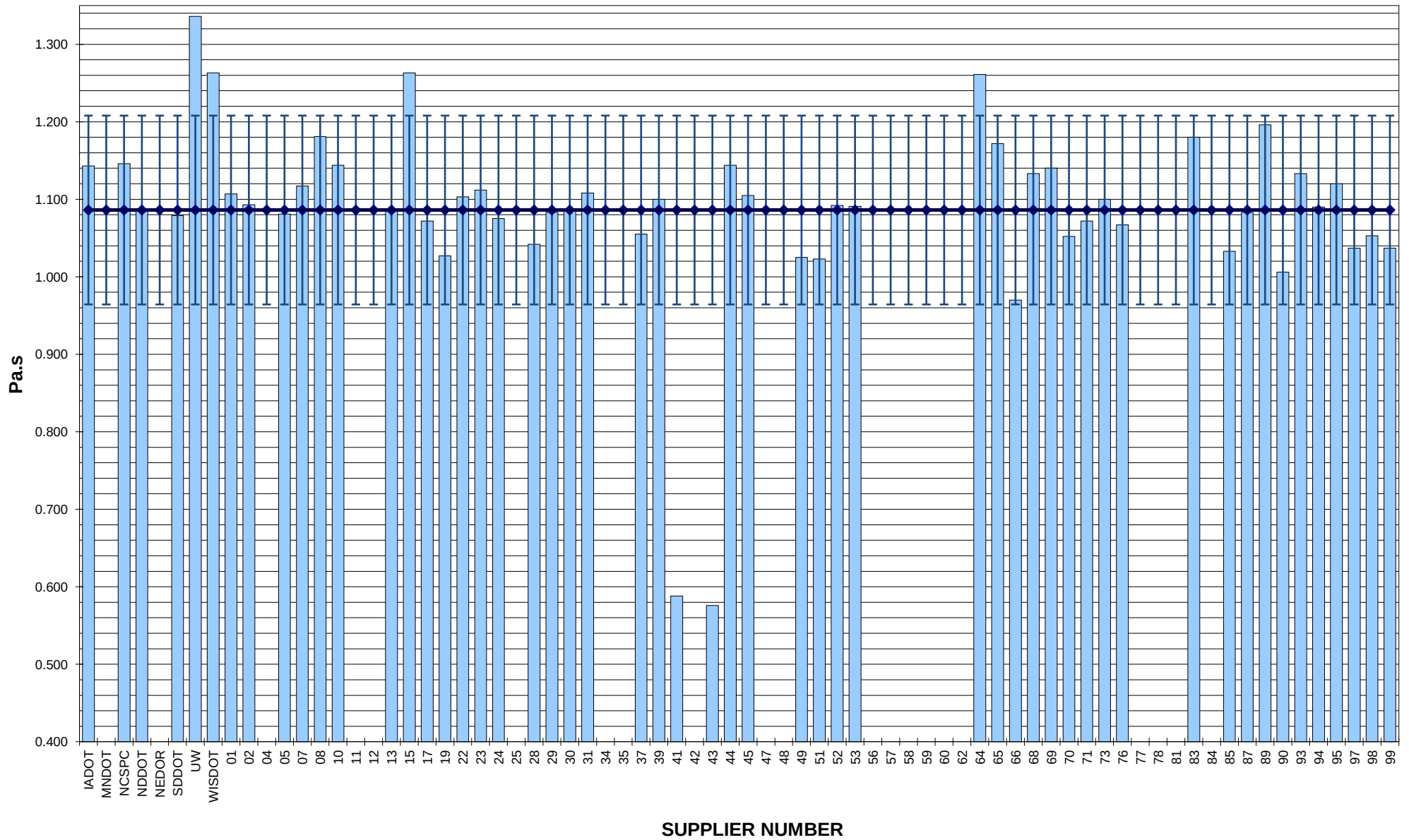


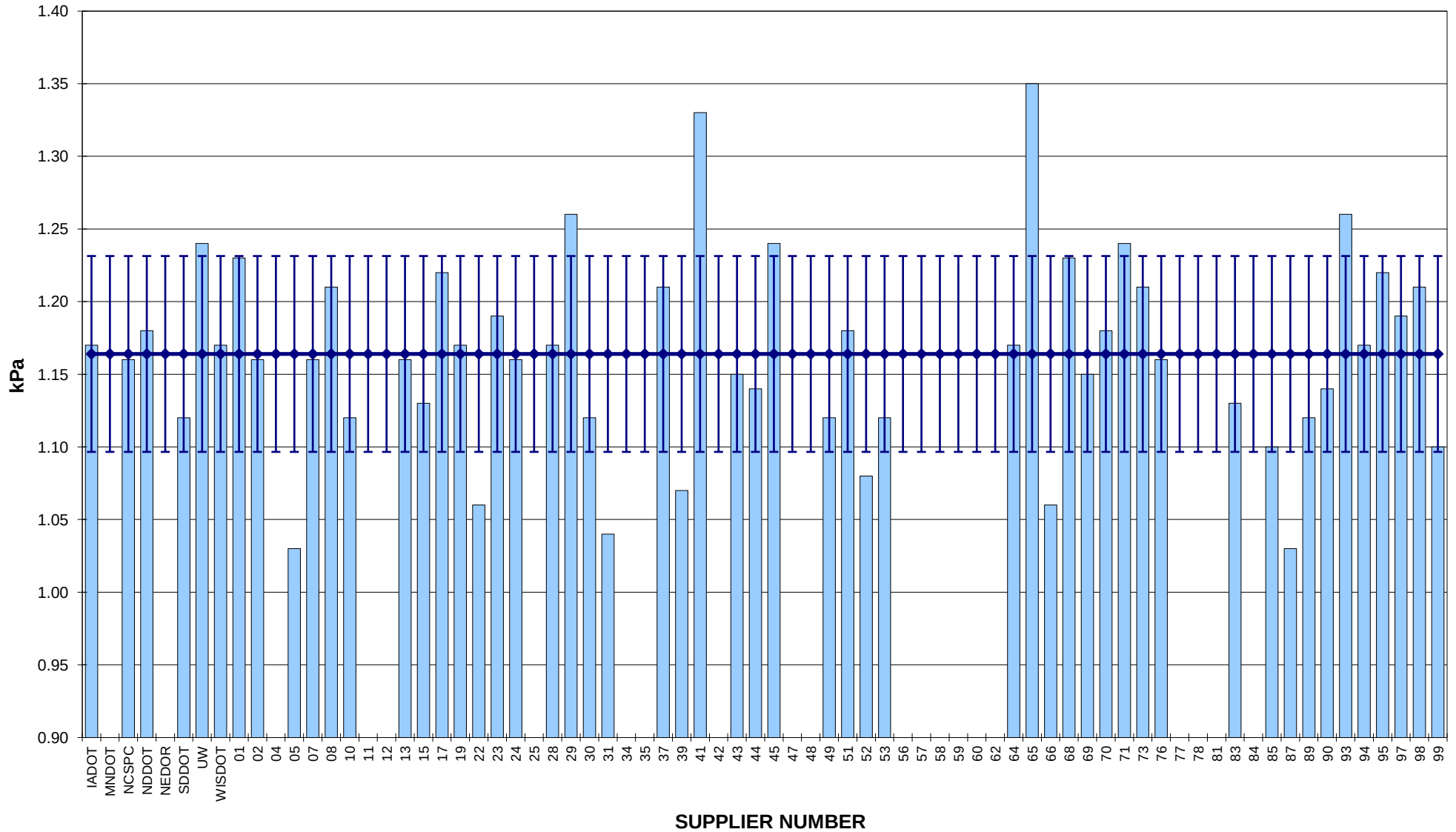
**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**PG 70-28**

