PPL Accelerated Break-In Procedure

April 11, 2025

Purpose

The performance of most pickleball paddles can change over the course of their life because of material changes resulting from repeated use or abuse. The rate at which paddles break in and the amount they break in are dependent on countless factors. Given the potential for paddles to dramatically increase in performance through the break in process, a standardized method is needed to break paddles in so that any increased performance can be readily determined. The Accelerated Break-In (ABI) procedure described herein has been developed to be such a standardized methodology. For clarity, ABI refers to lab-based methods which are utilized to break in paddles via techniques which are faster and more aggressive than regular play. Pickle Pro Labs (PPL) uses ABI in conjunction with Average Deflection Force (ADF) and paddle-ball coefficient of restitution (PBCOR) to evaluate changes in paddle performance.

Equipment / Materials

- Vise with 5.5” jaw length and minimum 3.5” throat depth, mounted to a sturdy surface
- Two clean 5/64” thick leather pieces (McMaster-Carr #8706K54)
    - Approximate dimensions are 8” x 4”
- Automated Design Corporation’s (ADC) Pickle Press Load Frame (PPLF) with paddle rest attachment
- Micrometer

Terminology

Displacement Distance – change in relative position between the clamping surfaces (jaws) of the vise, as monitored by directly, or indirectly, measuring/tracking the jaw-to-jaw distance.

Total Displacement Distance – a Displacement Distance equal to a specified percentage of the measured thickness of a paddle.

Compression Cycle – the compressive loading and unloading of a paddle by a displacement distance of 1.5 mm. For many common shop vises, this is approximately equal to a quarter turn of the vise’s lead/drive screw.

Compression Cycling Method – the process of applying and releasing a compressive load in incremental steps, or compression cycles, until a desired Total Displacement Distance has been reached.

Edge Cycling Method – the process of applying and releasing force along the edge of a paddle face in alternating directions to loosen the edge of a paddle structure.

Preparation

1. Condition Paddle
   a. Paddles must be stored in a conditioned environment for a minimum of 4 hours prior to start of any testing or measurements taken.
      i. Temperature requirement: $72^o \pm 2^o\ F$
      ii. Relative humidity requirement: $50\% \ \pm 10\%$
2. Determine pre-ABI paddle ADF following PPL's 'Average Deflection Force Testing Procedure' at the 3, 4 and 5 inch locations on both sides of the paddle.
   a. NOTE: the 3" location is tested following the standard PPL ADF procedure, but with a modified span of 5 inches instead of the standard 6 inches.
3. Verify the vise is securely mounted to a stable surface and that both clamping surfaces are covered with a leather piece per side (the function of the leather pieces is to prevent the vise jaws from damaging the paddle surface). See Figure 1.
4. Calculate the Total Displacement Distance
   a. Measure the paddle thickness using a micrometer at the tip of the paddle.
   b. Total Displacement Distance is equal to 20% of the measured thickness of the paddle (e.g. a 16 mm paddle will have a Total Displacement Distance of 3.2 mm).
   c. NOTE: The Total Displacement Distance is inclusive of any leather compression, as a result the actual face deflection of the paddle may be slightly less than the Total Displacement Distance.

Procedure

1. **Vertical Compression**
   a. Place the paddle, tip side down, into the vise and tighten until the paddle is held in place at the 3.5 inch location and is centered to the vise jaw as shown in Figure 1. Approximate clamping force is less than 2 lb.

