Synthetic Fuel

by

Steve “Skinner” Forbush

Arch Western Bituminous Coal

Synthetic Fuel

1. Coal to Liquids “CTL”
2. Gas to Liquids “GTL

Diesel Fuel vs. Synthetic Fuel

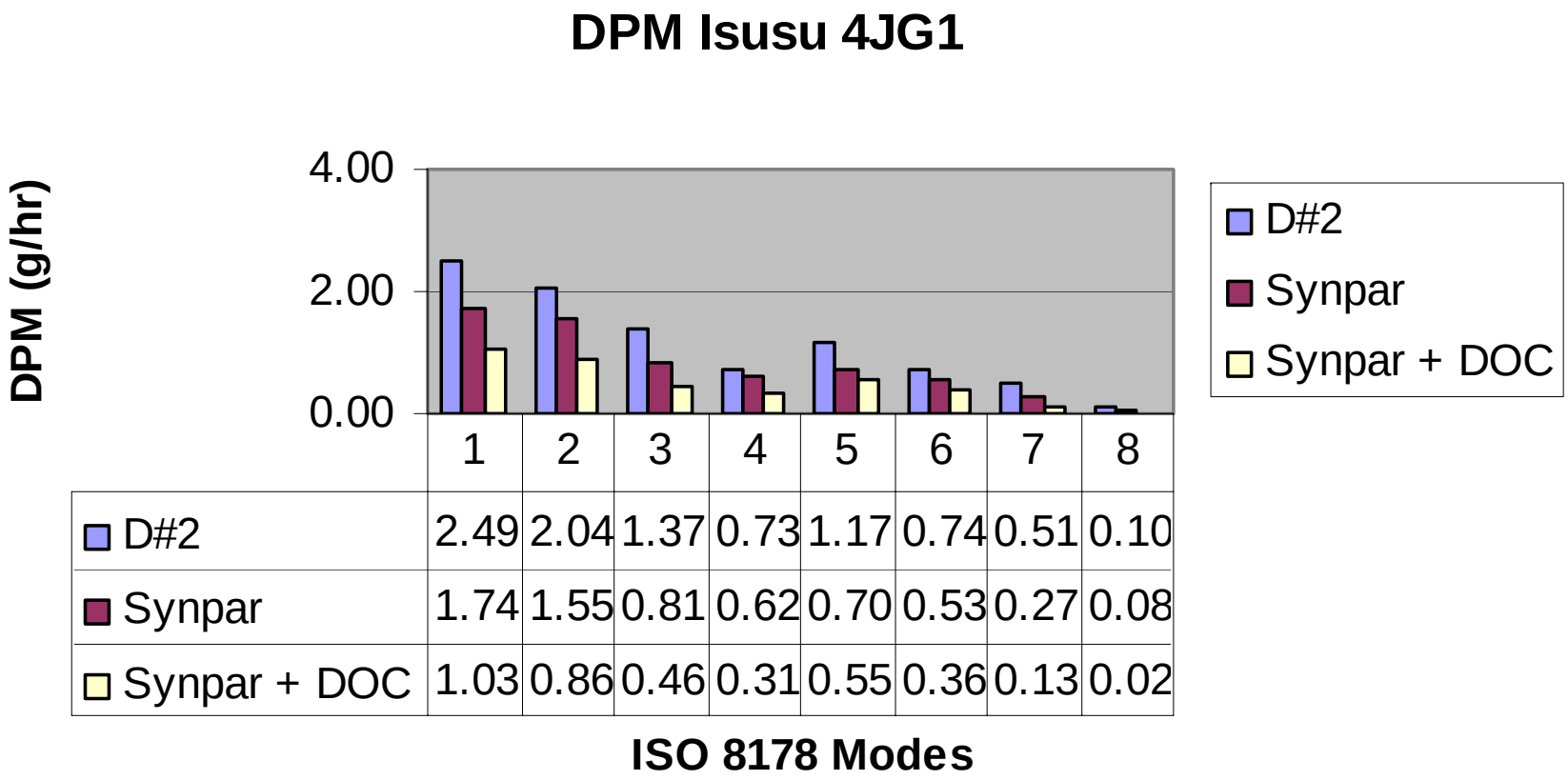
Diesel Fuel

- BTU's/lb……..18,500
- Cetane……40-45
- Aromatics, %.....20-30
- CFPP, °C……0 to -20
- Sulfur, ppm…….<300