| Supplier Number | Rotational Viscosity (Pa.s) @135°C | DSR Original (kPa) @70°C | DSR RTFO (kPa) @70°C | DSR PAV (kPa) @25°C | Mass Loss (%) @163°C | BBR S-value (MPa) @-18°C | BBR m-value @-18°C | Strain (%) @-18°C | DTT Stress (MPa) @-18°C | CRITICAL CRACK TEMP (°C) | Jnr @ 100Pa @ 58°C | % RECOVERY @ 100Pa @58° C | Jnr @ 3200Pa @ 58°C | RECOVER Y @ 3200Pa @ 58° C |
|-----------------|------------------------------------|--------------------------|----------------------|---------------------|----------------------|--------------------------|--------------------|-------------------|-------------------------|--------------------------|--------------------|---------------------------|---------------------|----------------------------|
| IADOT           | 1.143                              | 1.17                     | 2.98                 | 1770                | -0.658               | 228                      | 0.326              |                   |                         |                          | 0.175              | 70.59                     | 0.236               | 61.48                      |
| MNDOT           |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| NCSPC           | 1.146                              | 1.16                     | 3.36                 | 1630                | -1.197               | 210                      | 0.337              |                   |                         |                          | 0.167              | 67.84                     | 0.186               | 64.73                      |
| NDDOT           | 1.085                              | 1.18                     | 3.16                 | 1889                | -0.765               | 229                      | 0.332              |                   |                         |                          | 0.162              | 73.25                     | 0.217               | 64.90                      |
| NEDOR           |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| SDDOT           | 1.079                              | 1.12                     | 3.22                 | 1677                | -0.882               | 212                      | 0.325              |                   |                         |                          | 0.182              | 69.24                     | 0.197               | 67.26                      |
| UW              | 1.336                              | 1.24                     | 3.19                 | 1210                | -0.889               | 200                      | 0.365              |                   |                         |                          |                    |                           |                     |                            |
| WISDOT          | 1.263                              | 1.17                     | 3.04                 | 2067                | -0.647               | 221                      | 0.329              |                   |                         |                          | 0.183              | 67.10                     | 0.206               | 63.35                      |
| 01              | 1.107                              | 1.23                     | 3.37                 | 1835                | -0.625               | 202                      | 0.322              |                   |                         |                          | 0.167              | 68.08                     | 0.187               | 64.66                      |
| 02              | 1.093                              | 1.16                     | 3.18                 | 1890                | -0.742               | 223                      | 0.330              |                   |                         |                          | 0.180              | 68.33                     | 0.200               | 65.92                      |
| 04              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 05              | 1.081                              | 1.03                     | 3.20                 | 1778                | -1.313               | 228                      | 0.319              |                   |                         |                          | 0.171              | 68.61                     | 0.195               | 64.62                      |
| 07              | 1.117                              | 1.16                     | 2.87                 | 2022                | -0.749               | 224                      | 0.329              |                   |                         |                          | 0.300              | 56.64                     | 0.325               | 54.16                      |
| 08              | 1.181                              | 1.21                     | 3.04                 | 1920                | -0.651               | 220                      | 0.326              |                   |                         |                          | 0.187              | 67.47                     | 0.213               | 63.41                      |
| 10              | 1.144                              | 1.12                     | 3.44                 | 2076                | -0.876               | 230                      | 0.317              |                   |                         |                          | 0.153              | 69.80                     | 0.172               | 66.32                      |
| 11              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 12              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 13              | 1.085                              | 1.16                     | 3.38                 | 1790                | -0.501               | 210                      | 0.336              | 2.37              | 5.58                    | -29.5                    | 0.130              | 74.15                     | 0.173               | 67.04                      |
| 15              | 1.263                              | 1.13                     | 3.27                 | 1726                | -0.624               | 211                      | 0.342              |                   |                         |                          | 0.170              | 68.02                     | 0.191               | 65.31                      |
| 17              | 1.072                              | 1.22                     | 3.64                 | 1761                | -0.664               | 206                      | 0.330              |                   |                         |                          | 0.136              | 69.21                     | 0.149               | 66.62                      |
| 19              | 1.027                              | 1.17                     | 3.29                 | 1951                | -0.740               | 218                      | 0.330              |                   |                         |                          | 0.186              | 67.40                     | 0.200               | 64.70                      |
| 22              | 1.103                              | 1.06                     | 3.26                 | 2021                | -1.137               | 229                      | 0.319              |                   |                         |                          | 0.164              | 69.27                     | 0.195               | 64.38                      |
| 23              | 1.112                              | 1.19                     | 3.27                 | 1539                | -0.825               | 221                      | 0.341              |                   |                         |                          | 0.160              | 71.75                     | 0.207               | 63.42                      |
| 24              | 1.075                              | 1.16                     | 2.97                 | 1840                | -0.722               | 211                      | 0.333              | 1.43              | 4.36                    | -29.9                    | 0.160              | 73.04                     | 0.218               | 64.77                      |
| 25              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 28              | 1.042                              | 1.17                     | 3.46                 | 1938                | -0.679               | 204                      | 0.333              |                   |                         |                          | 0.161              | 68.69                     | 0.175               | 66.42                      |
| 29              | 1.083                              | 1.26                     | 3.54                 | 1913                | -0.774               | 209                      | 0.339              |                   |                         |                          | 0.165              | 69.41                     | 0.181               | 66.74                      |
| 30              | 1.085                              | 1.12                     | 3.29                 | 1862                | -0.740               | 233                      | 0.331              |                   |                         |                          |                    |                           |                     |                            |
| 31              | 1.108                              | 1.04                     | 3.22                 | 1923                | -1.269               | 219                      | 0.316              |                   |                         |                          | 0.177              | 68.12                     | 0.198               | 64.59                      |
| 34              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 35              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 37              | 1.055                              | 1.21                     | 2.82                 | 1854                | -0.674               | 217                      | 0.334              | 1.29              | 3.79                    | -29.00                   | 0.228              | 66.52                     | 0.258               | 62.78                      |
| 39              | 1.100                              | 1.07                     | 3.48                 | 2023                | -1.144               | 225                      | 0.320              |                   |                         |                          | 0.156              | 69.50                     | 0.180               | 65.44                      |
| 41              | 0.588                              | 1.33                     | 3.85                 | 2069                | -0.699               | 228                      | 0.320              |                   |                         |                          | 0.180              | 77.75                     | 0.241               | 74.33                      |
| 42              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 43              | 0.576                              | 1.15                     | 3.25                 | 1970                | -0.665               | 232                      | 0.336              |                   |                         |                          | 0.180              | 66.82                     | 0.200               | 63.22                      |
| 44              | 1.144                              | 1.14                     | 3.14                 | 2041                | -0.718               | 238                      | 0.331              |                   |                         |                          | 0.167              | 69.30                     | 0.199               | 64.36                      |
| 45              | 1.105                              | 1.24                     | 3.33                 | 1540                | -0.623               | 200                      | 0.329              |                   |                         |                          | 0.158              | 67.67                     | 0.176               | 64.69                      |
| 47              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 48              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 49              | 1.025                              | 1.12                     | 3.00                 | 1770                | -0.881               | 218                      | 0.327              |                   |                         |                          | 0.170              | 72.17                     | 0.226               | 63.70                      |
| 51              | 1.023                              | 1.18                     | 3.04                 | 1674                | -0.713               | 219                      | 0.333              |                   |                         |                          | 0.210              | 66.30                     | 0.228               | 63.20                      |
| 52              | 1.092                              | 1.08                     | 3.50                 | 1971                | -1.049               | 222                      | 0.320              |                   |                         |                          | 0.149              | 70.67                     | 0.180               | 65.77                      |
| 53              | 1.091                              | 1.12                     | 2.70                 | 1830                | -0.745               | 207                      | 0.334              |                   |                         |                          | 0.210              | 65.86                     | 0.242               | 61.59                      |
| 56              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 57              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 58              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 59              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 60              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 62              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 64              | 1.261                              | 1.17                     | 3.06                 | 1840                | -0.605               | 204                      | 0.336              |                   |                         |                          | 0.194              | 67.14                     | 0.218               | 63.51                      |
| 65              | 1.172                              | 1.35                     | 2.95                 | 1853                | -0.750               | 192                      | 0.332              |                   |                         |                          | 0.170              | 67.32                     | 0.191               | 64.17                      |
| 66              | 0.970                              | 1.06                     | 3.32                 | 1960                | -0.722               | 223                      | 0.333              |                   |                         |                          | 0.180              | 69.01                     | 0.195               | 66.90                      |
| 68              | 1.133                              | 1.23                     | 4.16                 | 1949                | -0.689               | 226                      | 0.319              |                   |                         |                          | 0.093              | 77.50                     | 0.123               | 70.90                      |
| 69              | 1.140                              | 1.15                     | 3.16                 | 2170                | -0.978               | 225                      | 0.328              | 2.33              | 5.56                    | -30.30                   | 0.262              | 58.71                     | 0.280               | 56.57                      |
| 70              | 1.052                              | 1.18                     | 3.56                 | 1671                | -0.868               | 208                      | 0.334              |                   |                         |                          |                    |                           |                     |                            |
| 71              | 1.072                              | 1.24                     | 3.97                 | 2032                | -0.695               | 223                      | 0.324              |                   |                         |                          | 0.100              | 76.90                     | 0.132               | 70.20                      |
| 73              | 1.100                              | 1.21                     | 3.91                 | 1929                | -0.751               | 217                      | 0.326              |                   |                         |                          | 0.103              | 76.60                     | 0.135               | 69.90                      |
| 76              | 1.067                              | 1.16                     | 3.08                 | 1670                | -0.657               | 231                      | 0.331              |                   |                         |                          | 0.200              | 65.30                     | 0.215               | 64.30                      |
| 77              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 78              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 81              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 83              | 1.180                              | 1.13                     | 3.32                 | 1910                | -0.744               | 220                      | 0.322              |                   |                         |                          | 0.175              | 69.26                     | 0.191               | 66.85                      |
| 84              |                                    |                          |                      |                     |                      |                          |                    |                   |                         |                          |                    |                           |                     |                            |
| 85              | 1.033                              | 1.10                     | 3.54                 | 1678                | -0.658               | 227                      | 0.319              |                   |                         |                          | 0.160              | 65.80                     | 0.173               | 66.60                      |
| 87              | 1.083                              | 1.03                     | 3.21                 | 1913                | -1.203               | 230                      | 0.326              |                   |                         |                          | 0.164              | 69.40                     | 0.199               | 64.01                      |
| 89              | 1.196                              | 1.12                     | 3.17                 | 1617                | -0.614               | 209                      | 0.338              |                   |                         |                          | 0.190              | 67.28                     | 0.206               | 64.12                      |
| 90              | 1.006                              | 1.14                     | 3.43                 | 1047                | -0.705               | 208                      | 0.334              |                   |                         |                          | 0.158              | 70.10                     | 0.171               | 68.12                      |
| 93              | 1.133                              | 1.26                     | 3.07                 | 1569                | -0.651               | 210                      | 0.340              |                   |                         |                          | 0.180              | 71.83                     | 0.237               | 63.02                      |
| 94              | 1.090                              | 1.17                     | 3.12                 | 1821                | -0.709               | 209                      | 0.323              |                   |                         |                          | 0.180              | 68.07                     | 0.207               | 64.75                      |
| 95              | 1.120                              | 1.22                     | 3.15                 | 1508                | -0.631               | 219                      | 0.341              |                   |                         |                          | 0.200              | 66.00                     | 0.220               | 61.80                      |
| 97              | 1.037                              | 1.19                     | 3.00                 | 1809                | -0.746               | 216                      | 0.335              |                   |                         |                          | 0.204              | 66.60                     | 0.226               | 63.40                      |
| 98              | 1.053                              | 1.21                     | 2.98                 | 1701                | -0.706               | 212                      | 0.337              |                   |                         |                          | 0.211              | 66.60                     | 0.231               | 63.40                      |
| 99              | 1.037                              | 1.10                     | 3.41                 | 1854                | -0.707               | 226                      | 0.324              |                   |                         |                          | 0.176              | 69.23                     | 0.193               | 66.55                      |
| Average         | 1.086                              | 1.16                     | 3.27                 | 1816                | -0.781               | 218                      | 0.330              | 1.86              | 4.82                    | -29.68                   | 0.175              | 68.94                     | 0.202               | 64.86                      |
| Std. Dev.       | 0.1218                             | 0.0674                   | 0.2852               | 206.55              | 0.1831               | 10.12                    | 0.0084             | 0.5747            | 0.8940                  | 0.5560                   | 0.0343             | 3.8323                    | 0.0350              | 3.1084                     |
| Coef. of Var.   | 11.217                             | 5.791                    | 8.723                | 11.371              | 23.463               | 4.649                    | 2.556              | 30.979            | 18.538                  | -1.874                   | 19.640             | 5.559                     | 17.318              | 4.793                      |

