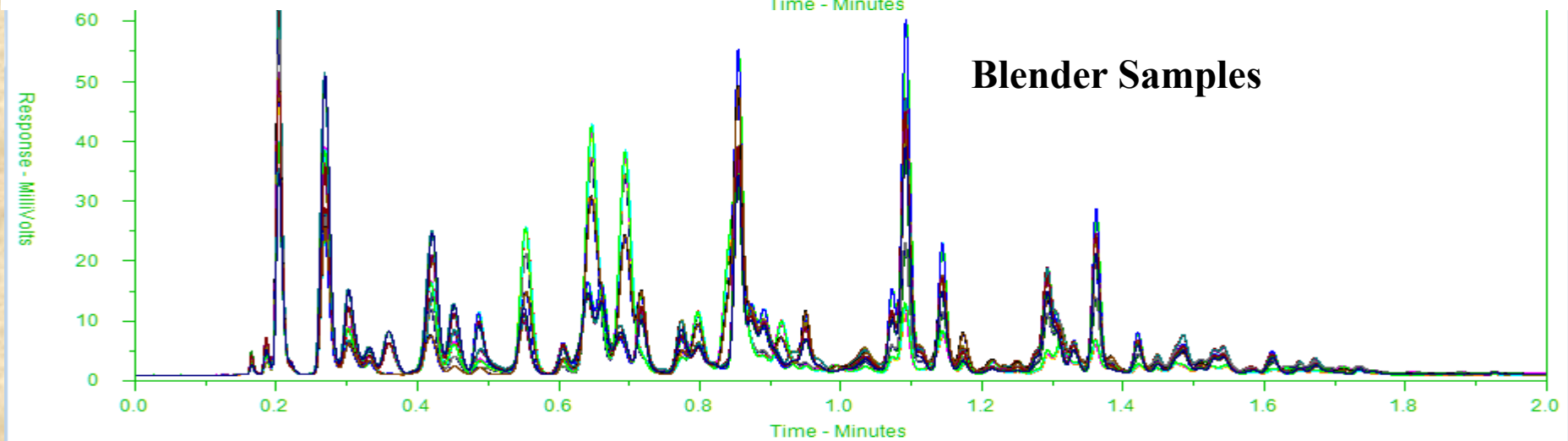
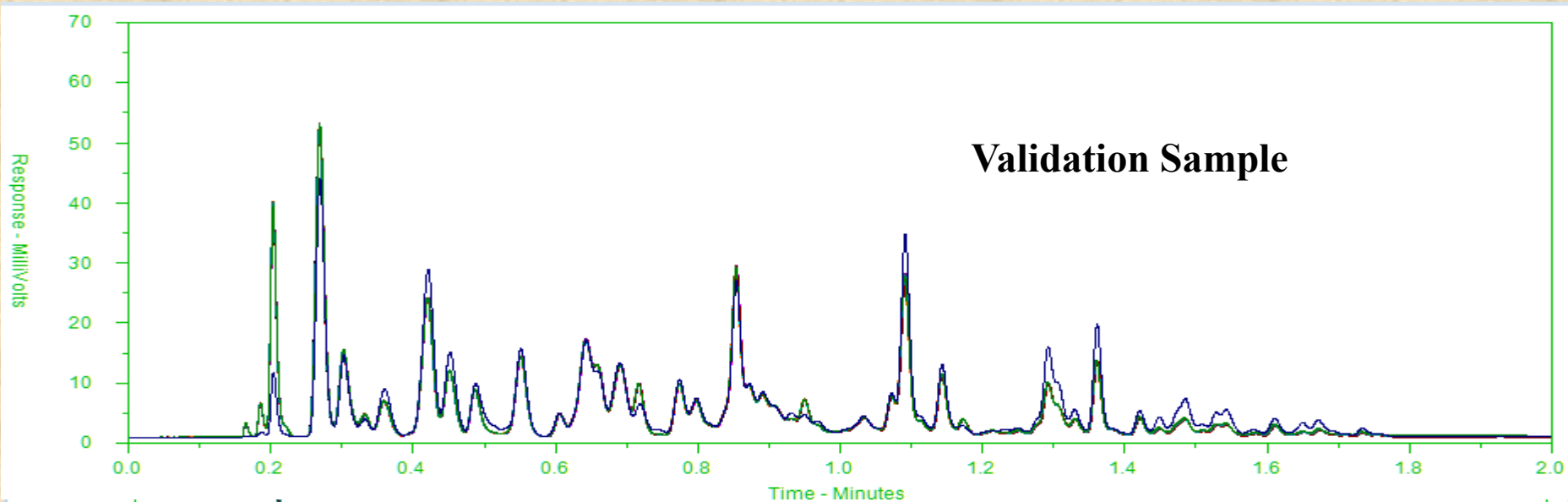
Retention Time Mix