Synthetic Fuel

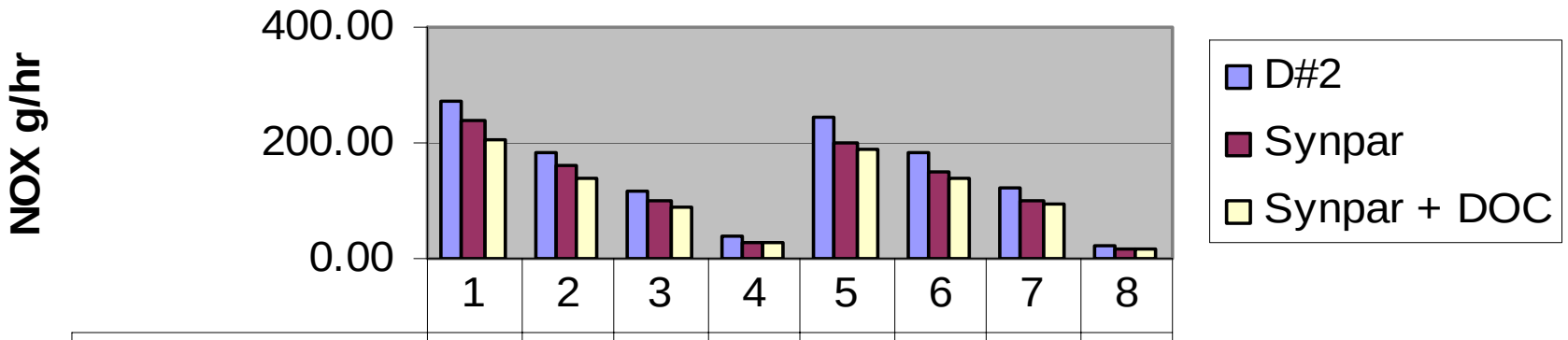
- BTU's/lb…….19,000
- Cetane……80
- Aromatics, %……..0
- CFPP, °C……<-40
- Sulfur, ppm…….<1

1st Lab Test
Isuzu 4JG1 EPA Tier 1
(50% Reduction)



	1	2	3	4	5	6	7	8
D#2	2.49	2.04	1.37	0.73	1.17	0.74	0.51	0.10
Synpar	1.74	1.55	0.81	0.62	0.70	0.53	0.27	0.08
Synpar + DOC	1.03	0.86	0.46	0.31	0.55	0.36	0.13	0.02

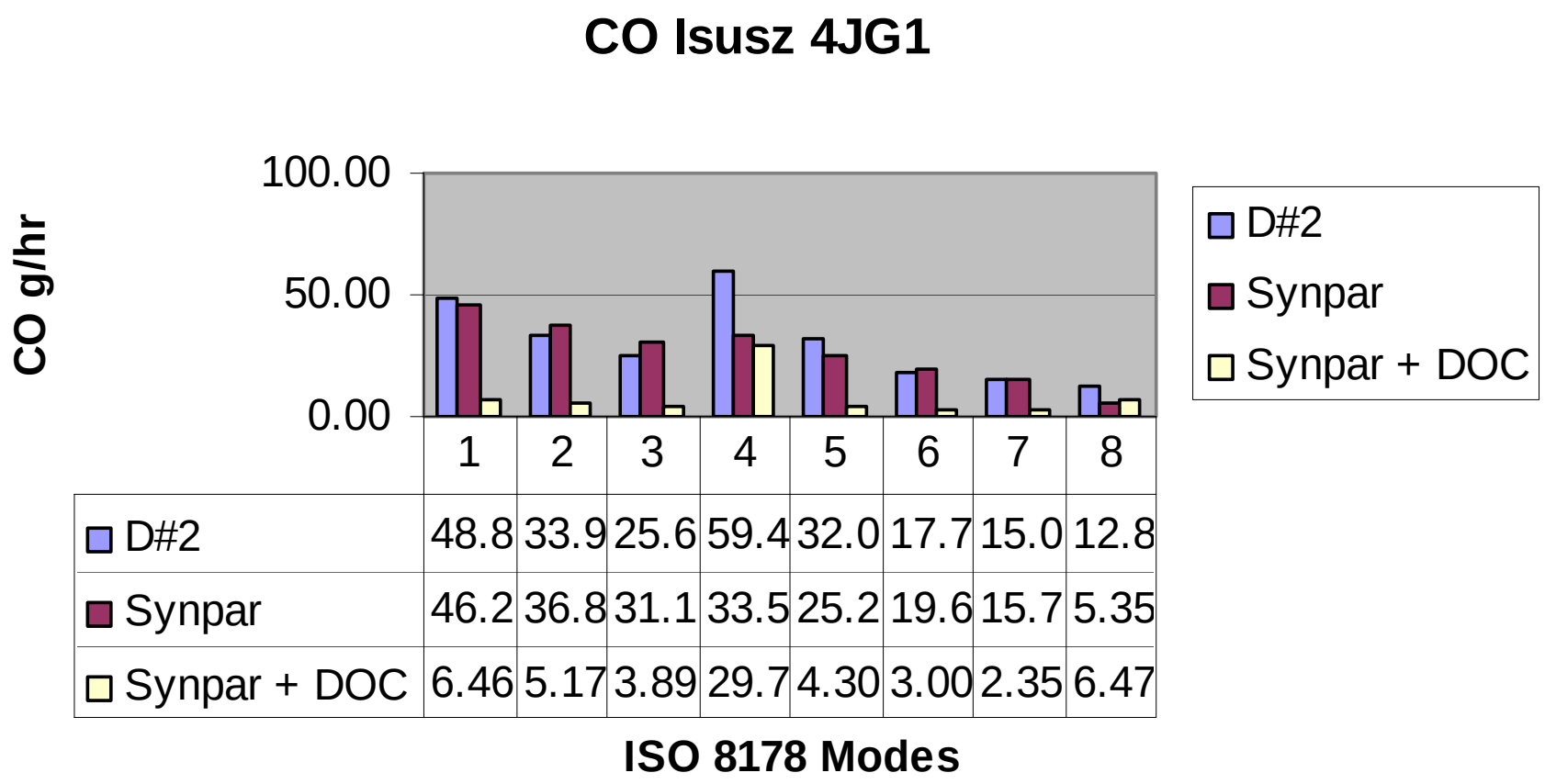
1st Lab Test
Isuzu 4JG1 EPA Tier 1
(21% Reduction)