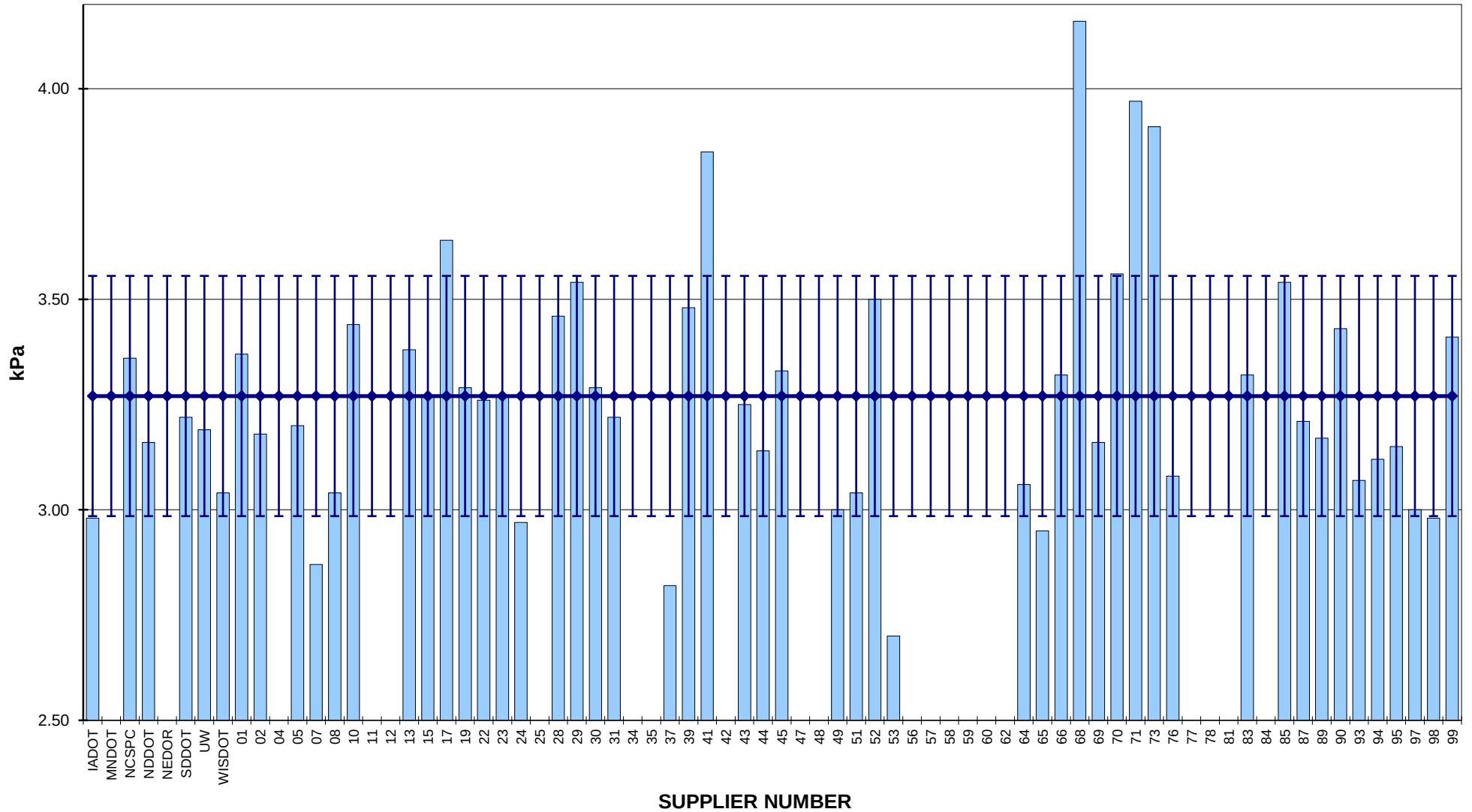
**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**PG 70-28**  
**ROTATIONAL VISCOSITY**



