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# Aging of Bowling Ball Surface - Re-surfacing the Ball is Required -

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# Introduction

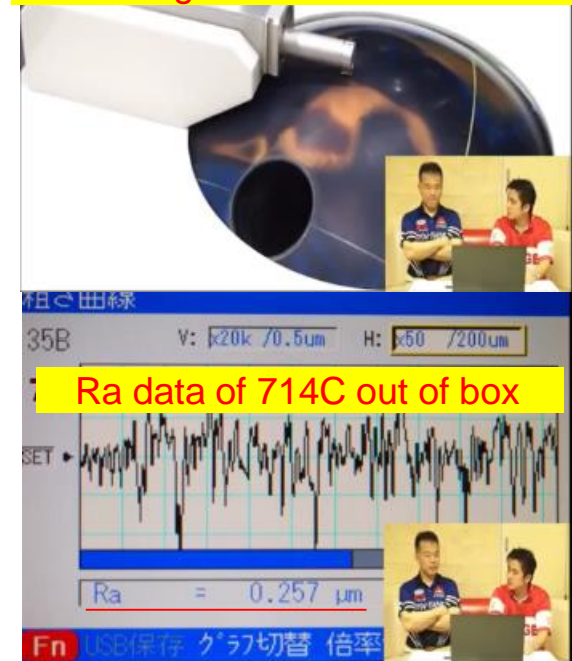
- This paper describes “How will the ball surface be changing while you are using the ball in games and what shall we do for the maintenance of your ball” based on the experiments shown in the videos (*Ref.1, Ref.2*).
- In the video, they measured the roughness of a ball surface when: out of box (after zero game), after 30 games, 50 games, and 100 games... by using a special tool which we (Femtech) developed.
- After watching the videos, you will understand that there are 2 big factors of the bowling ball surface conditions (texture) which effect to the performance.
  - No.1 factor is roughness. It can be measured as the combination of, so called, “Ra” value and “Rs” value.
  - No.2 factor is oil osmotic level (volume level of oil permeated to the ball).
- In this paper, we are focusing on No.1 factor, as for the No. 2 factor, please refer to our other white papers (*Ref.3, Ref.4*).
- Experiment-1 is for ageing test and Experiment-2 and 3 are for re-surfacing.
- In conclusion, we recommend to re-surface the ball at least after the 30 games, and re-surfacing process should be done from lower abrasive # to higher abrasive #, then you have to de-oil the ball.

# Tools and Methods (Experiment-1)

- The ball used for this experiment is TRACK 714C.
- The tool used for this measurement is “Femtech Surface Measurement System”.
  - Femtech is known as the ION POWER S maker in Japan.
- The specification of the new (unused) ball surface is made by Abralon #3000.
- The Ra value of it was measured as  $0.257\mu\text{m}$ .
  - Micrometer is 1 of 1 million meter (1/1 million meter).
- Ra stands for Roughness Average.
  - It is the average of the distance between Concavo and Set (original basement of the surface), and Convex and Set, i.e., average distance of High Peek to Base and Base to Valley Peek.
- In addition to this, there is a Rs value. Rs may stand for Roughness Sparse..
  - It is the value of the density of peeks. It is the average number of peeks within a predefined range.
- Assumed 15 times throws are the average 1 game.
- Every after 6 games, the ball is cleaned up.
- They measured Ra value and captured the data and took a photo of the ball at: after 30 games, 50 games, and 100 games.



Measuring Ra of 714C out of box



# Results & Observations (Experiment-1)

- The Ra value is significantly reduced after 30 games. The out of box value (after zero game) 0.257  $\mu\text{m}$  became 0.165  $\mu\text{m}$ . About 40% of roughness is reduced.
- Both the high peaks and valley peaks become lower (shallower).
- The following is the Ra values for each:

Games	zero	30	50	70	100
Ra ( $\mu\text{m}$ )	0.257	0.165	0.166	0.201	0.174

- The Rs value is not measured but looking at the data charts, it is obvious that Rs values are degraded as the number of games are done.
- The high peaks are degraded a lot close to the base level.
- The valley peaks become deeper sometimes but as same as at 30 games, they become shallower later.



