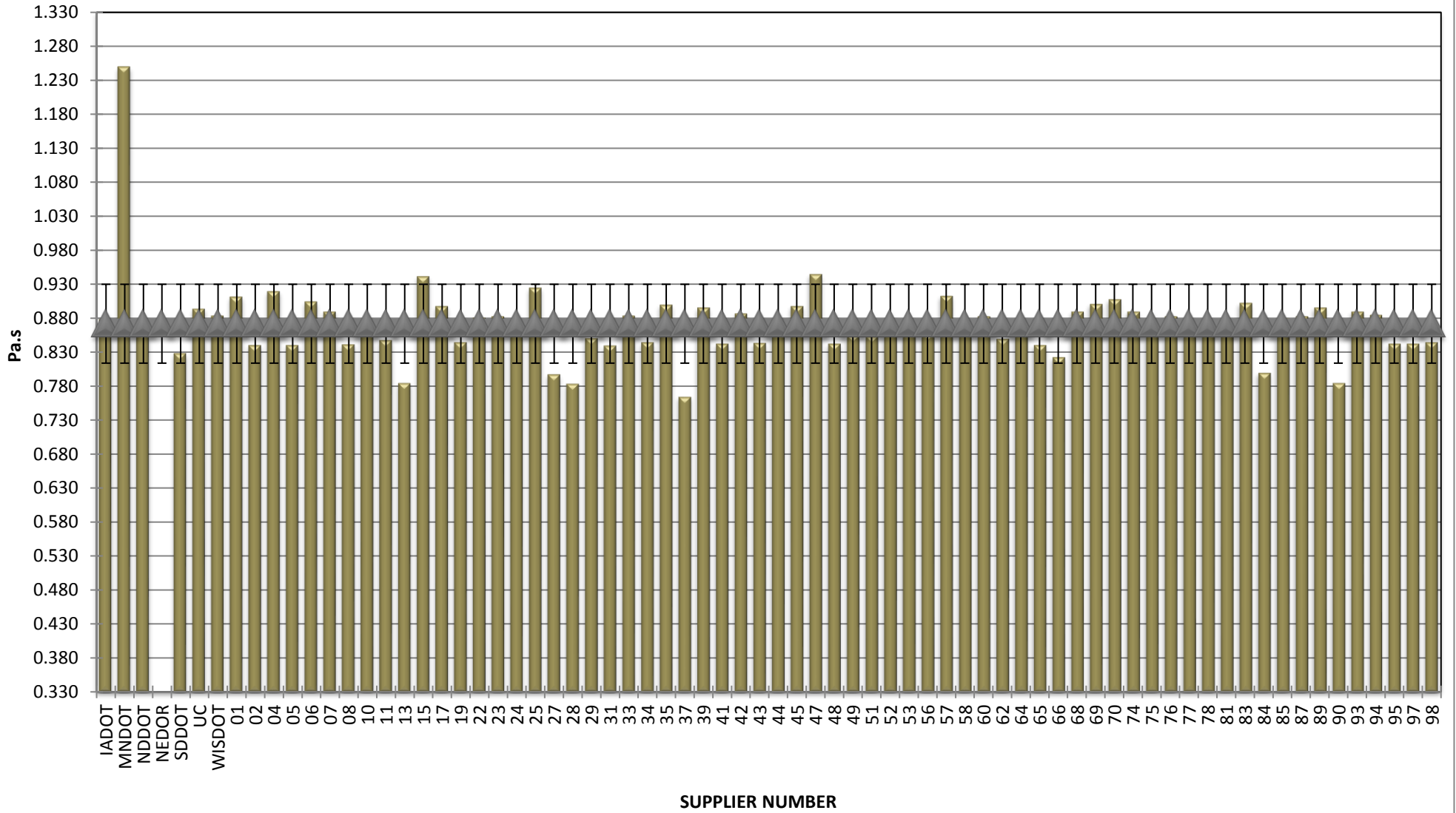


**COMBINED STATE BINDER GROUP ROUND ROBIN SUMMARY A 2018-1
PG 58V-34**

Supplier Number	Rotational Viscosity (Pa.s) @135°C	DSR Original (kPa)	DSR RTFO (kPa)	DSR PAV (kPa)	Mass Loss (%) @163°C	BBR S-value (MPa)	BBR m-value	Jnr @ 100 Pa	% Recov. @ 100 Pa	Jnr @ 3200 Pa	% Recov. @ 3200 Pa
IADOT	0.879	2.23		2,420	0.882	265	0.333	0.292	74.63	0.359	67.68
MNDOT	1.250	2.43		2,490	0.896	283	0.311	0.226	77.90	0.280	71.50
NDDOT	0.860	2.35		2,539	0.962	265	0.333	0.268	71.00	0.284	68.70
NEDOR		2.20		2,941	0.899	285	0.319	0.299	73.42	0.342	69.12
SDDOT	0.829	2.03		2,560	0.729	237	0.340	0.250	67.01	0.328	57.38
UC	0.894	2.14		2,193	0.851	260	0.337	0.380	69.50	0.467	63.50
WISDOT	0.884	2.24		2,580	0.811	249	0.330	0.231	76.94	0.303	69.55
01	0.912	2.26		3,440	1.010	261	0.332	0.220	78.30	0.270	72.20
02	0.841	2.27		2,499	0.817	288	0.333	0.258	76.02	0.321	69.38
04	0.920	2.15		1,970	0.590	274	0.327	0.236	78.70	0.315	71.70
05	0.841	2.14		1,950	0.827	237	0.348	0.280	75.60	0.360	68.10
06	0.905	2.18		2,590	1.061	281	0.329	0.256	77.15	0.326	70.44
07	0.890	2.27		2,490	0.973	256	0.345	0.250	75.20	0.032	68.30
08	0.842	2.09		1,910	0.831	224	0.354	0.260	76.10	0.340	69.00
10	0.879	2.16		2,225	0.960	272	0.331	0.203	79.30	0.298	70.69
11	0.848	2.30		2,595	0.837	294	0.334	0.239	76.97	0.304	70.11
13	0.785	2.27		2,440	0.814	270	0.336	0.227	76.51	0.309	69.33
15	0.942	2.25		2,440	0.888	241	0.346	0.250	75.79	0.315	69.25
17	0.898	2.25		3,550	0.889	268	0.327	0.210	78.40	0.270	72.30
19	0.845	2.26		2,315	1.033		0.337	0.222	77.90	0.275	72.20
22	0.881	2.24		2,358	0.958	269	0.330	0.188	80.40	0.271	72.45
23	0.883	2.22		2,390	0.972	270	0.343	0.240	77.07	0.301	70.82
24	0.878	2.31		2,840	0.830	272	0.330	0.233	76.61	0.293	70.30
25	0.925	2.27		2,253	0.028	258	0.330	0.294	73.72	0.371	66.46
27	0.798	2.12		1,810	0.864	265	0.337	0.320	72.58	0.410	64.58
28	0.784	2.17		2,709	0.980	283	0.333	0.263	75.67	0.325	69.96
29	0.851	2.13		2,297	0.823	271	0.332	0.287	74.99	0.365	67.84
31	0.840	2.16		1,530	0.833	238	0.349	0.251	76.40	0.314	69.95
33	0.884	2.24		2,570	0.813	261	0.341	0.229	76.87	0.288	70.52
34	0.845	2.29		2,328	0.969	281	0.341	0.285	74.60	0.363	67.34
35	0.900	2.25		1,970	0.876	257	0.331				
37	0.765	2.22		2,280	0.642	246	0.338	0.280	75.20	0.360	68.40
39	0.896	2.23		2,460	0.883	240	0.342	0.261	75.50	0.329	68.80
41	0.843	2.06		1,680	0.836	236	0.363	0.223	77.34	0.283	70.88
42	0.887	2.16		2,450	0.950	264	0.320	0.240	76.79	0.300	70.42
43	0.844	2.28		2,580	0.888	276	0.321	0.293	72.43	0.310	70.10
44	0.871	2.17		2,263	0.984	270	0.327	0.211	78.30	0.289	70.81