	1	2	3	4	5	6	7	8
D#2	271.	184.	119.	39.7	246.	181.	119.	19.5
Synpar	238.	158.	102.	29.9	202.	147.	99.1	15.5
Synpar + DOC	204.	141.	90.2	25.8	189.	141.	93.2	14.6

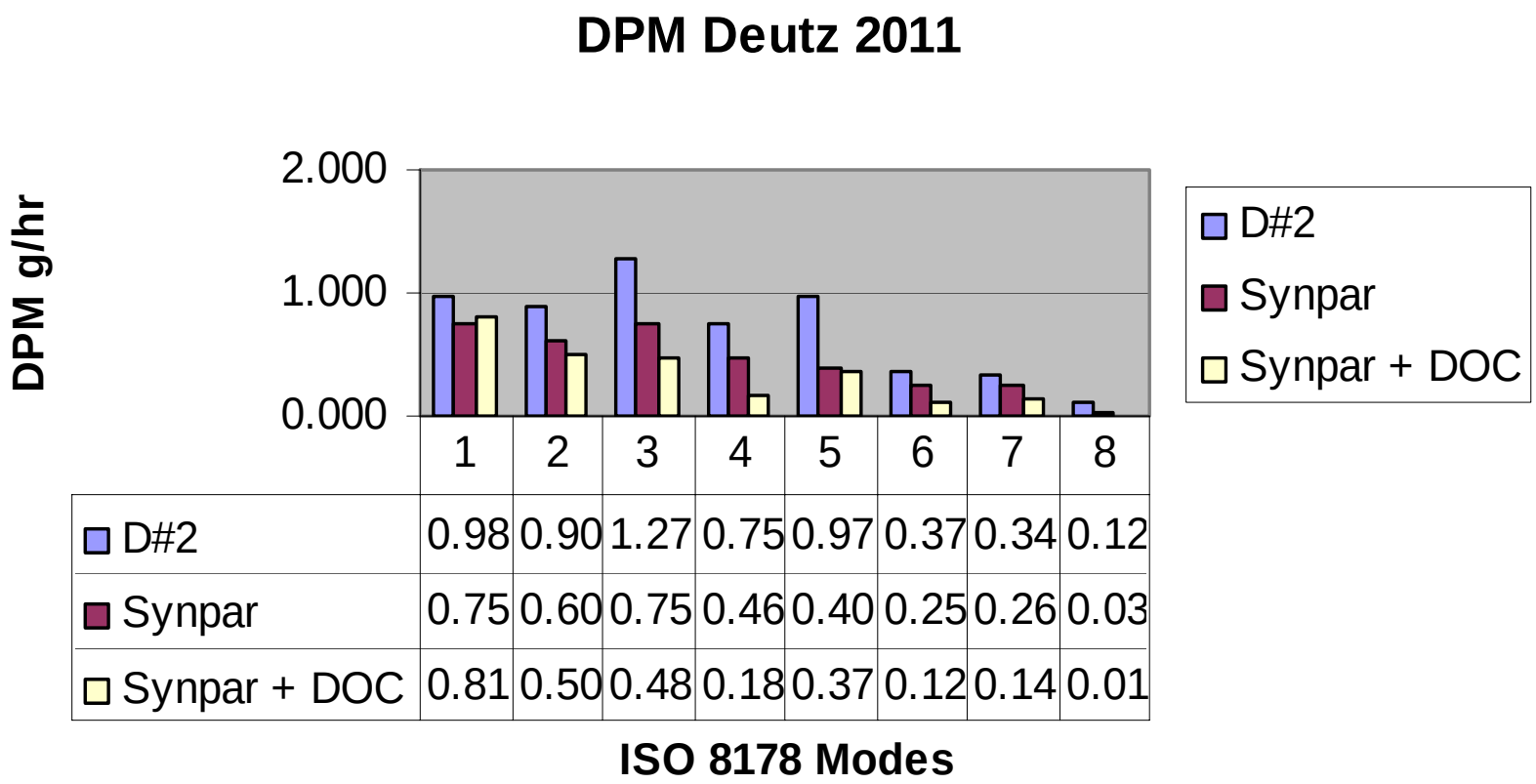
ISO 8178 Modes

1st Lab Test
