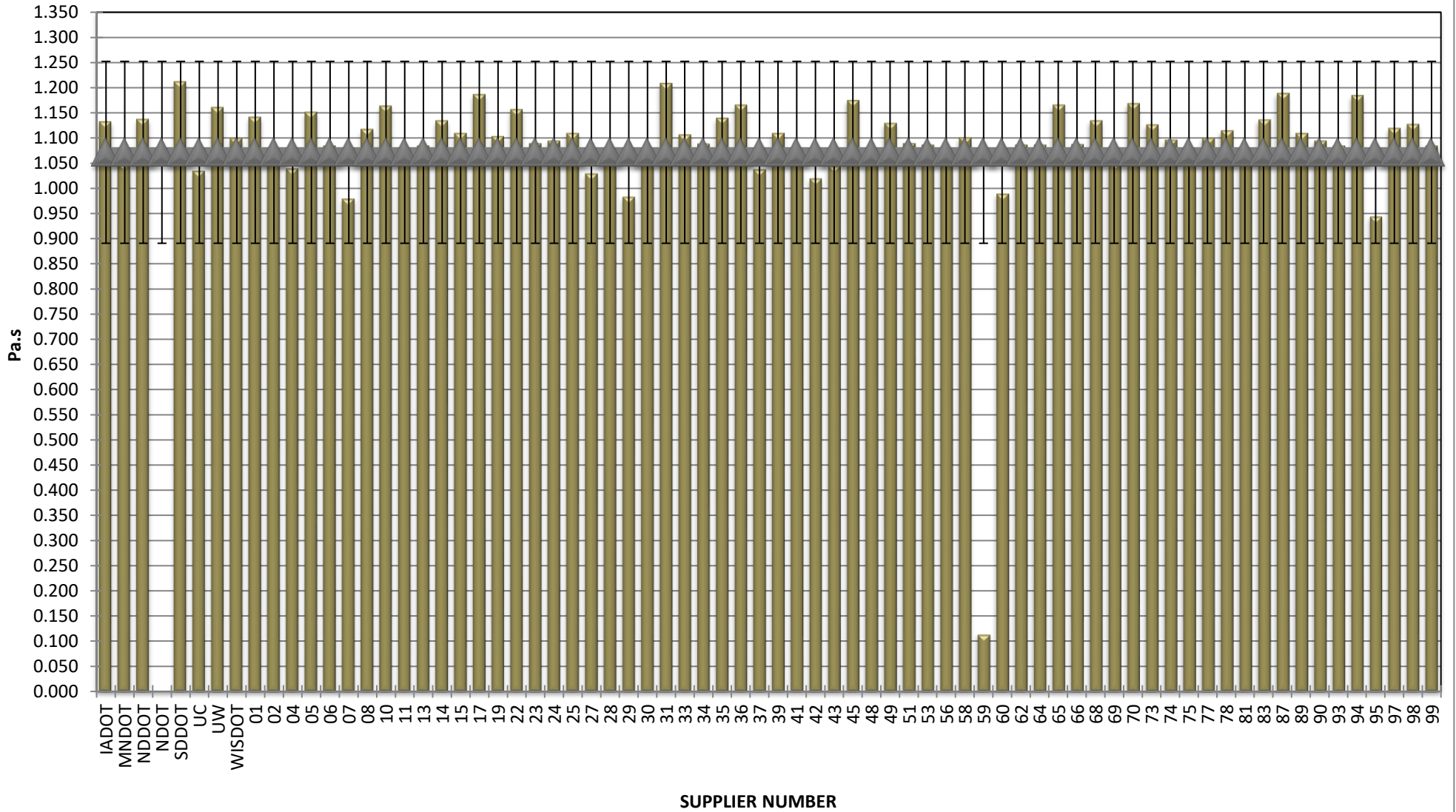


**COMBINED STATE BINDER GROUP ROUND ROBIN SUMMARY A 2021-1  
PG 58E-34**

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	1.133	3.73		3,540	0.340	292	0.327	0.065	91.95	0.096	87.94
MNDOT	1.050	3.82		3,080	0.455	270	0.319	0.056	92.52	0.088	88.47
NDDOT	1.138	3.72		3,661	0.348	291	0.326	0.066	91.55	0.099	87.41
NDOT	0.000	3.82		2,681	0.267	285	0.316	0.035	95.20	0.080	89.70
SDDOT	1.212	3.57		2,980	0.307	277	0.326	0.071	90.93	0.105	86.22
UC	1.035	3.38		3,233	0.290	292	0.310	0.049	93.40	0.068	91.30
UW	1.162	3.69		1,835	0.461	244	0.325	0.051	92.72	0.083	88.19
WISDOT	1.100	3.70		3,670	0.318	300	0.324	0.074	90.78	0.110	86.39
01	1.142	3.60		3,800	0.334	292	0.306	0.065	91.53	0.099	87.17
02	1.080	3.74		3,792	0.331	292	0.312	0.064	91.71	0.098	87.48
04	1.040	3.54		2,540		285	0.319	0.099	89.11	0.143	84.67
05	1.152	3.83		3,241	0.355	282	0.311	0.032	95.48	0.062	91.43
06	1.085	3.45		3,100	0.487	266	0.329	0.076	90.90	0.114	86.57
07	0.980	3.49		3,042	0.396	290	0.323	0.025	96.80	0.088	89.40
08	1.118	3.80		3,238	0.365	290	0.317	0.012	98.34	0.051	92.95
10	1.164	3.88		3,025	0.385	269	0.319	0.000	100.00	0.073	90.07
11	1.075	3.70		3,423	0.340	292	0.308	0.060	92.06	0.095	87.71
13	1.085	3.62		3,240	0.368	297	0.325	0.678	90.99	0.101	86.72
14	1.135	3.84		3,145	0.380	281	0.321	0.006	99.13	0.045	93.75
15	1.110	3.67		3,286	0.357	296	0.320	0.007	99.00	0.061	91.90
17	1.187	3.81		2,950	0.390	292	0.308	0.057	92.33	0.090	88.08
19	1.104	3.59		3,271	0.341	278	0.322	0.077	90.51	0.110	86.53
22	1.157	3.87		3,256	0.383	289	0.324	0.016	97.72	0.046	93.62
23	1.090	3.68		3,480	0.410	276	0.322	0.060	92.18	0.092	88.00
24	1.095	3.69		3,230	0.314	289	0.325	0.057	91.98	0.085	87.96
25	1.110	3.74		3,488	0.313	277	0.314	0.069	91.09	0.104	86.69
27	1.030	3.94		3,616	0.343	299	0.310	0.059	91.23	0.089	86.71
28	1.074	3.95		3,294	0.376	294	0.314	0.055	92.04	0.086	87.67
29	0.984	3.52		3,154	0.402	288	0.318	0.067	90.70	0.100	86.16
30	1.072	3.59		3,406	0.297	302	0.320	0.066	91.40	0.098	87.24
31	1.209	3.87		3,165	0.379	277	0.313	0.024	96.66	0.064	91.21
33	1.107	3.70		3,232	0.296	287	0.321	0.070	91.07	0.105	86.67
34	1.089	3.82		3,616	0.294	286	0.313	0.054	93.10	0.093	88.16
35	1.140	3.64		3,030	0.386	293	0.326	0.068	91.02	0.101	86.71
36	1.166	3.82		3,015	0.385	289	0.323	0.002	99.72	0.028	96.07
37	1.038	3.53		3,460	0.444	295	0.313	0.066	91.07	0.098	86.89
39	1.110	3.70		3,385	0.354	288	0.319	0.038	95.00	0.050	93.20
