

UPDATE

ASTM D8003 Standard Test Method for Determination of Light Hydrocarbon and Cut Point Intervals in Live Crude Oils and Condensates by Gas Chromatography

Alberta Innovates – Technology Futures

October 2015

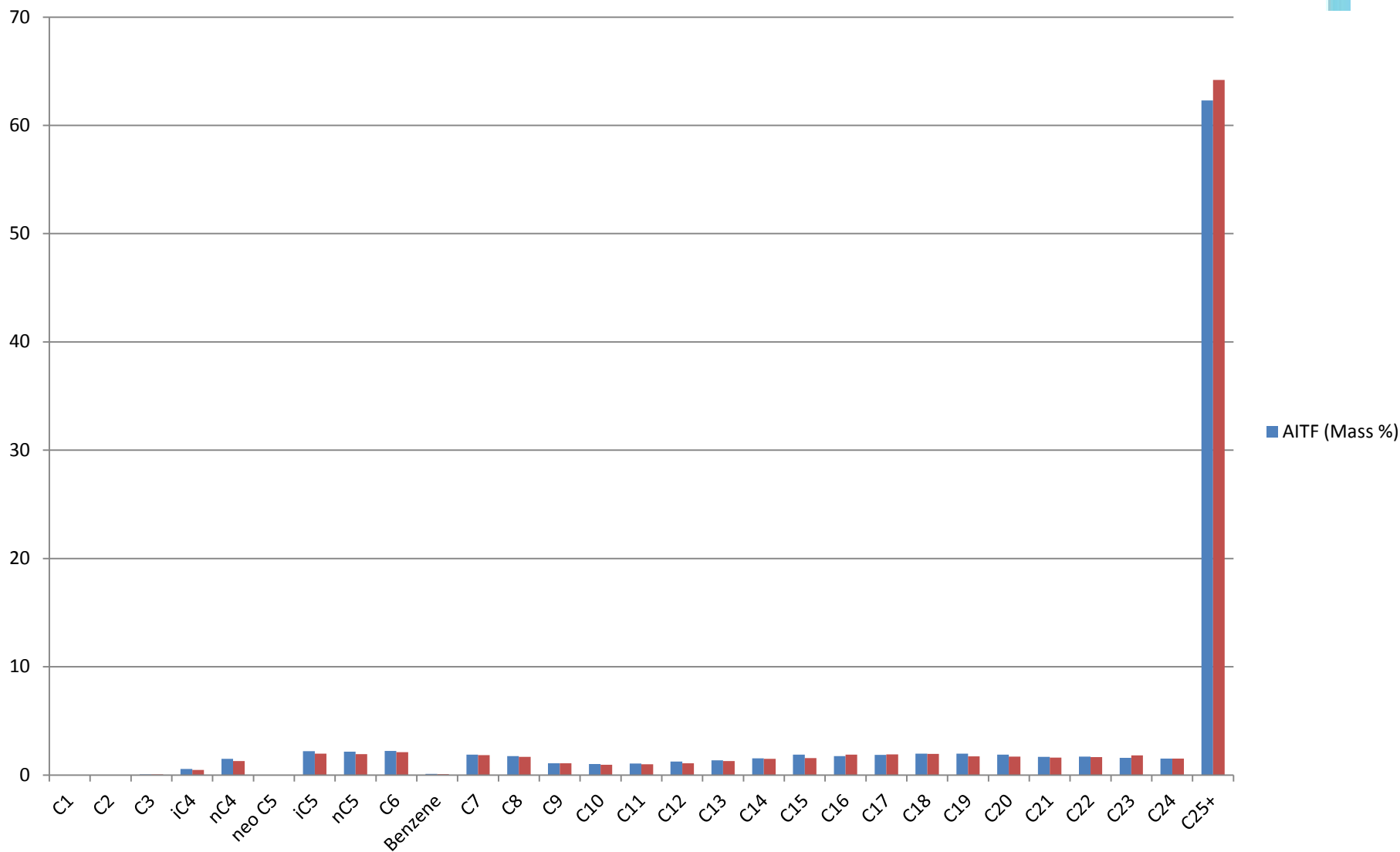
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Current Project Status

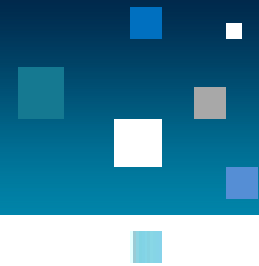
- Method has been published, ASTM D8003
- Inter-laboratory Data Comparison
 - To date; two samples analyzed at AITF and second lab
- Data Comparison Between GC models
 - Comparison between HP and Perkin Elmer GCs at AITF