Isuzu 4JG1 EPA Tier 1
(75% Reduction)



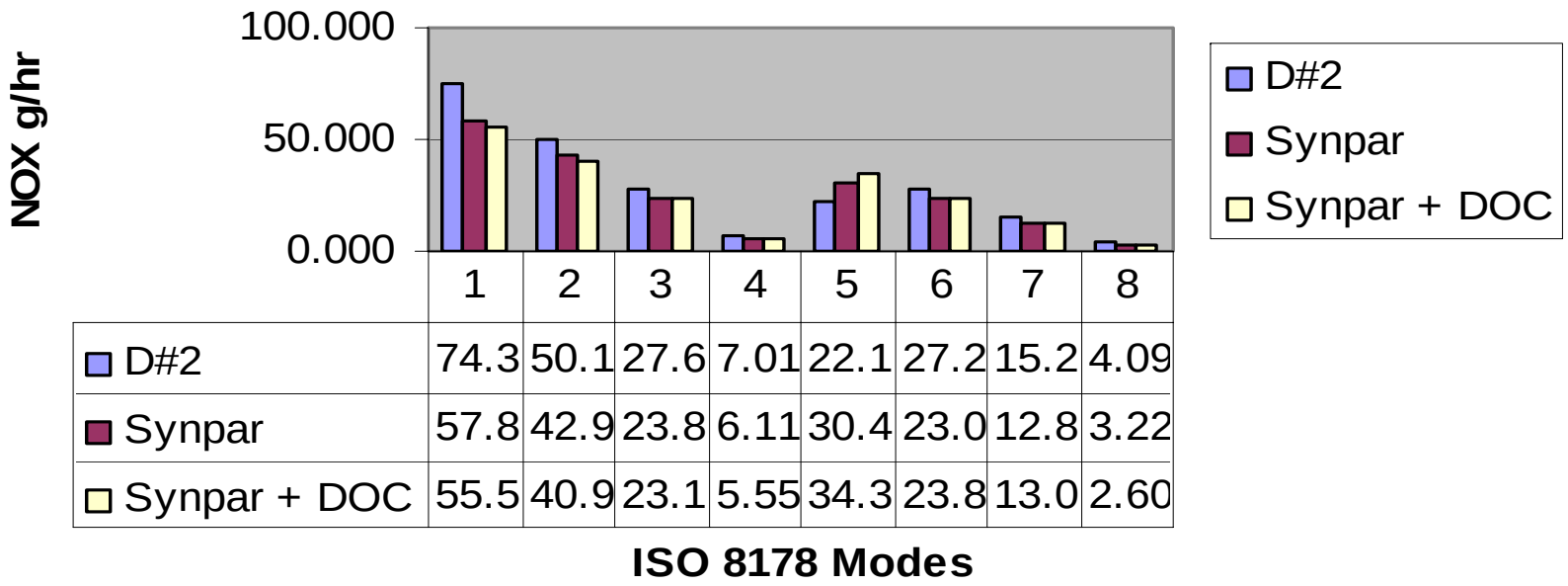
	1	2	3	4	5	6	7	8
D#2	48.8	33.9	25.6	59.4	32.0	17.7	15.0	12.8
Synpar	46.2	36.8	31.1	33.5	25.2	19.6	15.7	5.35
Synpar + DOC	6.46	5.17	3.89	29.7	4.30	3.00	2.35	6.47

