

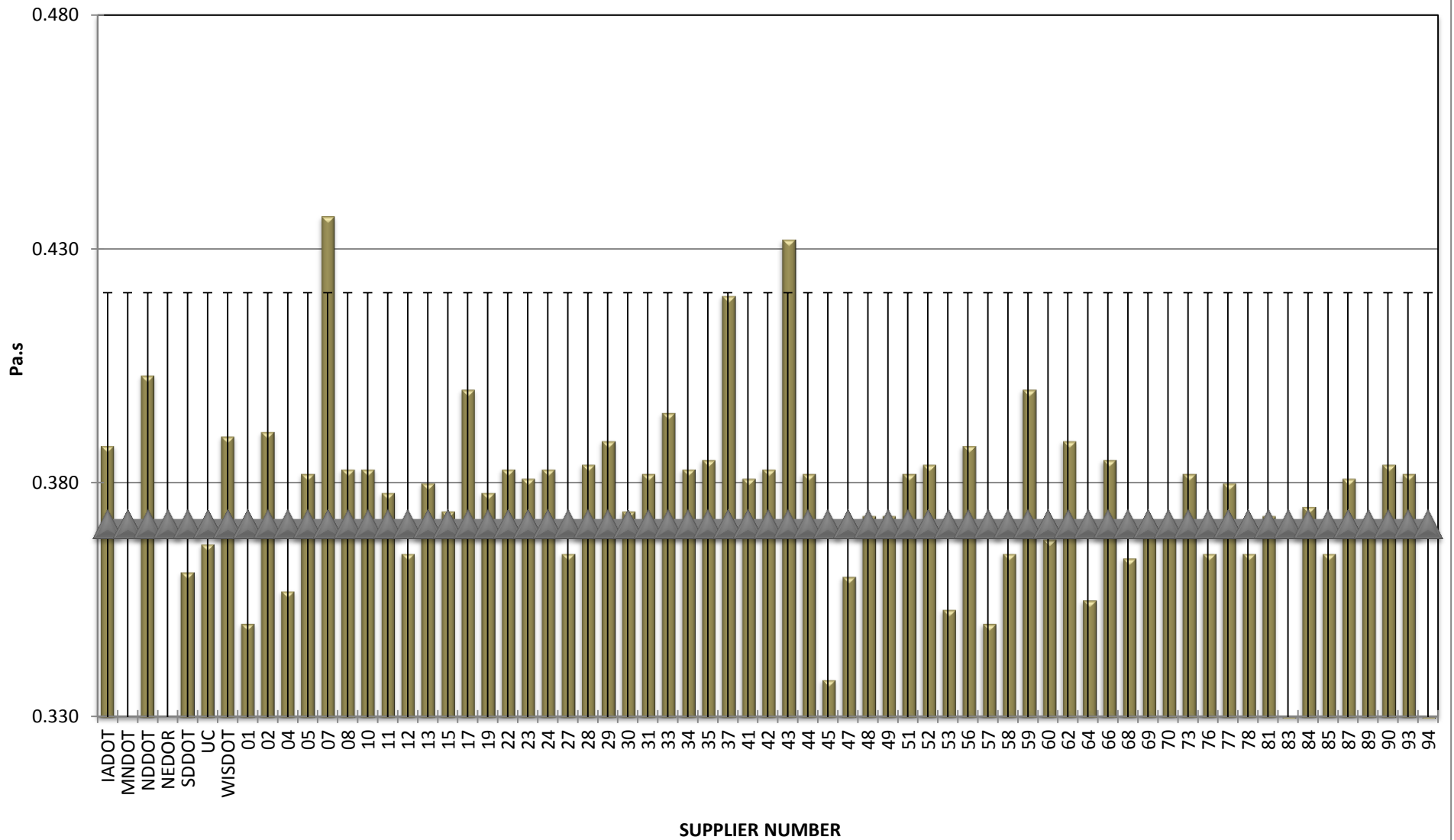
**COMBINED STATE BINDER GROUP ROUND ROBIN SUMMARY A 2015-3**

| 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           | 0.388                              | 1.12               | 2.790          | 3.910         | 0.625                | 206               | 0.352       | 1.376        | 5.12              | 1.439         | 2.48               |
| MNDOT           |                                    | 1.08               | 2.350          | 2.910         | 0.700                | 188               | 0.337       | 1.446        | 4.37              |               | 2.22               |
| NDDOT           | 0.403                              | 1.13               | 2.810          | 3.811         | 0.706                | 213               | 0.343       | 1.332        | 4.90              | 1.419         | 2.40               |
| NEDOR           |                                    | 1.11               | 3.890          | 4.411         | 0.654                | 223               | 0.331       | 0.941        | 6.02              | 0.983         | 4.74               |
| SDDOT           | 0.361                              | 1.14               | 2.960          | 4.160         | 0.523                | 194               | 0.356       | 1.285        | 4.99              | 1.354         | 2.86               |
| UC              | 0.367                              | 1.13               | 2.810          | 3.616         | 0.632                | 223               | 0.348       | 1.354        | 5.90              | 1.514         | 2.10               |
| WISDOT          | 0.390                              | 1.18               | 2.880          | 3.087         | 0.584                | 200               | 0.362       | 1.320        | 5.87              | 1.450         | 2.54               |
| 01              | 0.350                              | 1.30               | 3.240          | 4.045         | 0.707                | 202               | 0.342       | 1.102        | 8.68              | 1.222         | 3.48               |
| 02              | 0.391                              | 1.14               | 2.830          | 3.905         | 0.638                | 198               | 0.352       | 1.405        | 4.41              | 1.484         | 2.50               |
| 04              | 0.357                              | 1.03               | 2.317          | 3.490         | 0.573                | 180               | 0.345       |              | 4.60              |               | 2.10               |
| 05              | 0.382                              | 1.09               | 2.830          | 3.705         | 0.721                | 203               | 0.346       | 1.268        | 4.88              | 1.398         | 1.75               |
| 07              | 0.437                              | 1.14               | 2.960          | 4.270         | 0.586                | 218               | 0.346       | 1.260        | 8.18              | 1.400         | 2.20               |
| 08              | 0.383                              | 1.08               | 2.816          | 3.639         | 0.576                | 199               | 0.354       | 1.355        | 4.47              | 1.493         | 1.76               |
| 10              | 0.383                              | 1.07               | 2.817          | 3.537         | 0.573                | 198               | 0.352       | 1.318        | 4.92              | 1.456         | 1.65               |
| 11              | 0.378                              | 1.11               | 2.970          | 3.651         | 0.669                | 210               | 0.350       | 1.322        | 4.52              | 1.397         | 2.63               |
| 12              | 0.365                              | 1.08               | 2.900          | 3.670         | 0.788                | 213               | 0.344       |              |                   |               |                    |
| 13              | 0.380                              | 1.06               | 2.770          | 3.610         | 0.614                | 208               | 0.337       | 1.310        | 6.33              | 0.430         | 2.32               |
| 15              | 0.374                              | 1.10               | 2.950          | 3.685         | 0.692                | 208               | 0.349       | 1.304        | 4.51              | 1.379         | 2.27               |
| 17              | 0.400                              | 1.25               | 2.540          | 4.552         | 0.573                | 192               | 0.346       | 1.541        | 4.51              | 1.926         | 1.93               |
| 19              | 0.378                              | 1.07               | 2.935          | 4.096         | 0.724                | 212               | 0.351       | 1.374        | 4.90              | 1.464         | 1.80               |
| 22              | 0.383                              | 1.08               | 2.936          | 3.808         | 0.711                | 206               | 0.348       | 1.275        | 4.66              | 1.404         | 1.94               |
| 23              | 0.381                              | 1.16               | 3.000          | 3.531         | 0.689                | 204               | 0.357       | 1.240        | 5.82              | 1.330         | 2.86               |
| 24              | 0.383                              | 1.09               | 2.850          | 3.610         | 0.602                | 193               | 0.342       | 1.340        | 5.06              | 1.430         | 2.15               |
| 27              | 0.365                              | 1.08               | 2.700          | 3.770         | 0.553                | 208               | 0.354       | 1.415        | 4.63              | 1.513         | 1.68               |
| 28              | 0.384                              | 1.09               | 2.763          | 3.582         | 0.580                | 182               | 0.342       | 1.492        | 5.07              | 1.590         | 2.23               |
| 29              | 0.389                              | 1.10               | 2.840          | 4.508         | 0.734                | 215               | 0.349       | 1.394        | 4.36              | 1.463         | 2.55               |
| 30              | 0.374                              | 1.14               | 2.760          | 3.523         | 0.463                | 207               | 0.362       | 1.460        | 6.21              | 1.550         | 2.43               |
| 31              | 0.382                              | 1.11               | 2.887          | 3.881         | 0.738                | 220               | 0.344       | 1.274        | 5.16              | 1.407         | 1.77               |
| 33              | 0.395                              | 1.09               | 2.860          | 3.670         | 0.580                | 214               | 0.344       | 1.341        | 4.67              | 1.426         | 1.98               |
| 34              | 0.383                              | 1.15               | 2.780          | 3.843         | 0.578                | 211               | 0.347       | 1.411        | 5.54              | 1.520         | 2.25               |
| 35              | 0.385                              | 1.16               | 3.100          | 3.520         | 0.736                | 214               | 0.344       |              |                   |               |                    |
| 37              | 0.420                              | 1.18               | 2.960          | 4.171         | 0.689                | 212               | 0.345       | 1.350        | 5.16              | 1.450         | 2.50               |
| 41              | 0.381                              | 1.10               | 2.849          | 3.914         | 0.588                | 208               | 0.350       | 1.315        | 4.93              | 1.452         | 1.79               |
| 42              | 0.383                              | 1.11               | 2.910          | 3.690         | 0.816                | 198               | 0.359       | 1.332        | 5.18              | 1.425         | 2.15               |