45	0.898	2.25		3,750	0.858	262	0.321	0.220	77.30	0.270	71.50
47	0.945	2.20		2,135	0.757	286	0.324	0.192	80.70	0.286	72.10
48	0.843	2.28		2,280	0.993	298	0.333	0.275	75.01	0.351	67.73
49	0.855	2.30		2,370	1.066	271	0.328	0.230	77.15	0.290	70.79
51	0.854	2.27		2,212	1.028		0.343	0.225	78.00	0.283	71.70
52	0.875	2.18		2,511	0.968	271	0.329	0.222	77.99	0.294	71.28
53	0.863	2.20		2,320	0.960	269	0.337	0.290	74.68	0.376	65.52
56	0.858	2.24		2,280	0.900	293	0.324	0.251	76.43	0.329	68.75
57	0.913	2.14		2,059	0.578	275	0.332	0.235	78.90	0.346	69.80
58	0.868	2.27		2,220	0.926	259	0.353	0.242	75.83	0.305	69.25
60	0.883	2.17		3,110	1.049	252	0.332	0.214	76.60	0.270	70.00
62	0.850	2.22		2,410	0.868	300	0.327	0.241	76.74	0.308	69.57
64	0.864	2.21		2,293	0.951	271	0.336	0.282	74.60	0.367	65.50
65	0.841	2.08		1,600	0.836	232	0.351	0.251	76.60	0.319	69.65
66	0.823	2.17		2,601	1.014	287	0.326	0.252	75.74	0.312	69.97
68	0.890	2.10		2,571	0.944	255	0.339	0.322	71.08	0.360	67.35
69	0.901	2.15		2,336	0.857	255	0.335	0.311	72.70	0.379	67.70
70	0.908	2.28		2,500	0.902	263	0.328	0.485	71.86	0.623	62.90
74	0.890	2.22		2,350	1.017	266	0.336	0.304	74.68	0.406	65.93
75	0.879	2.20		2,250	0.981	268	0.329	0.220	77.87	0.299	70.53
76	0.883	2.22		2,700	0.852	282	0.335	0.278	75.39	0.350	62.63
77	0.875	2.24		4,510	1.011	245	0.331	0.269	73.72	0.326	67.75
78	0.866	2.18		2,290	0.919	266	0.348	0.216	77.12	0.278	70.61
81	0.862	2.22		2,830	0.911			0.257	75.84	0.326	69.13
83	0.903	2.20		3,040	0.896	245	0.328	0.171	79.91	0.215	74.42
84	0.800	2.27		2,751	0.900	268	0.337	0.269	74.73	0.339	67.88
85	0.880	2.17		2,760	0.878	271	0.322	0.254	76.71	0.318	78.41
87	0.883	2.34		2,400	0.909	264	0.322	0.252	74.03	0.263	72.27
89	0.896	2.21		2,140	0.877	246	0.352	0.269	75.16	0.339	68.41
90	0.785	2.21		2,907	0.963	282	0.324	0.218	77.55	0.274	71.54
93	0.890	2.22		2,566	0.997	268	0.342	0.249	76.17	0.313	69.70
94	0.885	2.23		2,300	0.690	231	0.343	0.201	78.45	0.256	72.34
95	0.843	2.33		2,620	0.861	277	0.332	0.289	72.08	0.306	69.87
97	0.843	2.34		2,238	1.012		0.341	0.224	77.80	0.275	72.30
98	0.845	2.25		2,286	1.001		0.340	0.226	77.90	0.281	72.00
99	0.811	2.14		2,755	0.952	277	0.330	0.251	75.85	0.306	70.40
Average	0.872	2.22		2,468	0.887	265	0.334	0.254	75.91	0.317	69.41
Std. Dev.	0.058	0.07		454	0.142	17	0.009	0.045	2.45	0.064	2.91
Coef. of Var.	6.657	3.21		18	16.059	6	2.799	17.611	3.22	20.244	4.19

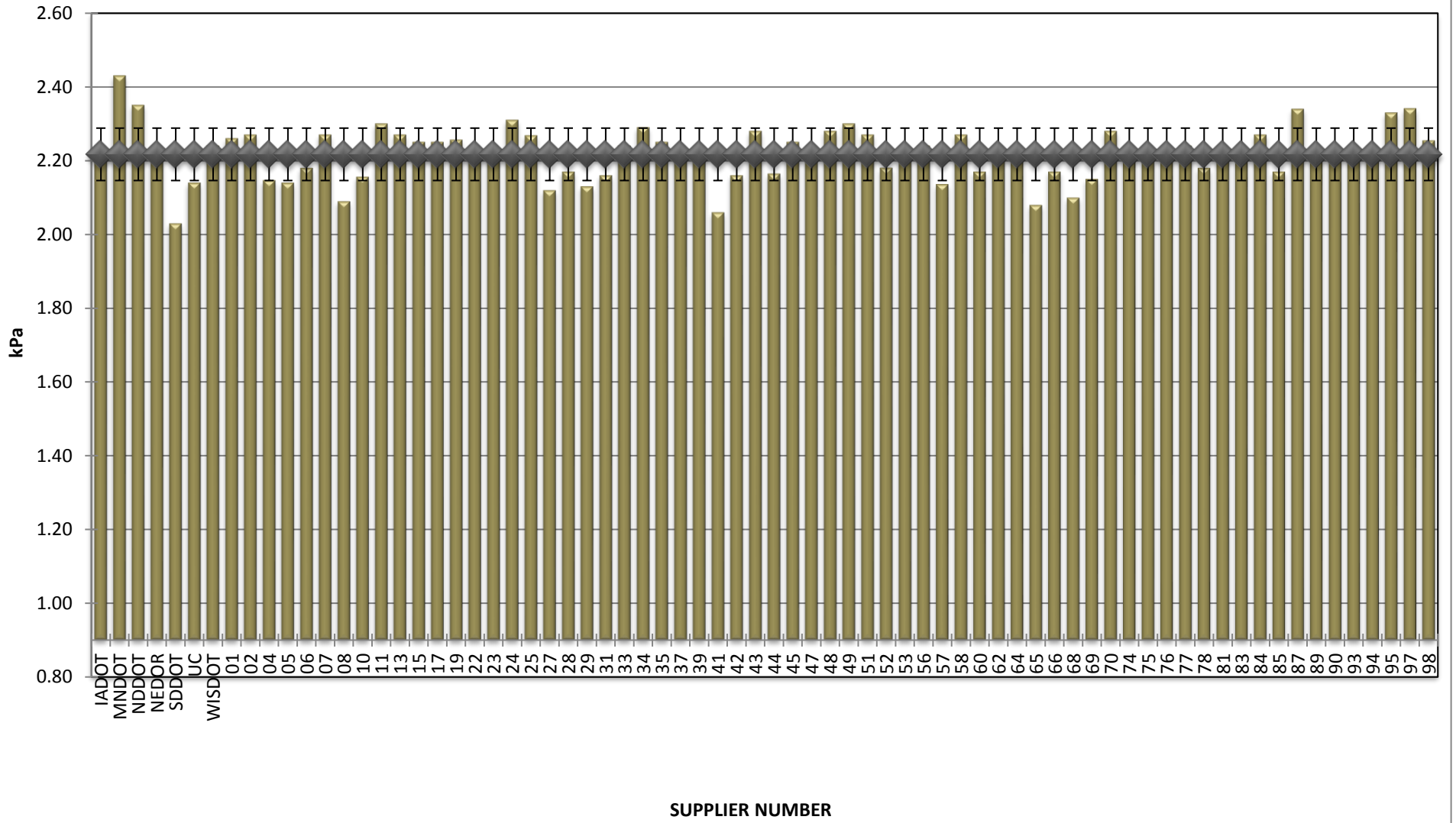
**COMBINED STATE BINDER GROUP ROUND ROBIN
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PG 58V-34**

