PCCAS 2016 DSR Equipment Survey Results

PCCAS Region DSR Equipment Inventory, and responses to some operational questions.

[Study conducted from 10/28/16 through 2/14/17]

Cooperative effort of:
- Alaska DOT - Albina Asphalt
- Asphalt Institute - Alon Asphalt (AZ)
- Arizona DOT - APART
- Caltrans SRL - Ergon
- Caltrans Translab - Holley Frontier
- Hawaii DOT - Idaho Asphalt
- Nevada DOT - McCall Oil
- Oregon DOT - San Joaquin Refining
- Washington DOT - US Oil
- WFLHD (Federal Lands) - Valero Wilmington
- Valero Benicia

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March 23, 2017
The Questions the Respondents were asked to answer are:

1. How many DSRs do you have in use in your Lab?
2. List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.
3. Do you run the MSCR on the RTFO sample?
4. Do you run the MSCR at the same temperature as the RTFO sample?
5. Can you see the raw data for the MSCR?
6. Do you evaluate the raw data with each MSCR result?
7. Do you see a shift between the peak value and the recorded value, and for which of your DSRs?

Question 1):  
3; 3; 1; 3; 2; 4; 2; 4; 1; 2; 2; 2; 2; 2; 2; 4; 2; 1; 2; 3.

Conclusions regarding makes of DSRs in use in the PCCAS:
1. We have 49 DSRs in 21 Laboratories.
2. Anton Parr (39); Bohlin/Malvern (8); and TA (2).
3. Four Labs have more than one brand of DSR.

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Parr</td>
<td>Smartpave 101</td>
<td>2006</td>
<td>RheoPlus/32 Multi 6 V3.62</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Anton Parr</td>
<td>Smartpave 101</td>
<td>2008</td>
<td>RheoPlus/32 Multi 6 V3.62</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Anton Parr</td>
<td>Smartpave 101</td>
<td>2009</td>
<td>RheoPlus/32 Multi 6 V3.62</td>
<td></td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? Most of the time on production samples. At times when doing research, we will do MSCR on RTFO sample and also run a MSCR by itself. Depends on what we are looking at.

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? Yes, most of the time on production samples. When doing research or cooperative samples were the temperature change is requested, we will drop the temperature one grade or sometimes two grade temperatures.
**Question 5):** Can you see the raw data for the MSCR? I have attached a copy of the printout data we get with each sample.

**Question 6):** Do you evaluate the raw data with each MSCR result? No. Most of the time we look at the graph and the results.

**Question 7):** Do you evaluate the raw data with each MSCR result? No. Don’t really look for it.
**LAB # 02**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave 101</td>
<td>2008</td>
<td>Rheoplus (V3.61)</td>
<td>June 2015</td>
</tr>
<tr>
<td>2</td>
<td>Anton Paar</td>
<td>SmartPave 103</td>
<td>2011</td>
<td>Rheoplus (V3.61)</td>
<td>June 2015</td>
</tr>
</tbody>
</table>

* Software update is representative of the MSCR procedure, not the instrument’s software.

**Question 3):** Do you run the MSCR on the RTFO sample? Yes.

**Question 4):** Do you run the MSCR at the same temperature as the RTFO sample? No

**Question 5):** Can you see the raw data for the MSCR? Not on the printout. No

**Question 6):** Do you evaluate the raw data with each MSCR result? No

**Question 7):** Do you see a shift between the peak value and the recorded value, and for which of your DSRs? n/a.

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**LAB # 03**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave 102</td>
<td>2012</td>
<td>RheoPlus (V3.61)</td>
<td>2012</td>
</tr>
</tbody>
</table>

*Note:* It uses a MSCR template “RTFO+MSCR_V9”, updated in Spring 2016.

**Question 3):** Do you run the MSCR on the RTFO sample? Yes.

**Question 4):** Do you run the MSCR at the same temperature as the RTFO sample? Yes.

**Question 5):** Can you see the raw data for the MSCR? Yes

**Question 6):** Do you evaluate the raw data with each MSCR result? Yes

**Question 7):** Do you see a shift between the peak value and the recorded value, and for which of your DSRs? n/a. Did not specifically look into it.