2nd Lab Test
Deutz 2011 EPA Tier 2
(54% Reduction)



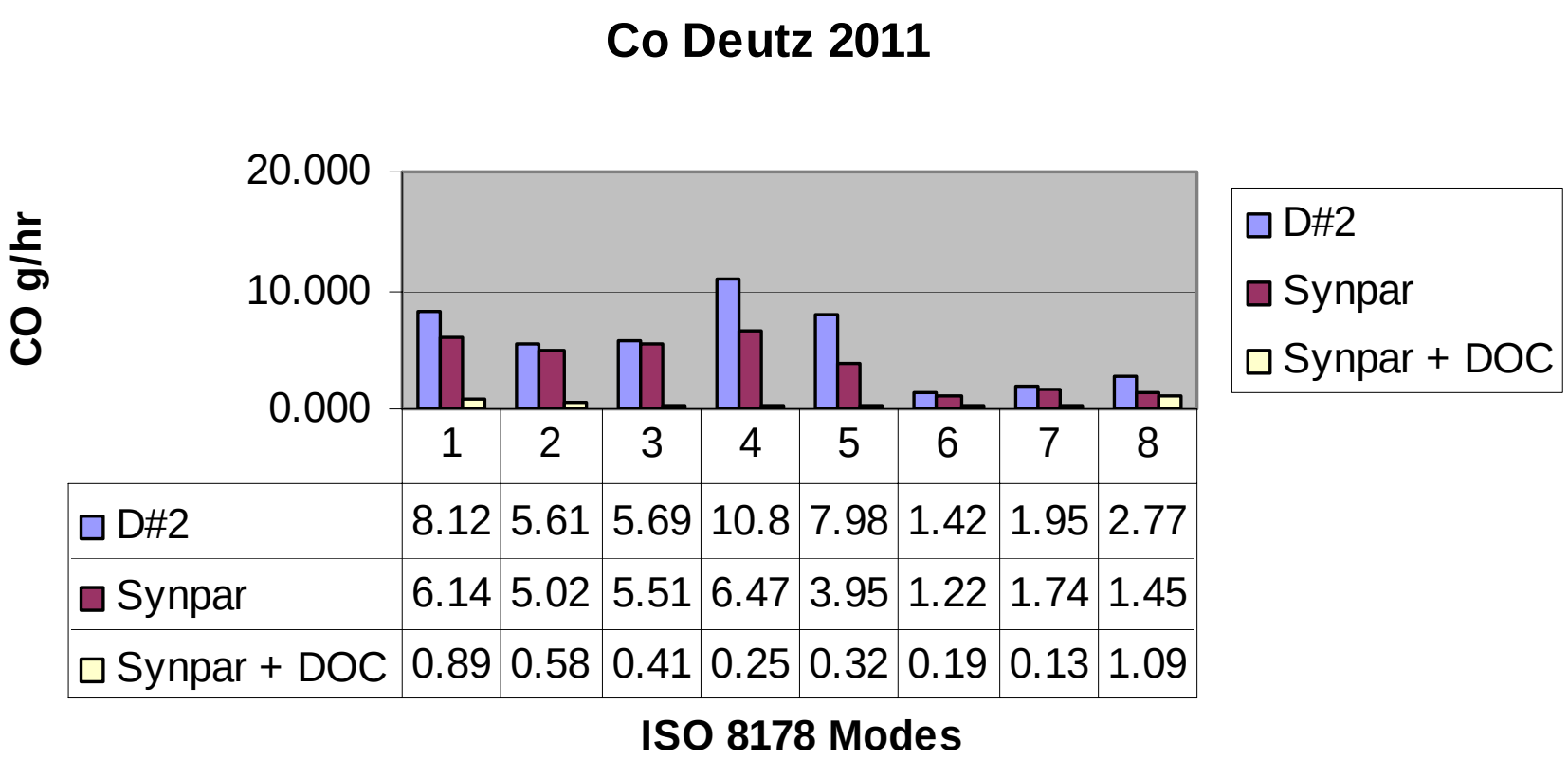
	1	2	3	4	5	6	7	8
D#2	0.98	0.90	1.27	0.75	0.97	0.37	0.34	0.12
Synpar	0.75	0.60	0.75	0.46	0.40	0.25	0.26	0.03
Synpar + DOC	0.81	0.50	0.48	0.18	0.37	0.12	0.14	0.01