Inter-Laboratory Data Comparison: AITF and Lab 2

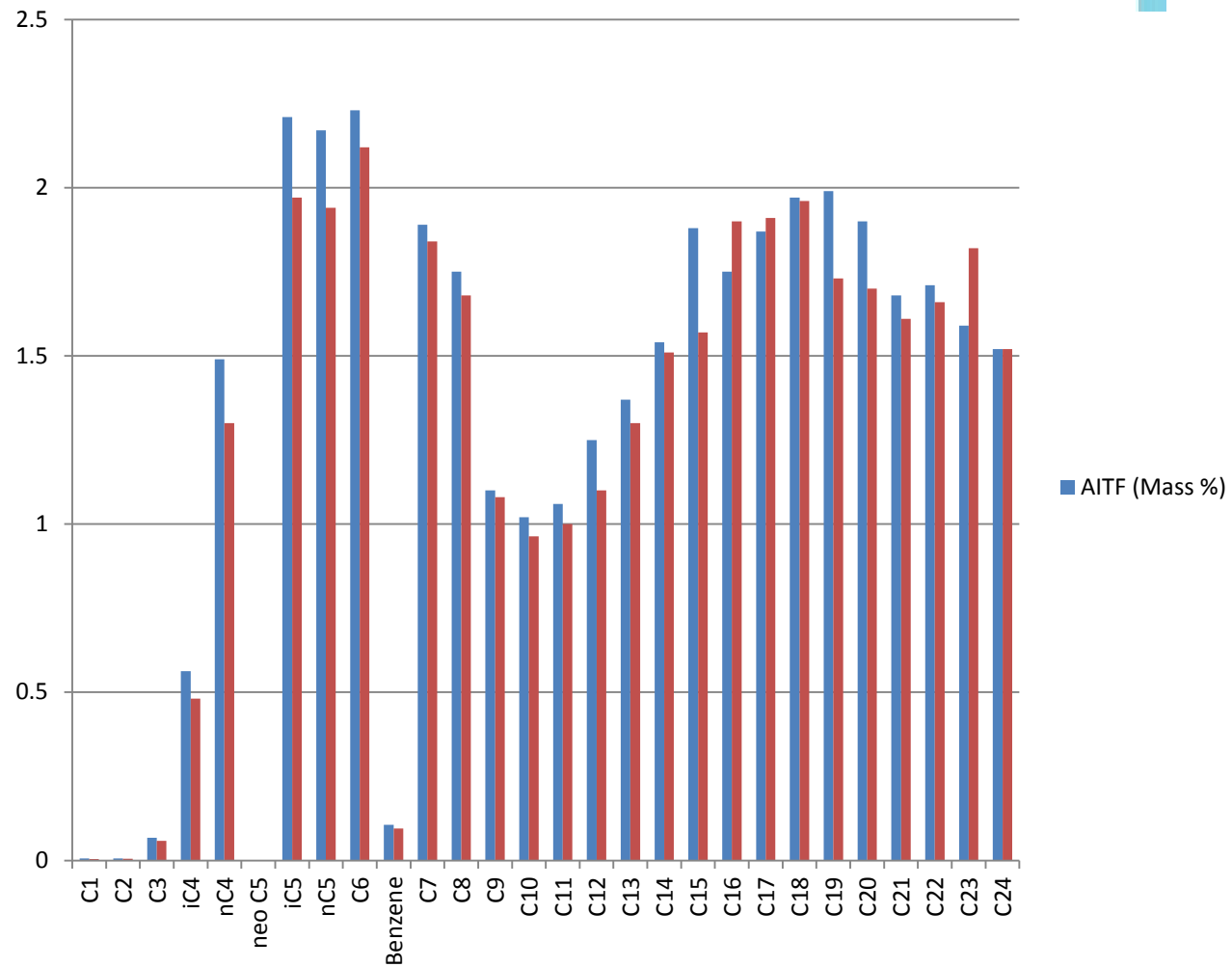
Sample 2: dilbit



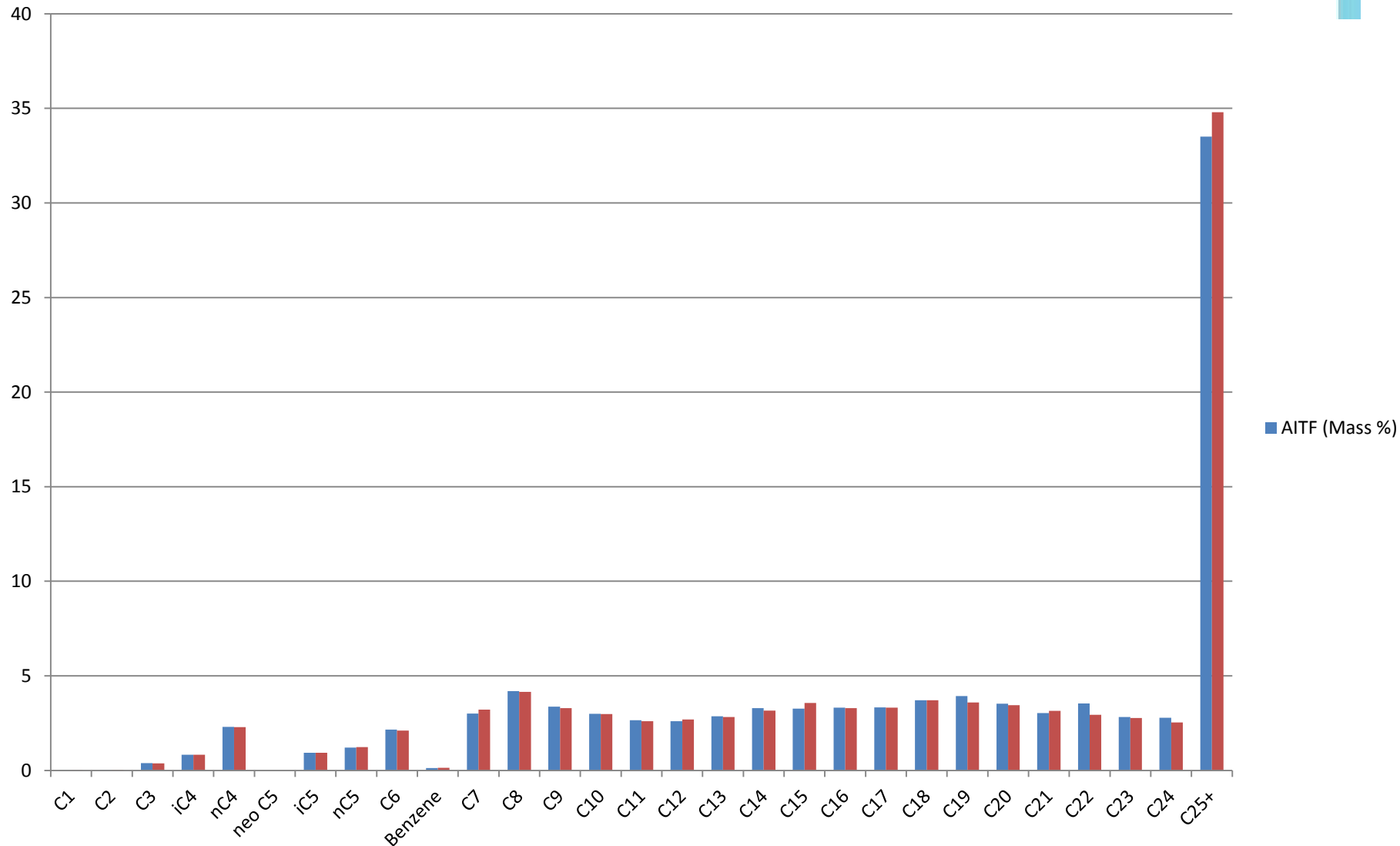
Sample 2: dilbit C1-C24



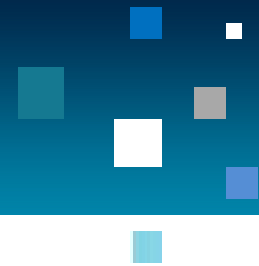
Component	AITF (Mass %)	Lab 2 (Mass %)	Difference (Mass %)
C1	0.006	0.004	0.002
C2	0.006	0.005	0.001
C3	0.068	0.058	0.010
iC4	0.563	0.481	0.082
nC4	1.49	1.30	0.19
neo C5	0	0	0
iC5	2.21	1.97	0.24
nC5	2.17	1.94	0.23
C6	2.23	2.12	0.11
Benzene	0.106	0.095	0.011
C7	1.89	1.84	0.05
C8	1.75	1.68	0.07
C9	1.10	1.08	0.02
C10	1.02	0.964	0.056
C11	1.06	1.00	0.06
C12	1.25	1.10	0.15
C13	1.37	1.30	0.07
C14	1.54	1.51	0.03
C15	1.88	1.57	0.31
C16	1.75	1.90	-0.15
C17	1.87	1.91	-0.04
C18	1.97	1.96	0.01
C19	1.99	1.73	0.26
C20	1.90	1.70	0.20
C21	1.68	1.61	0.07
C22	1.71	1.66	0.05
C23	1.59	1.82	-0.23
C24	1.52	1.52	0
C25+	62.3	64.2	-1.9