ROTATIONAL VISCOSITY



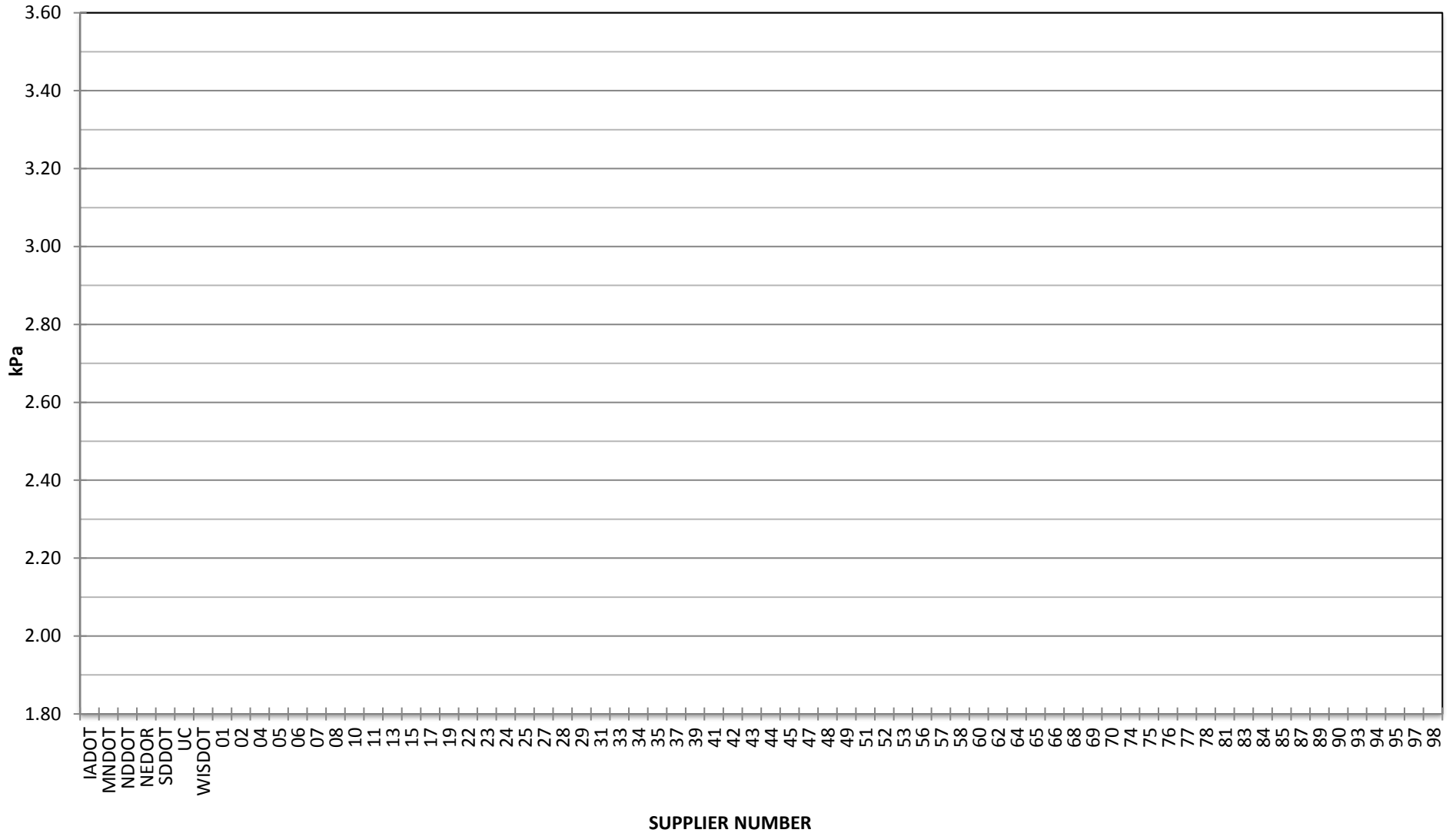
**COMBINED STATE BINDER GROUP ROUND ROBIN
SUMMARY A 2018-1
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DSR - ORIGINAL



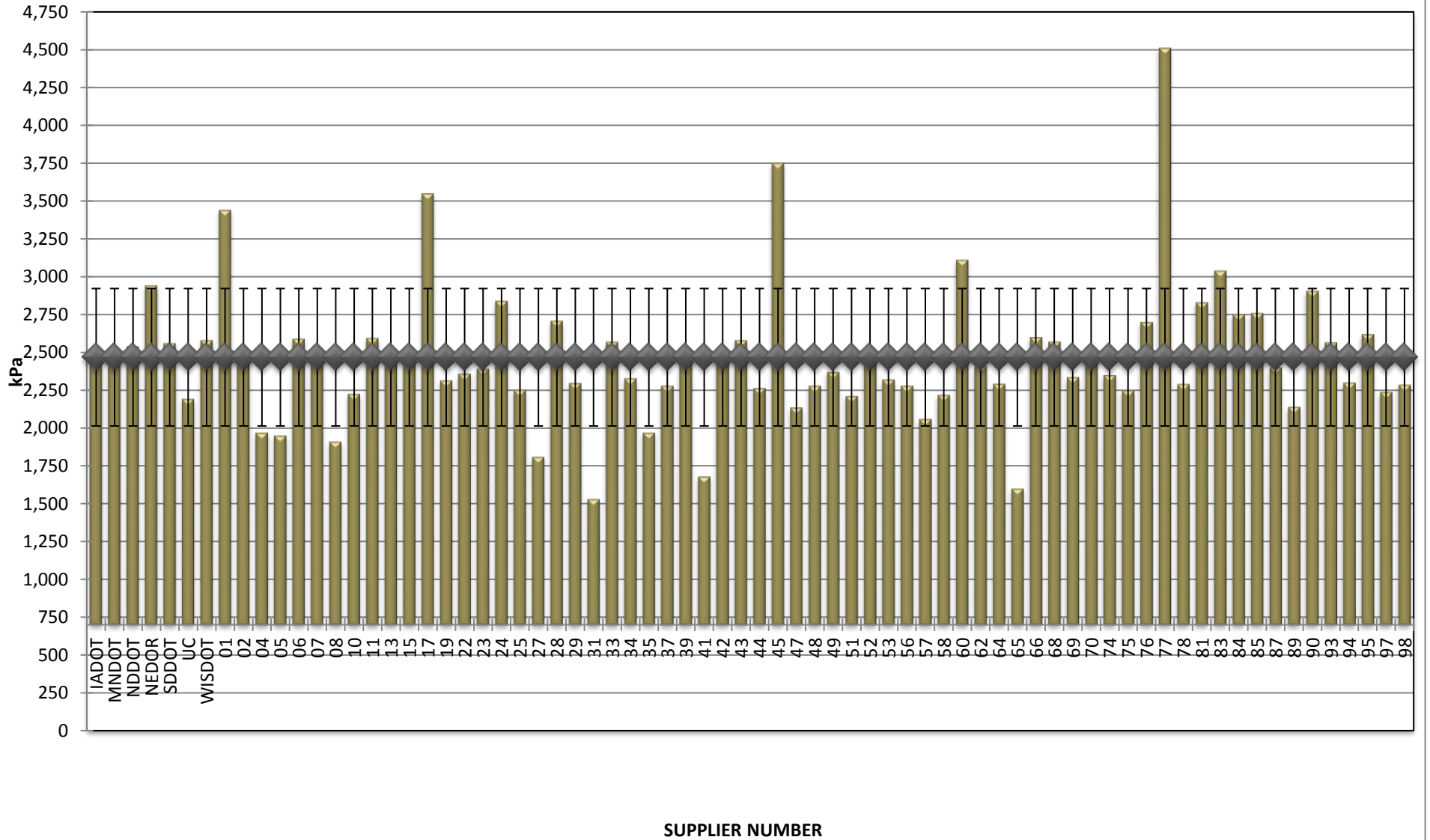
COMBINED STATE BINDER GROUP ROUND ROBIN
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DSR - RTFO