| 43              | 0.432                              | 1.17               | 2.910          | 3.780         | 0.330                | 206               | 0.342       | 1.270        | 7.08              | 1.390         | 2.28               |
| 44              | 0.382                              | 1.08               | 2.864          | 3.542         | 0.586                | 203               | 0.348       | 1.309        | 4.70              | 1.442         | 1.83               |
| 45              | 0.338                              | 1.19               | 3.120          | 4.343         | 0.686                | 195               | 0.338       | 1.176        | 5.70              | 1.257         | 2.92               |
| 47              | 0.360                              | 1.03               | 2.405          | 3.491         | 0.645                | 183               | 0.350       |              | 4.40              |               | 5.10               |
| 48              | 0.373                              | 1.12               | 2.680          | 3.682         | 0.600                | 207               | 0.348       | 1.479        | 4.85              | 1.586         | 2.18               |
| 49              | 0.373                              | 1.10               | 2.850          | 3.710         | 0.667                | 204               | 0.339       | 1.367        | 4.49              | 1.452         | 1.99               |
| 51              | 0.382                              | 1.06               | 3.140          | 3.894         | 0.694                | 205               | 0.354       | 1.230        | 5.40              | 1.308         | 2.20               |
| 52              | 0.384                              | 1.07               | 2.934          | 3.789         | 0.723                | 207               | 0.348       | 1.266        | 4.72              | 1.383         | 1.95               |
| 53              | 0.353                              | 1.10               | 2.760          | 3.680         | 0.745                | 192               | 0.356       | 1.405        | 4.44              | 1.492         | 1.91               |
| 56              | 0.388                              | 1.09               | 2.970          | 3.730         | 0.611                | 209               | 0.344       | 1.358        | 5.11              | 1.452         | 2.09               |
| 57              | 0.350                              | 1.04               | 2.408          | 3.499         | 0.658                | 169               | 0.350       |              | 4.40              |               | 5.10               |
| 58              | 0.365                              | 1.08               | 2.860          | 3.800         | 0.680                | 205               | 0.350       | 1.361        | 4.60              | 1.445         | 1.86               |
| 59              | 0.400                              | 1.15               | 2.936          | 3.723         | 0.514                |                   |             | 1.300        | 5.98              |               | 2.78               |
| 60              | 0.368                              | 1.02               | 2.500          | 3.670         | 0.723                | 212               | 0.351       | 1.609        | 3.88              | 1.715         | 1.47               |
| 62              | 0.389                              | 1.06               | 2.830          | 4.120         | 0.613                | 213               | 0.345       | 1.293        | 5.06              | 1.378         | 2.22               |
| 64              | 0.355                              | 1.10               | 2.730          | 3.760         | 0.717                | 194               | 0.352       | 1.426        | 4.19              | 1.511         | 1.84               |
| 66              | 0.385                              | 1.11               | 2.860          | 3.823         | 0.500                | 188               | 0.345       | 1.395        | 4.32              | 1.484         | 2.53               |
| 68              | 0.364                              | 1.11               | 3.110          | 3.982         |                      | 203               | 0.342       | 1.220        | 8.98              | 1.330         | 3.17               |
| 69              | 0.370                              | 1.22               | 2.780          | 3.361         | 0.493                | 188               | 0.358       | 1.384        | 5.20              | 1.528         | 2.10               |
| 70              | 0.370                              | 1.10               | 2.899          | 3.272         | 0.670                | 197               | 0.370       | 1.296        | 5.25              | 1.381         | 2.82               |
| 73              | 0.382                              | 1.16               | 3.050          | 3.657         | 0.683                | 215               | 0.357       | 1.290        | 5.94              | 1.380         | 2.79               |
| 76              | 0.365                              | 1.06               | 2.610          | 3.500         | 0.384                | 192               | 0.349       | 1.496        | 4.28              | 1.589         | 1.83               |
| 77              | 0.380                              | 1.05               | 2.360          | 3.820         | 0.518                | 195               | 0.361       | 1.620        | 3.98              |               | 1.12               |
| 78              | 0.365                              | 1.09               | 2.920          | 3.630         | 0.680                | 209               | 0.349       | 1.234        | 5.64              | 1.322         | 2.37               |
| 81              | 0.373                              | 1.10               | 2.860          | 3.640         | 0.630                | 210               | 0.350       | 1.314        | 5.95              | 1.419         | 1.98               |
| 83              | 0.195                              | 1.10               | 3.115          | 3.638         | 0.620                | 212               | 0.338       | 1.240        | 6.77              | 1.339         | 2.95               |
| 84              | 0.375                              | 1.12               | 2.850          | 3.779         | 0.660                | 217               | 0.346       | 1.354        | 5.12              | 1.449         | 1.98               |
| 85              | 0.365                              | 1.06               | 2.760          | 3.690         | 0.366                | 190               | 0.341       | 1.421        | 4.54              | 1.508         | 2.01               |
| 87              | 0.381                              | 1.10               | 2.752          | 3.486         | 0.578                | 200               | 0.354       | 1.339        | 4.87              | 1.479         | 1.63               |
| 89              | 0.372                              | 1.15               | 3.100          | 3.546         | 0.814                | 204               | 0.347       | 1.212        | 5.81              | 1.300         | 2.55               |
| 90              | 0.384                              | 1.08               | 2.890          | 3.781         | 0.588                | 187               | 0.348       | 1.418        | 5.16              | 1.512         | 2.39               |
| 93              | 0.382                              | 1.13               | 3.010          | 3.591         | 0.672                | 210               | 0.354       | 1.270        | 5.59              | 1.350         | 2.77               |
| 94              | 0.042                              | 1.12               | 3.190          | 3.273         | 0.532                | 155               | 0.359       | 1.213        | 6.01              |               | 3.20               |
| 98              | 0.384                              | 1.07               | 2.935          | 4.126         | 0.681                | 206               | 0.359       | 1.334        | 5.00              | 1.420         | 1.90               |
| 99              | 0.384                              | 1.11               | 2.750          | 3.588         | 0.568                | 209               | 0.335       | 1.444        | 4.86              | 1.542         | 2.27               |