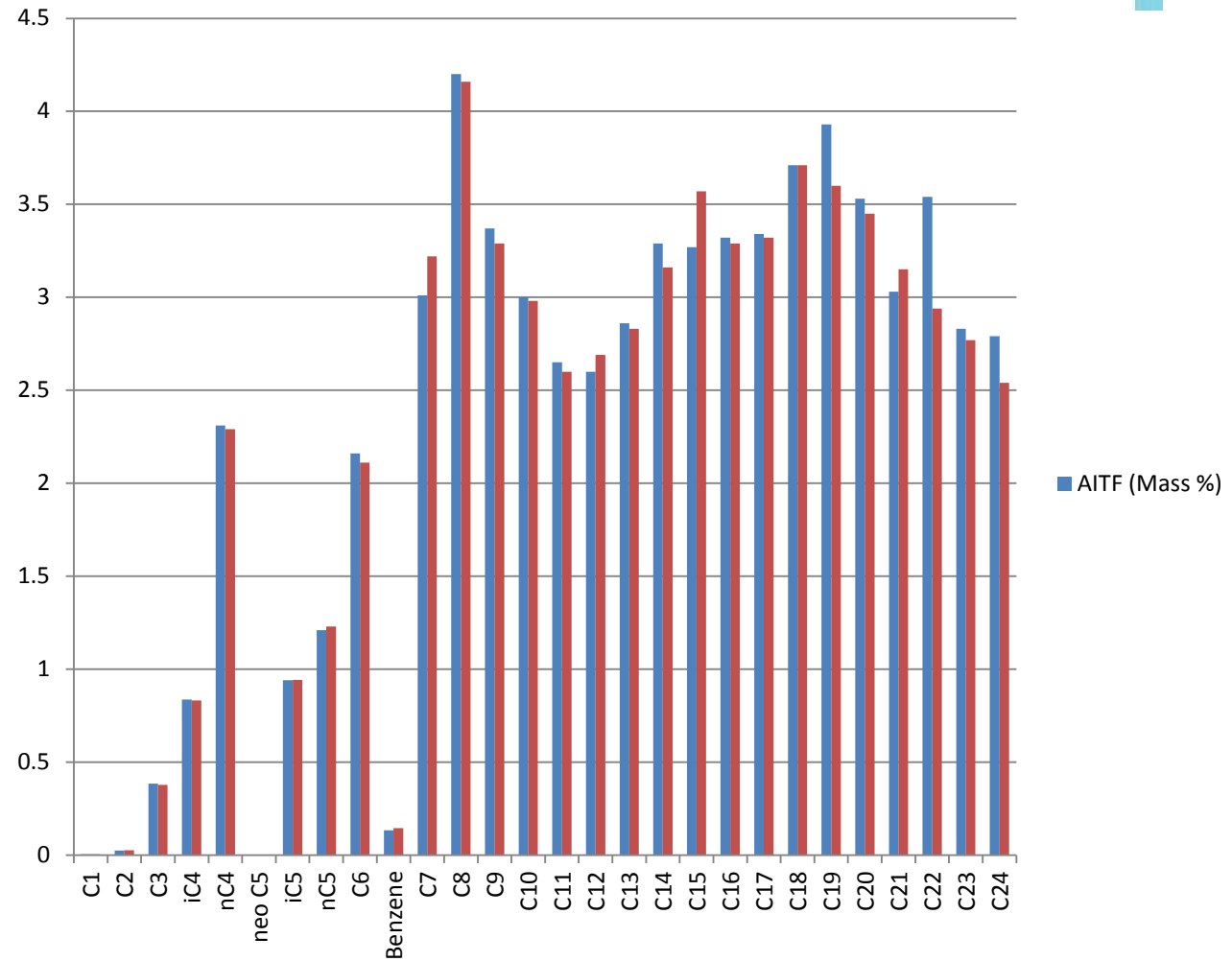
Sample 1:light crude



Sample 1: light crude C1-C24



Component	(Lab 2 Mass %)	AITF (Mass %)	Difference (Mass %)
C1	0.005	0.005	0.000
C2	0.024	0.026	0.002
C3	0.384	0.377	-0.007
iC4	0.837	0.832	-0.005
nC4	2.31	2.29	-0.02
neo C5	0	0	0.000
iC5	0.940	0.942	0.002
nC5	1.21	1.23	0.02
C6	2.16	2.11	-0.05
Benzene	0.133	0.145	0.012
C7	3.01	3.22	0.21
C8	4.20	4.16	-0.04
C9	3.37	3.29	-0.08
C10	3.00	2.98	-0.02
C11	2.65	2.60	-0.05
C12	2.60	2.69	0.09
C13	2.86	2.83	-0.03
C14	3.29	3.16	-0.13
C15	3.27	3.57	0.30
C16	3.32	3.29	-0.03
C17	3.34	3.32	-0.02
C18	3.71	3.71	0.00
C19	3.93	3.60	-0.33
C20	3.53	3.45	-0.08
C21	3.03	3.15	0.12
C22	3.54	2.94	-0.60