41	1.073	3.64		3,212	0.386	282	0.314	0.030	95.91	0.061	91.78
42	1.020	3.60		3,200	0.363	300	0.316	0.061	91.51	0.093	87.10
43	1.045	3.56		3,030	0.306	305	0.323	0.125	85.86	0.121	86.33
45	1.175	3.78		3,580	0.371	298	0.304	0.055	92.48	0.085	88.40
48	1.078	3.86		3,390	0.307	299	0.311	0.054	93.07	0.092	88.28
49	1.130	3.61		3,190	0.343	298	0.320	0.060	91.82	0.092	87.57
51	1.090	3.69		3,121	0.319	282	0.319	0.075	90.35	0.107	86.28
53	1.087	3.64		3,096	0.312	274	0.315	0.061	92.05	0.093	87.60
56	1.076	3.74		3,240	0.371	292	0.308	0.064	91.52	0.092	87.92
58	1.101	3.70		3,685	0.414	293	0.318	0.058	92.32	0.091	88.00
59	0.115	2.76		5,373	0.456			0.074	87.40	0.075	86.80
60	0.990	3.73		3,450	0.424	261	0.324	0.065	91.53	0.100	86.98
62	1.087	3.72		3,164	0.301	277	0.321	0.060	92.33	0.084	89.22
64	1.087	3.68		3,006	0.350	295	0.320	0.059	92.52	0.092	87.60
65	1.166	3.86		3,115	0.400	280	0.319	0.009	98.65	0.048	93.20
66	1.088	3.72		3,230	0.345	289	0.314	0.064	92.07	0.099	87.91
68	1.135	3.60		2,952	0.397	282	0.313	0.093	87.77	0.095	87.58
69	1.051	3.55		3,298	0.290	284	0.315	0.051	93.40	0.046	94.20
70	1.169	3.79		3,220	0.310	289	0.314	0.048	93.22	0.079	89.03
73	1.127	3.63		3,308	0.385	280	0.324	0.051	93.07	0.083	88.88
74	1.097	3.60		3,332	0.314	270	0.338	0.060	91.90	0.091	87.73
75	1.054	3.74		3,250	0.380	284	0.313	0.064	91.38	0.094	87.60
77	1.100	3.71		3,352	0.430	270	0.318	0.065	92.18	0.101	87.85
78	1.115	3.79		3,910	0.416	287	0.321	0.059	92.32	0.092	88.07
81	1.062	3.61		3,965	0.388	294	0.318	0.070	91.23	0.106	86.80
83	1.137	3.73		3,910	0.384	285	0.309	0.053	92.50	0.080	88.64
87	1.189	3.82		3,082	0.384	278	0.315	0.002	99.64	0.056	92.11
89	1.110	3.66		3,343	0.369	292	0.322	0.002	99.70	0.071	90.80
90	1.095	3.71		3,416	0.337	294	0.315	0.061	92.34	0.096	88.07
93	1.085	3.64		3,340	0.340	282	0.325	0.060	92.26	0.091	88.31
94	1.185	3.83		1,796	0.126	276	0.323	0.053	92.98	0.082	89.20
95	0.945	3.52		2,994	0.391	288	0.320	0.048	93.90	0.066	91.70
97	1.120	3.58		3,159	0.344	263	0.321	0.070	91.39	0.104	87.40
98	1.128	3.80		3,162	0.354	286	0.323	0.066	91.69	0.098	87.65
99	1.085	3.76		3,456	0.378	297	0.314	0.060	92.21	0.096	87.73
Average	1.072	3.69		3,277	0.359	286	0.318	0.063	92.91	0.087	88.66
Std. Dev.	0.181	0.16		438	0.054	11	0.006	0.077	2.93	0.020	2.31
Coef. of Var.	16.870	4.36		13	14.981	4	1.923	123.328	3.15	23.097	2.61

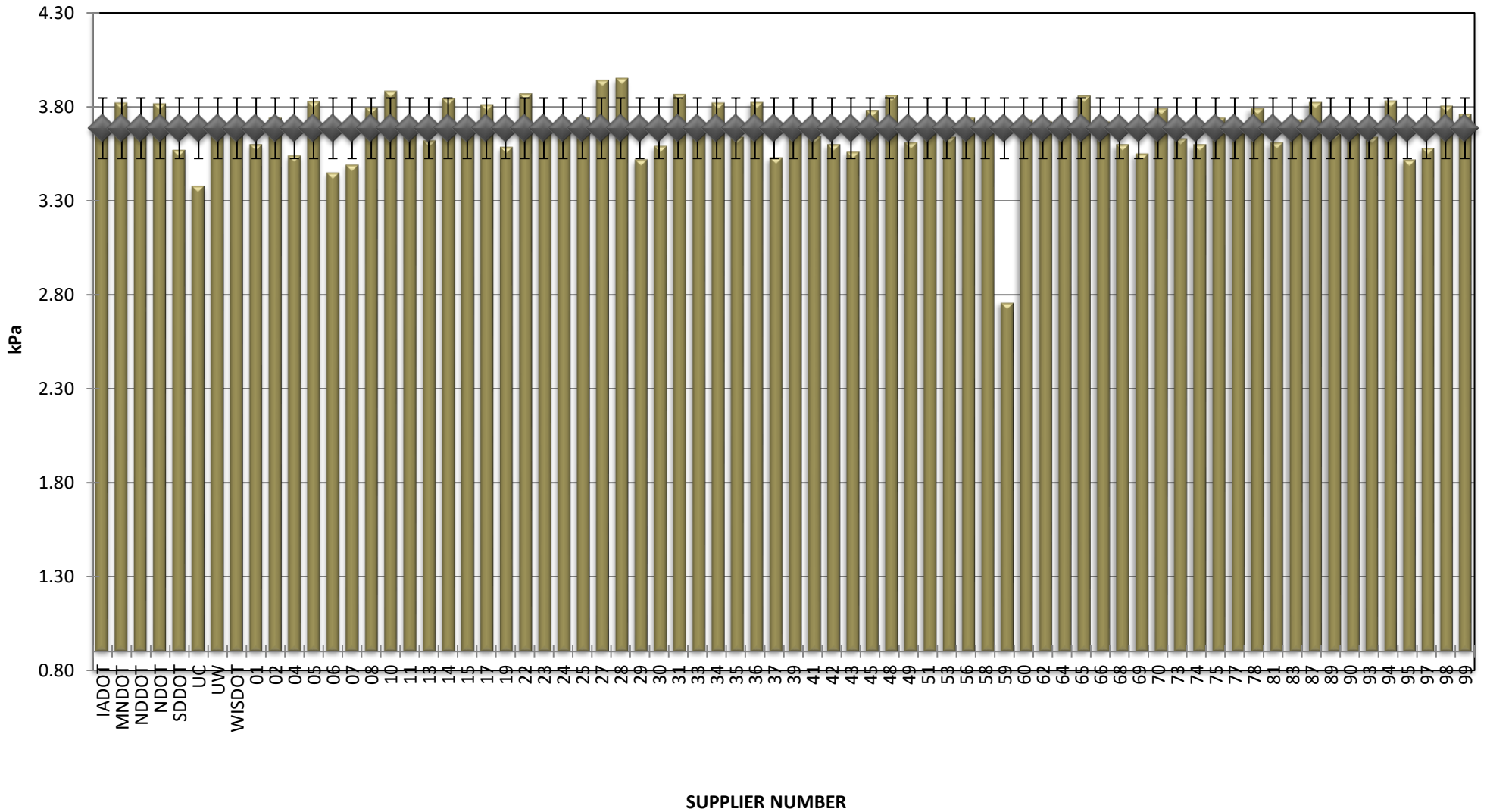
**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2021-1  
PG 58E-34**