|               |        |      |       |       |        |     |       |       |       |        |       |
|---------------|--------|------|-------|-------|--------|-----|-------|-------|-------|--------|-------|
| Average       | 0.371  | 1.11 | 2.859 | 3.742 | 0.629  | 202 | 0.349 | 1.337 | 5.24  | 1.422  | 2.36  |
| Std. Dev.     | 0.049  | 0.05 | 0.229 | 295   | 0.096  | 12  | 0.007 | 0.108 | 0.99  | 0.178  | 0.72  |
| Coef. of Var. | 13.336 | 4.41 | 8.017 | 8     | 15.285 | 6   | 2.054 | 8.054 | 18.91 | 12.535 | 30.54 |

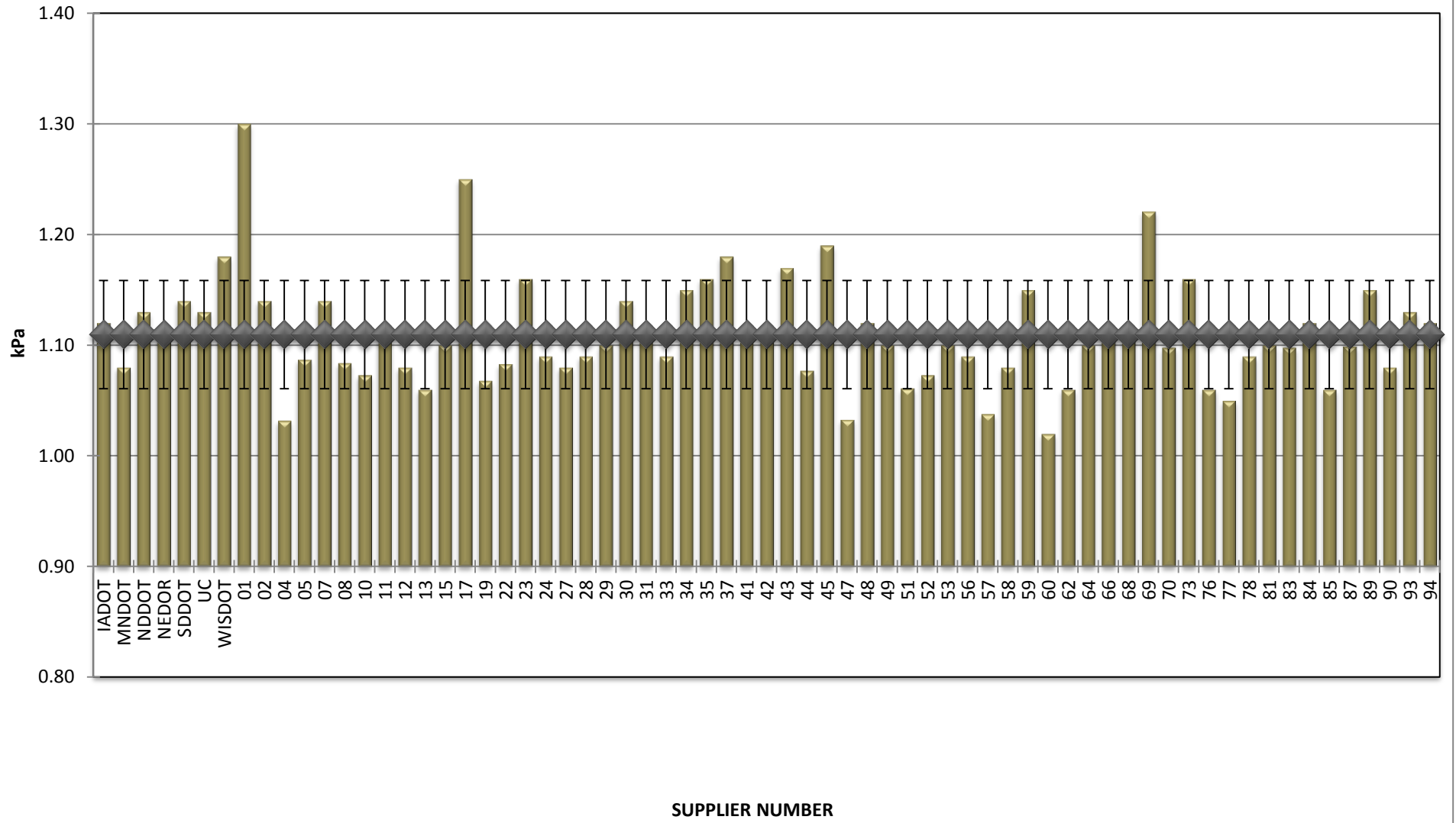
COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3

ROTATIONAL VISCOSITY



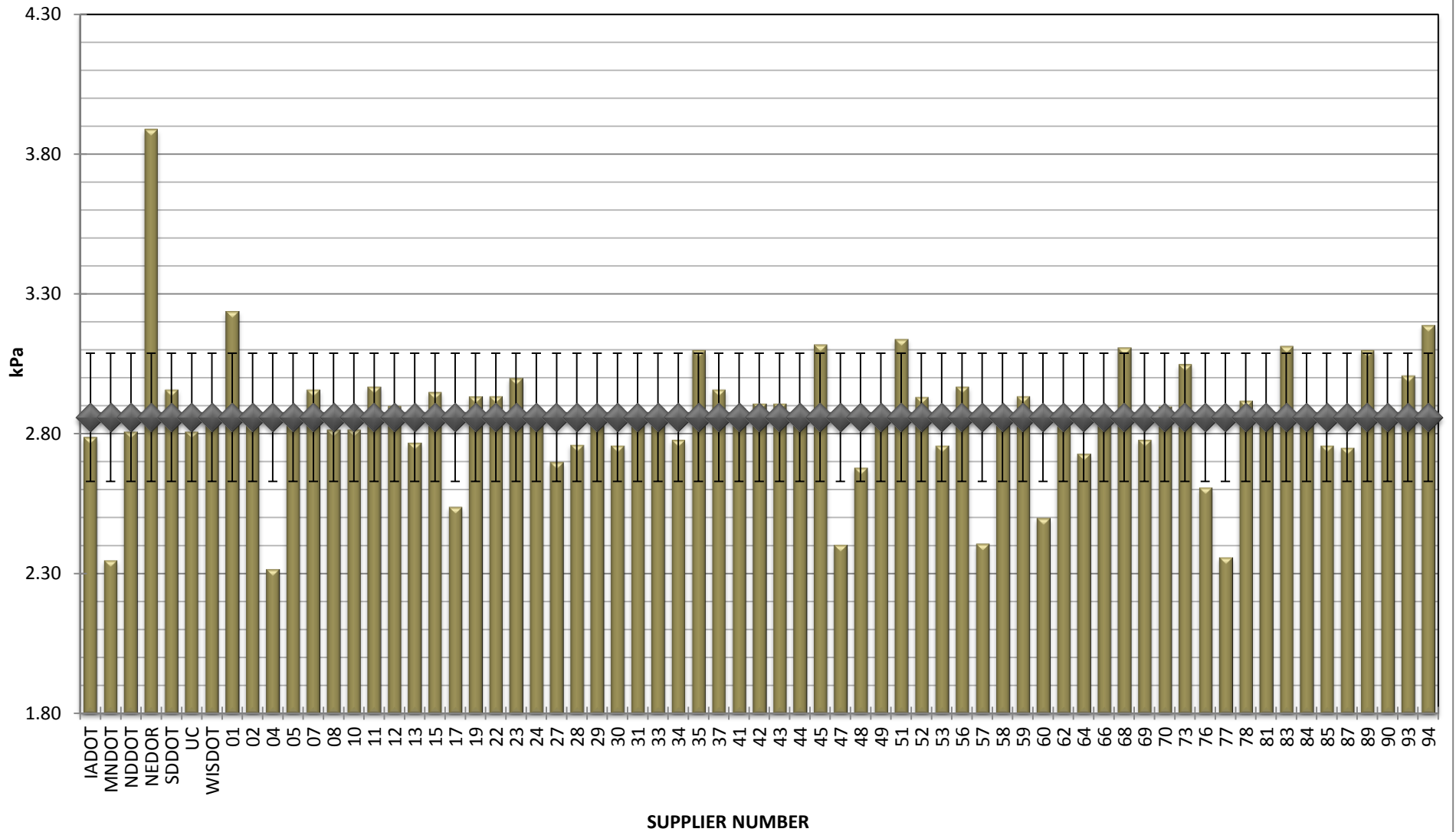
**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3**