**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**PG 70-28**  
**DSR - ORIGINAL**

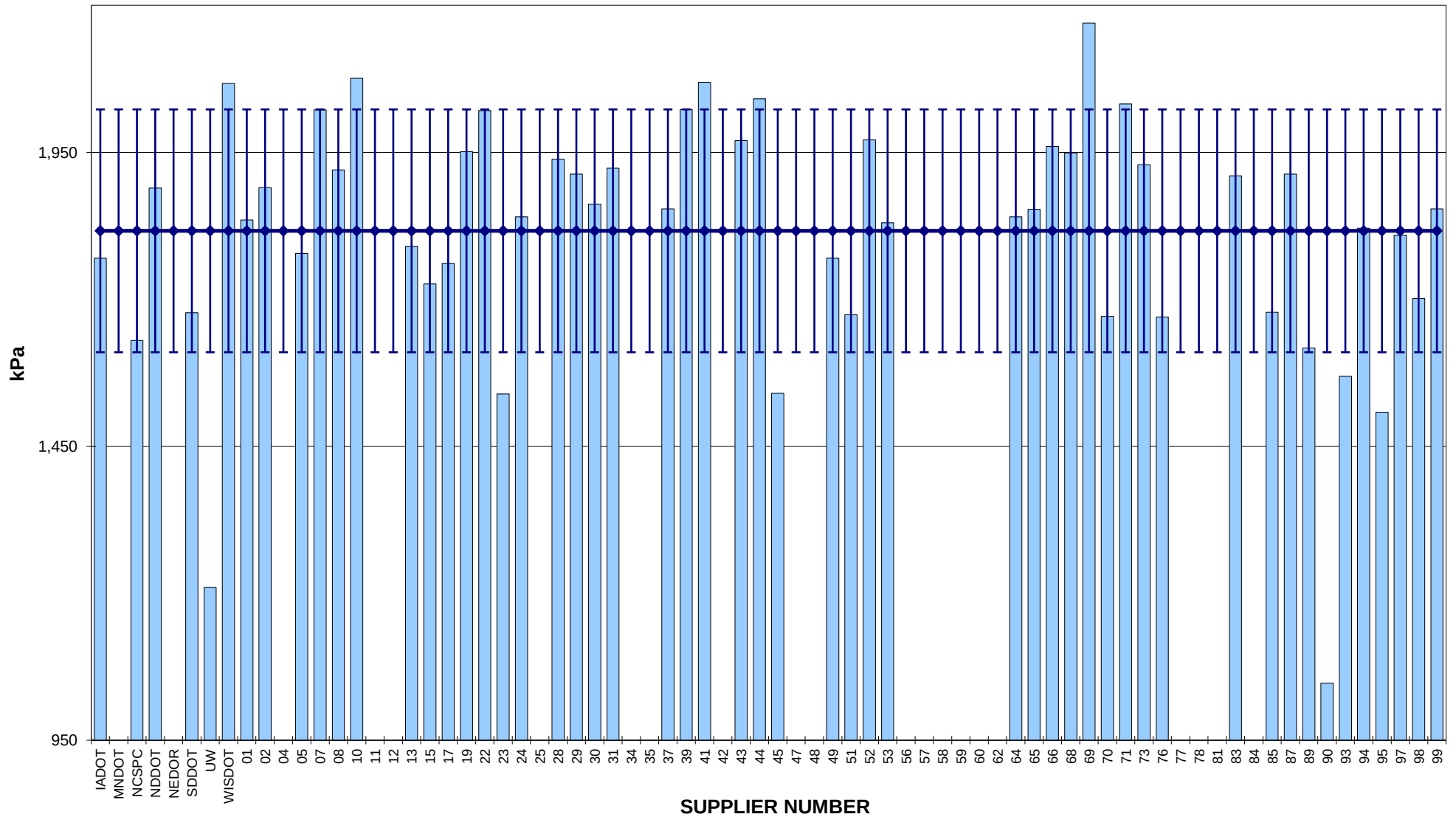


**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**PG 70-28**  
**DSR - RTFO**



COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2  
SUMMARY A  
PG 70-28

DSR - PAV

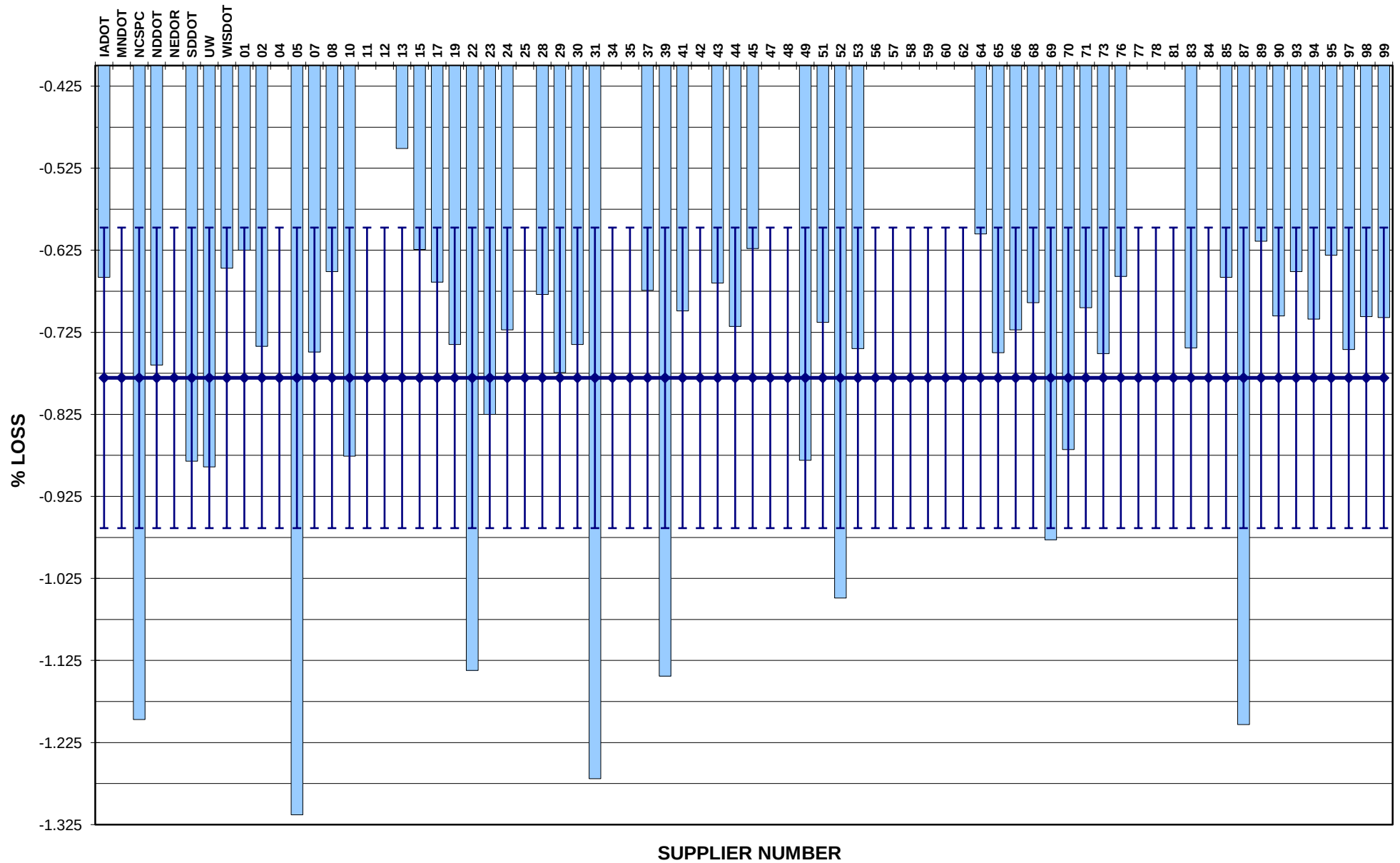


# COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2

## SUMMARY A

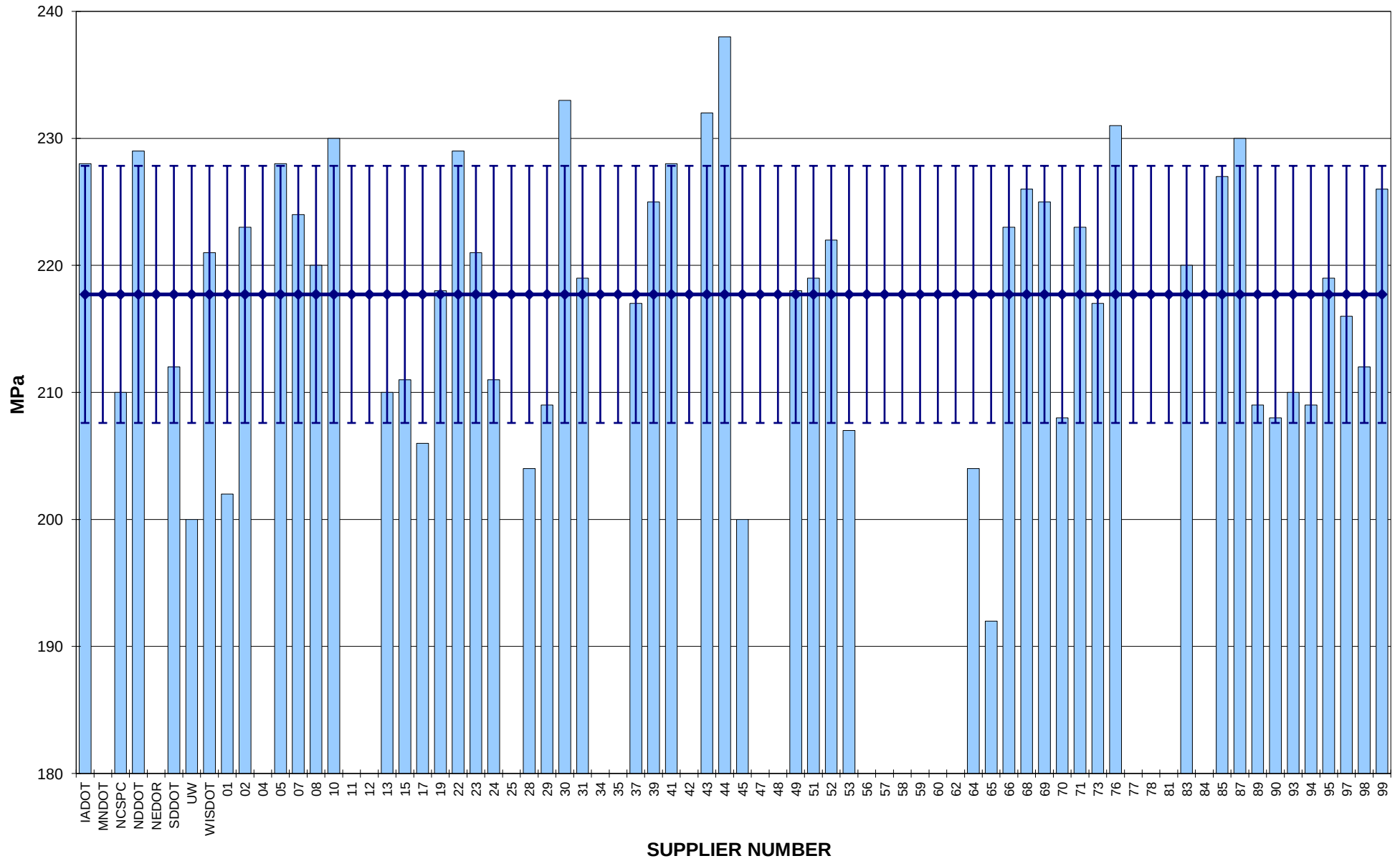
PG 70-28

### RTFO MASS LOSS

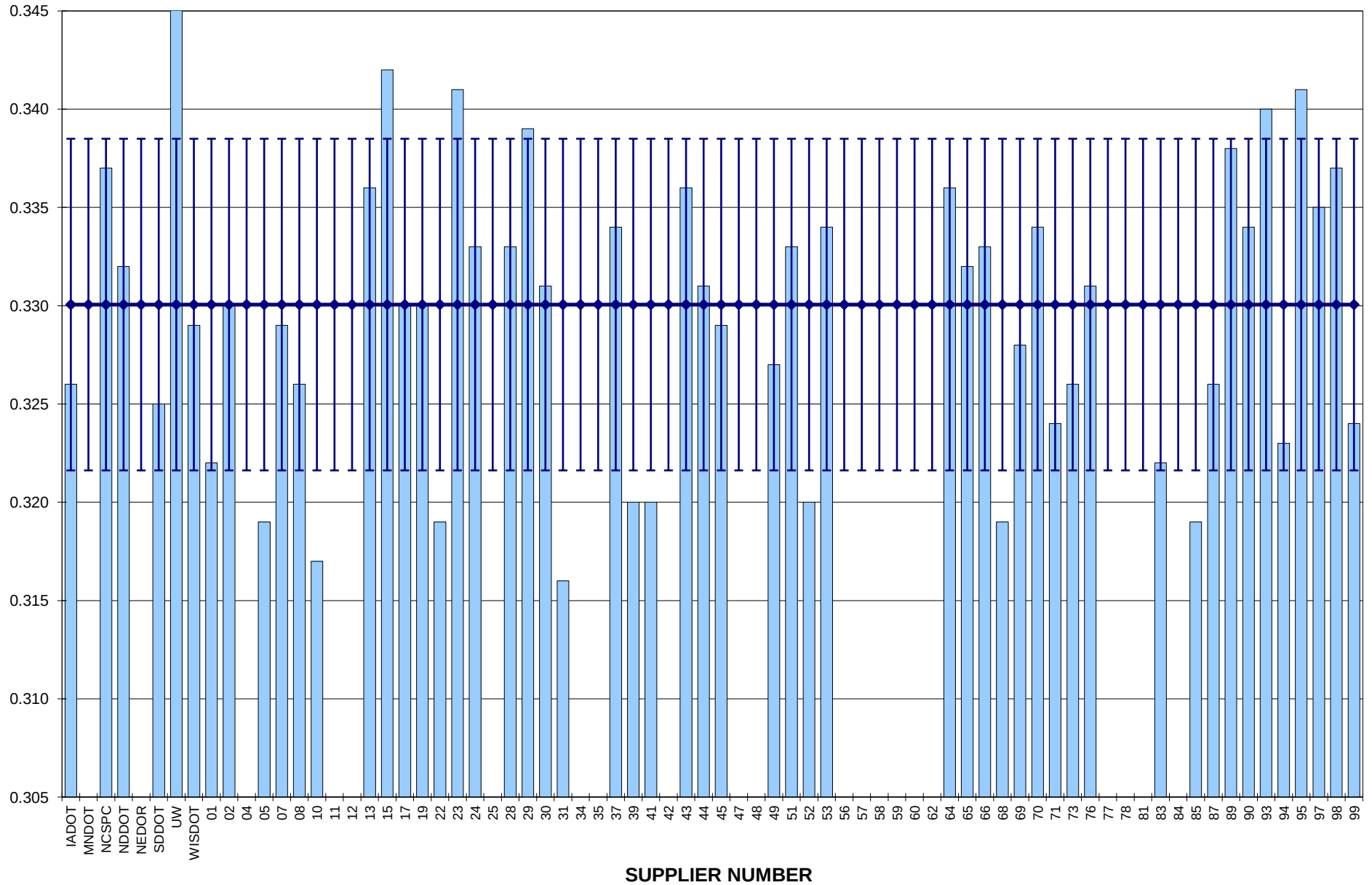


**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**PG 70-28**

**BBR STIFFNESS**



**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**PG 70-28**  
**BBR m-VALUE**



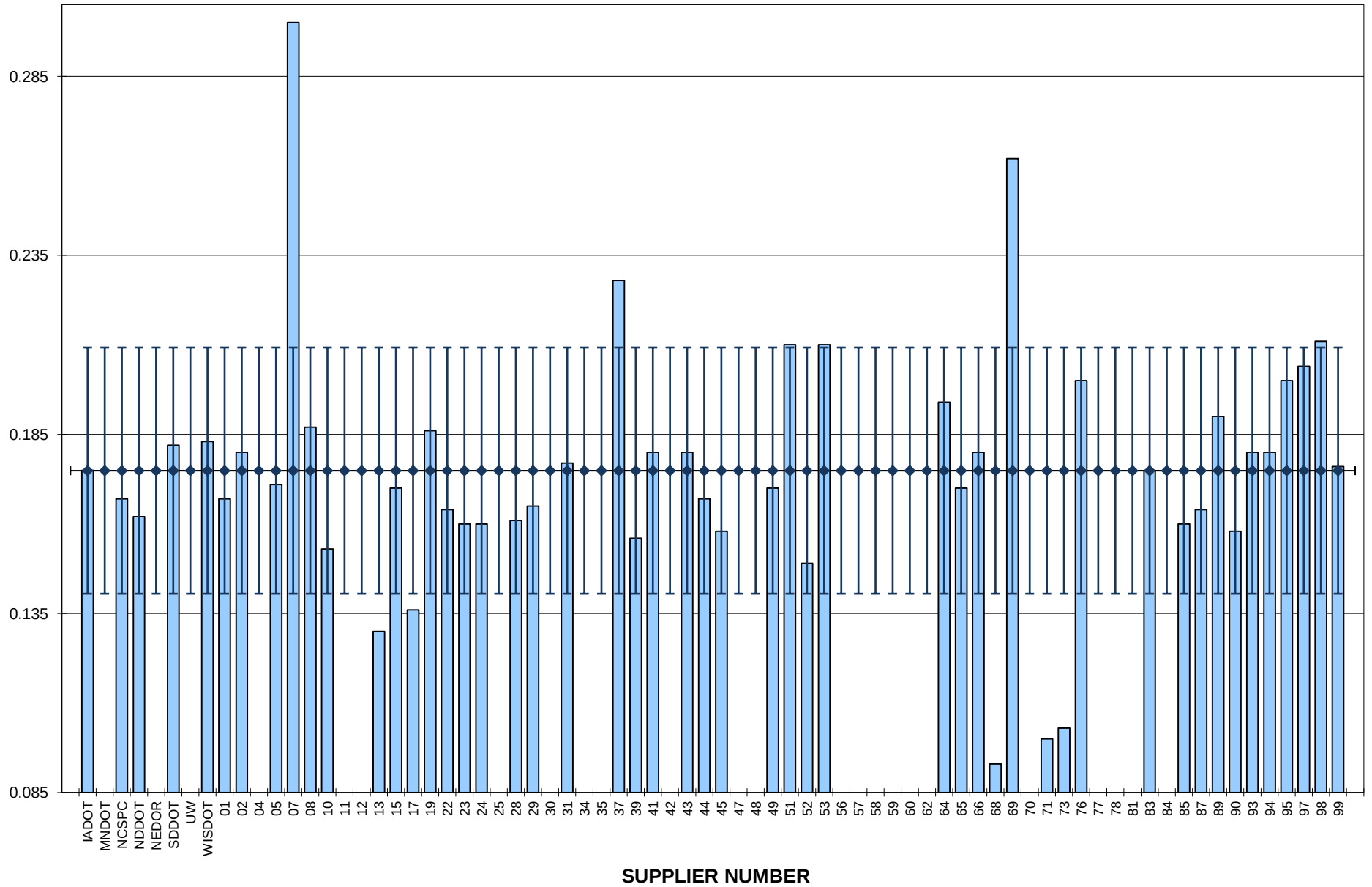


COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2

SUMMARY A

PG 70-28

Jnr@100 Pa

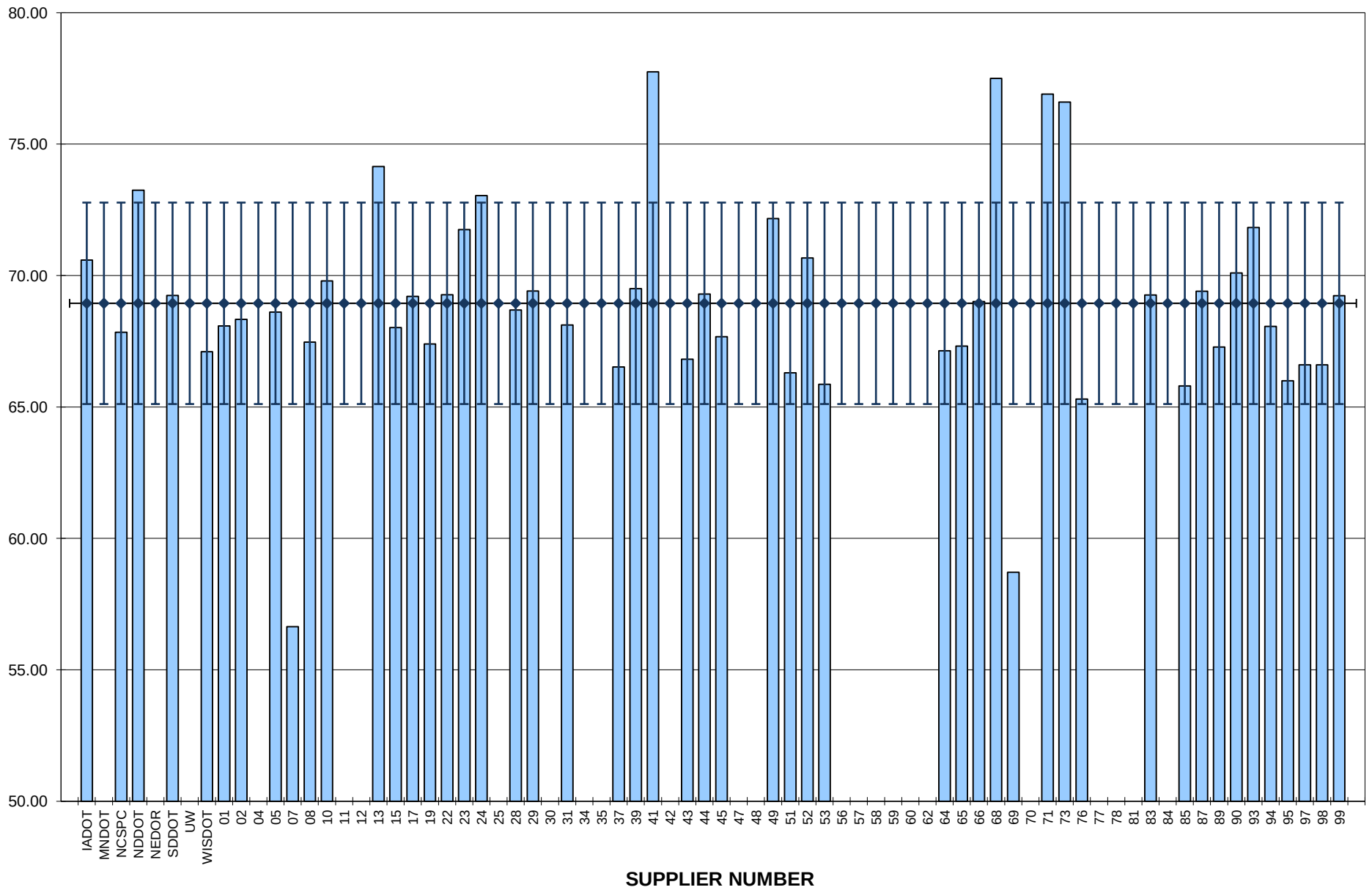


COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2

SUMMARY A

PG 70-28

%Recovery@100 Pa