C23	2.83	2.77	-0.06
C24	2.79	2.54	-0.25
C25+	33.5	34.8	1.3



Within Lab Data Comparison Between and GCs

Purpose

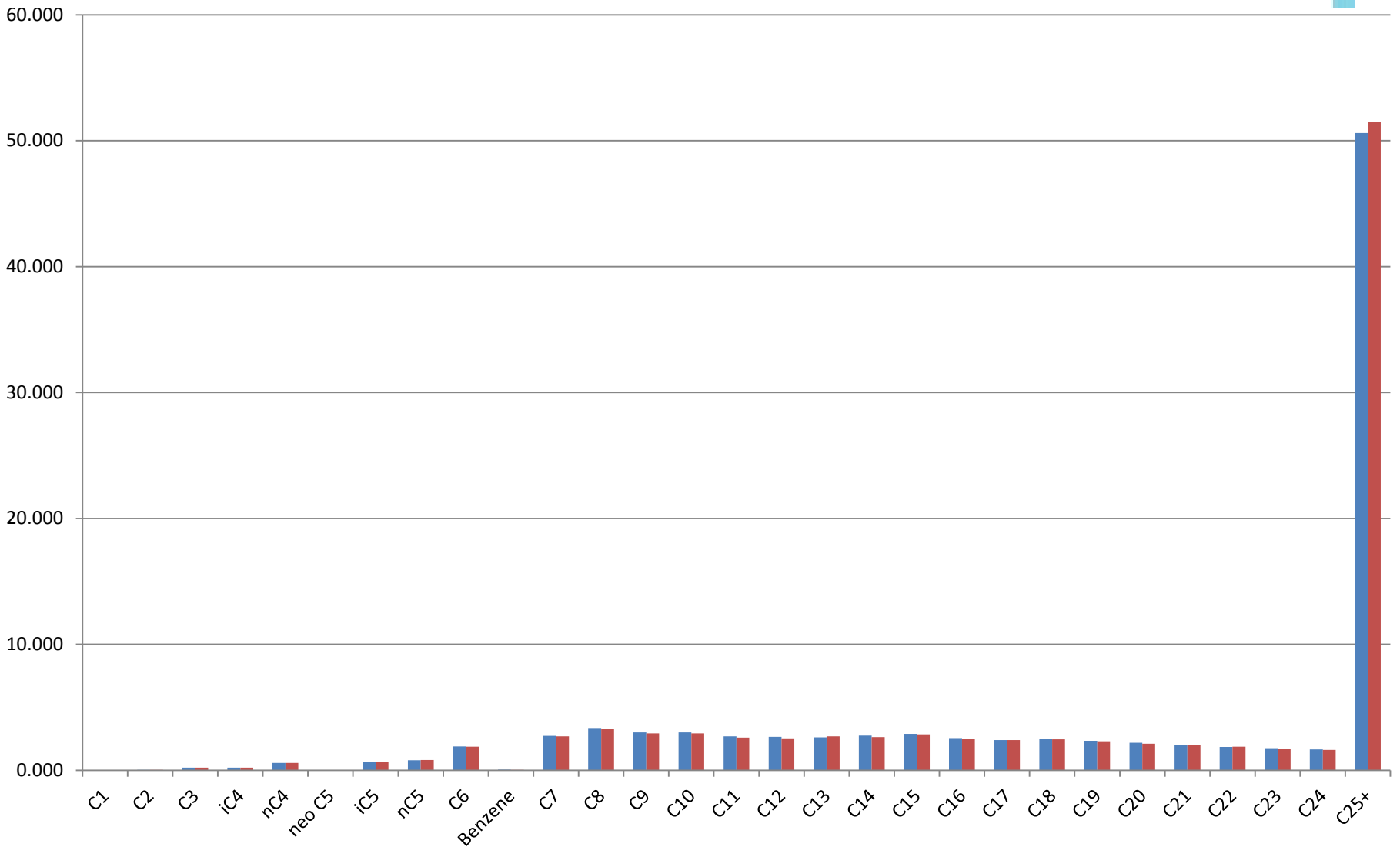
- Set up the HPLIS on the PerkinElmer Clarus GC
- PE Clarus GC was run in accordance with ASTM D8003-15, and the same samples were run on another system with HPLIS attached.
 - Validation of the data obtained from Clarus GC
 - Indication of site precision
 - Allows more flexibility for HPLIS vendors customers

Sample Types

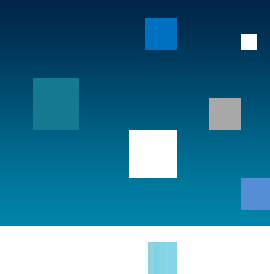
- light crude oil, 892 kg/m³
- accumulator sample
- accumulator sample

- Accumulator sample: dead oil to which known amounts of light ends have been added under pressure.