Validation Sample

(Composition changed 3X)

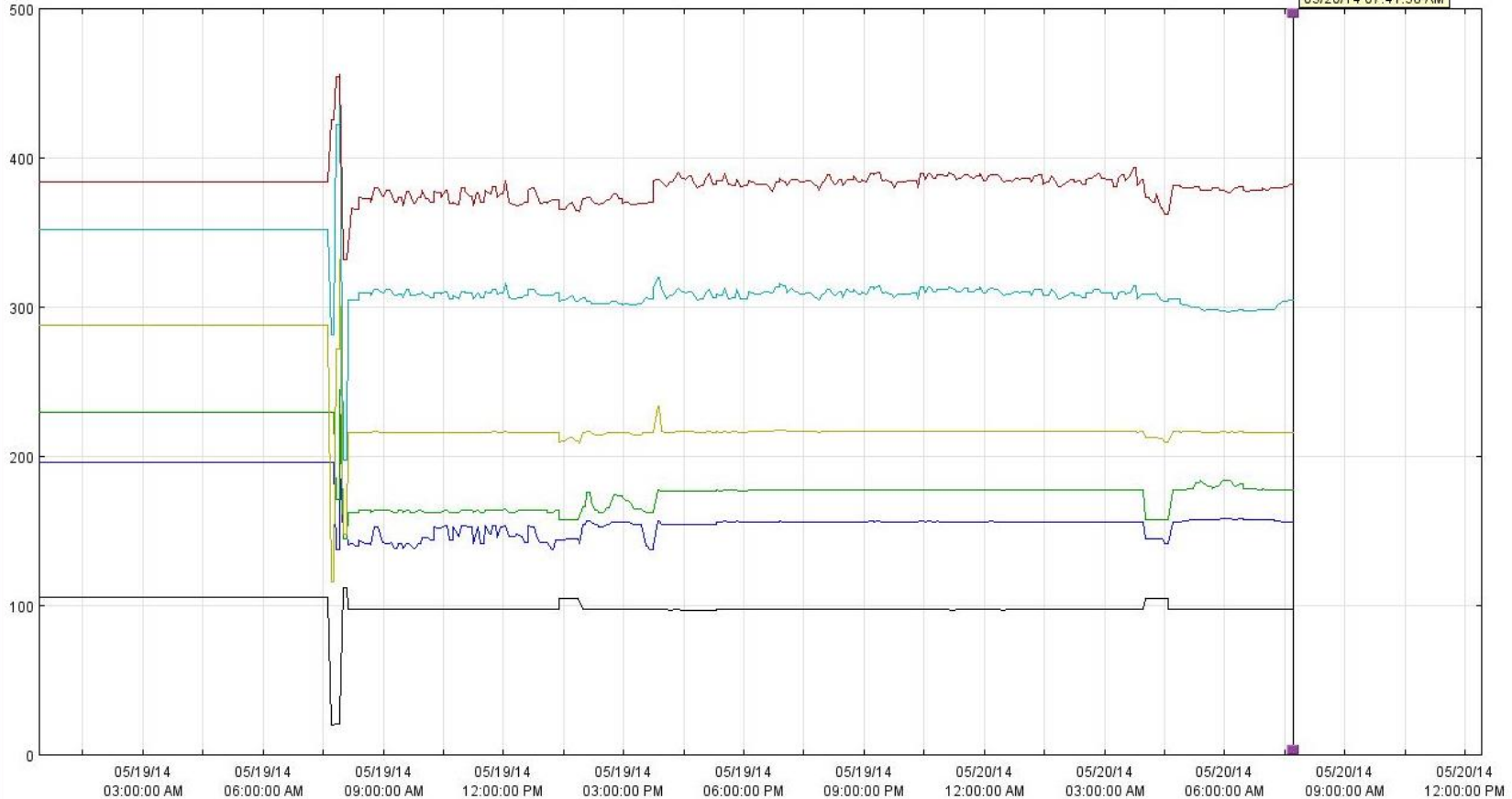




Plant Information System -1

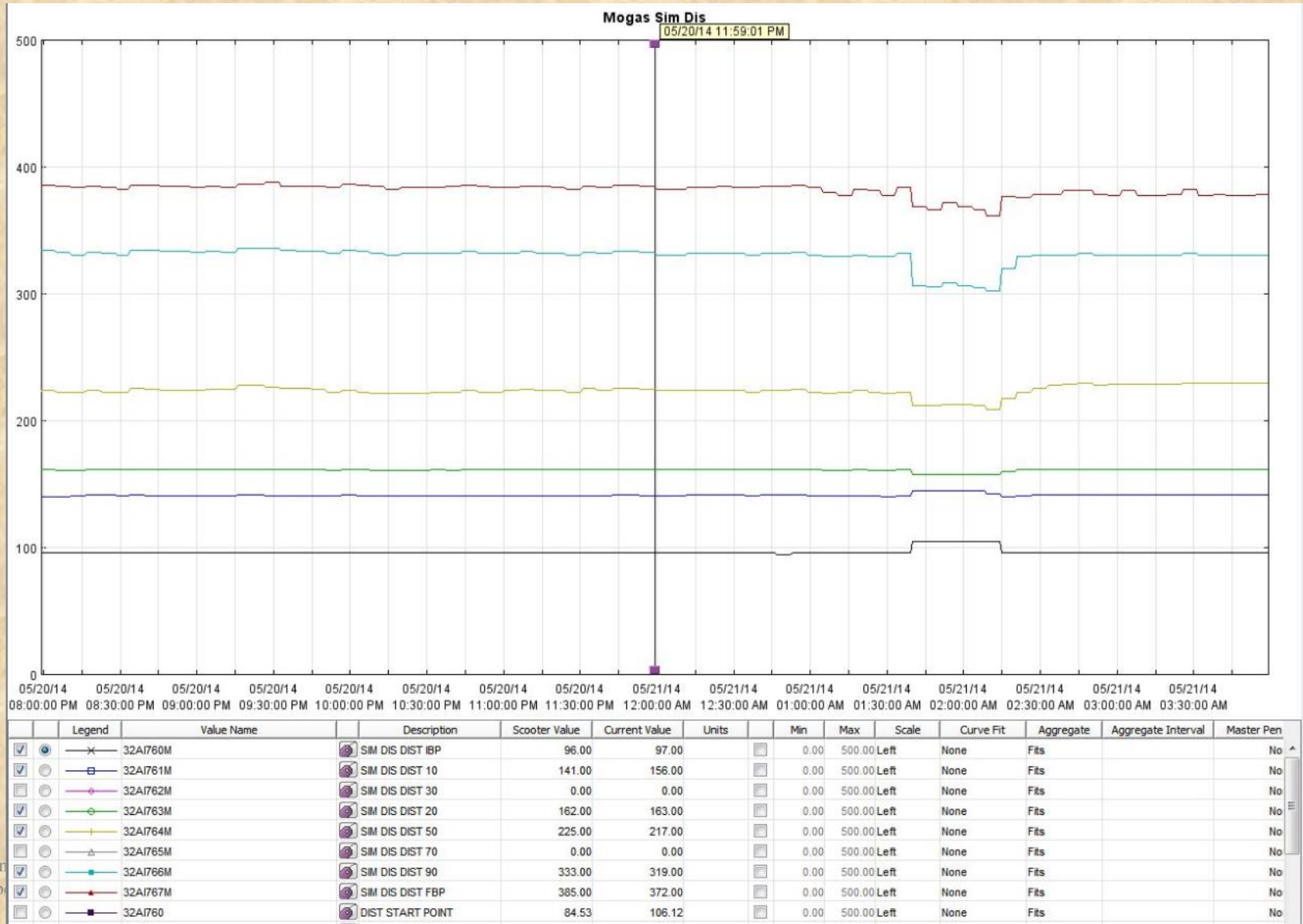
Mogas Sim Dis

05/20/14 07:41:58 AM

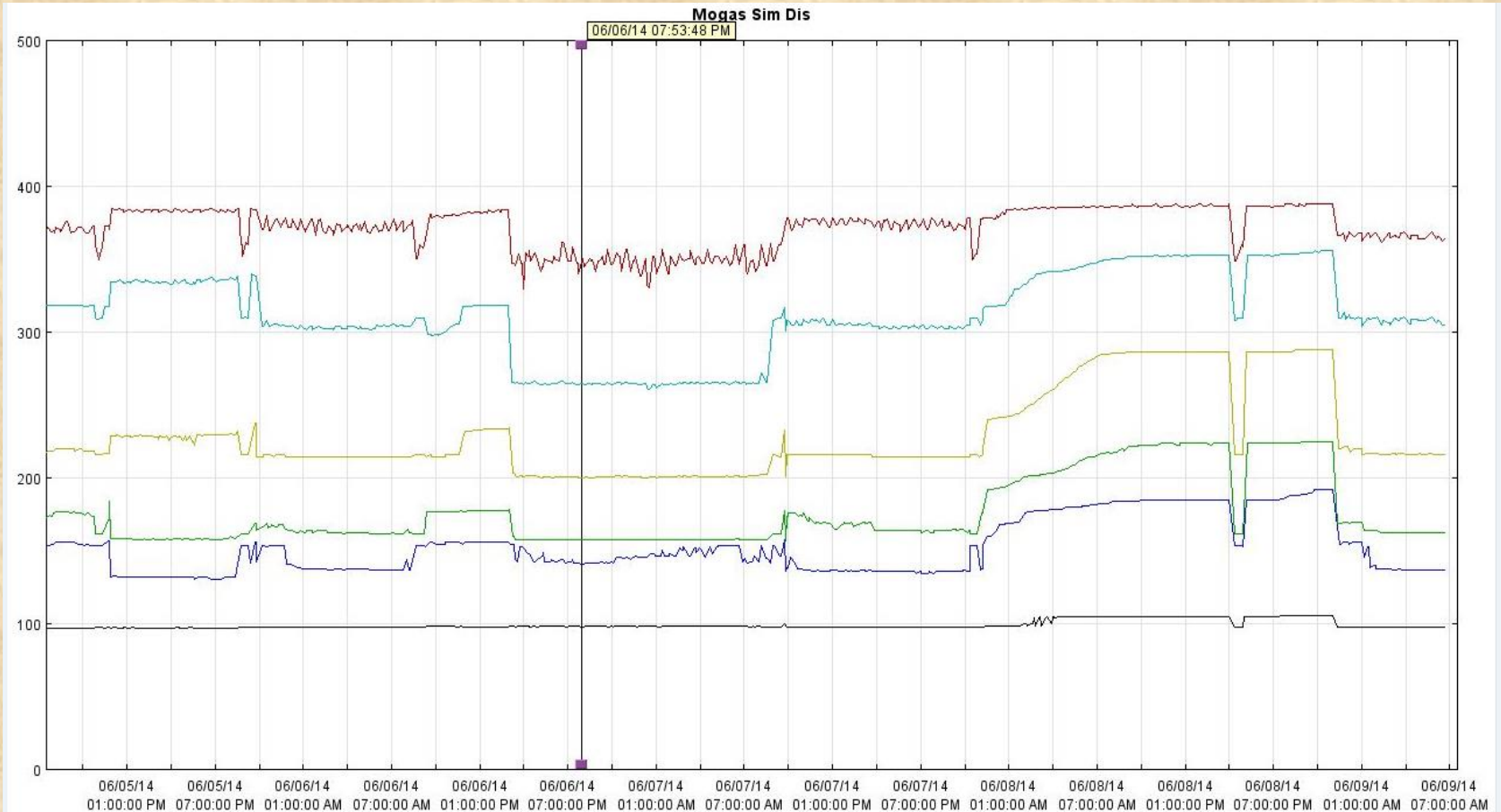


	Legend	Value Name	Description	Scooter Value	Current Value	Units	Min	Max	Scale	Curve Fit	Aggregate	Aggregate Interval	Master Pen
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—x— 32AI760M	<input checked="" type="checkbox"/> SIM DIS DIST IBP	98.00	98.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—□— 32AI761M	<input checked="" type="checkbox"/> SIM DIS DIST 10	156.00	156.00		0.00	500.00	Left	None	Fits		No
<input type="checkbox"/>	<input type="checkbox"/>	—◇— 32AI762M	<input checked="" type="checkbox"/> SIM DIS DIST 30	0.00	0.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—◇— 32AI763M	<input checked="" type="checkbox"/> SIM DIS DIST 20	178.00	178.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—+— 32AI764M	<input checked="" type="checkbox"/> SIM DIS DIST 50	216.00	216.00		0.00	500.00	Left	None	Fits		No
<input type="checkbox"/>	<input type="checkbox"/>	—△— 32AI765M	<input checked="" type="checkbox"/> SIM DIS DIST 70	0.00	0.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—■— 32AI766M	<input checked="" type="checkbox"/> SIM DIS DIST 90	305.00	305.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—▲— 32AI767M	<input checked="" type="checkbox"/> SIM DIS DIST FBP	383.00	383.00		0.00	500.00	Left	None	Fits		No