# Considerations and Conclusions (Experiment-1)

- It looks within the 30 games, the big degradation of the performance happens.
  - The reasons of Ra degradation:
    - Initial peak tops are very thin and sharp, they will be easily crushed by the lane and pins. Then they become low, and by the pressure and friction, the cover stock (plastics) spreads, therefore the valley become shallow.
  - The reason of Rs degradation:
    - Since peaks close each other will become the same level of heights by above reasons and some peaks are gone.
- The reasons of less Ra difference between 30 games and 50 games.
  - The high peaks of 30 games are already close to the base (SET) level, so that the thickness of each peak is increased, so that degradation of Ra is minimum... but Rs is degraded a lot.
- The reasons why Ra of 70 games becomes higher:
  - It looks like a scratch, since the high peaks are almost reached to the base level, so that anything can easily make a damage to the weak valley surface which was far from high peaks.
- The reasons why Ra of 100 games becomes lower than 70 games:
  - Again, the high peaks reached to base level more and the pressure makes the valley shallow.

**Given these, just doing the regular cleaning and de-oiling are not enough, we have to re-surface the ball within every 30 games.**

# Report of Experiment-2

## Tools and Methods:

In Experiment-2, we tried to re-surface the ball used in Experiment-1.

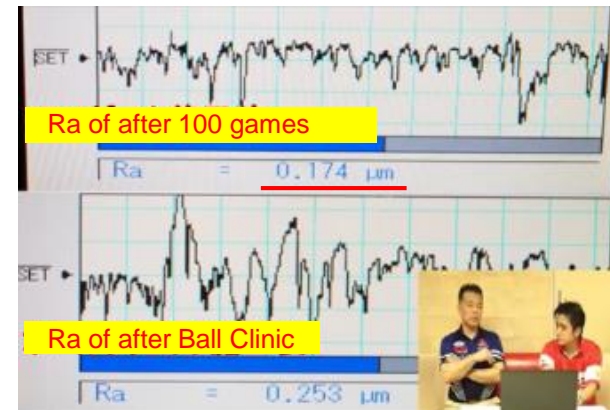
- Put the ball used for the Experiment-1 (after 100 games) into a ball clinic machine set as abrasive level #1000.
- Measure the Ra value by the same tool used in Experiment-1.

## Results and Observations:

- Ra value is 0.253 which is almost same as out of box Abralon #3000, i.e., 0.257.
- There are several reasons, like the machine setting, but the biggest reasons might be that this ball was used for 100 games, the hardness level of the ball had been changed to harder. Thus, to gain the same level of Ra, you have to use the lower abrasive level.

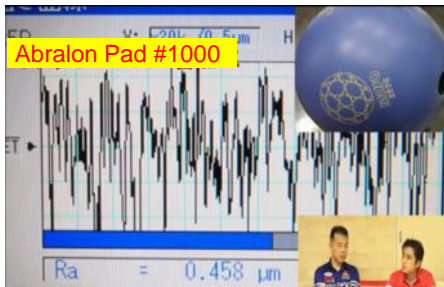
## Conclusions:

- For the aged ball, it is recommended to use the lower abrasive level like #400 first and then use #1000, and for the finish, use #3000 etc. It revives the surface better.
- Please note, of course, oil removal is also important to maintain the performance. It is recommended to do re-surfacing first then do de-oiling process.



# Report of Experiment-3

Following is the list of data by using several resurfacing tools on another used ball. We used the same surface measurement tool used in Experiment-1 & 2.



- Step 1. Used Abralon Pad #1000
- This is to make base surface.
  - Ra = 0.458
  - Rs looks nice.
  - No shines.



- Step 2. Used Femtech Walnut Gel #400
- This is completely different looks from Abralon Pad
  - Ra = 0.265
  - Rs looks more.
  - It shines.



- Step 3. Used Femtech Alundum Gel #400
- This looks no different from Walnut.
  - Ra = 0.185
  - Rs looks more. Some more smaller peaks on the peaks.
  - It shines.



## Experiment-2: Report-3

Step 4. Used Femtech Diamond Gel #1200

- Ra = 0.158
- Rs looks great.
- It shines much.

Step 5. Used Femtech Cerium Gel #15000

- Ra = 0.082
- Rs looks great.
- It shines much.