**ROTATIONAL VISCOSITY**



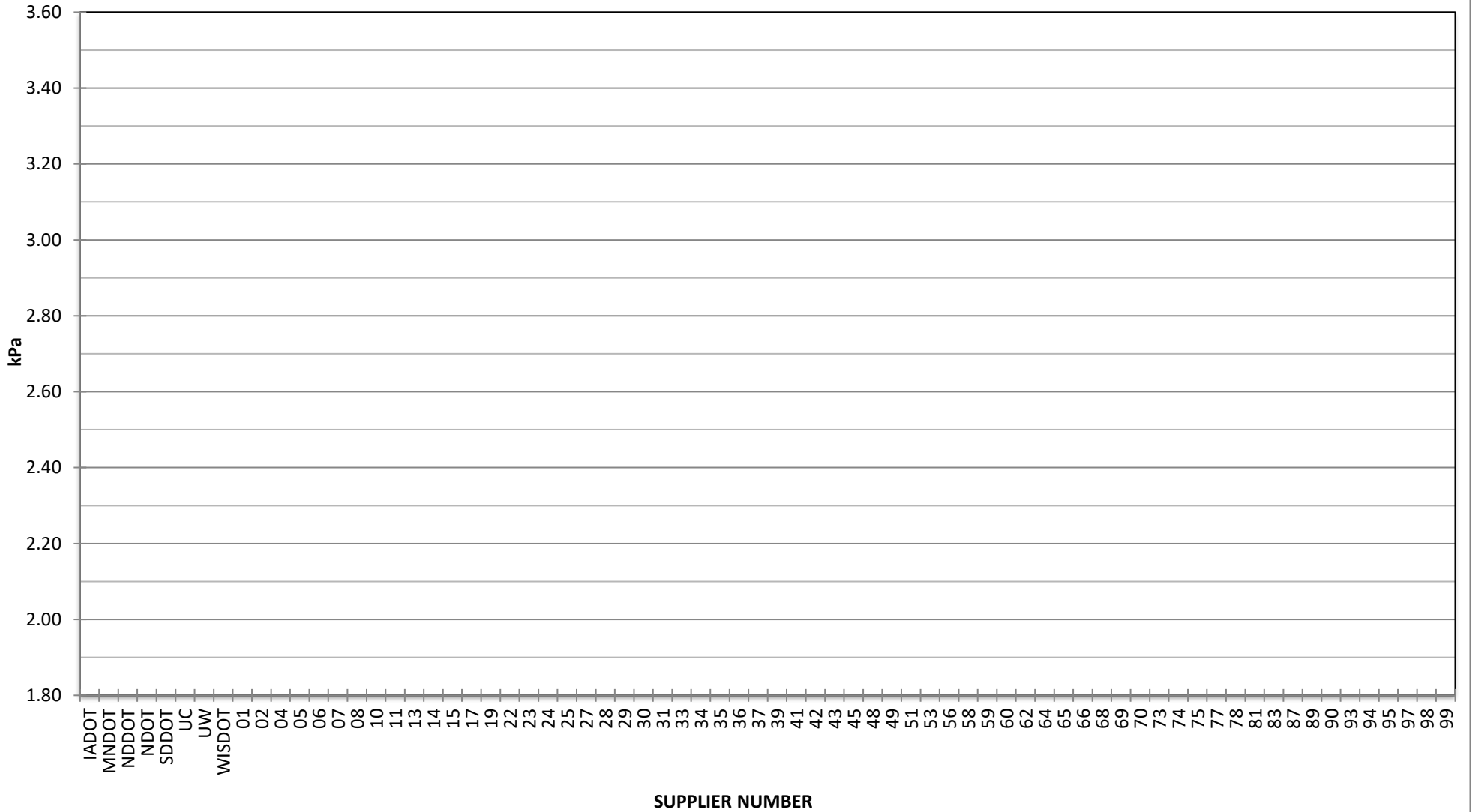
**COMBINED STATE BINDER GROUP ROUND ROBIN  
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**DSR - ORIGINAL**



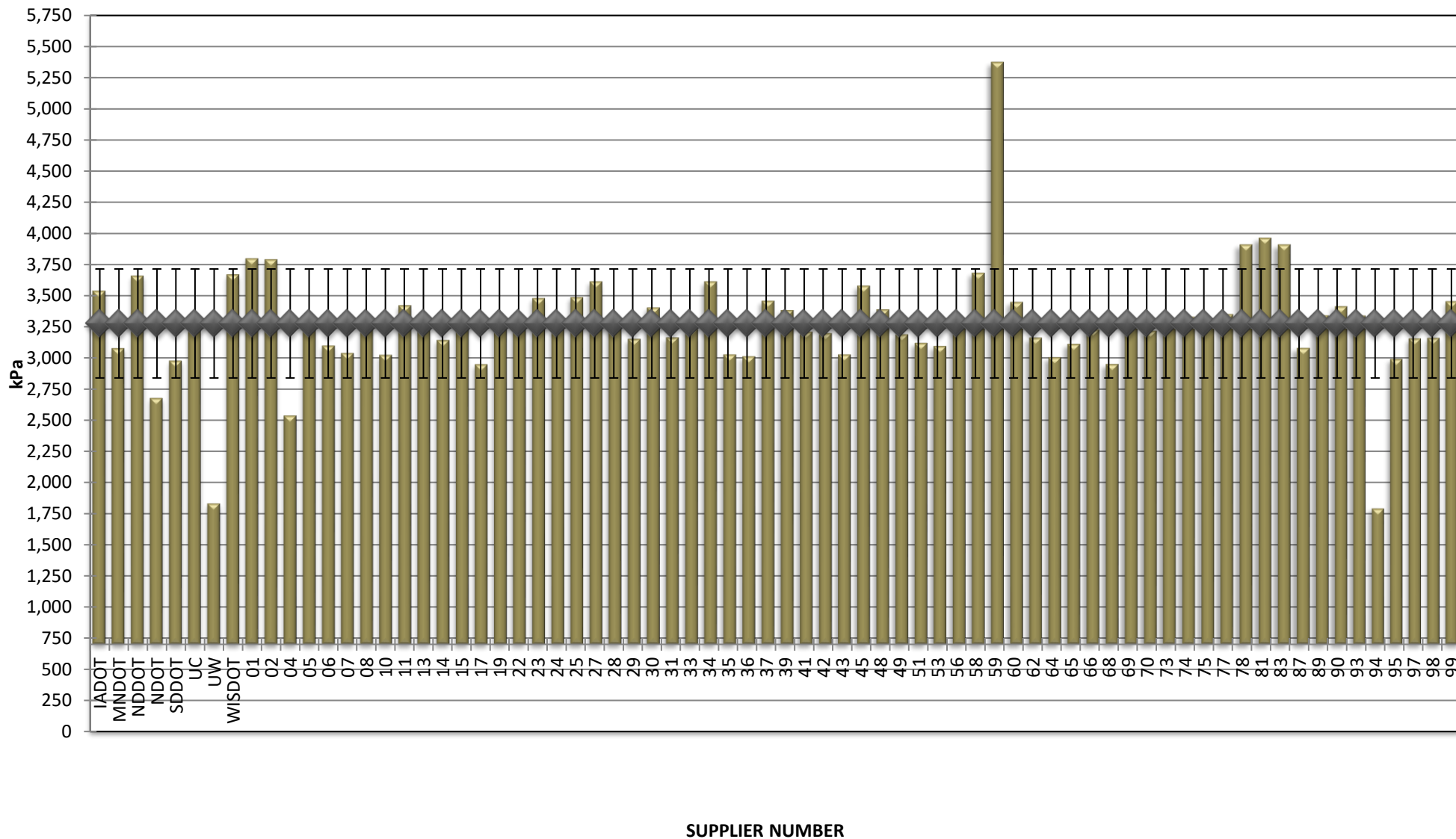
COMBINED STATE BINDER GROUP ROUND ROBIN  
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DSR - RTFO



