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
- Asphalt Institute
- Arizona DOT
- Caltrans SRL
- Caltrans Translab
- Hawaii DOT
- Nevada DOT
- Oregon DOT
- Washington DOT
- WFLHD (Federal Lands)

- Albina Asphalt
- Alon Asphalt (AZ)
- APART
- Ergon
- Holley Frontier
- Idaho Asphalt
- McCall Oil
- San Joaquin Refining
- US Oil
- Valero Wilmington
- Valero Benicia

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March 23, 2017

DSR Equipment Survey (PCCAS Region) January 2017 status.

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?

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

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Questions 2) through 7):

LAB # 01
Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	Smartpave 101	2006	RheoPlus/32 Multi 6 V3.62	
1	Anton Paar	Smartpave 101	2008	RheoPlus/32 Multi 6 V3.62	
1	Anton Paar	Smartpave 101	2009	RheoPlus/32 Multi 6 V3.62	

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.

Multiple Stress Creep Recovery   9
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Anton Paar

Date: 1/4/2017
Time: 11:24:06 AM
Name: Silly Putty 100/3200 170104 1052 1
Sample: 16-3625 AL 64-22
Remark: # 1
Operator: NJ
File: C:\DSR Results\2016\16-3625rm.orx
Temperature: 58°C

MSCR 100 Pa

AVERAGE PERCENT RECOVERY
0.1 kPa: 10.6598%
3.2 kPa: 5.3204%

PERCENT DIFFERENCE BETWEEN AVERAGE PERCENT RECOVERIES
50.0891%

NON-RECOVERABLE CREEP COMPLIANCE (Jnr)
0.1 kPa: 0.9425 1/kPa
3.2 kPa: 1.0354 1/kPa

PERCENT DIFFERNCE BETWEEN Jnr
[Jnr_diff=((Jnr3.2-Jnr0.1)-100)/(Jnr0.1)]
9.8563 %

MSCR 3200 Pa

Meas. Pts.	tau [kPa]	Epsilon_0 [%]	Epsilon_c [%]	Epsilon_r [%]
1	0.1	1.5864	2.10244	1.71109
2	0.1	1.71109	2.22913	1.8336
3	0.1	1.8336	2.351	1.95345
4	0.1	1.95345	2.47017	2.07252
5	0.1	2.07252	2.58622	2.18725
6	0.1	2.18725	2.70041	2.30148
7	0.1	2.30148	2.81135	2.41195
8	0.1	2.41195	2.92197	2.52086
9	0.1	2.52086	3.02854	2.62676
10	0.1	2.62676	3.13696	2.73289
11	3.2	2.73289	20.9347	14.9019
12	3.2	14.9019	32.8392	26.1019
13	3.2	26.1019	43.8729	36.8287
14	3.2	36.8287	54.4512	47.2774
15	3.2	47.2774	64.7933	57.5572
16	3.2	57.5572	75.0037	67.7302
17	3.2	67.7302	85.1336	77.856
18	3.2	77.856	95.2235	87.9542
19	3.2	87.9542	105.288	98.0618
20	3.2	98.0618	115.39	108.165
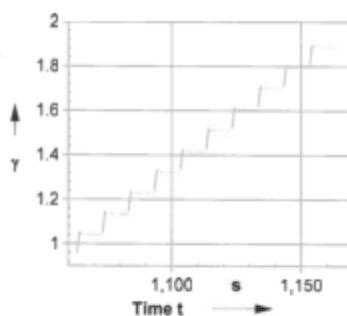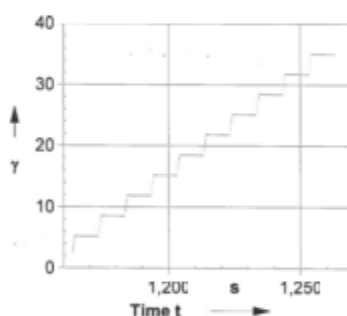
Jnr vs. % recovery.
X axis=Jnr, Y axis=% recovery

Page 1 (1/4/2017 11:32:48 AM)   Signature:
Filename: 16-3625rm.orx
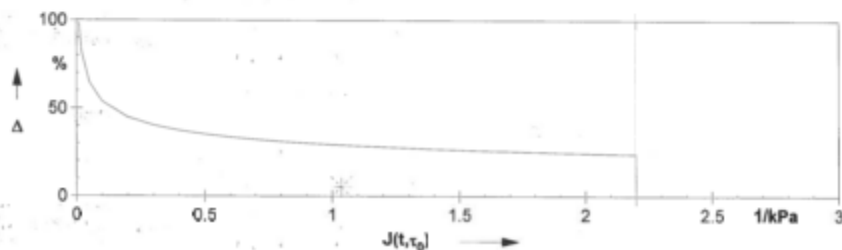
LAB # 02
Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

Priority of use	Make	Model	Year of Purchase	Software	Last software* update
1	Anton Paar	SmartPave 101	2008	Rheoplus (V3.61)	June 2015
2	Anton Paar	SmartPave 103	2011	Rheoplus (V3.61)	June 2015
3	Anton Paar	MCR 502	2014	Rheoplus (V3.62)	June 2015

* 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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	SmartPave 102	2012	RheoPlus (V3.61)	2012

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? No
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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	Rheoplus	2012	Rheoplus (32V3.61)	Jan. 2016
1	Anton Paar	Rheoplus	2012	Rheoplus (32V3.61)	Jan. 2016
1	Anton Paar	Rheoplus	2012	Rheoplus (32V3.61)	Jan. 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? 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.