Plant Information System -2



Plant Information System -3

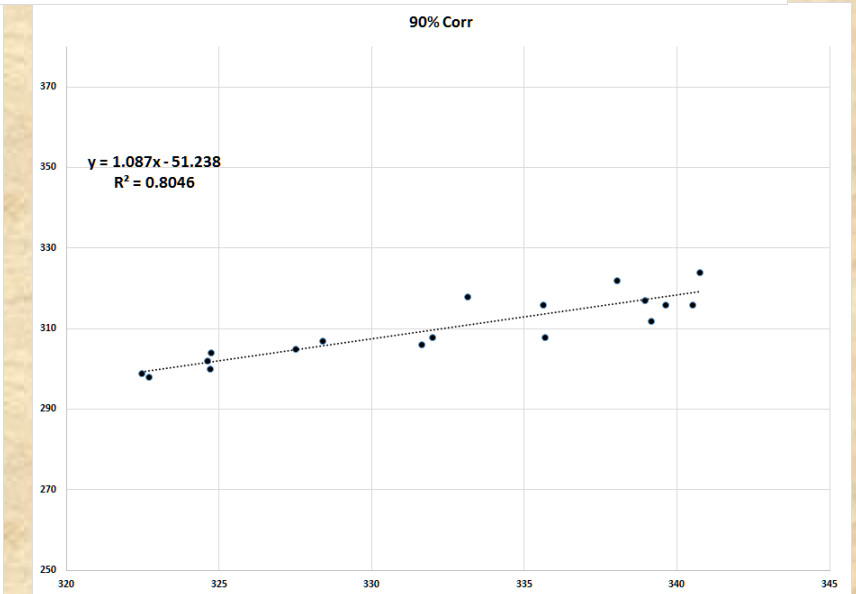
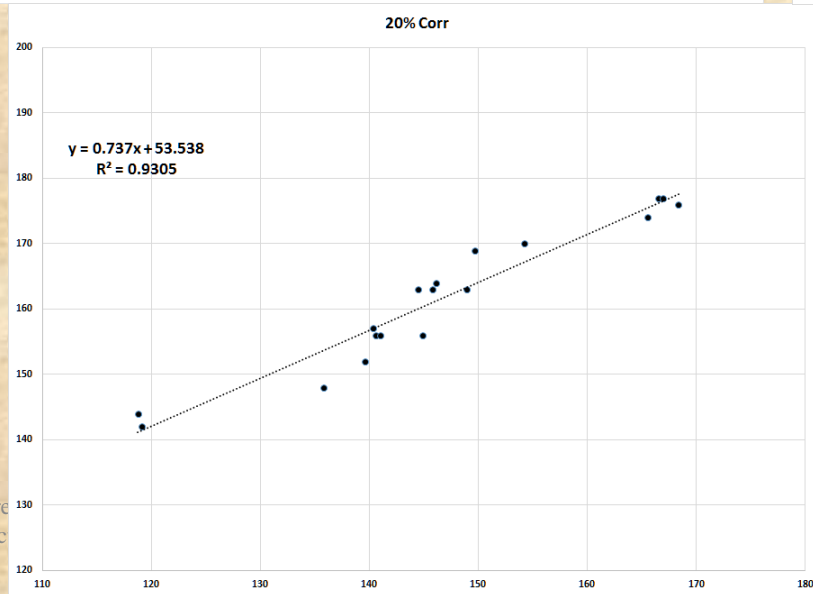
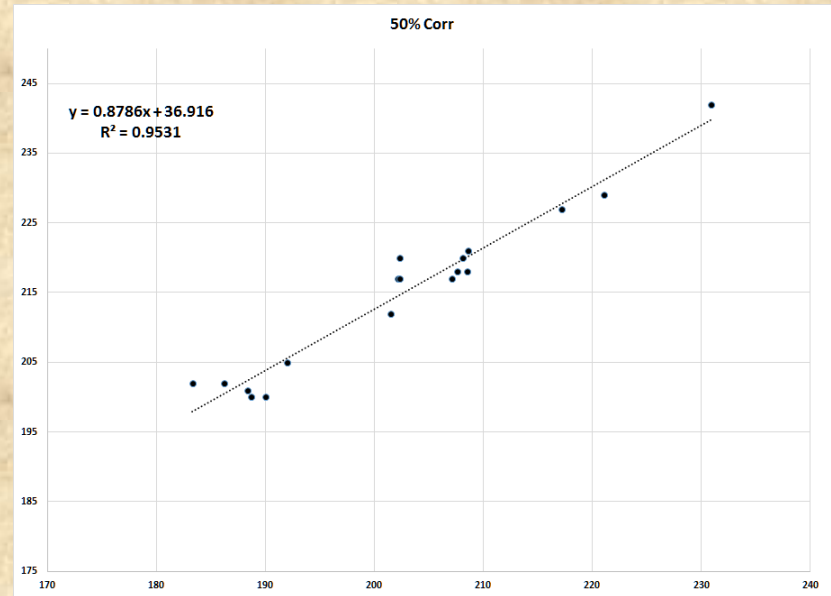
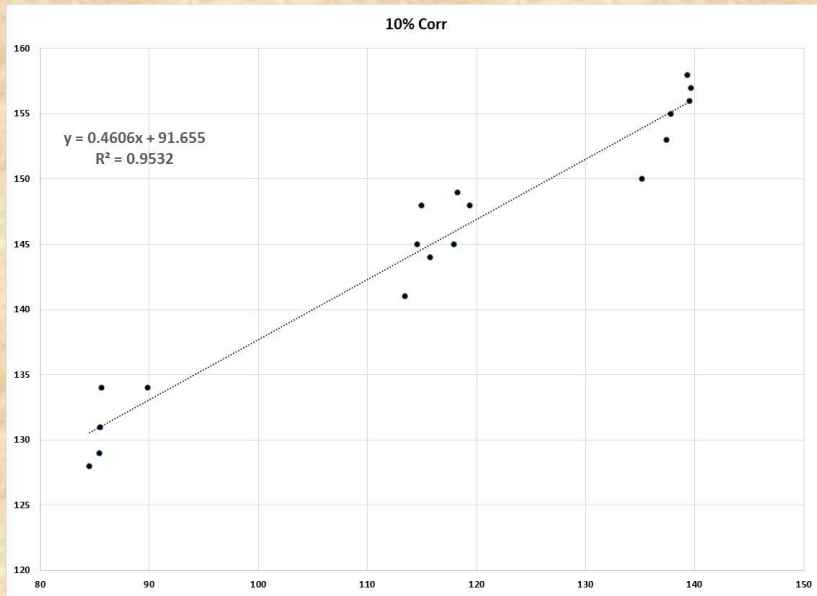