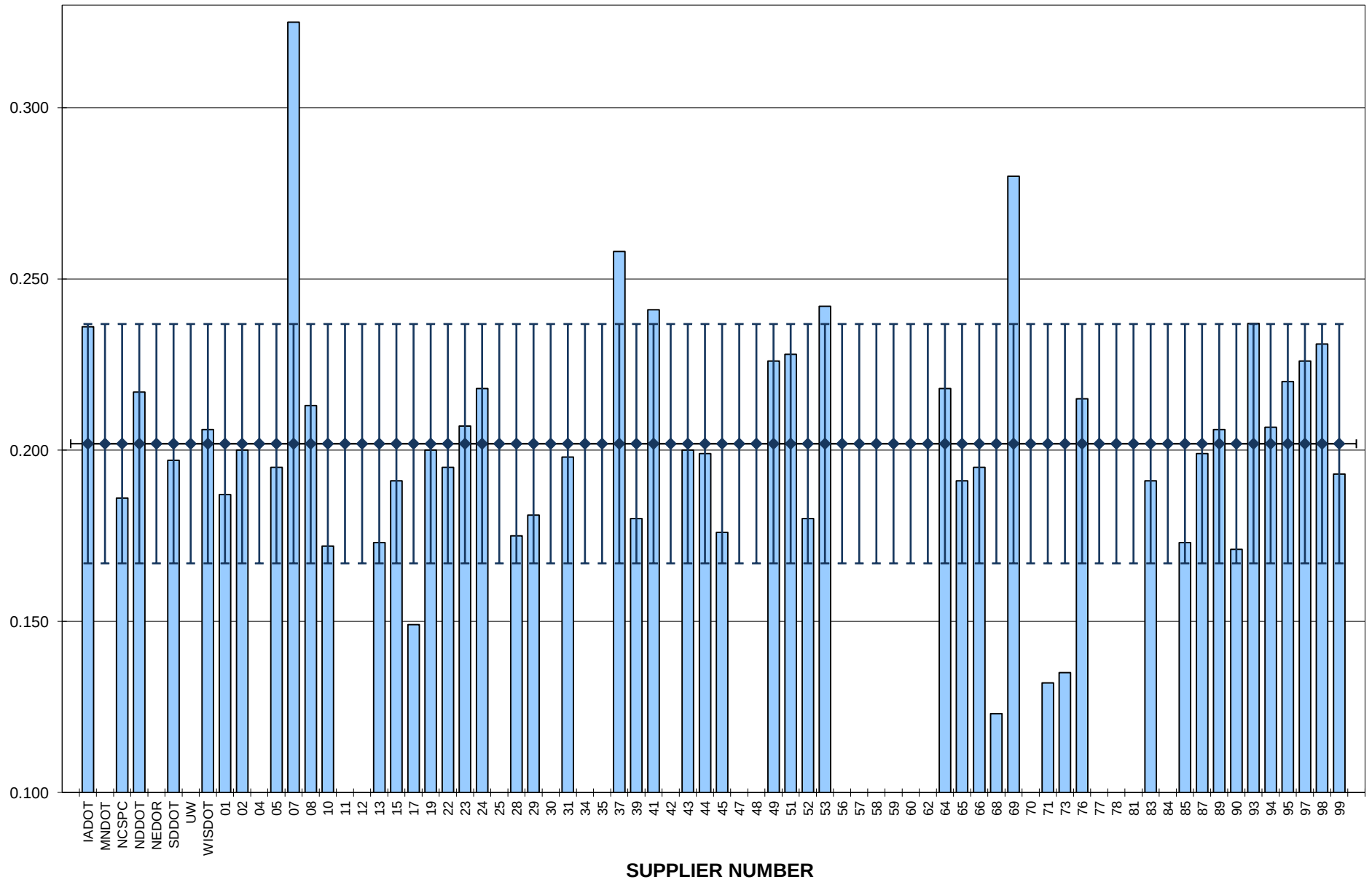


COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2

SUMMARY A

PG 70-28

Jnr@3200 Pa

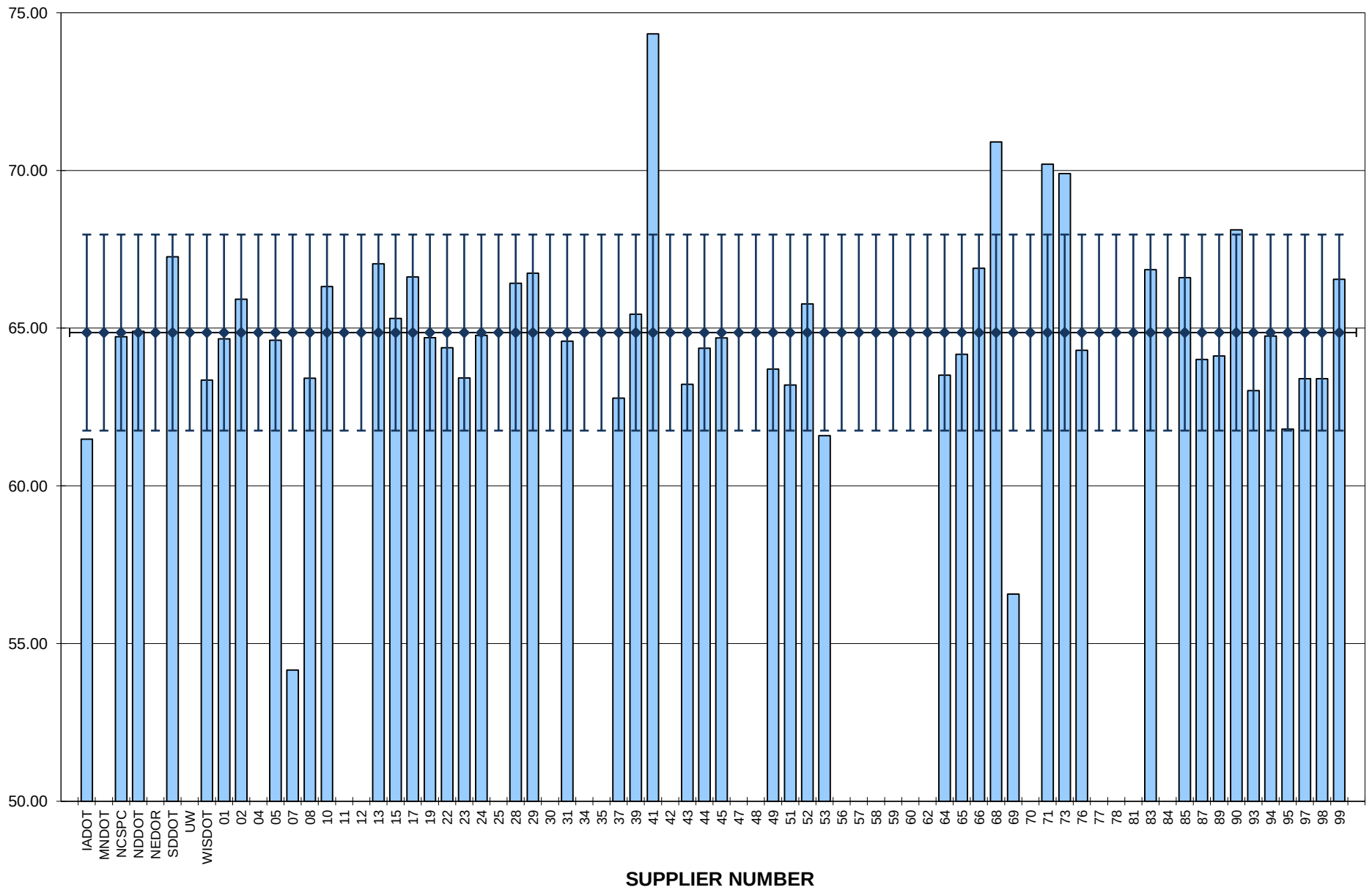


# COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2

## SUMMARY A

PG 70-28

%Recovery@3200 Pa



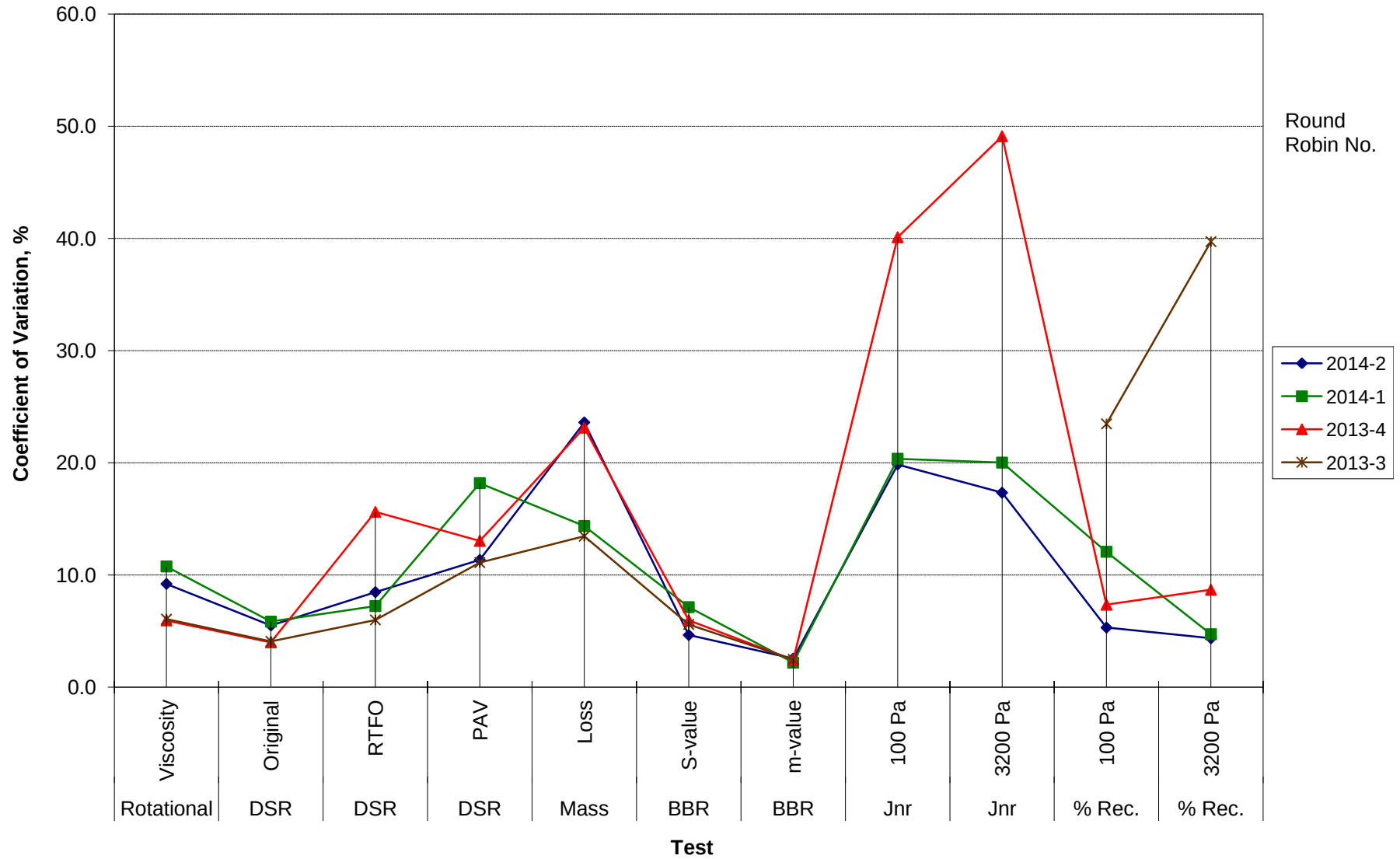
**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**70-28**

**COEFFICIENT OF VARIATION**

| R R<br>No. | Number of<br>Participants | Coefficient of Variation, % |                 |             |            |              |                |                |               |                |                  |                   |               |
|------------|---------------------------|-----------------------------|-----------------|-------------|------------|--------------|----------------|----------------|---------------|----------------|------------------|-------------------|---------------|
