ENGINEERING REPORT

Subject: Repeatability of Oil Absorption in Same Location

Date: 7/14/2017

Place: International Training & Research Center

Present: Allyson Stanton

Purpose:

Test oil absorption in the same location several times to determine repeatability and consistency to potentially being a way to improve repeatability.

Summary:

Four different bowling ball releases, including two of the same one, were chosen to observe oil absorption trends in the same location, compared to the current standard operating procedure (SOP) of testing 10 random locations across the ball surface. Each ball was tested 20 times in the same location over several days and compared back to its 10-location data.

Only three of the five balls tested produced acceptable differences within the gauge discrimination. It was noticed that the first oil drop taken each day had about the same oil absorption time, followed by an immediate increase in oil absorption time.

Procedure:

This study used four different ball models, which were selected for short-oil absorption times.

Two of the same ball model were prepared using the SOP, which requires sanding with 500-grit for 3 minutes and 9 seconds in the Surface Factory. Oil absorption data was taken at 10 random spots across the balls surface, within all colors, to determine the oil absorption rate for the ball. The oil absorption rate for a ball is determined by measuring 10 drops and then taking the average from the fastest six times (out of the 10 results).

The same balls were re-sanded using the same procedure detailed above. This time, a singular location in the light red color was outlined on the 14-pound ball, and a singular location in the dark red color was outlined on the 15-pound ball. Twenty drops of oil were observed in each circle over two days. The original idea was to continue recording drops until a significant difference was seen in time duration. We stopped at 20 drops when we failed to see much change.

Next, the other three ball models were prepared in the same fashion. Over the course of three days, each ball was tested for oil absorption rates in a singular location 20 times. All 20 drops, single location data was compared back to original data taken at 10 random locations.

Data:

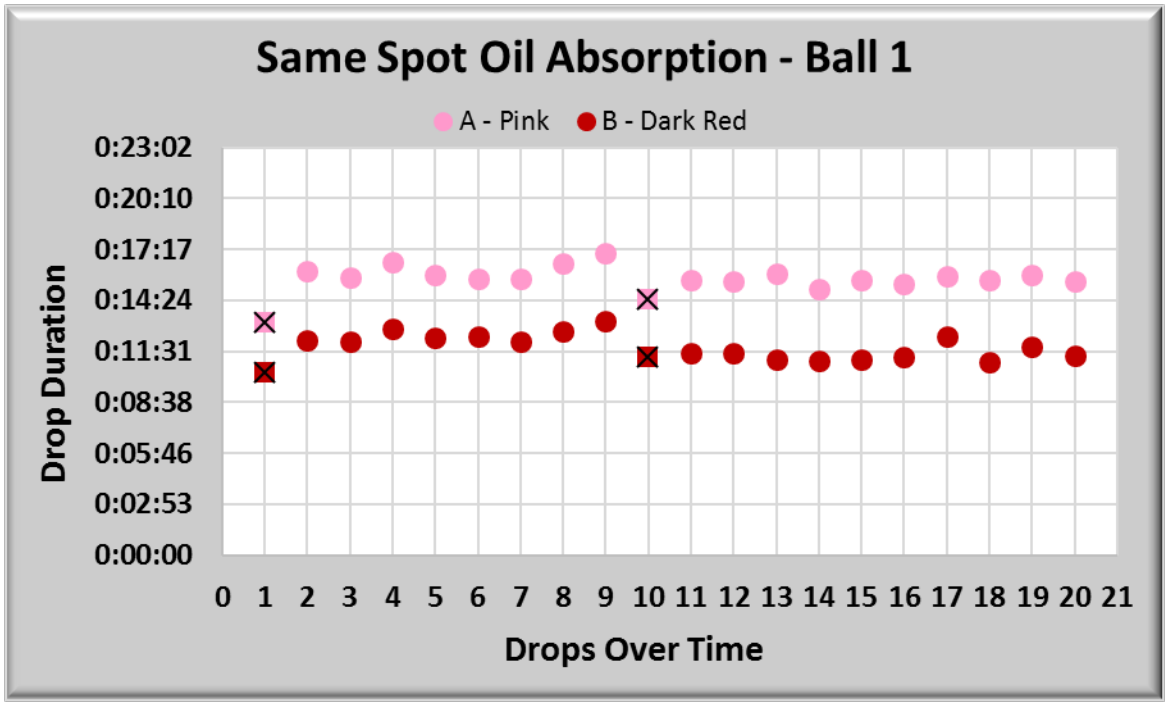
The table below compares average and standard deviation data taken between the trial covering 10 random locations and the trial using the same test location.