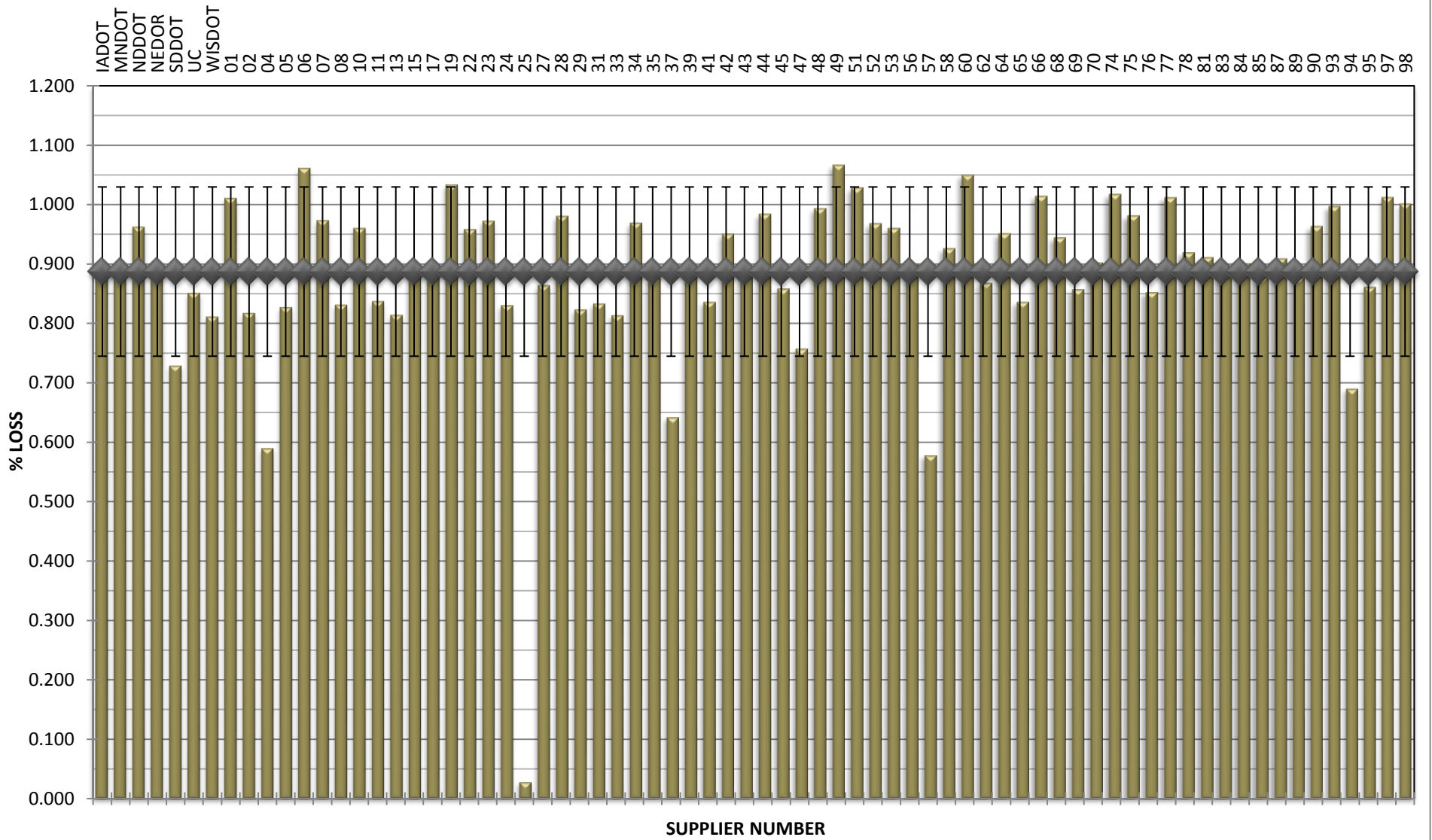
**COMBINED STATE BINDER GROUP ROUND ROBIN
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DSR - PAV



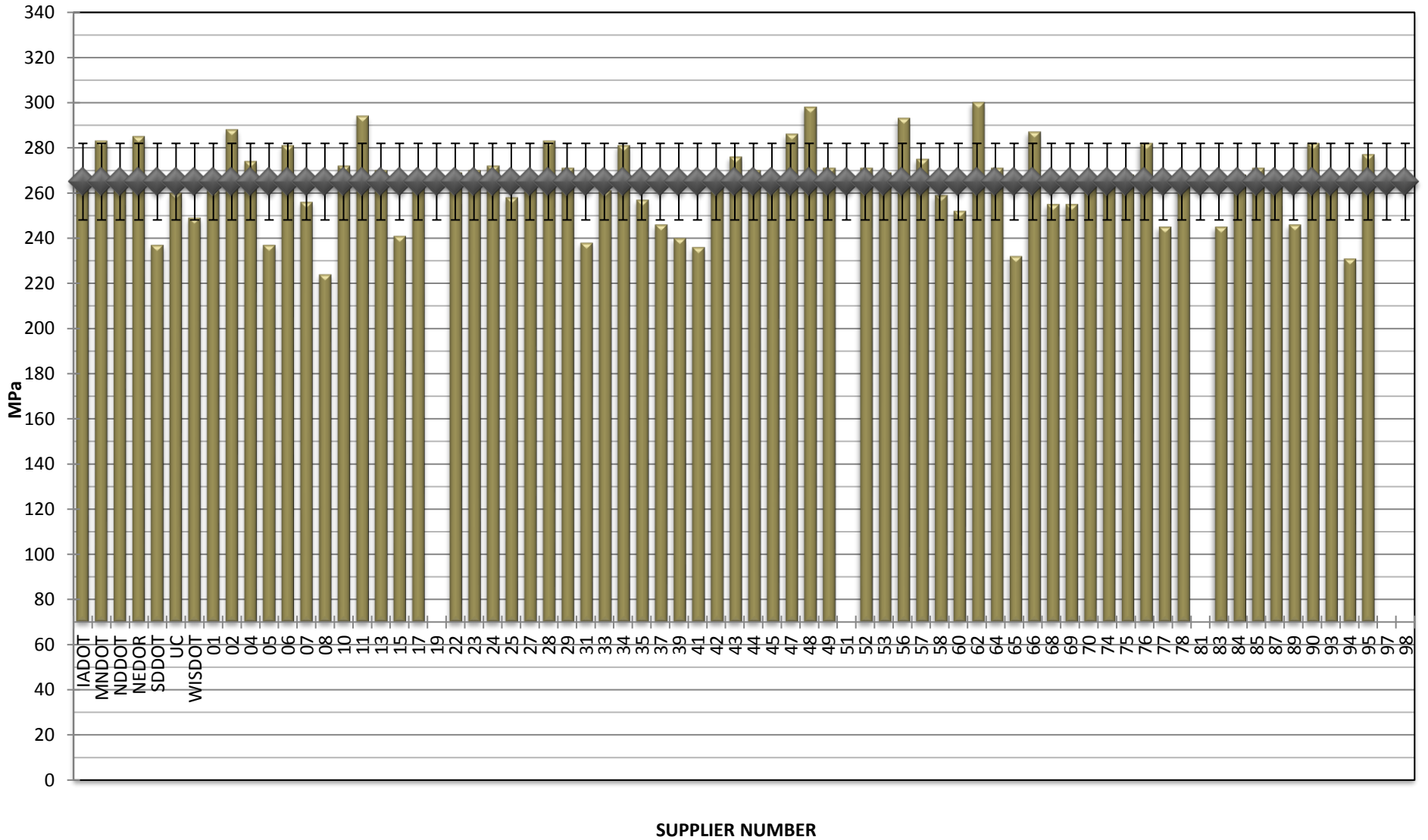
**COMBINED STATE BINDER GROUP ROUND ROBIN
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RTFO MASS LOSS