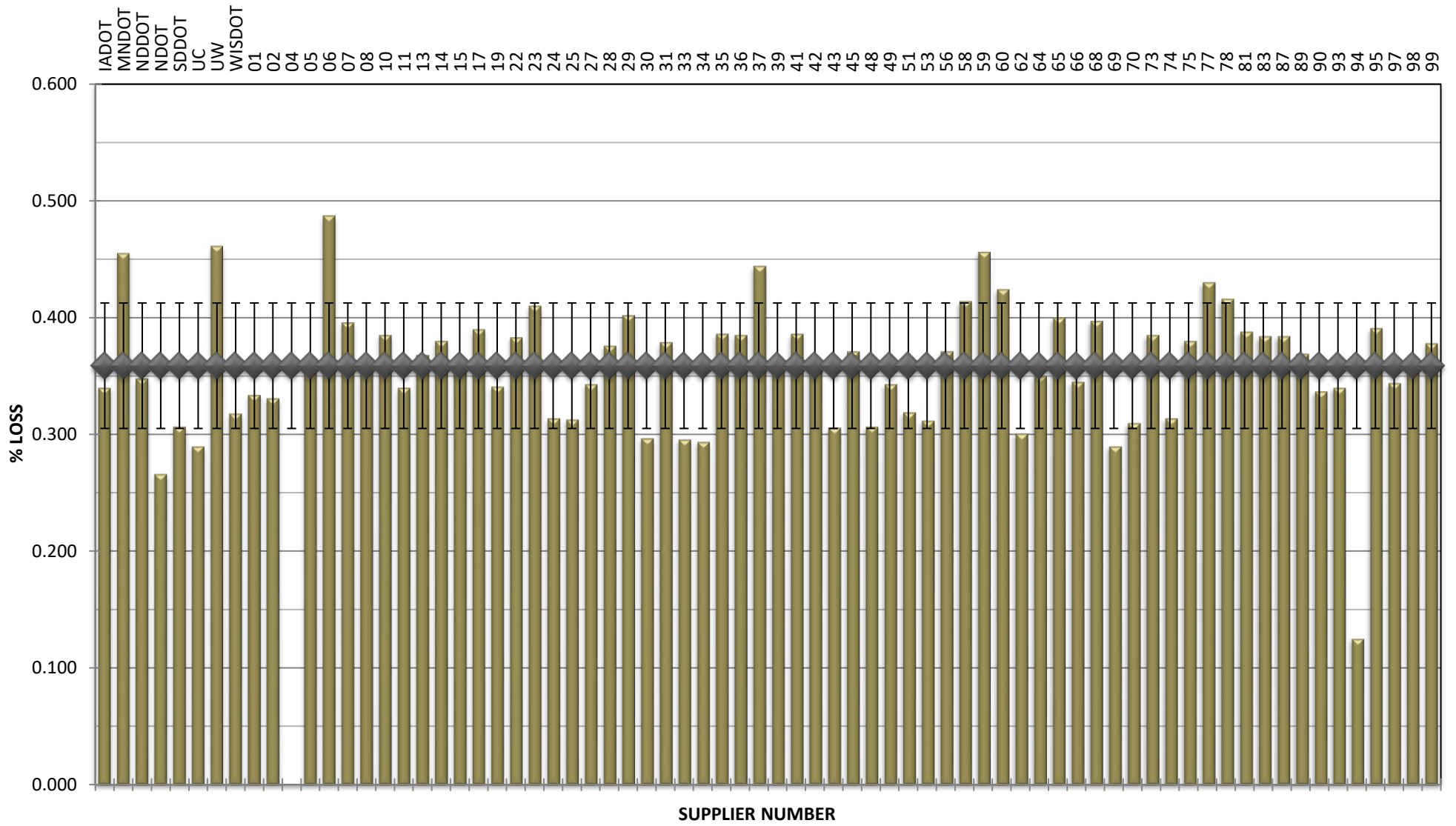
**COMBINED STATE BINDER GROUP ROUND ROBIN  
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**DSR - PAV**