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**LAB # 04**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
</table>

**Question 3):** Do you run the MSCR on the RTFO sample? Yes.

**Question 4):** Do you run the MSCR at the same temperature as the RTFO sample? Yes
Question 5): Can you see the raw data for the MSCR? Not on the printout. Software can extract raw data.

Question 6): Do you evaluate the raw data with each MSCR result? No

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? We do not monitor.

LAB # 05

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bohlin/Malvern CVO - ADS</td>
<td>2000</td>
<td>6.50</td>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bohlin/Malvern CVO - ADS</td>
<td>2005</td>
<td>6.50</td>
<td>2015</td>
<td></td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? Not on a routine basis.

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? Yes, we would if it was to be run on a routine basis.

Question 5): Can you see the raw data for the MSCR? Currently not determined.

Question 6): Do you evaluate the raw data with each MSCR result?

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs?

LAB # 06

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave Rheometer</td>
<td>10/2006</td>
<td>(V3.62)</td>
<td>2010</td>
</tr>
<tr>
<td>2</td>
<td>Anton Paar</td>
<td>SmartPave Rheometer</td>
<td>1/2010</td>
<td>(V3.62)</td>
<td>2010</td>
</tr>
<tr>
<td>3</td>
<td>Anton Paar</td>
<td>SmartPave Rheometer</td>
<td>10/2005</td>
<td>(V3.62)</td>
<td>2010</td>
</tr>
<tr>
<td>4</td>
<td>Anton Paar</td>
<td>MCR 300 Rheometer</td>
<td>11/2003</td>
<td>(V3.62)</td>
<td>unknown</td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? Yes.

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? Yes

Question 5): Can you see the raw data for the MSCR? The report shows Epsilon_0, Epsilon_c, and Epsilon_r.

Question 6): Do you evaluate the raw data with each MSCR result? No. Although I checked one because of this questionnaire and the manual calculations matched the computer.

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? I’m not really sure what is meant by the raw data and the shift between peak and recorded value. I’m guessing it is more in depth than what is printed on the report. It may be accessible, but if it is I do not know how.

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LAB # 07

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malvern</td>
<td>Kinexus</td>
<td>2015</td>
<td>rSpace 1.7.2180</td>
<td>March 2016</td>
</tr>
<tr>
<td>1</td>
<td>Malvern</td>
<td>Kinexus</td>
<td>2015</td>
<td>rSpace 1.7.2180</td>
<td>March 2016</td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? **Only if it is at the same temperature.**

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? **Sometimes but mostly at lower temperatures.**

Question 5): Can you see the raw data for the MSCR? Yes.

Question 6): Do you evaluate the raw data with each MSCR result? **No do not have time. I assume since we cannot change anything that the machine is correct.**

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? **Do not look.**

LAB # 08

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave 101</td>
<td>2013</td>
<td>RheoPlus</td>
<td>April 2016</td>
</tr>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave 102</td>
<td>2013</td>
<td>RheoPlus</td>
<td>April 2016</td>
</tr>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave 102</td>
<td>2014</td>
<td>RheoPlus</td>
<td>April 2016</td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? **Yes.**

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? **Yes**

Question 5): Can you see the raw data for the MSCR? **No, not all of the raw data is displayed on test reports. However, data is displayed graphically on the test report. Tabulated data on the test report shows Epsilon sub-O, Epsilon sub-C, and Epsilon sub-R at the 10 recorded 0.1 kPa and the 10 recorded 3.2 kPa shear stress levels. The required AASHTO T350 test result calculations are also shown on the test report.**

Question 6): Do you evaluate the raw data with each MSCR result? **No**

Question 7): Do you evaluate the raw data with each MSCR result? **No, not on the Anton Paar DSRs. Tabulated data shows the peak strain value at the end of 1 second (Epsilon sub-C) for all test cycles and there is no indication of a shift in the peak strain value.**

**Additional Comments:** The answers to Questions 5 and 7 were not answered while viewing the test as it was being run. We have noticed that the graphical data that is plotted on the test report has unexpected values on the time axis (i.e., the expectation is a plot from 100 to 200 seconds for the 0.1 kPa stress level, and a plot from 200 to 300 seconds for the 3.2 kPa stress level). The graphs appear to have a 20 second delay built in.
One other thing regarding the plotted data, we may have a time sequence difference due to a choice of testing template for the DSR, which can be either an AASHTO T350 (MSCR) only test, or a combined AASHTO T315 and AASHTO T350 test. I didn’t check which template was used when I was going over the test result report.