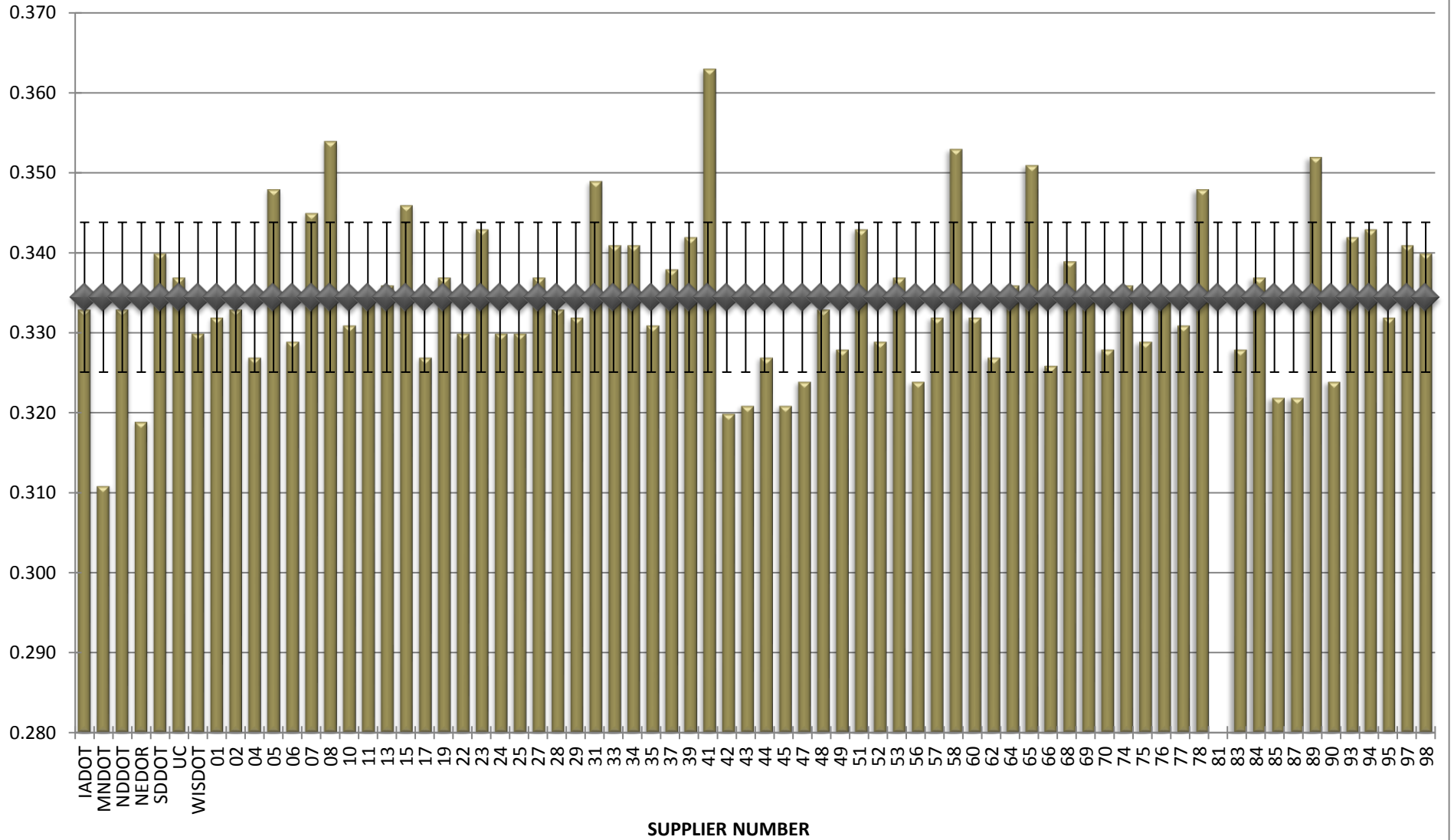
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BBR STIFFNESS



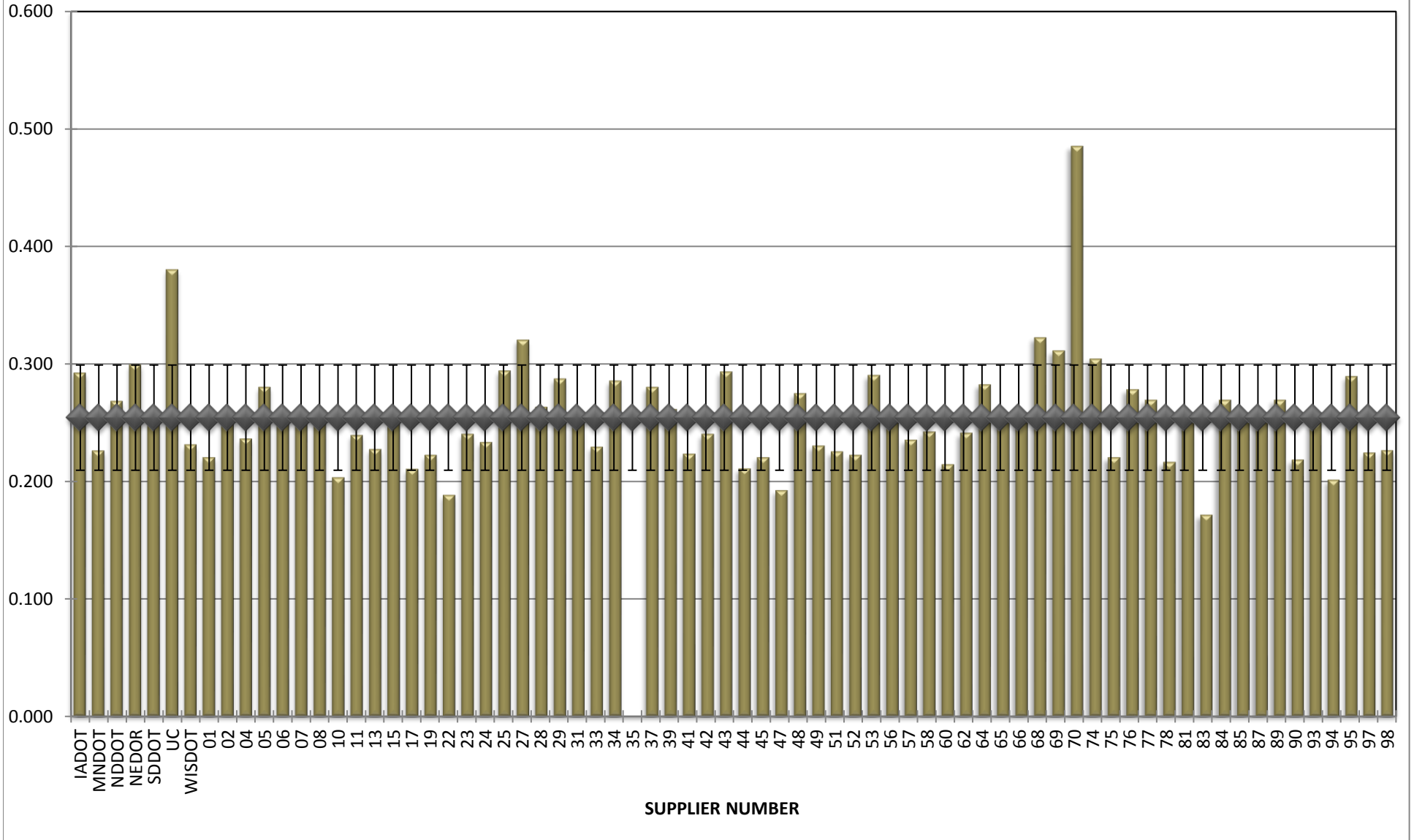
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BBR m-VALUE