**DSR - ORIGINAL**



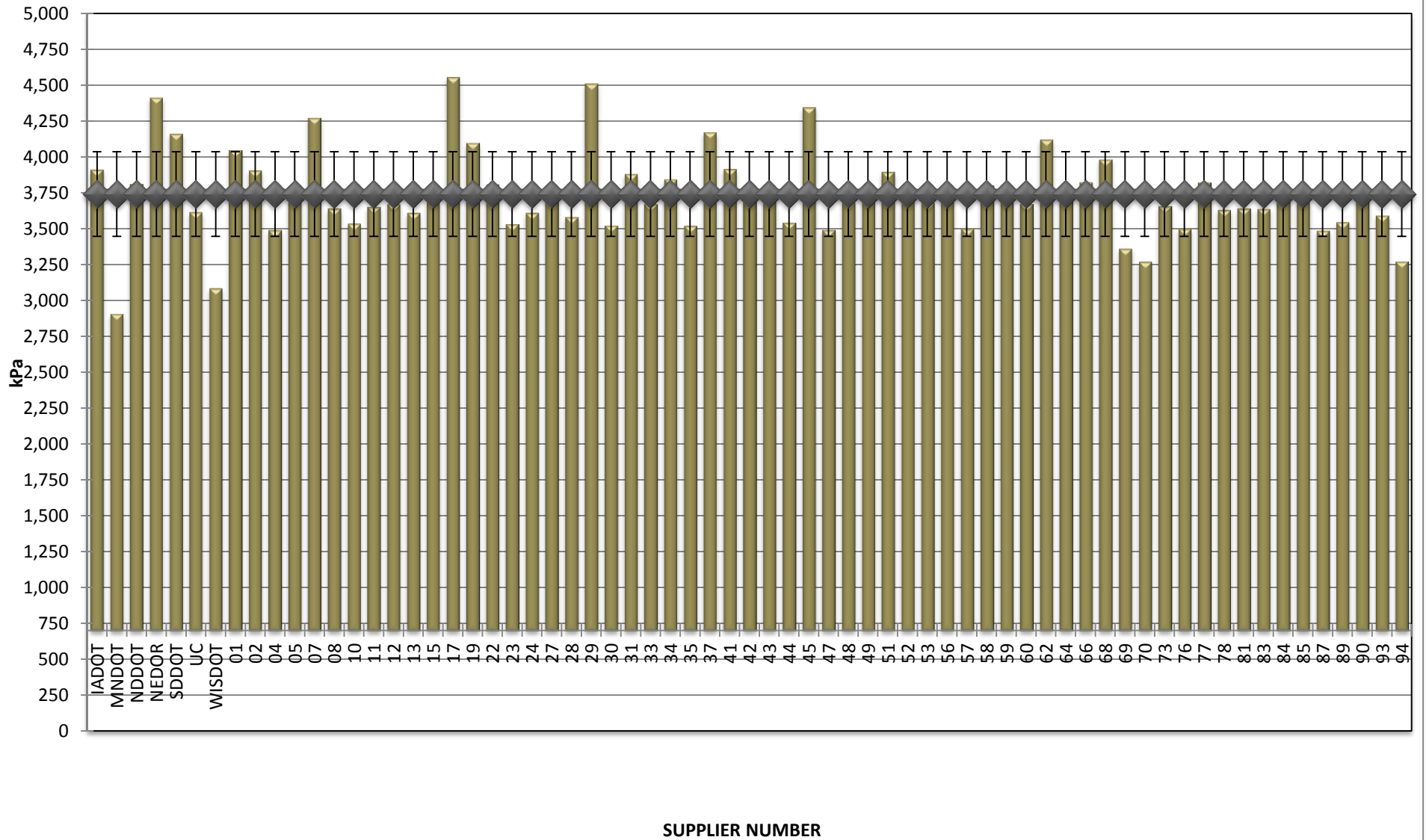
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SUMMARY A 2015-3

DSR - RTFO



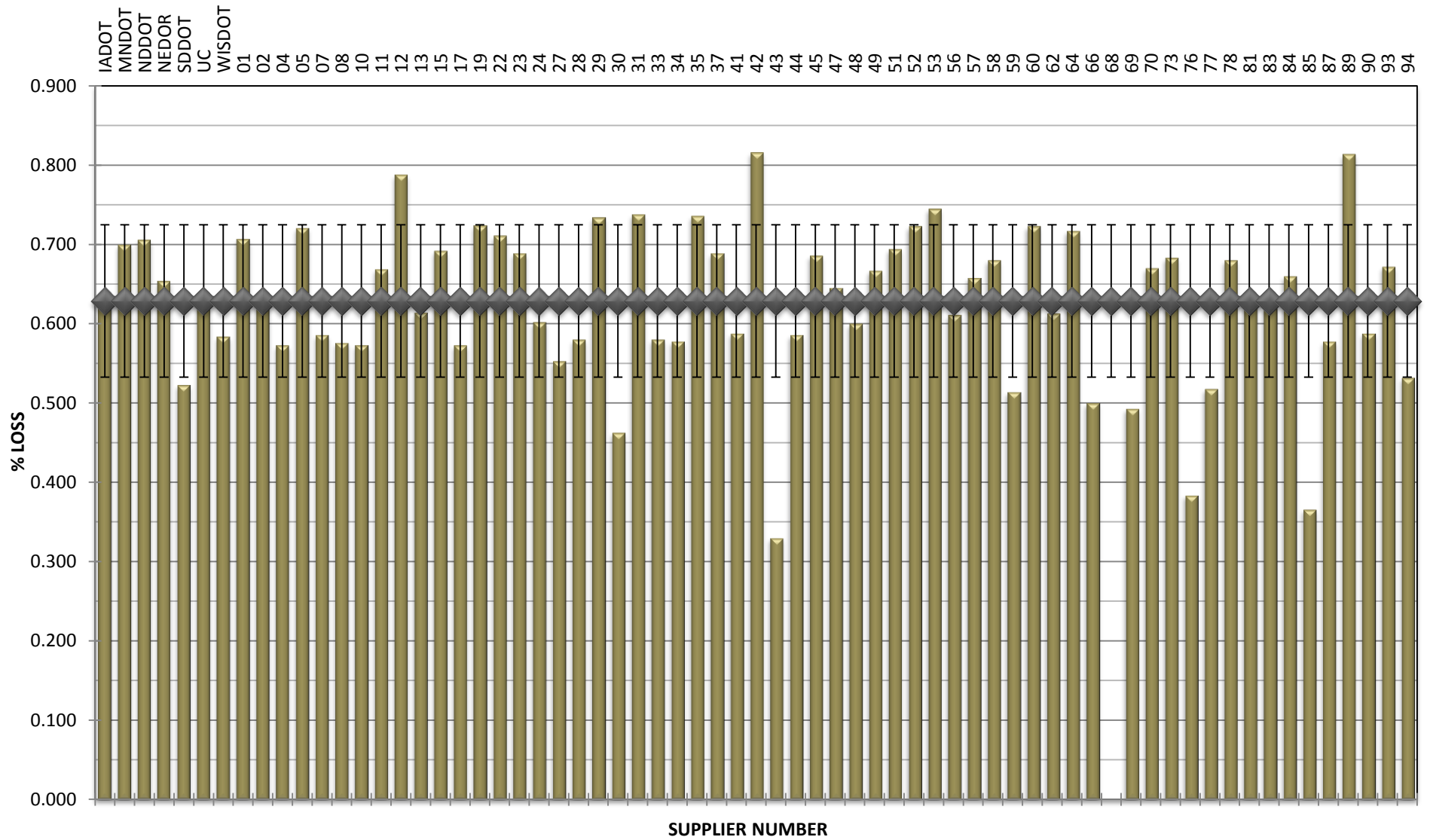
**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3**