	Legend	Value Name	Description	Scooter Value	Current Value	Units	Min	Max	Scale	Curve Fit	Aggregate	Aggregate Interval	Master Pen
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI760M	SIM DIS DIST IBP	98.00	98.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI761M	SIM DIS DIST 10	141.00	137.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI762M	SIM DIS DIST 30	0.00	0.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI763M	SIM DIS DIST 20	158.00	163.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI764M	SIM DIS DIST 50	200.00	216.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI765M	SIM DIS DIST 70	0.00	0.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI766M	SIM DIS DIST 90	265.00	305.00		0.00	500.00	Left	None	Fits		No
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	32AI767M	SIM DIS DIST FBP	348.00	364.00		0.00	500.00	Left	None	Fits		No

Correlations

- STP 577 and API Procedure 3A3.2
- 1979 Agilent Application Note gives information on fine tuning correlation
- Good correlation albeit with limited data
- Known differences between ASTM D86 and D2887 results

Correlation SimDis to D-86 Distillation



Challenges

Technology is easy, people are difficult.

Information Protection

Crew Change-outs

Full plate syndrome

Summary

This presentation discussed the operation of a Falcon Calidus GC with Motor Gasoline Blender. Significant cycle time reduction was achieved compared to the existing process.

The speed of this system, nominally 10 times faster than conventional, research grade GCs, can be exploited to move from after the fact measurements to on-line control applications.

Acknowledgements

The authors would like to thank the Refiner for allowing selected information to be presented, albeit without their name.