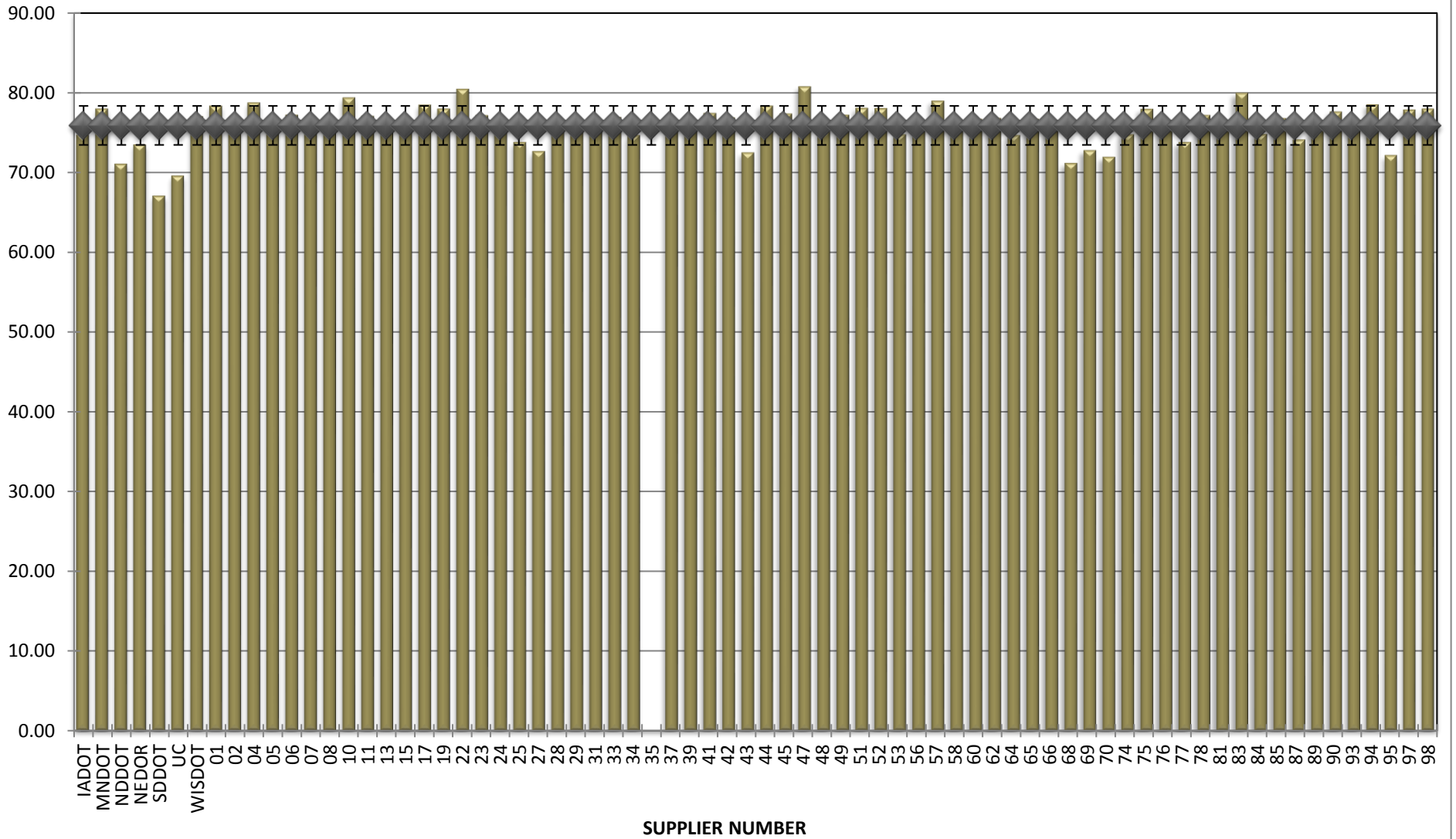
**COMBINED STATE BINDER GROUP ROUND ROBIN
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Jnr @ 100 Pa