2nd Lab Test
Deutz 2011 EPA Tier 2
(21% Reduction)



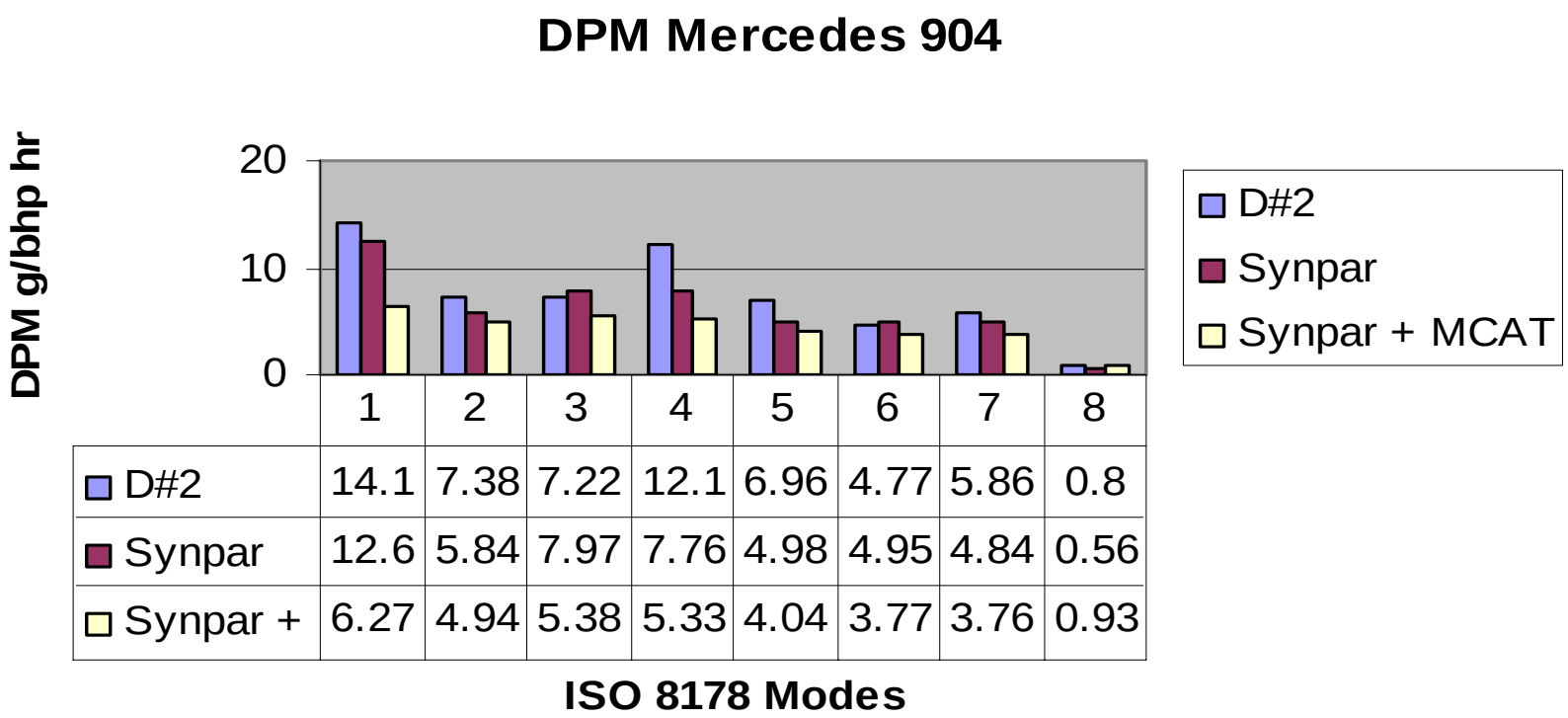
	1	2	3	4	5	6	7	8
D#2	74.3	50.1	27.6	7.01	22.1	27.2	15.2	4.09
Synpar	57.8	42.9	23.8	6.11	30.4	23.0	12.8	3.22
Synpar + DOC	55.5	40.9	23.1	5.55	34.3	23.8	13.0	2.60