LAB # 09

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bohlin</td>
<td></td>
<td>2014</td>
<td>6.5.1</td>
<td></td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? Yes, but we test for information only.

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? Yes.

Question 5): Can you see the raw data for the MSCR? Yes

Question 6): Do you evaluate the raw data with each MSCR result? No

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? No.

LAB # 10

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bohlin/Malvern CVO-50- ADS</td>
<td></td>
<td>2000</td>
<td>R6.51.03</td>
<td>2012</td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? Yes.

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? Depends on the specifications (same temp or 64C).

Question 5): Can you see the raw data for the MSCR? Yes

Question 6): Do you evaluate the raw data with each MSCR result? Yes

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? No.

LAB # 11

Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.
Question 3): Do you run the MSCR on the RTFO sample? Yes, typically the MSCR is run automatically after the M320 RTFO specification test.

Question 4): Do you run the MSCR at the same temperature as the RTFO sample? It depends on the PG grade, some are run at the same temperature others are run at 6 or 12 degrees less. PG64-28, PG70-28 and PG76-28 are run at 64 C, PG64-22, 70-22 are run at 58 C.

Question 5): Can you see the raw data for the MSCR? Yes, it is printed on the report.

Question 6): Do you evaluate the raw data with each MSCR result? No

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? The values we report are the average Jnr at 0.1 and 3.2 kPa so there will be some shift between the peak and recorded values. I do not see in T350 where is indicates to report the peak value but it does instruct for the calculation of the average values.

Question 8): You may list our responses.
**Question 4):** Do you run the MSCR at the same temperature as the RTFO sample? When requested.

**Question 5):** Can you see the raw data for the MSCR? No.

**Question 6):** Do you evaluate the raw data with each MSCR result? No.

**Question 7):** Do you see a shift between the peak value and the recorded value, and for which of your DSRs? No.

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**LAB # 14**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software Type</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Parr</td>
<td>Smartpave 102</td>
<td>2016</td>
<td>Rheoplus/32 V 3.62</td>
<td>2012</td>
</tr>
<tr>
<td>2</td>
<td>Anton Parr</td>
<td>Smartpave 101</td>
<td>2004</td>
<td>Rheoplus/32 Vs 3.62</td>
<td>2012</td>
</tr>
</tbody>
</table>

**Question 3):** Do you run the MSCR on the RTFO sample? No, unless specified by WCTC or OCTC.

**Question 4):** Do you run the MSCR at the same temperature as the RTFO sample? Yes, unless specified by WCTC or OCTC. If two temps are required, then a separate sample is used for MSCR.

**Question 5):** Can you see the raw data for the MSCR? Not on the printout. No

**Question 6):** Do you evaluate the raw data with each MSCR result? No

**Question 7):** Do you see a shift between the peak value and the recorded value, and for which of your DSRs? No.

====================================================================

**LAB # 15**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software Type</th>
<th>Last software update</th>
</tr>
</thead>
</table>

**Question 3):** Do you run the MSCR on the RTFO sample? Only on round robin samples.

**Question 4):** Do you run the MSCR at the same temperature as the RTFO sample? When requested.

**Question 5):** Can you see the raw data for the MSCR? No.

**Question 6):** Do you evaluate the raw data with each MSCR result? No.

**Question 7):** Do you see a shift between the peak value and the recorded value, and for which of your DSRs? No.

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**LAB # 16**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.
Question 3): Do you run the MSCR on the RTFO sample? Yes.
Question 4): Do you run the MSCR at the same temperature as the RTFO sample? Yes
Question 5): Can you see the raw data for the MSCR? Yes
Question 6): Do you evaluate the raw data with each MSCR result? No
Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? Don’t know.