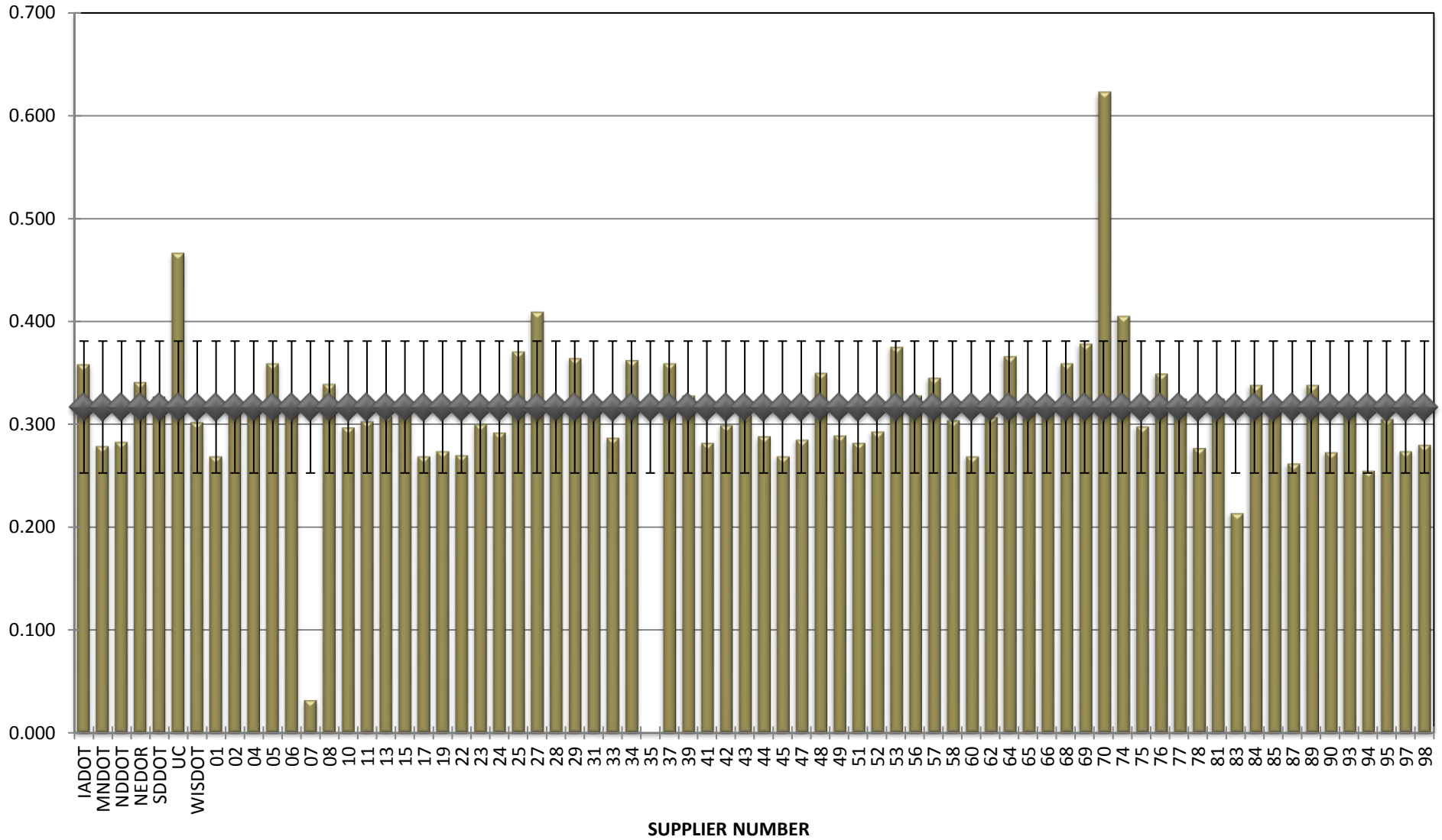
**COMBINED STATE BINDER GROUP ROUND ROBIN
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% Recovery @ 100 Pa