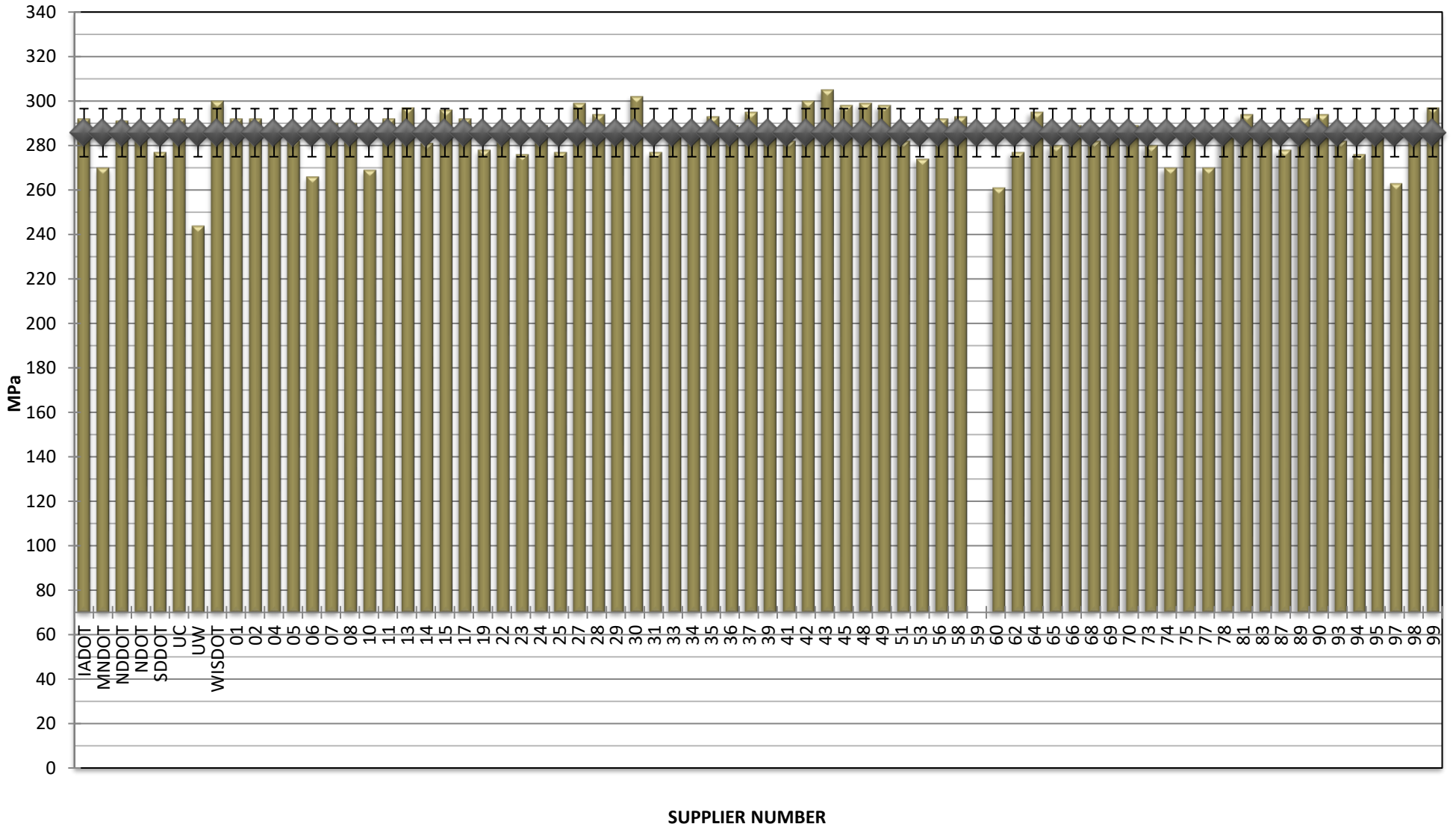
**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2021-1  
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**RTFO MASS LOSS**



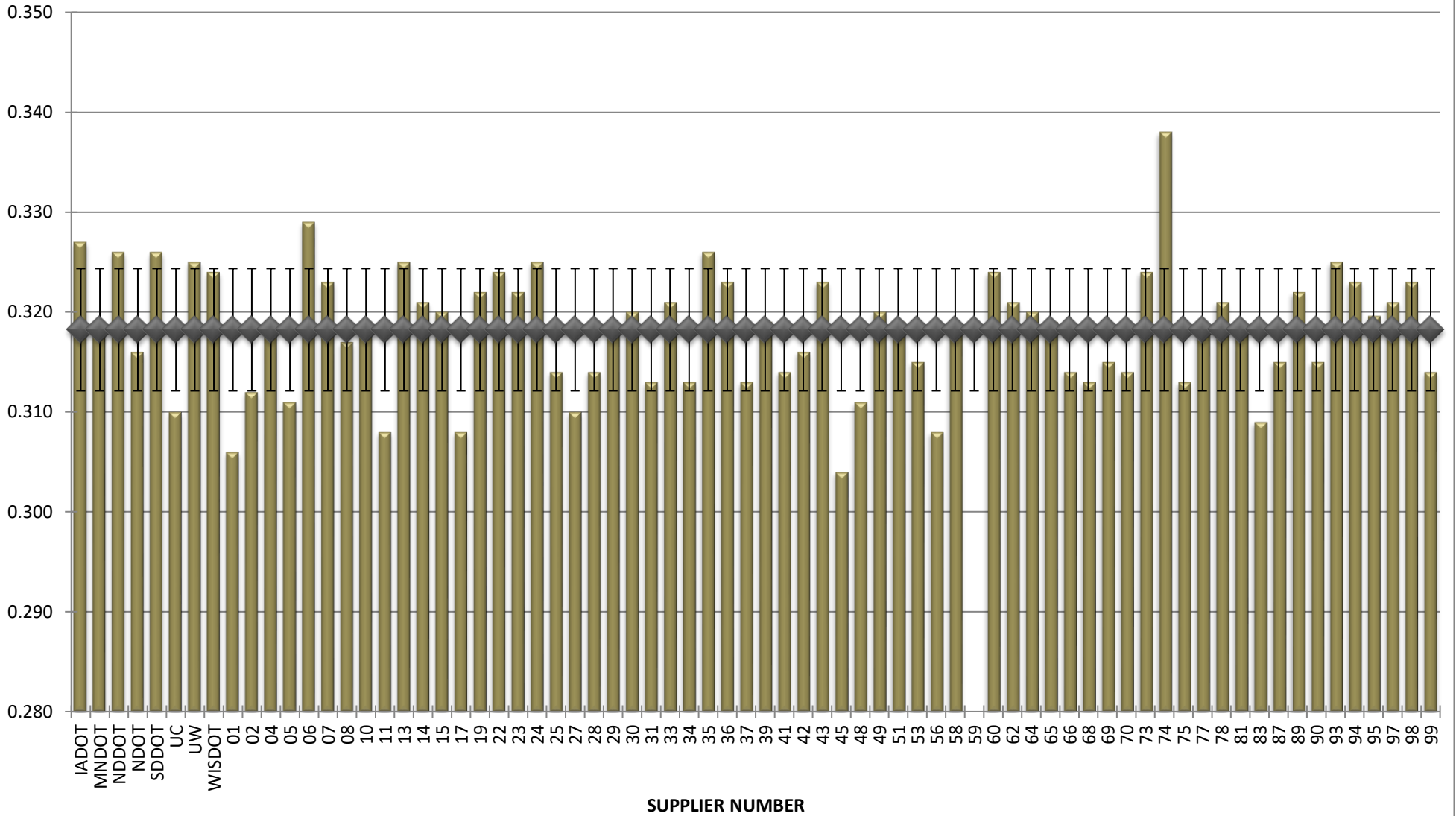
**COMBINED STATE BINDER GROUP ROUND ROBIN  
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**BBR STIFFNESS**