2nd Lab Test
Deutz 2011 EPA Tier 2
(91% Reduction)



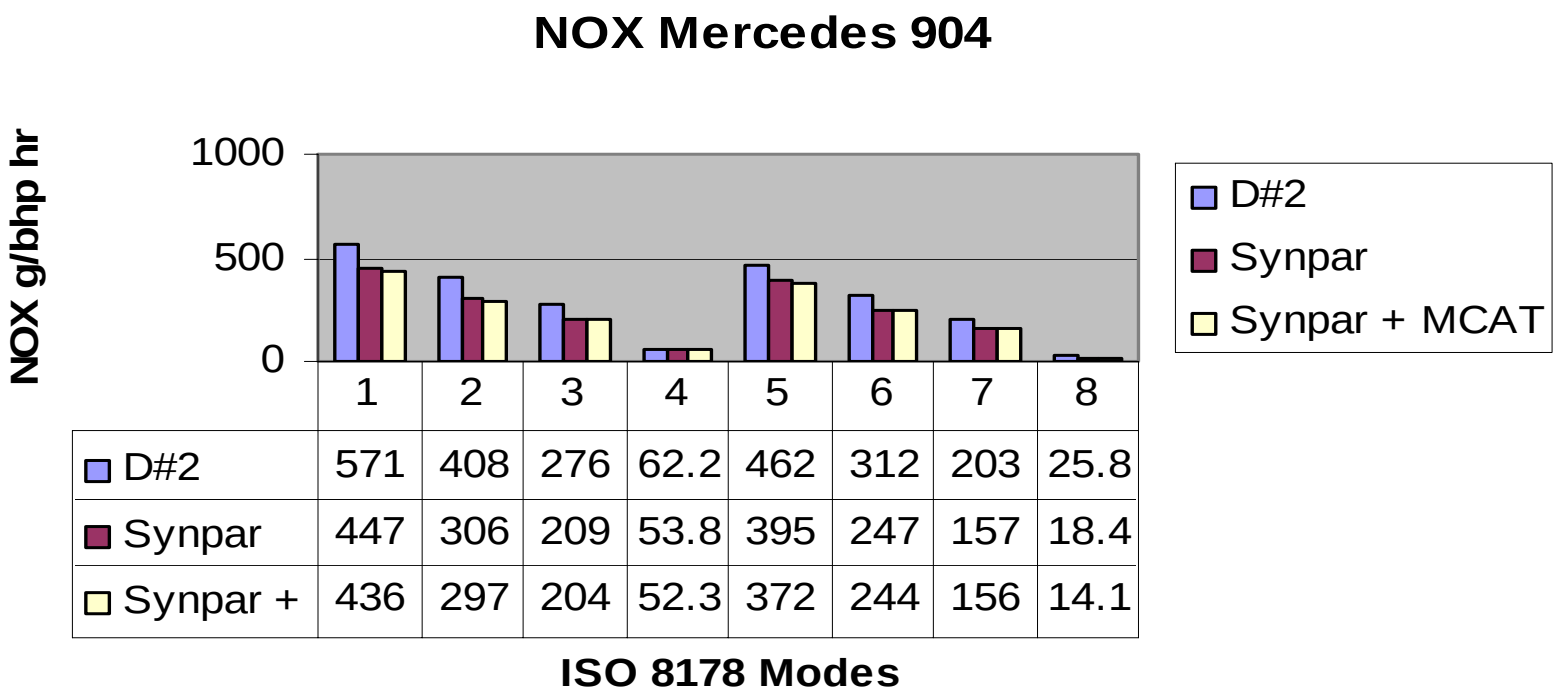
	1	2	3	4	5	6	7	8
D#2	8.12	5.61	5.69	10.8	7.98	1.42	1.95	2.77
Synpar	6.14	5.02	5.51	6.47	3.95	1.22	1.74	1.45
Synpar + DOC	0.89	0.58	0.41	0.25	0.32	0.19	0.13	1.09

3rd Lab Test
Mercedes 904 EPA Tier 3
(41% Reduction)