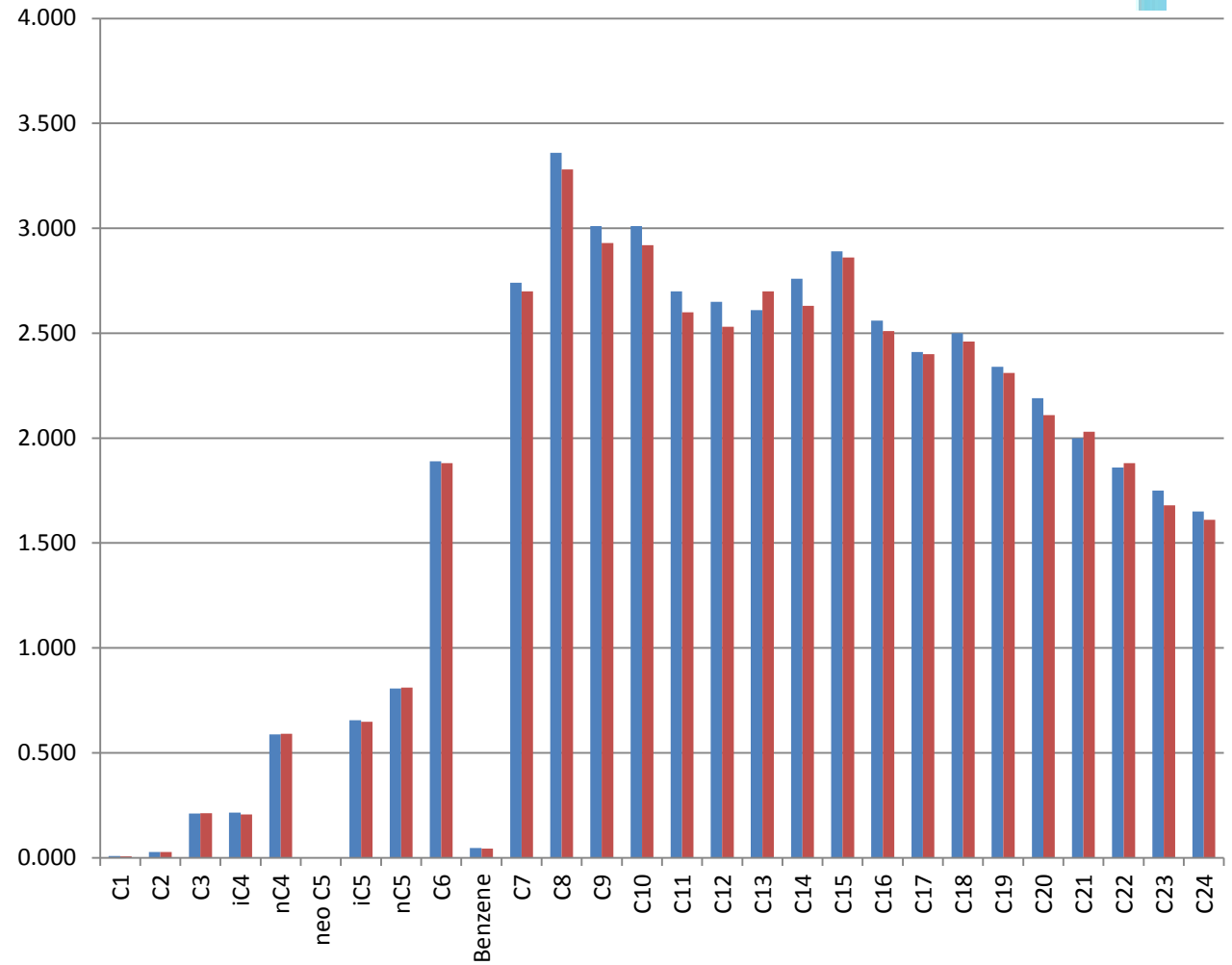
Light crude 2



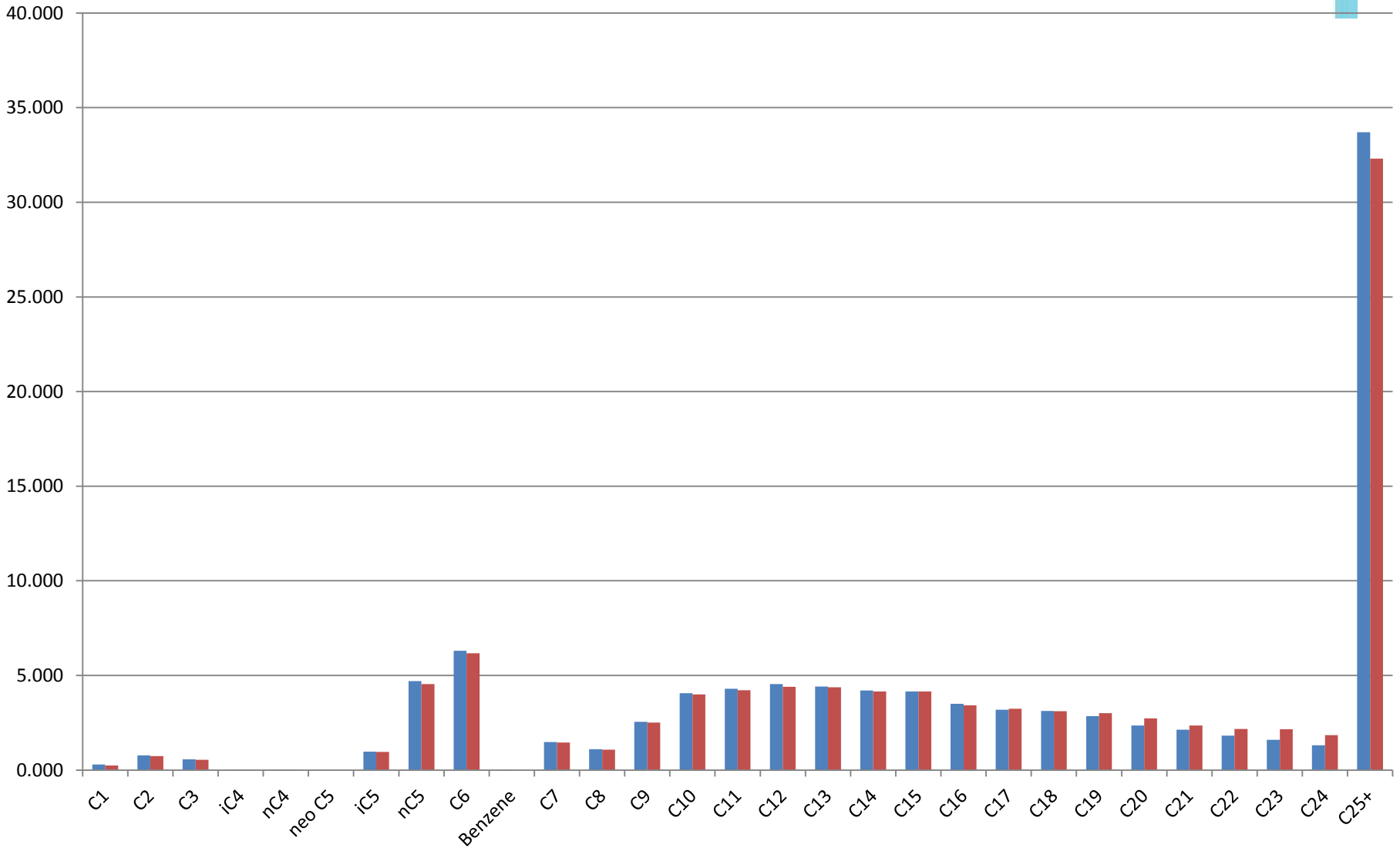
Light Crude Oil 2, C1-C24



Component	GC1 (Mass %)	PE (Mass %)	Difference (Mass %)
C1	0.008	0.007	0.001
C2	0.027	0.027	0.000
C3	0.211	0.212	-0.001
iC4	0.216	0.207	0.009
nC4	0.588	0.591	-0.003
neo C5	0.000	0.000	0.000
iC5	0.655	0.648	0.007
nC5	0.807	0.811	-0.004
C6	1.89	1.88	0.01
Benzene	0.047	0.044	0.003
C7	2.74	2.70	0.04
C8	3.36	3.28	0.08
C9	3.01	2.93	0.08
C10	3.01	2.92	0.09
C11	2.70	2.60	0.10
C12	2.65	2.53	0.12
C13	2.61	2.70	-0.09
C14	2.76	2.63	0.13
C15	2.89	2.86	0.03
C16	2.56	2.51	0.05
C17	2.41	2.40	0.01
C18	2.50	2.46	0.04
C19	2.34	2.31	0.03
C20	2.19	2.11	0.08
C21	2.00	2.03	-0.03
C22	1.86	1.88	-0.02
C23	1.75	1.68	0.07
C24	1.65	1.61	0.04
C25+	50.6	51.5	-0.9