**COMBINED STATE BINDER GROUP ROUND ROBIN  
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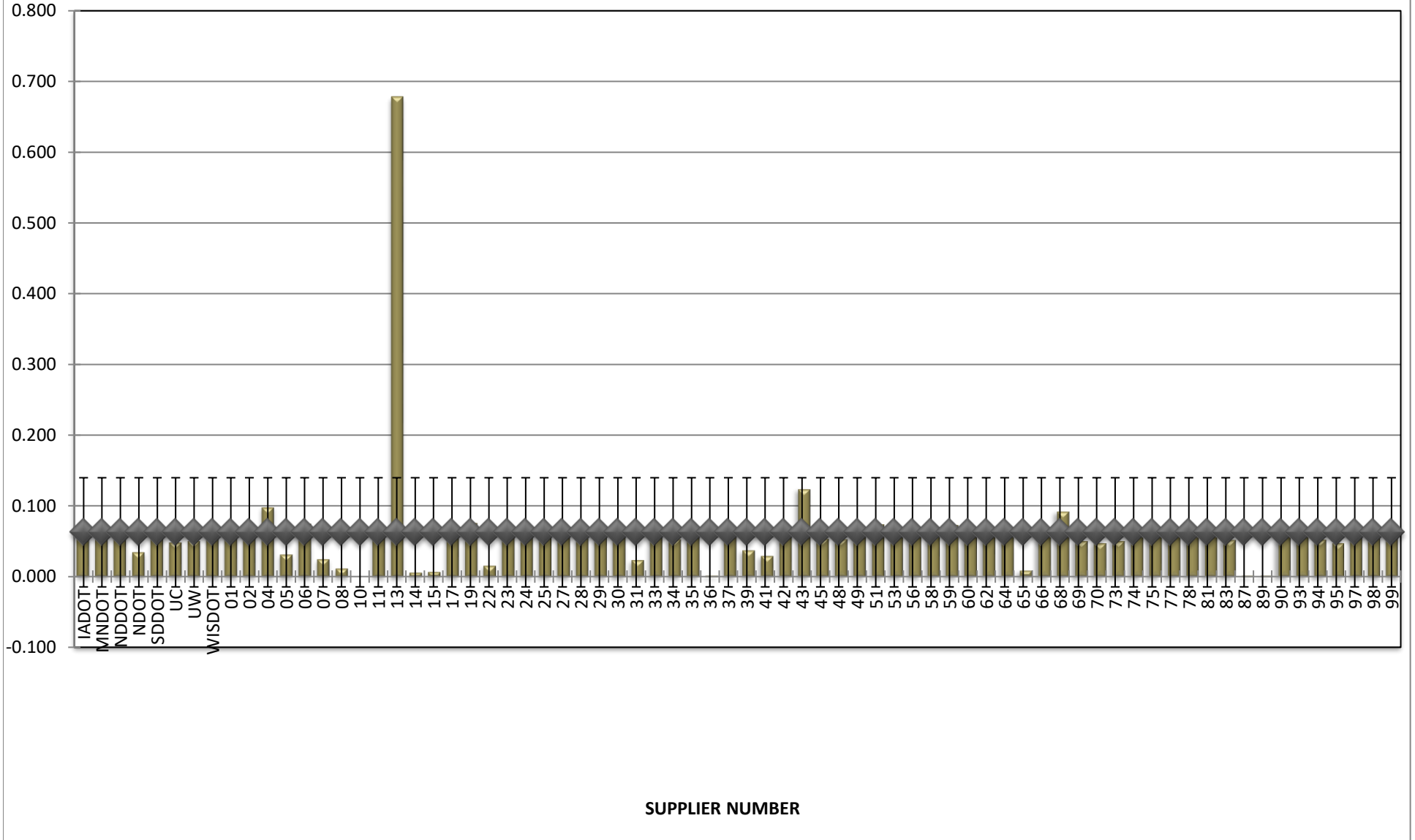
**BBR m-VALUE**





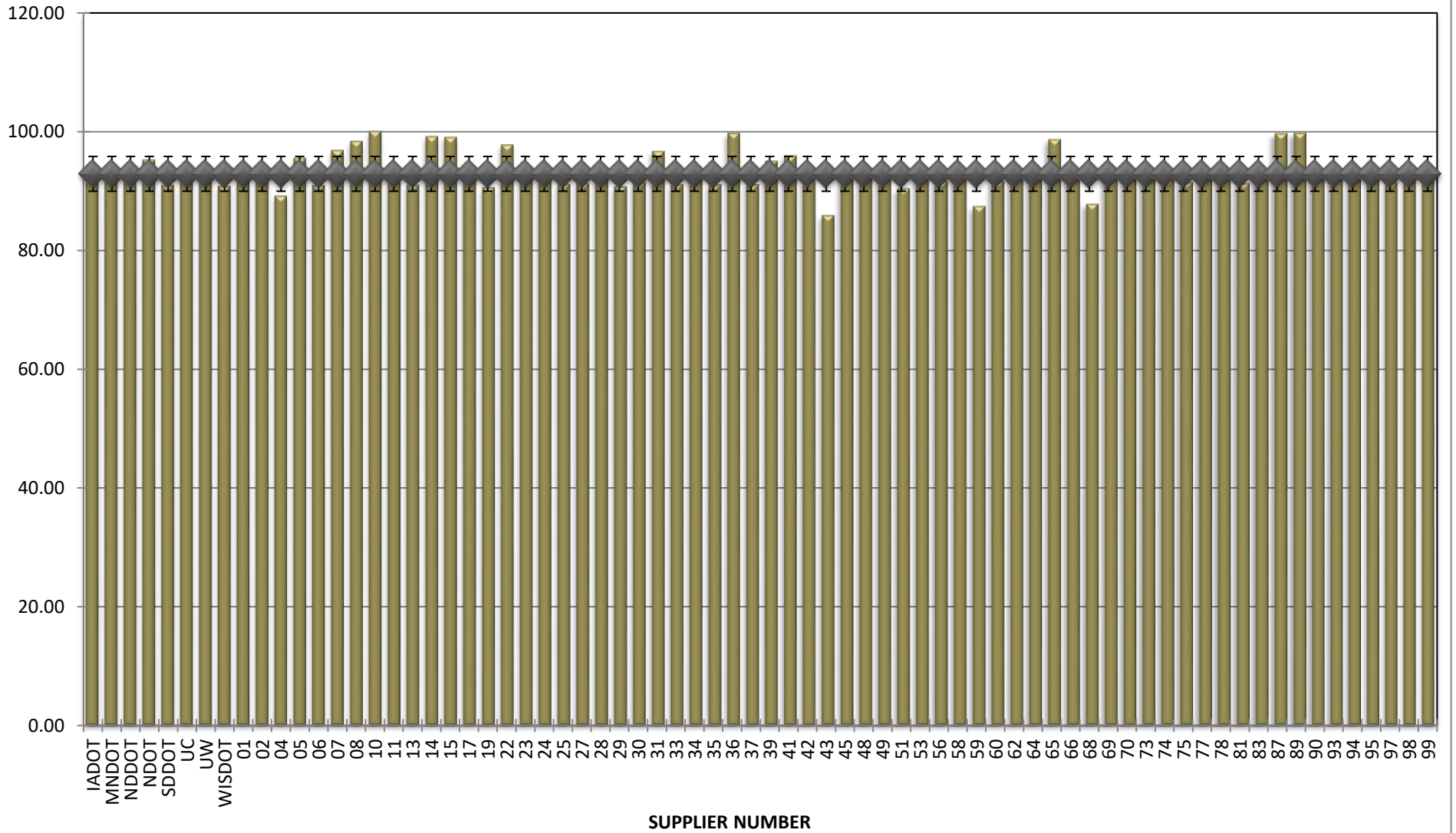
**COMBINED STATE BINDER GROUP ROUND ROBIN  
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**Jnr @ 100 Pa**