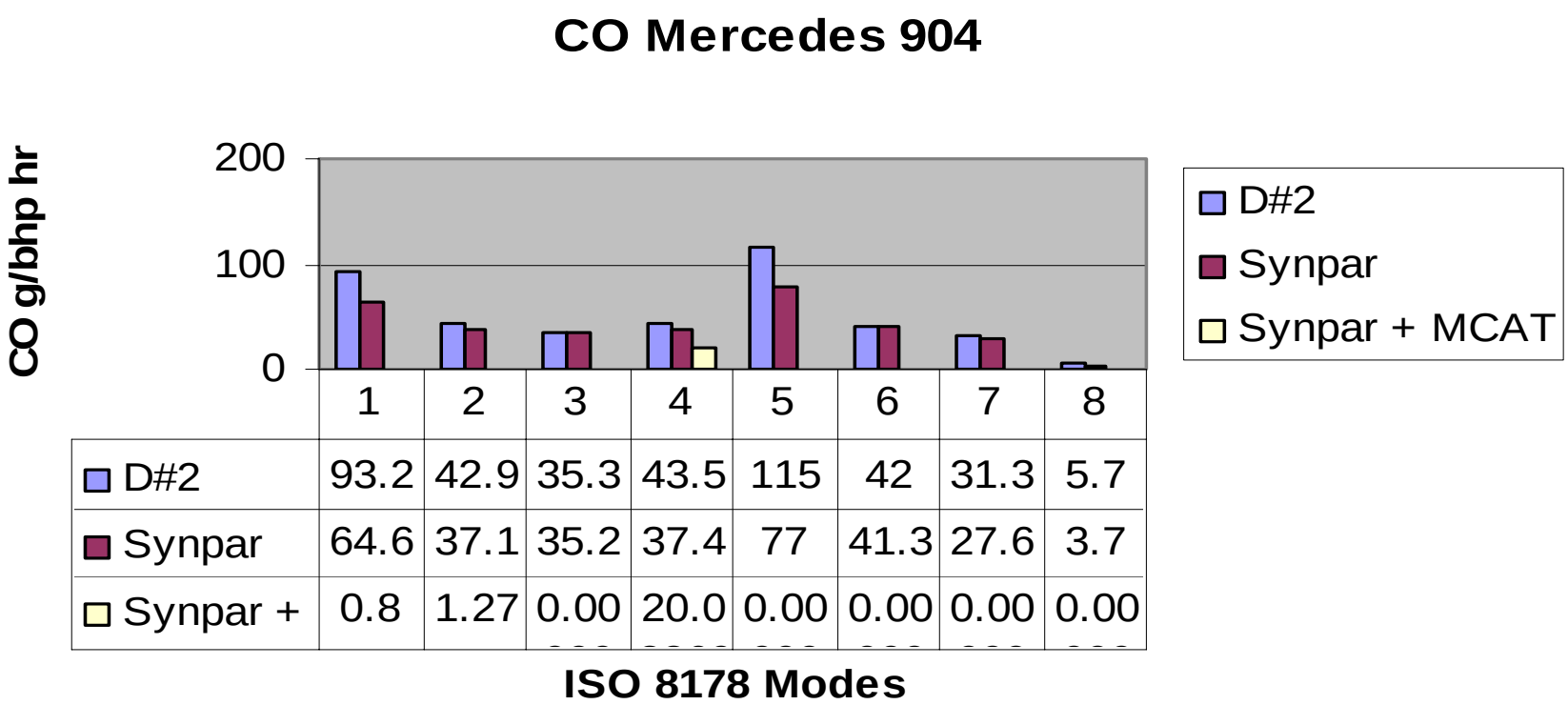
	1	2	3	4	5	6	7	8
D#2	14.1	7.38	7.22	12.1	6.96	4.77	5.86	0.8
Synpar	12.6	5.84	7.97	7.76	4.98	4.95	4.84	0.56
Synpar +	6.27	4.94	5.38	5.33	4.04	3.77	3.76	0.93

3rd Lab Test
Mercedes 904 EPA Tier 3
(24% Reduction)



	1	2	3	4	5	6	7	8
D#2	571	408	276	62.2	462	312	203	25.8
Synpar	447	306	209	53.8	395	247	157	18.4
Synpar +	436	297	204	52.3	372	244	156	14.1

3rd Lab Test
Mercedes 904 EPA Tier 3
(95% Reduction)



	1	2	3	4	5	6	7	8
D#2	93.2	42.9	35.3	43.5	115	42	31.3	5.7
Synpar	64.6	37.1	35.2	37.4	77	41.3	27.6	3.7
Synpar +	0.8	1.27	0.00	20.0	0.00	0.00	0.00	0.00

Questions?