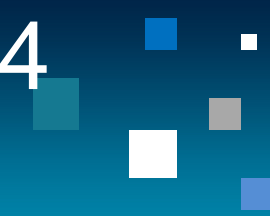


Accumulator Sample 1

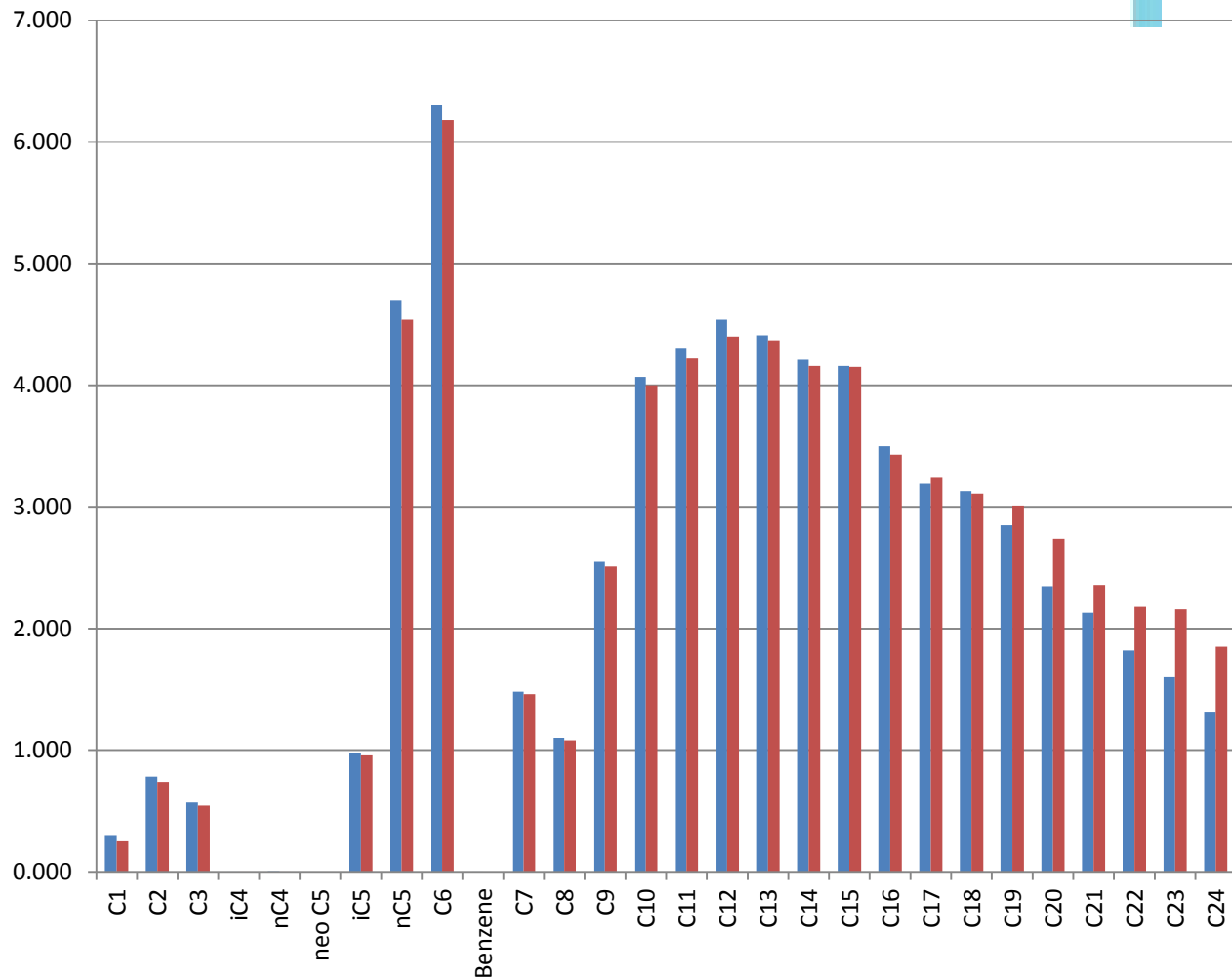


Accumulator Sample #1

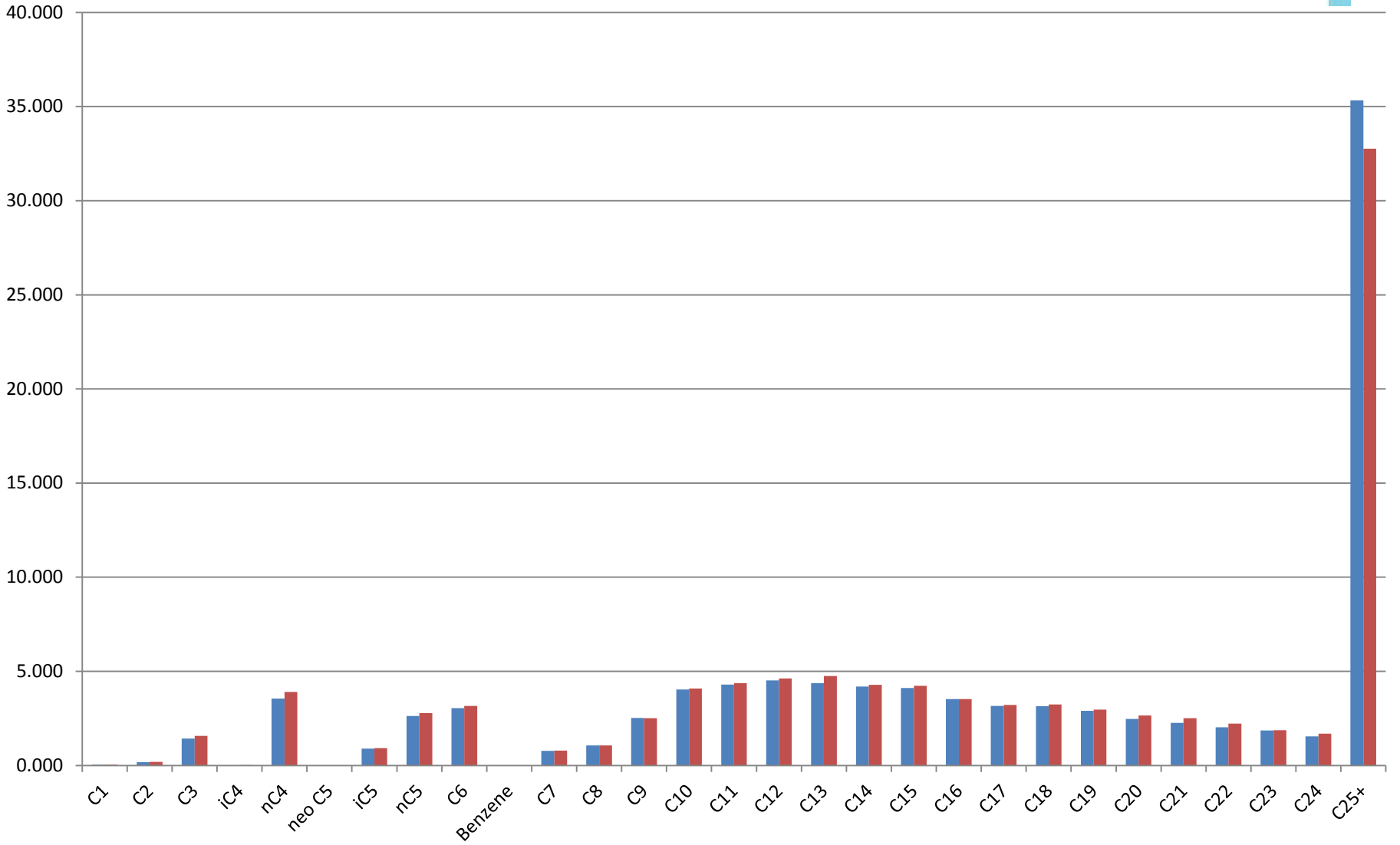
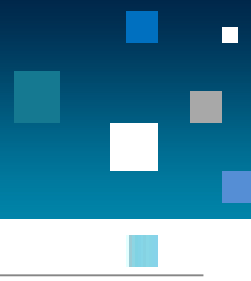
C1-C24



Component	GC1, 1 st Run (Mass %)	GC1 (Mass %)	PE (Mass %)	Difference (GC1& PE) (Mass %)
C1	0.286	0.295	0.250	0.045
C2	0.850	0.782	0.740	0.042
C3	0.630	0.569	0.543	0.026
iC4	0.003	0.003	0.002	0.001
nC4	0.002	0.004	0.002	0.002
neo C5	0.000	0	0	0.000
iC5	1.010	0.972	0.957	0.015
nC5	5.01	4.70	4.54	0.16
C6	6.59	6.30	6.18	0.12
Benzene	0.001	0.001	0.000	0.001
C7	1.52	1.48	1.46	0.02
C8	1.10	1.10	1.08	0.02
C9	2.55	2.55	2.51	0.04
C10	4.13	4.07	4.00	0.07
C11	4.42	4.30	4.22	0.08
C12	4.70	4.54	4.40	0.14
C13	4.85	4.41	4.37	0.04
C14	4.38	4.21	4.16	0.05
C15	4.36	4.16	4.15	0.01
C16	3.65	3.50	3.43	0.07
C17	3.32	3.19	3.24	-0.05
C18	3.30	3.13	3.11	0.02
C19	2.93	2.85	3.01	-0.16
C20	2.54	2.35	2.74	-0.39
C21	2.34	2.13	2.36	-0.23
C22	2.05	1.82	2.18	-0.36
C23	1.75	1.60	2.16	-0.56
C24	1.57	1.31	1.85	-0.54
C25+	30.2	33.7	32.3	1.4