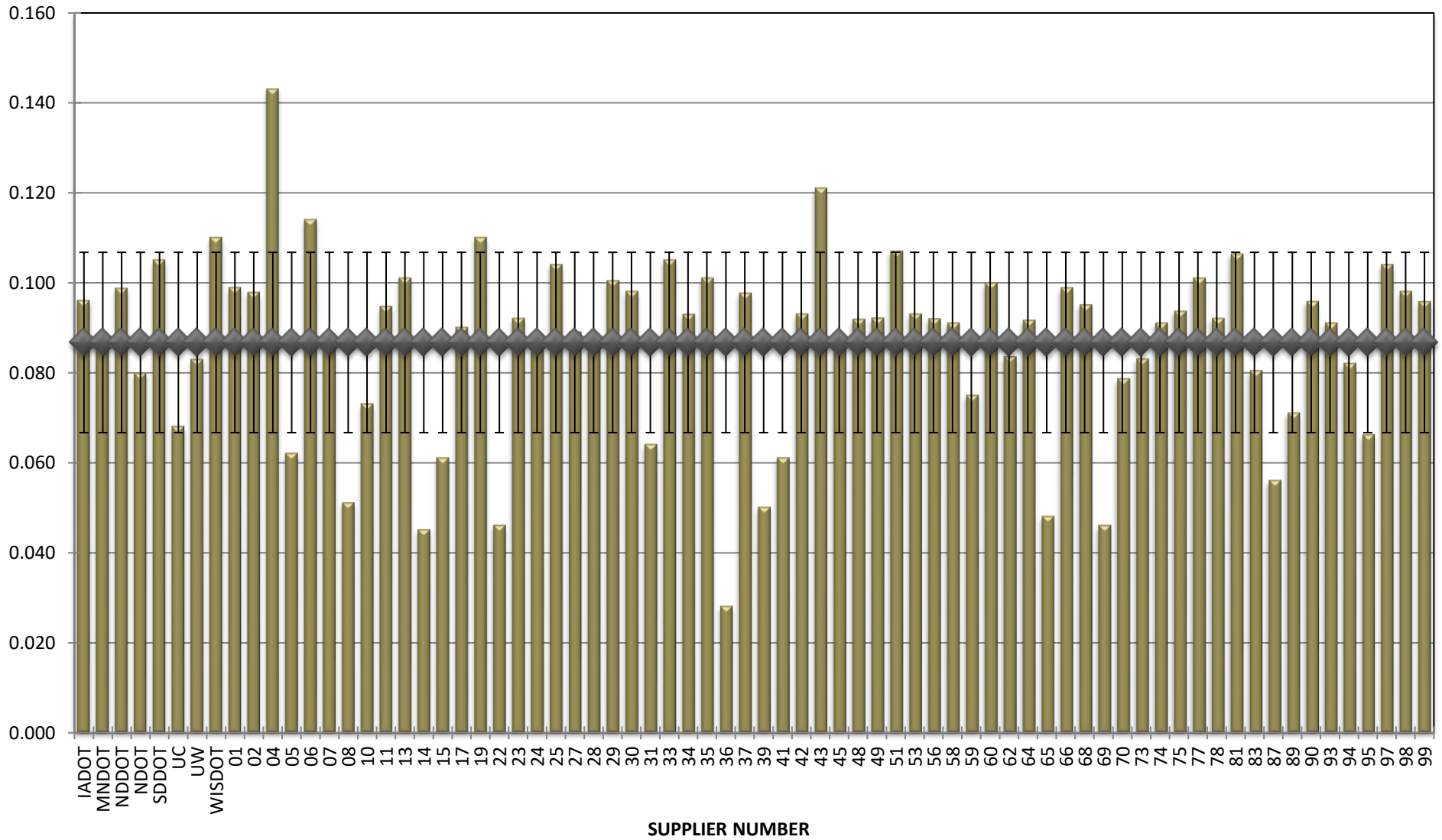
COMBINED STATE BINDER GROUP ROUND ROBIN  
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% Recovery @ 100 Pa



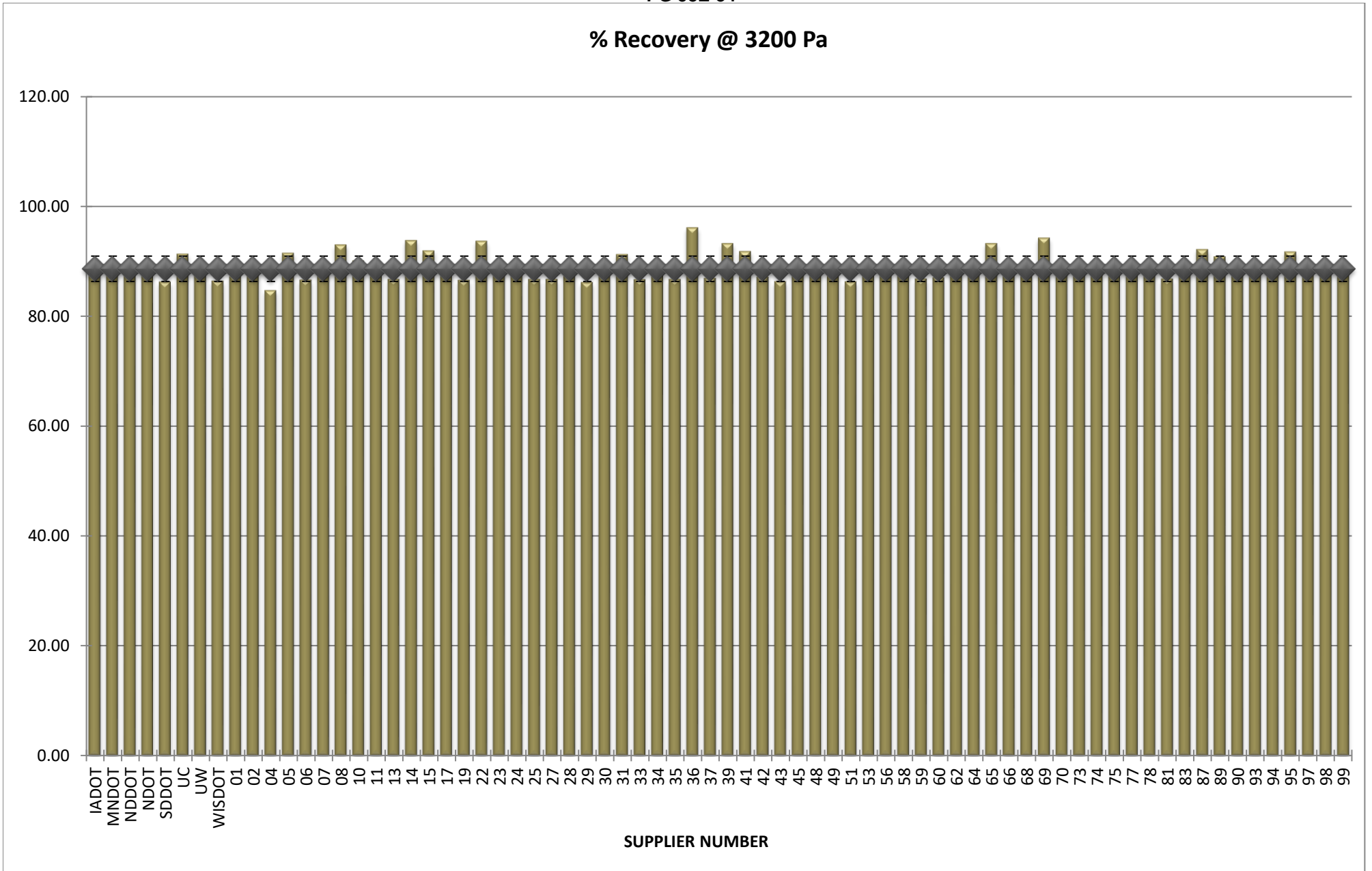
**COMBINED STATE BINDER GROUP ROUND ROBIN  
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**Jnr @ 3200 Pa**