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**LAB # 17**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave 102</td>
<td>2012</td>
<td>RheoCompass (V1.19)</td>
<td>Jan. 2017</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RheoPlus (V3.60)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Anton Paar</td>
<td>SmartPave 101</td>
<td>2011</td>
<td>RheoPlus (V3.60)</td>
<td>2015</td>
</tr>
<tr>
<td>3</td>
<td>Anton Paar</td>
<td>SmartPave 101</td>
<td>2008</td>
<td>RheoPlus (V3.60)</td>
<td>2015</td>
</tr>
<tr>
<td>4</td>
<td>TA</td>
<td>DHR2</td>
<td>2012</td>
<td>TRIOS/FastTrack (V4.1.133073)</td>
<td>Jan. 2017</td>
</tr>
</tbody>
</table>

Question 3): Do you run the MSCR on the RTFO sample? In most cases, yes.
Question 4): Do you run the MSCR at the same temperature as the RTFO sample? We test MSCR at 64°C about 75% of the time.
Question 5): Can you see the raw data for the MSCR? Yes
Question 6): Do you evaluate the raw data with each MSCR result? No
Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? n/a.

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**LAB # 18**

**Question 2):** List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Bohlin/Malvern</td>
<td>CVO ADS</td>
<td>2002</td>
<td>R6.51.0.3</td>
<td>MSCR not run on this one.</td>
</tr>
</tbody>
</table>
**Question 6)**: Do you evaluate the raw data with each MSCR result? No  
**Question 7)**: Do you see a shift between the peak value and the recorded value, and for which of your DSRs? Haven’t looked.

---

**LAB # 19**

**Question 2)**: List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software Type</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TA</td>
<td>DHR/HR-1</td>
<td>2011</td>
<td>TRIO Navigator full (v3.2.0.3877)</td>
<td>March 2016</td>
</tr>
</tbody>
</table>

**Question 3)**: Do you run the MSCR on the RTFO sample? In most cases, Yes.  
**Question 4)**: Do you run the MSCR at the same temperature as the RTFO sample? Yes.  
**Question 5)**: Can you see the raw data for the MSCR? With how the results are presented in the software, the raw data is not available. There may be a method to observe but this is not something that has been done.  
**Question 6)**: Do you evaluate the raw data with each MSCR result? No  
**Question 7)**: Do you see a shift between the peak value and the recorded value, and for which of your DSRs? Not applicable since the raw data is not evaluated.

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**LAB # 20**

**Question 2)**: List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

<table>
<thead>
<tr>
<th>Priority of use</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software Type</th>
<th>Last software update</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anton Paar</td>
<td>SmartPave 102</td>
<td>2011</td>
<td>RheoPlus (V3.62)</td>
<td>2016</td>
</tr>
</tbody>
</table>

**Question 3)**: Do you run the MSCR on the RTFO sample? Yes.  
**Question 4)**: Do you run the MSCR at the same temperature as the RTFO sample? Yes, and at 6 or 12 degrees lower.  
**Question 5)**: Can you see the raw data for the MSCR? Yes  
**Question 6)**: Do you evaluate the raw data with each MSCR result? No  
**Question 7)**: Do you see a shift between the peak value and the recorded value, and for which of your DSRs? n/a.

---

**LAB # 21**

**Question 2)**: List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.
<table>
<thead>
<tr>
<th>Priority</th>
<th>Make</th>
<th>Model</th>
<th>Year of Purchase</th>
<th>Software</th>
<th>Last software update</th>
</tr>
</thead>
</table>

**Question 3):** Do you run the MSCR on the RTFO sample? Yes.
**Question 4):** Do you run the MSCR at the same temperature as the RTFO sample? Not always. Depends on what LTPP indicated regional climate.
**Question 5):** Can you see the raw data for the MSCR? We can access the raw data by importing it to Excel.
**Question 6):** Do you evaluate the raw data with each MSCR result? Not usually unless there is an indication that something does not appear normal.
**Question 7):** Do you evaluate the raw data with each MSCR result? No I do not see a shift in peak vs the recorded value. However, on the Malvern Kinexus, it often appears that the instrument does not use E0 in determining the strain values. It looks like the software captures Er and Ec to determine strain values. It should also be brought to the attention that the last software update on R-space has some bugs. The combined RTFO-MSCR script initially showed 12% strain instead of the required 10% for RTFO DSR. I called support and they sent me the corrected script. Anton Paar Smart Pave DSRs sometimes have an electronic issue where temperature can fluctuate more than ±0.1°C. It does not always occur, but none the less it’s an issue that might introduce some variability.
**Question 8):** It’s OK to use our identity.

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