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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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Bohlin/Malvern	CVO - ADS	2000	6.50	2015
2	Bohlin/Malvern	CVO - ADS	2005	6.50	2015

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?

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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.

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

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

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Malvern	Kinexus	2015	rSpace 1.70.2180	March 2016
1	Malvern	Kinexus	2015	rSpace 1.70.2180	March 2016

<u>Question 3):</u> Do you run the MSCR on the RTFO sample? Only if it is at the same temperature.
<u>Question 4):</u> Do you run the MSCR at the same temperature as the RTFO sample? Sometimes but mostly at lower temperatures.
<u>Question 5):</u> Can you see the raw data for the MSCR? Yes.
<u>Question 6):</u> 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.
<u>Question 7):</u> Do you see a shift between the peak value and the recorded value, and for which of your DSRs? Do not look.

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LAB # 08
<u>Question 2):</u> List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	SmartPave 101	2005	RheoPlus/32 v3.62	April 2016
1	Anton Paar	SmartPave 101	2013	RheoPlus	April 2016
1	Anton Paar	SmartPave 102	2013	RheoPlus	April 2016
1	Anton Paar	SmartPave 102	2014	RheoPlus	April 2016

<u>Question 3):</u> Do you run the MSCR on the RTFO sample? Yes.
<u>Question 4):</u> Do you run the MSCR at the same temperature as the RTFO sample? Yes
<u>Question 5):</u> 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-0, 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.
<u>Question 6):</u> Do you evaluate the raw data with each MSCR result? No
<u>Question 7):</u> 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.

<u>Additional Comments:</u> 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.

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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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Bohlin		2014	6.5.1	

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.

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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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Bohlin/Malvern	CVO-50- ADS	2000	R6.51.03	2012
2	Anton Parr	SmartPave 102	2014	RheoPlus/32, V.3.62)	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? 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.

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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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	Smartpave	2010	Rheoplus v3.61	2014
2	Anton Paar	Smartpave	2012	Rheoplus v3.61	2014

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.

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LAB # 12

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

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	SmartPave	2005	Rheoplus 3.62	2016
1	Anton Paar	SmartPave	2008	Rheoplus 3.62	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? Not always.

Question 7): Do you see a shift between the peak value and the recorded value, and for which of your DSRs? It is not clear how the values are recorded.

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LAB # 13

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

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	Smartpave 101	3/30/2006	RheoPlus/32 Multi 6 V3.2	8/7/2014
1	Anton Paar	Smartpave 101	5/31/2007	RheoPlus/32 Multi 6 V3.2	8/7/2014

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 # 14
Question 2): List by priority of use, for each DSR; make and model, year of purchase, DSR software type and last software update.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Parr	Smartpave 102	2016	Rheoplus/32 V 3.62	2012
2	Anton Parr	Smartpave_101	2004	Rheoplus/32 Vs 3.62	2012

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?

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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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	Smart Pave 101	2/2009	Rheoplus/32 Multi9 V3.62	5/2013
2	Anton Paar	Smart Pave 102	10/2014	Rheoplus/32 Multi9 V3.62	10/2014

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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	SmartPave 102	2012	Rheoplus	Dec. 2016
1	Anton Paar	SmartPave 102	2012	Rheoplus	Dec. 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? 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.

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

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 64C 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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	SmartPave 101	2010	RheoPlus /32, V3.62)	2016
2	Bohlin/Malvern	CVO ADS	2002	R6.51.0.3 MSCR not run on this one.	

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? As requested.
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? Haven't looked.

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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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	TA	DHR/HR-1	2011	TRIOS / Navigator full (v3.2.0.3877)	March 2016

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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Anton Paar	SmartPave 102	2013	RheoPlus /32, V3.62)	Jan. 2015
1	Anton Paar	SmartPave 102	2011	RheoPlus (V3.62)	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, 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.

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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.

Priority of use	Make	Model	Year of Purchase	Software	Last software update
1	Malvern Kinexus	knx 2100	2011	R-space v 1.72.2193	Aug. 2016
1	Anton Paar	SmartPave 101	2014	RheoPlus/32 v3.62	Feb. 2016
1	Anton Paar	SmartPave 102	2016	RheoPlus/32 v3.62	Feb. 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? 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 ε_0 in determining the strain values. It looks like the software captures ε_r and ε_c 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°. 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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