**DSR - PAV**



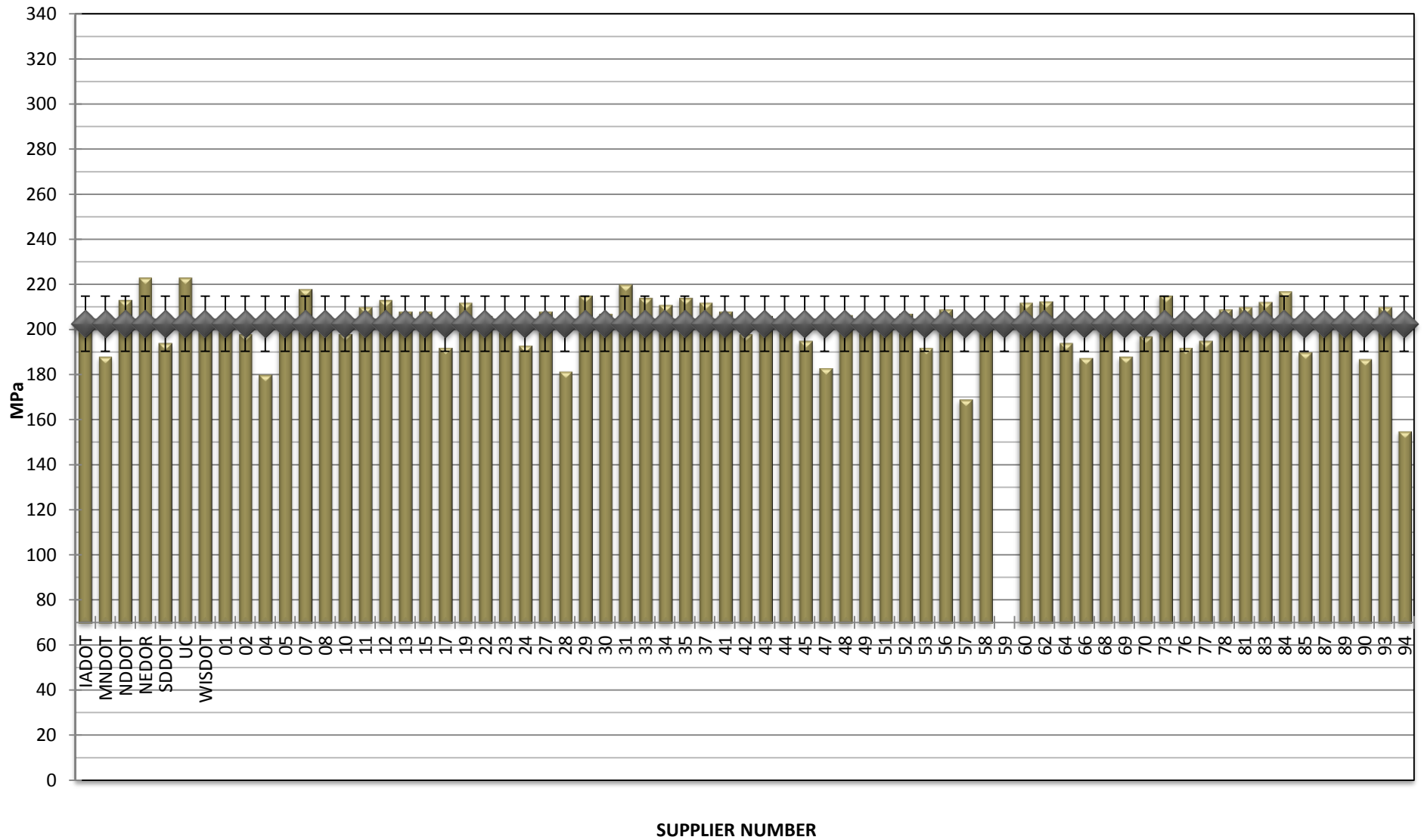
**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3**

**RTFO MASS LOSS**



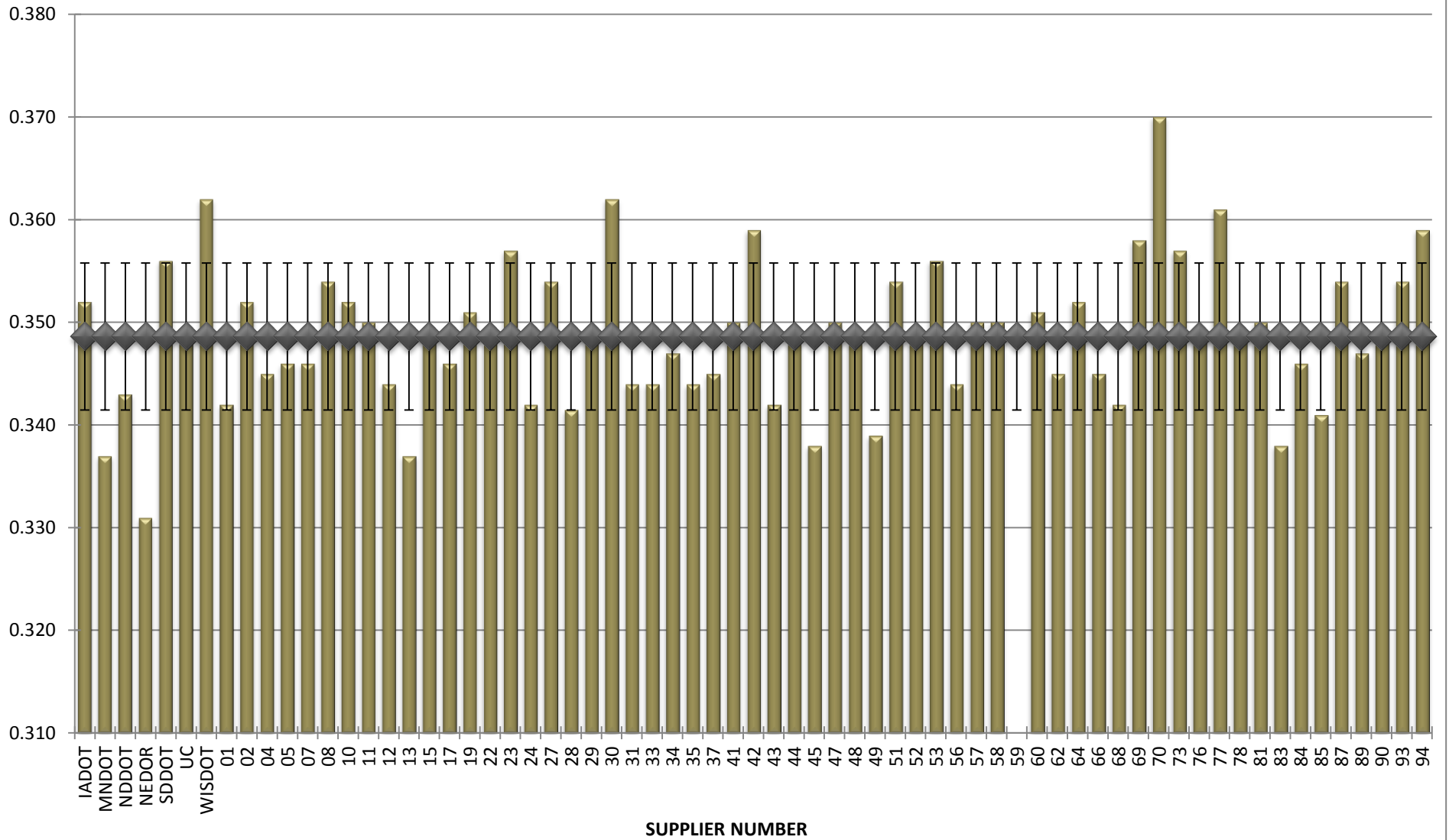
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SUMMARY A 2015-3