test location	Ball 1- 14# ball 10 Locations	Ball 1- 14# ball Same Location	Ball 1-15# ball 10 Locations	Ball 1-15# ball Same Location	Ball 2 10 Locations	Ball 2 Same Location	Ball 3 10 Locations	Ball 3 Same Location	Ball 4 10 Locations	Ball 4 Same Location
stdev	0:03:30	0:00:48	0:02:37	0:00:45	0:01:59	0:03:06	0:02:42	0:01:51	0:01:56	0:02:31
fast 6 ave	0:11:57	0:14:49	0:12:22	0:10:56	0:11:30	0:12:14	0:09:15	0:13:06	0:06:37	0:12:41
time difference	0:02:53		0:01:26		0:00:44		0:03:51		0:06:03	
date	6/30	7/5-7	6/30	7/5-7	7/14	7/10-13	7/14	7/10-13	7/24	7/10-13
	5-7 days after		5-7 days after		1-3 days before		1-3 days before		10-14 days before	

The two Ball #1's showed approximately 3 minutes and a 1.5-minute time difference between testing in random locations vs testing repeatedly in the same location. The 14-pound ball seems to show an increase in time, while the 15-pound ball shows a decrease in oil absorption times, but the differences still lie within our current 3.128-minute gauge discrimination. The standard deviations between the two trials do drop from 3.5 and about 2.5 minutes for the random locations to 48 and 45 seconds in the same location.

Of the other three balls, only Ball #2 shows a time difference below the three-minute gauge discrimination. All single location data on the five balls cannot be compared back to their 10-location data and be considered the same, since only three of the five balls have differences within the gauge discrimination.

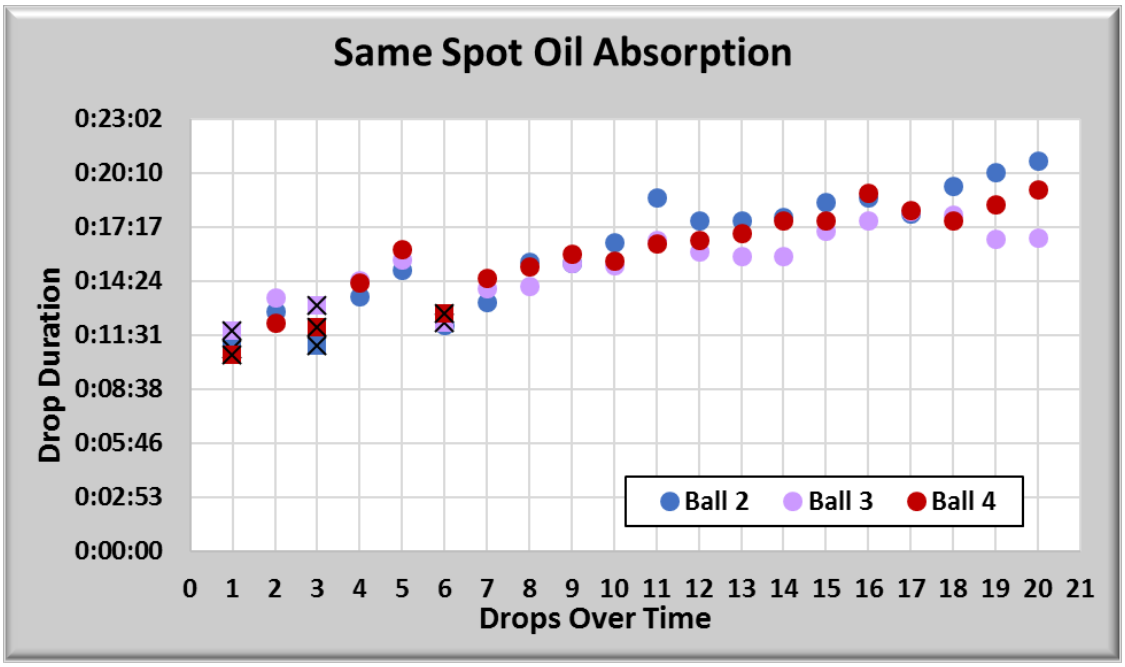
The graph below shows the oil absorption times for the 20 drops applied to the two Ball #1s.



All data points represented by a box with and "X" through it indicate the first drop taken on that day. This means drops 1-9 were recorded on one day and drops 10- 20 were taken on a second day. It is important to notice that both balls, although they are two separate balls and colors, show the same relative patterns throughout each day. In all cases shown here, the first drop is a shorter duration

drop followed by a longer duration drop, then durations seem to stay within the second oil absorption time. The first drop the next day starts over as a shorter duration.

This is seen again in the other three balls tested a week later as shown in the graph below.



Again, the marked “X“ points represent the first drop of a new day meaning two drops were taken the first day, three the next, and the remaining 15 drops taken the last day. The three first drops of the day are the shortest drop durations for the day as duration times only increase from there. All three balls also seem to follow the same trend throughout the 20-drop test.

The first drop in the same location on different days seems to return to approximately the same oil absorption time. This is a possible way for USBC and the manufacturers to get more repeatable results by testing in the same location but would need to ensure that the test locations selected were randomly selected to represent the entire ball color.