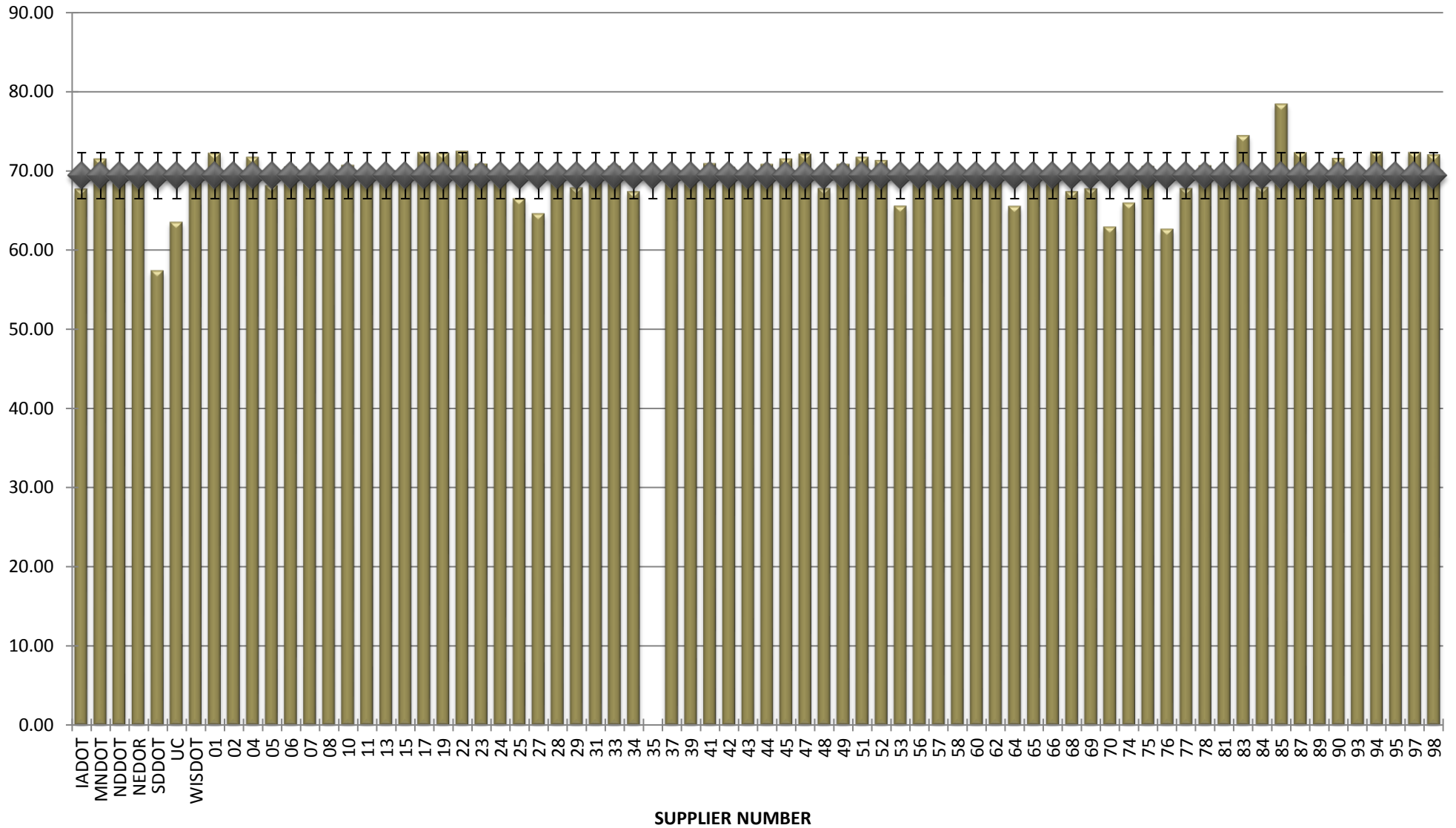
**COMBINED STATE BINDER GROUP ROUND ROBIN
SUMMARY A 2018-1
PG 58V-34**

Jnr @ 3200 Pa



**COMBINED STATE BINDER GROUP ROUND ROBIN
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% Recovery @ 3200 Pa



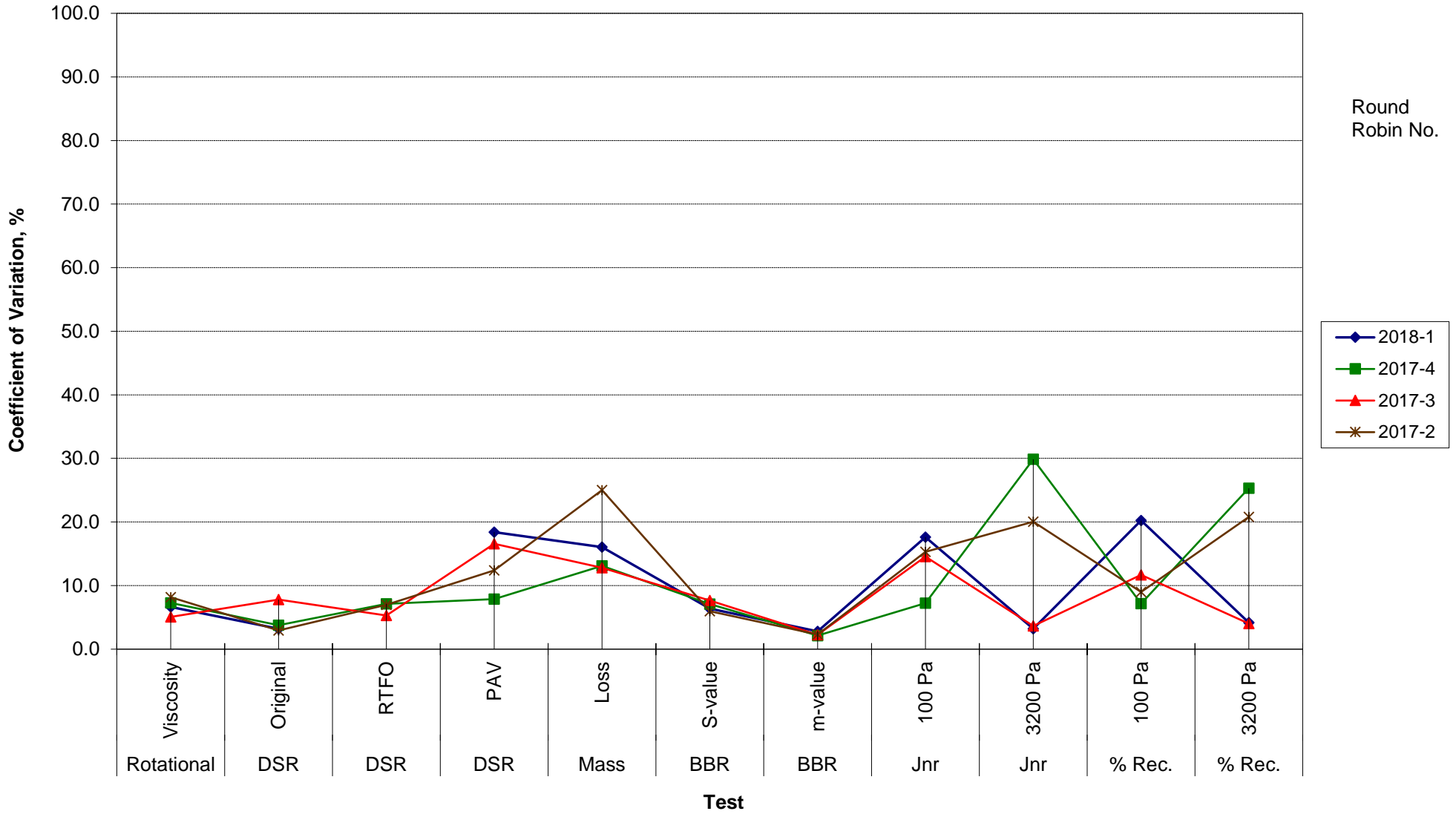
**COMBINED STATE BINDER GROUP ROUND ROBIN
SUMMARY A**

COEFFICIENT OF VARIATION

R R No.	Number of Participants	Coefficient of Variation, %											
		Rotational Viscosity	DSR Original	DSR RTFO	DSR PAV	Mass Loss	BBR S-value	BBR m-value	Jnr 100 Pa	Jnr 3200 Pa	% Rec. 100 Pa	% Rec. 3200 Pa	DTT Strain
2018-1	73	6.657	3.206		18.405	16.059	6.397	2.799	17.611	3.221	20.244	4.188	18.381
2017-4	72	7.295	3.762	7.122	7.869	13.091	7.085	2.139	7.236	29.865	7.175	25.328	38.605
2017-3	68	5.072	7.804	5.305	16.576	12.812	7.658	2.261	14.541	3.656	11.690	4.017	32.224
2017-2	72	8.189	2.942	6.977	12.404	25.015	5.960	2.306	15.323	20.048	9.000	20.782	38.912

**COMBINED STATE BINDER GROUP ROUND ROBIN
SUMMARY A
PG**

COEFFICIENT OF VARIATION



**COMBINED STATE BINDER GROUP ROUND ROBIN
SUMMARY A
PG**

STATISTICS WITH OUTLIERS REMOVED:

	Rotational Viscosity (Pa.s) @135°C	DSR Original (kPa)	DSR RTFO (kPa)	DSR PAV (kPa)	Mass Loss (%) @163°C	BBR S-value (MPa)	BBR m-value	Jnr @ 100Pa	% RECOV. @ 100Pa	Jnr @ 3200Pa	% RECOV. @ 3200Pa
Average	0.866	2.22		2,440	0.887	265	0.334	0.251	76.04	0.316	69.45
Std. Dev.	0.0363	0.0710		387.75	0.1007	17.02	0.0088	0.0358	2.2333	0.0415	2.3423
Coef. of Var.	4.190	3.201		15.895	11.354	6.421	2.643	14.262	2.937	13.107	3.373

**COMBINED STATE BINDER GROUP ROUND ROBIN
SUMMARY A**

COEFFICIENT OF VARIATION

R R No.	Number of Participants	Coefficient of Variation, %											
		Rotational Viscosity	DSR Original	DSR RTFO	DSR PAV	Mass Loss	BBR S-value	BBR m-value	Jnr 100 Pa	Jnr 3200 Pa	% Rec. 100 Pa	% Rec. 3200 Pa	DTT Strain
2014-1	72	10.760	5.843	7.228	18.189	14.368	7.133	2.186	20.363	20.016	12.070	4.720	8.048
2014-2	52	9.206	5.504	8.472	11.343	23.598	4.651	2.543	19.850	17.336	5.312	4.362	30.979
2014-3	73	6.670	4.095	5.347	15.777	23.221	6.408	2.506	8.817	5.915	7.950	5.335	37.884
2014-4	69	7.780	2.733	8.730	11.549	15.452	8.069	2.975	11.001	11.328	4.454	6.044	20.593
2015-1	72	4.15	3.659	6.878	11.854	14.423	10.602	2.986	21.946	4.132	16.523	2.826	18.552
2015-2	66	48.6813	3.5255	9.2076	13.885	72.575464	5.750708	2.142825	29.61683	5.154988	26.72097	4.610388	36.64349
2015-3	69	13.3356	4.4147	8.0174	7.8859	15.285329	6.038911	2.054348	8.053945	18.90702	12.53481	30.53914	50.36555
2015-4	72	6.93449	3.3122	7.0742	11.465	15.349729	6.549548	2.640035	15.25514	4.718882	8.41301	4.678398	73.56208
2016-1	62	26.2663	3.967	6.9128	10.424	20.650786	7.371125	3.279961	25.7382	4.753085	29.48599	6.309624	21.62796
2016-2	74	9.35379	4.3545	6.6077	9.769	15.131773	8.633694	2.198488	14.13471	16.1848	13.86873	23.11892	70.70604
2016-3	64	12.5161	22.641	21.497	16.608	14.221102	5.999379	2.33875	55.38365	4.044346	115.6536	4.750328	41.51925
2016-4	72	28.1722	2.9891	6.2693	9.9115	17.39022	6.764994	4.719315	14.48671	3.160854	10.95691	2.507913	15.86679
2017-2	72	8.1892	2.9418	6.9766	12.404	25.015248	5.960391	2.305579	15.32323	20.04762	9.000087	20.78232	38.9118
2017-3	68	5.07204	7.8037	5.3053	16.576	12.811858	7.65849	2.261035	14.54116	3.656197	11.69038	4.017192	32.22362
2017-4	72	7.29502	3.7618	7.1225	7.8688	13.091449	7.085242	2.138683	7.235638	29.86519	7.175334	25.32789	38.60541
2018-1	73	6.6568	3.2058		18.405	16.059455	6.396957	2.799457	17.61143	3.221264	20.24388	4.187814	18.38078