BBR STIFFNESS



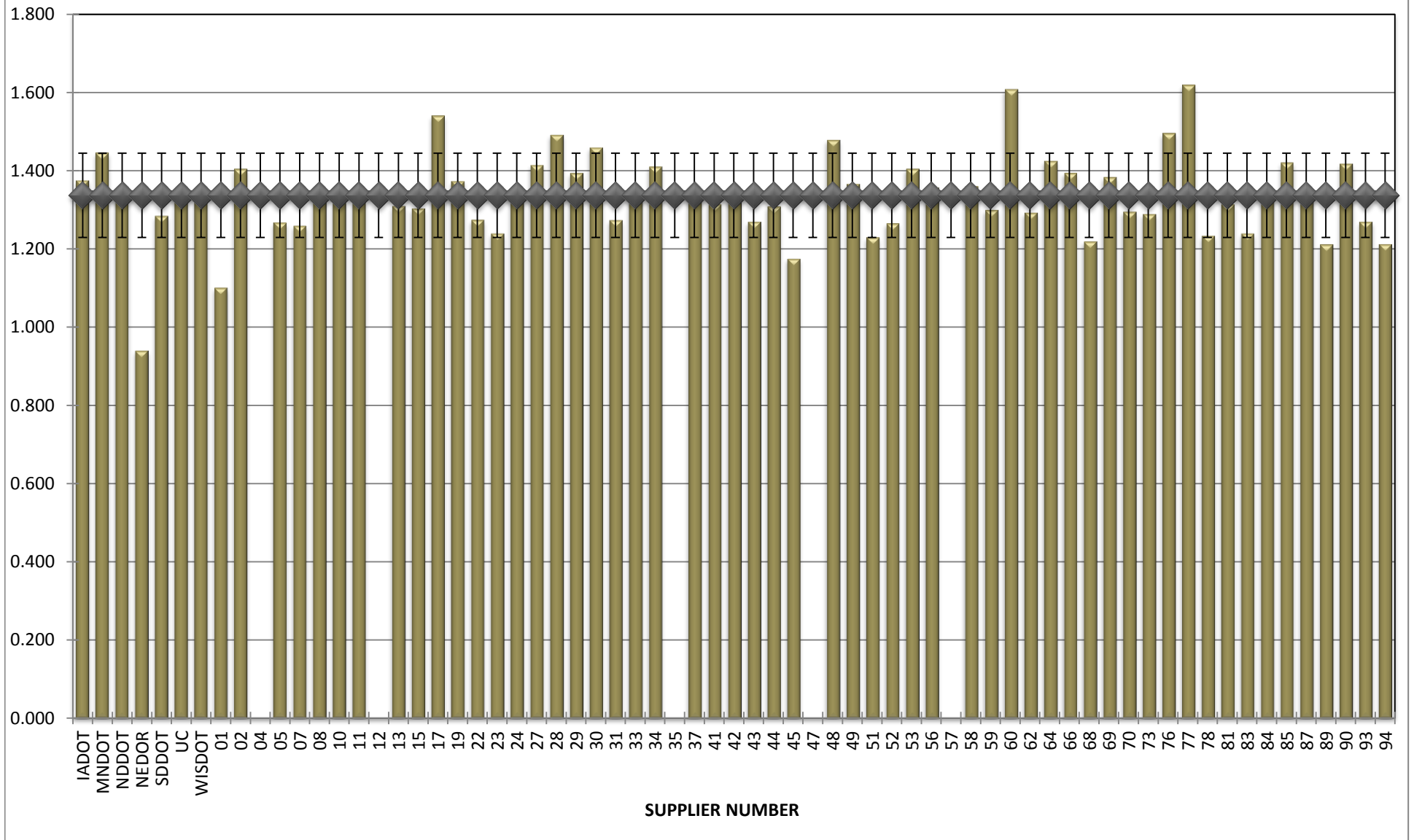
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BBR m-VALUE



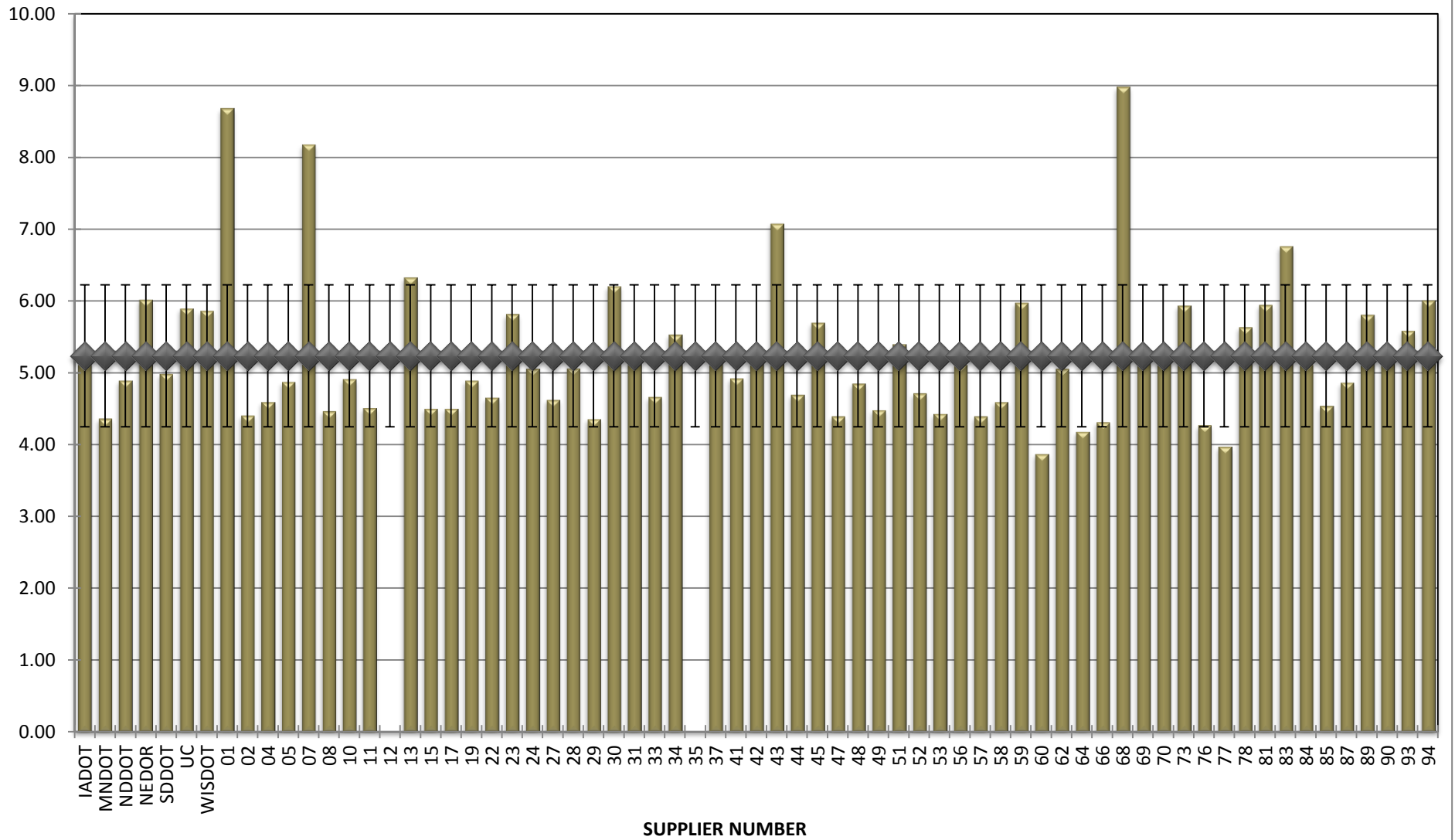
COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3