|            |                           | Rotational<br>Viscosity     | DSR<br>Original | DSR<br>RTFO | DSR<br>PAV | Mass<br>Loss | BBR<br>S-value | BBR<br>m-value | Jnr<br>100 Pa | Jnr<br>3200 Pa | % Rec.<br>100 Pa | % Rec.<br>3200 Pa | DTT<br>Strain |
| 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        |
| 2014-1     | 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         |
| 2013-4     | 72                        | 5.951                       | 4.000           | 15.623      | 13.043     | 23.130       | 5.964          | 2.446          | 40.101        | 49.104         | 7.354            | 8.681             | 0.000         |
| 2013-3     | 72                        | 6.066                       | 4.085           | 5.997       | 11.103     | 13.455       | 5.594          | 2.477          |               |                | 23.467           | 39.713            | 30.613        |

**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**70-28**

**COEFFICIENT OF VARIATION**



**COMBINED STATE BINDER GROUP ROUND ROBIN 2014-2**  
**SUMMARY A**  
**PG 70-28**

**STATISTICS WITH OUTLIERS REMOVED:**

|                      | Rotational<br>Viscosity<br>(Pa.s)<br>@135°C | DSR<br>Original<br>(kPa)<br>@70°C | DSR<br>RTFO<br>(kPa)<br>@70°C | DSR<br>PAV<br>(kPa)<br>@25°C | Mass<br>Loss<br>(%)<br>@163°C | BBR<br>S-value<br>(MPa)<br>@-18°C | BBR<br>m-value<br>@-18°C | Jnr @<br>100Pa @<br>58°C | %<br>RECOV.<br>@ 100Pa<br>@58° C | Jnr @<br>3200Pa<br>@ 58°C | %<br>RECOV.<br>@<br>3200Pa<br>@ 58° C |
|----------------------|---------------------------------------------|-----------------------------------|-------------------------------|------------------------------|-------------------------------|-----------------------------------|--------------------------|--------------------------|----------------------------------|---------------------------|---------------------------------------|
| <b>Average</b>       | 1.101                                       | 1.16                              | 3.24                          | 1,812                        | -0.782                        | 218                               | 0.330                    | 0.172                    | 69.02                            | 0.198                     | 65.06                                 |
| <b>Std. Dev.</b>     | 0.0622                                      | 0.0639                            | 0.2474                        | 205.49                       | 0.1846                        | 10.12                             | 0.0069                   | 0.0298                   | 3.2304                           | 0.0301                    | 2.0781                                |
| <b>Coef. of Var.</b> | 5.647                                       | 5.504                             | 7.633                         | 11.343                       | 23.598                        | 4.651                             | 2.087                    | 17.315                   | 4.681                            | 15.176                    | 3.194                                 |