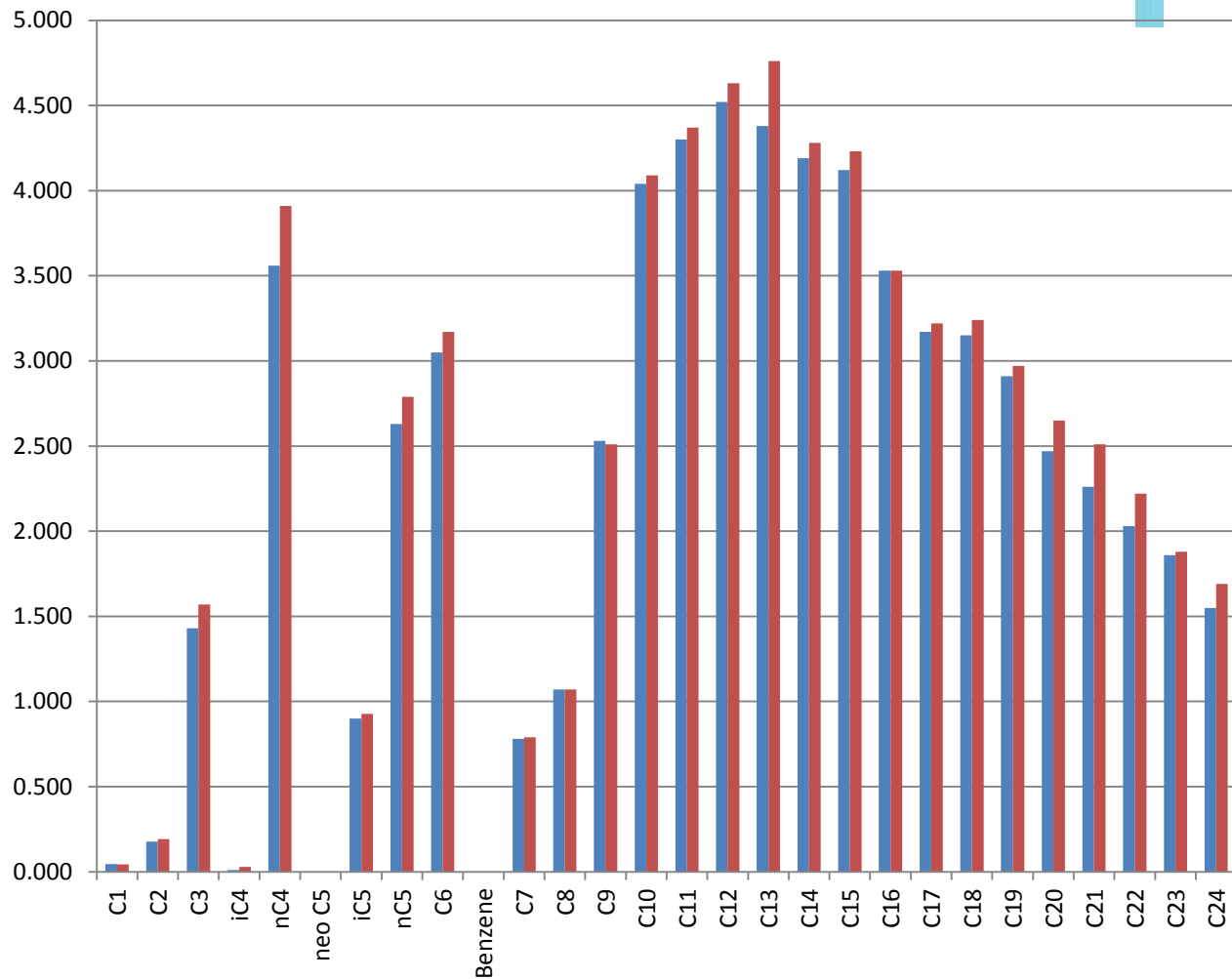


Accumulator 2, C1-C24



Accumulator 2

Component	GC1, 1 st Run (Mass %)	GC1 (Mass %)	PE (Mass %)	Difference (HP & PE) (Mass %)
C1	0.047	0.045	0.044	0.001
C2	0.182	0.178	0.193	-0.015
C3	1.46	1.43	1.57	-0.14
iC4	0.010	0.010	0.028	-0.018
nC4	3.63	3.56	3.91	-0.35
neo C5	0.000	0.000	0.000	0.000
iC5	0.919	0.900	0.928	-0.028
nC5	2.68	2.63	2.79	-0.16
C6	3.10	3.05	3.17	-0.12
Benzene	0.000	0.001	0.001	0.000
C7	0.801	0.781	0.790	-0.009
C8	1.10	1.07	1.07	0.00
C9	2.57	2.53	2.51	0.02
C10	4.14	4.04	4.09	-0.05
C11	4.38	4.30	4.37	-0.07
C12	4.64	4.52	4.63	-0.11
C13	4.50	4.38	4.76	-0.38
C14	4.27	4.19	4.28	-0.09
C15	4.29	4.12	4.23	-0.11
C16	3.58	3.53	3.53	0.00
C17	3.36	3.17	3.22	-0.05
C18	3.31	3.15	3.24	-0.09
C19	3.11	2.91	2.97	-0.06
C20	2.77	2.47	2.65	-0.18
C21	2.44	2.26	2.51	-0.25
C22	2.28	2.03	2.22	-0.19
C23	2.21	1.86	1.88	-0.02
C24	1.99	1.55	1.69	-0.14
C25+	32.2	35.3	32.8	2.6



Summary

- Consistent Results
 - Between labs, between GCs and over time