Jnr @ 100 Pa



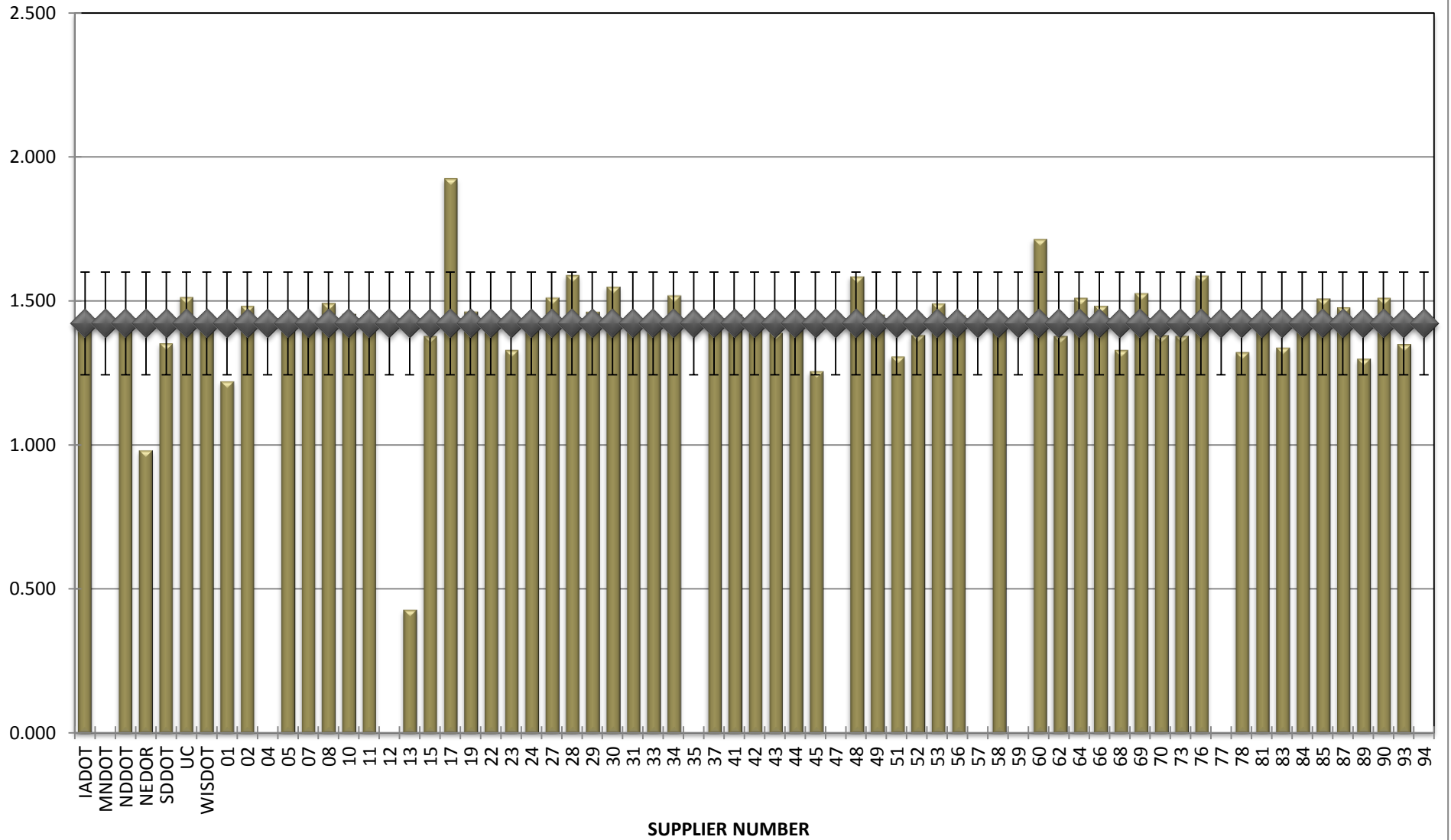
COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3

% Recovery @ 100 Pa



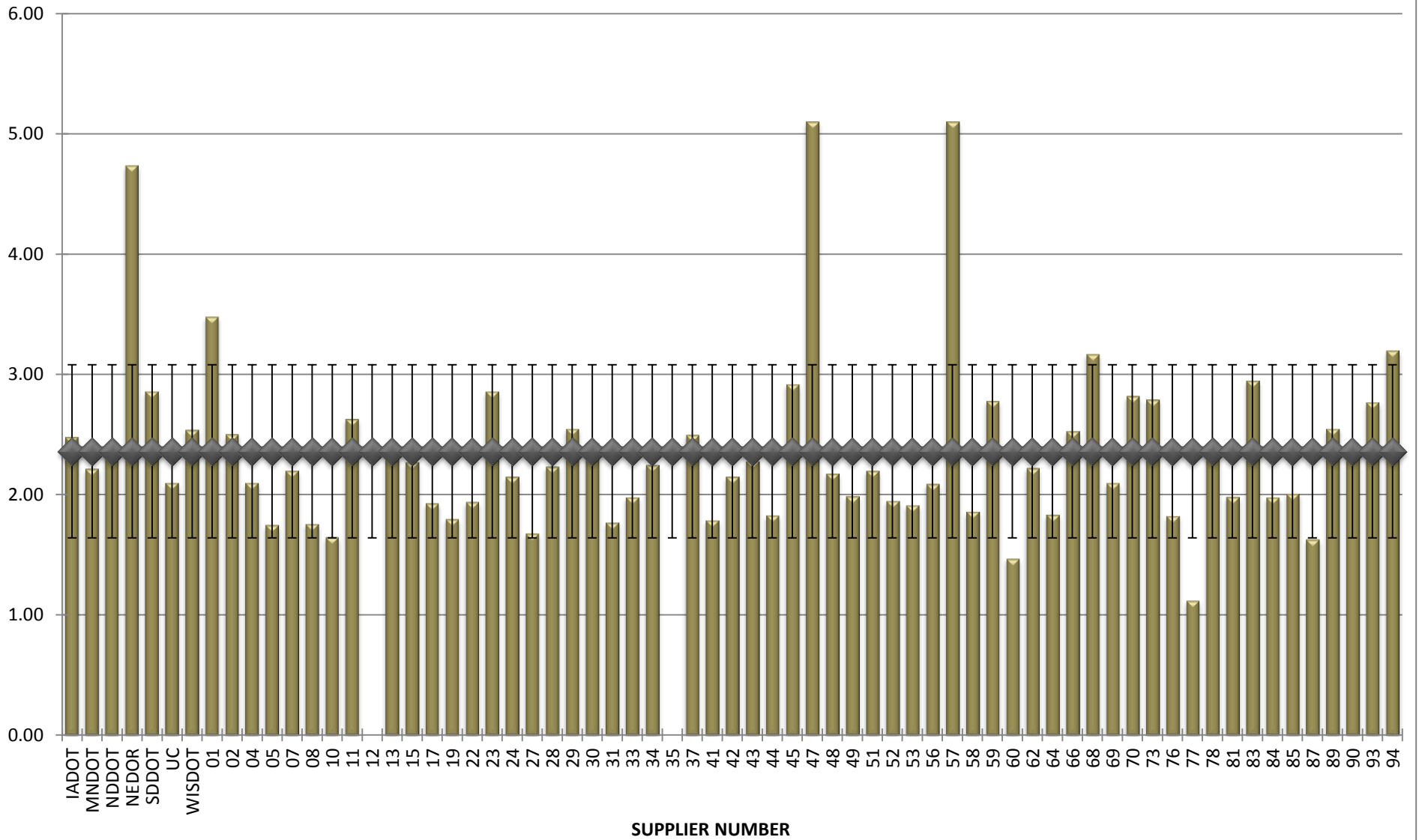
COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3