Step 6. Used Femtech Aluminum Gel #150000

- Ra = 0.062
- Rs looks great.
- It shines much.

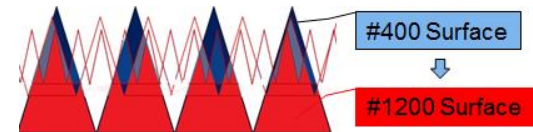
Step 7. Used 3M Polisher

- Ra = 0.042
- Rs looks great.
- It shines much.



# Considerations and Conclusions

- As stated in the conclusions of Experiment-1, we have to resurface the bowling ball at least after 30 games.
- For the bowlers, resurfacing is a more important issue than de-oiling now, since de-oiling can be done easily at anytime whenever you want if you use the right de-oiling cleaners.
- You need to resurface the ball first, and then remove oils from new surface since oils may be penetrated into the cover stock and some may remain even after de-oiling. Thus, de-oiling from new surface (resurfaced) is better.
- To resurface, it is recommended to start from lower abrasive # to higher #, so that you can mix the smaller peaks on top of bigger peaks. (Peaks on a Peak)
- There are lots of combinations of polisher abrasive levels. It is hard to determine what is the best for what type of the bowler.
- We had no time to measure the real performance of each combinations, so that if you have a chance to try some combinations, your feedback is highly appreciated.



## References

In this paper, we used the data from the following videos in YouTube.

**Ref. 1 Video: Tokue-Pro To Fujikawa-Pro No “SNC Bowling Jyoho Tairiku Bangai Hen Sono Ni Zenhen”**  
(徳江プロとスタッフ藤川のボウリング情報大陸 番外編其の弐前編 (04/04/2013) )  
<https://youtu.be/OsJenI8mUxw>

**Ref. 2 Video: Tokue-Pro To Fujikawa-Pro No “SNC Bowling Jyoho Tairiku Bangai Hen Sono Ni Kouhen”**  
(徳江プロとスタッフ藤川のボウリング情報大陸 番外編其の弐後編 (04/05/2013) )  
<https://youtu.be/bxGUCv5OC8g>

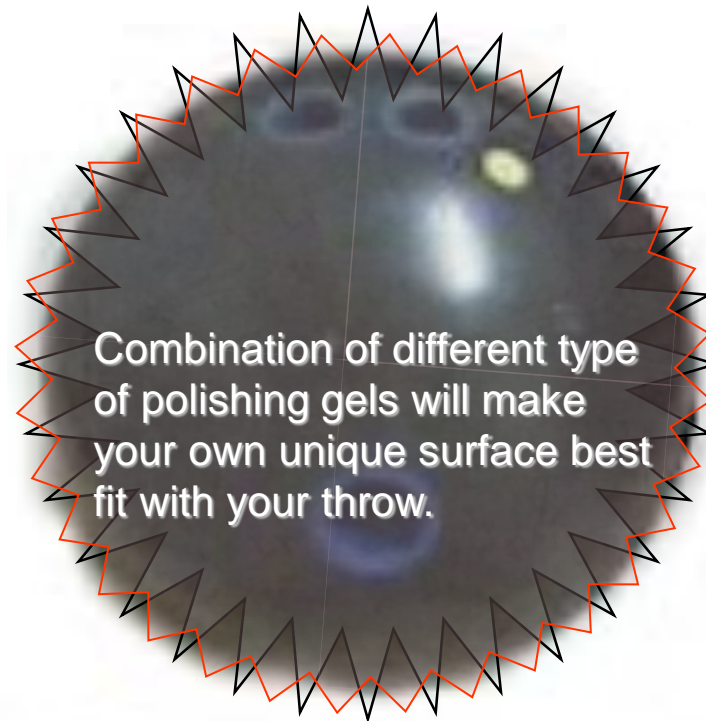
**Ref. 3 white paper: Experiment of Bowling Lane Oil Removal**  
K. Sakai, FEMTECH Co., Ltd (11/24/2014)

**Ref. 4 white paper: Experiments of Heating Effects on Bowling Ball**  
K. Sakai, FEMTECH Co., Ltd (11/24/2014)

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**R & D**

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