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



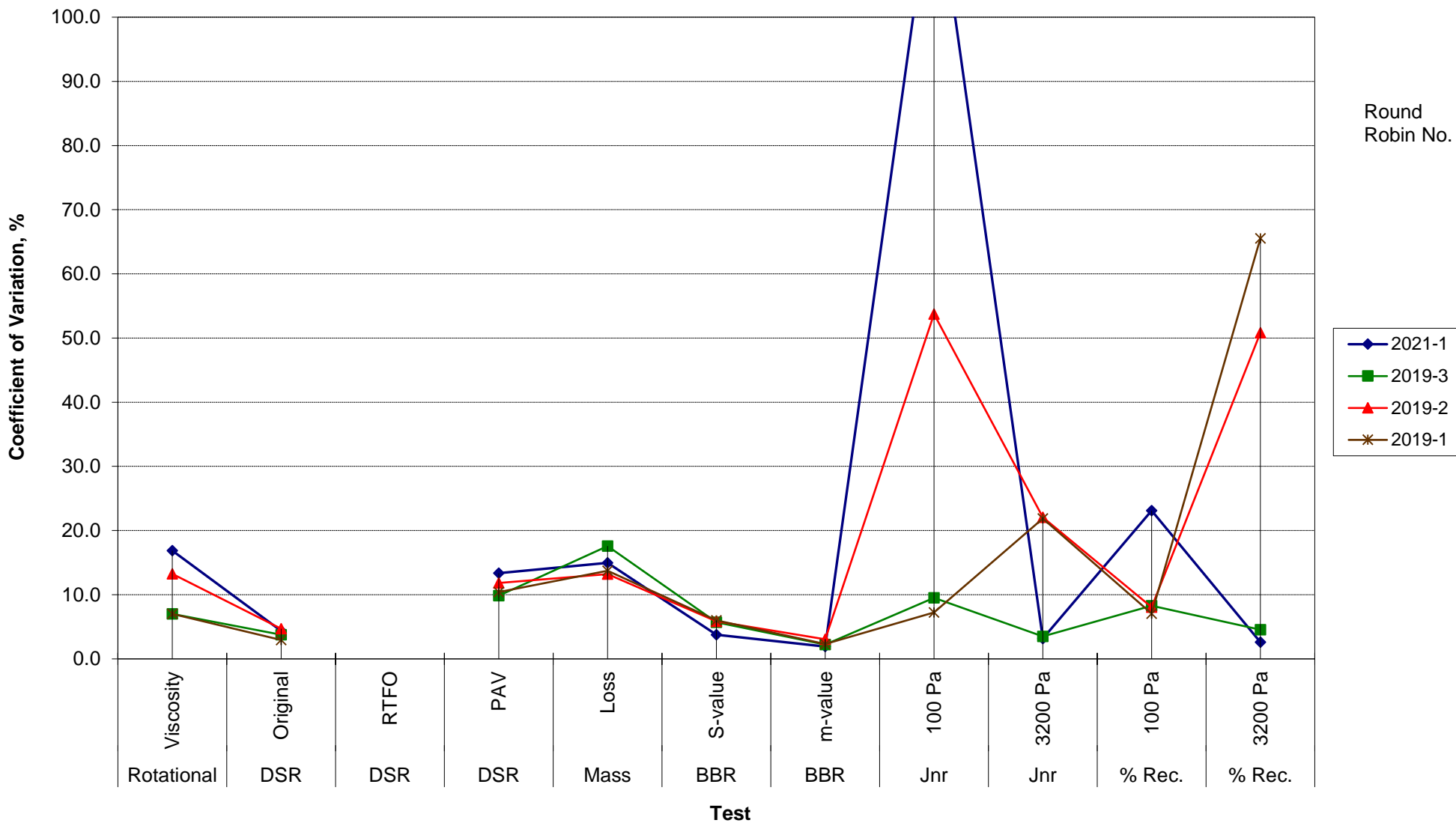
**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A**

**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
2021-1	72	16.870	4.360		13.354	14.981	3.785	1.923	123.328	3.154	23.097	2.608	29.516
2019-3	66	7.028	3.779		9.848	17.580	5.691	2.231	9.519	3.499	8.284	4.540	33.516
2019-2	74	13.258	4.708		11.840	13.213	5.855	3.057	53.743	22.057	8.044	50.807	20.079
2019-1	75	7.021	2.932		10.403	13.730	5.989	2.318	7.221	21.894	7.064	65.537	37.342

**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:**

	<b>Rotational Viscosity (Pa.s) @135°C</b>	<b>DSR Original (kPa)</b>	<b>DSR RTFO (kPa)</b>	<b>DSR PAV (kPa)</b>	<b>Mass Loss (%) @163°C</b>	<b>BBR S-value (MPa)</b>	<b>BBR m-value</b>	<b>Jnr @ 100Pa</b>	<b>% RECOV. @ 100Pa</b>	<b>Jnr @ 3200Pa</b>	<b>% RECOV. @ 3200Pa</b>
<b>Average</b>	1.101	3.70		3,289	0.359	286	0.318	0.054	92.91	0.087	88.55
<b>Std. Dev.</b>	0.0536	0.1175		268.97	0.0462	9.65	0.0057	0.0235	2.9305	0.0200	2.1513
<b>Coef. of Var.</b>	4.870	3.175		8.179	12.876	3.368	1.786	43.635	3.154	23.097	2.429

**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	72	6.70339	3.2264		18.537	16.120244	6.395676	2.814315	17.6796	3.240715	20.36877	4.21767	18.38078
2018-2	65	10.2401	3.2247		8.5454	16.987038	5.301906	2.285746	13.08987	42.04845	13.138	95.94854	25.74922
2018-3	74	7.46112	5.7239		9.7593	19.498873	6.97184	1.638225	7.07208	24.52983	11.72352	59.74421	24.22734
2018-4	64	13.3804	2.9787		15.593	14.267542	12.49947	5.858218	372.6974	30.4146	328.5556	26.97164	54.58176
2019-1	75	7.0211	2.9324		10.403	13.729654	5.989426	2.318013	7.221429	21.89445	7.063977	65.53669	37.34238
2019-2	74	13.2579	4.7082		11.84	13.212726	5.854851	3.05673	53.74261	22.0569	8.043793	50.80675	20.07887
2019-3	66	7.0285	3.7792		9.8478	17.580086	5.690624	2.23106	9.518568	3.498796	8.283841	4.539972	33.51614
2021-1	72	16.8701	4.3597		13.354	14.980827	3.784658	1.923067	123.3285	3.154241	23.09658	2.608384	29.51648