Jnr @ 3200 Pa



**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A 2015-3**

**% Recovery @ 3200 Pa**



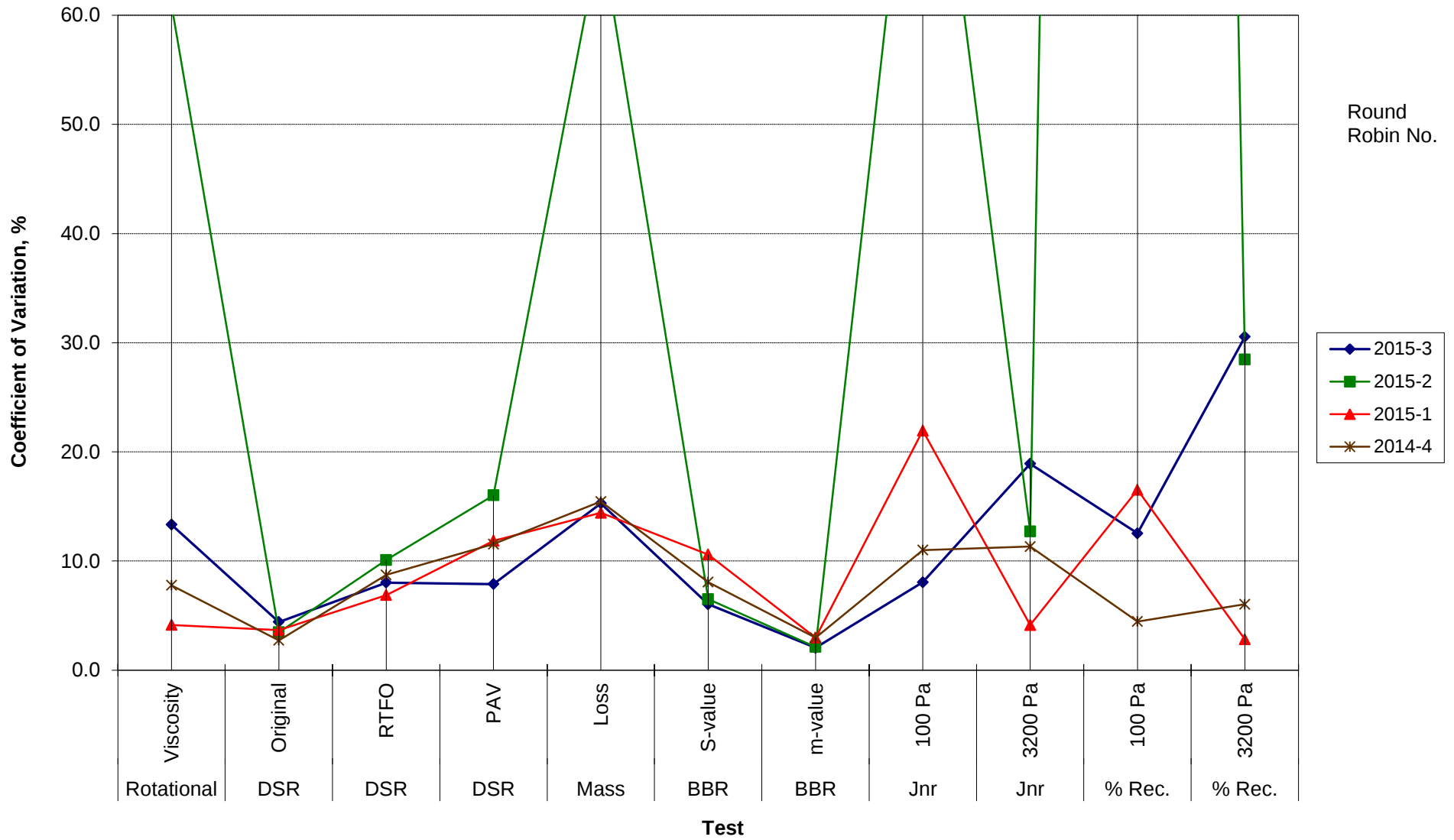
**COMBINED STATE BINDER GROUP ROUND ROBIN  
SUMMARY A**

**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 |
| 2015-3     | 69                        | 13.336                      | 4.415           | 8.017       | 7.886      | 15.285       | 6.039          | 2.054          | 8.054         | 18.907         | 12.535           | 30.539            | 50.366        |
| 2015-2     | 74                        | 60.942                      | 3.477           | 10.093      | 16.023     | 67.514       | 6.513          | 2.132          | 89.787        | 12.712         | 538.884          | 28.458            | 66.179        |
| 2015-1     | 72                        | 4.150                       | 3.659           | 6.878       | 11.854     | 14.423       | 10.602         | 2.986          | 21.946        | 4.132          | 16.523           | 2.826             | 18.552        |
| 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        |

**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<br>Viscosity<br>(Pa.s)<br>@135°C | DSR<br>Original<br>(kPa) | DSR<br>RTFO<br>(kPa) | DSR<br>PAV<br>(kPa) | Mass<br>Loss<br>(%)<br>@163°C | BBR<br>S-value<br>(MPa) | BBR<br>m-value | Jnr @<br>100Pa | %<br>RECOV.<br>@ 100Pa | Jnr @<br>3200Pa | %<br>RECOV.<br>@ 3200Pa |
|----------------------|---------------------------------------------|--------------------------|----------------------|---------------------|-------------------------------|-------------------------|----------------|----------------|------------------------|-----------------|-------------------------|
| <b>Average</b>       | 0.379                                       | 1.11                     | 2.84                 | 3,742               | 0.629                         | 203                     | 0.349          | 1.344          | 5.12                   | 1.439           | 2.24                    |
| <b>Std. Dev.</b>     | 0.0694                                      | 0.0504                   | 0.2374               | 287.77              | 0.1265                        | 27.87                   | 0.0448         | 0.3793         | 1.3599                 | 0.5159          | 0.8250                  |
| <b>Coef. of Var.</b> | 18.322                                      | 4.553                    | 8.347                | 7.691               | 20.128                        | 13.717                  | 12.850         | 28.231         | 26.535                 | 35.859          | 36.886                  |

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

**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 |
| 2014-1     | 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     | 74                        | 60.9418                     | 3.4767          | 10.093      | 16.023     | 67.514076    | 6.512815       | 2.131805       | 89.78704      | 12.71161       | 538.884          | 28.45789          | 66.17945      |
| 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      |

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