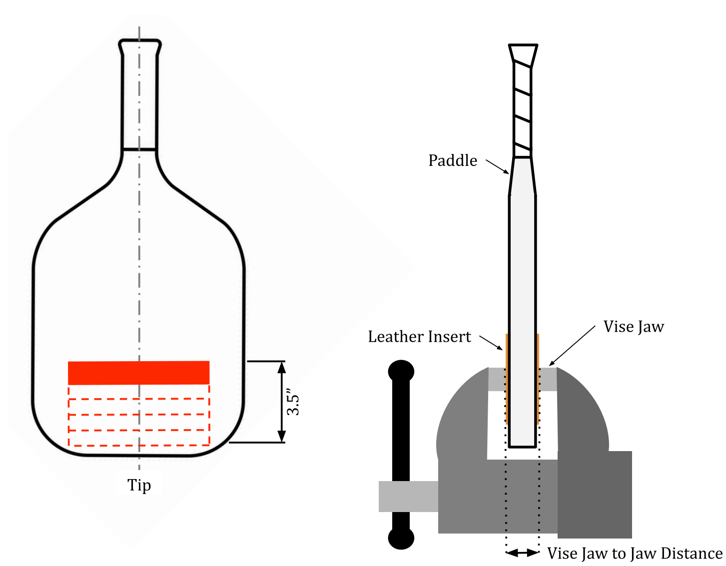

Figure 1 – *Vertical compression placement in vise, front and side views*

b. Compress paddle using Compression Cycling Method as described below.
    i. A single Compression Cycle should compress the paddle by a distance equal to 1.5 mm of movement by the jaw of the vise before releasing the force. This is approximately a quarter turn of the vise's lead/drive screw as shown in Figure 2.
    ii. Each Compression Cycle should result in an incremental increase in the compression distance.
    iii. Continue performing Compression Cycles until the Total Displacement Distance has been reached.
    iv. At minimum, 15 Compression Cycles should be completed per location on paddle.
    v. NOTE 1: The goal is to compress the paddle further and further in such a way that the paddle does not fail in a catastrophic manner which is more likely to occur if the paddle were compressed to its Total Displacement Distance in a single cycle.
    vi. NOTE 2: Cracking noises will occur and are acceptable so long as there is no visible damage on the face of the paddle.

Figure 2 – *Tightening and loosening range of motion in vise*

c. Release the paddle from the jaws and move the paddle upwards in the vise until the jaws compress the 3" location on the paddle face.

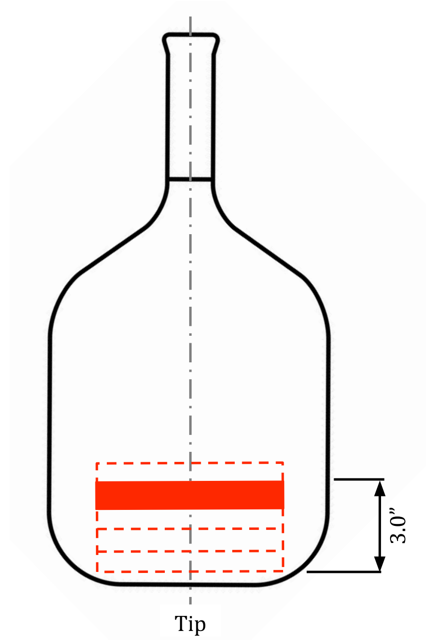

Figure 3 – *Vertical compression placement in vise at the 3” location*

d. Perform the Compression Cycling Method (Section 1b) at the 3” location.
e. Continue to adjust the location of the paddle such that the paddle has been properly compressed in ½” increments from 3.5” to the furthest reachable point toward the tip of the paddle using the Compression Cycling Method (Section 1b) at each location.

2. Horizontal Compression

a. Rotate the paddle 90 degrees in the vise so that the jaws alight with position A1 just under the paddle centerline as shown in Figure 4. Approximate clamping force is less than 2 lb.

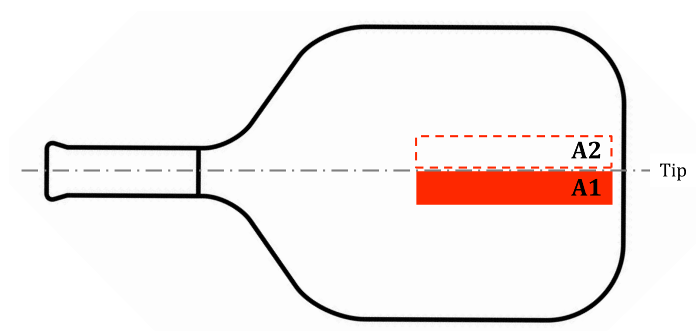

Figure 4 – *Horizontal paddle ABI placement in vise, position A1*

b. Compress paddle using Compression Cycling Method as described in Section 1b.

c. Release the paddle from the jaws and rotate the paddle 180 degrees in the vise so that the jaws alight with position A2 just under the paddle centerline as shown in Figure 4. Approximate clamping force is less than 2 lb.

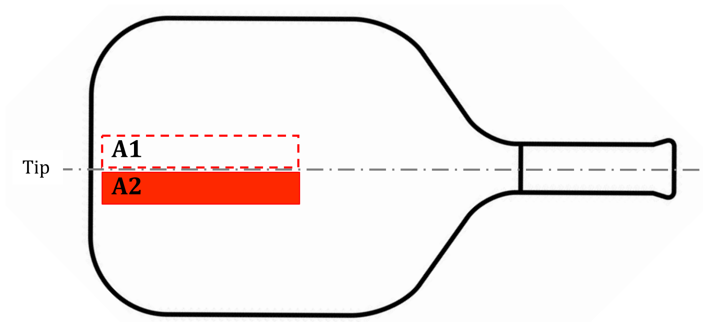

Figure 5 – *Horizontal paddle ABI placement in vise, position A2*

d. Compress paddle using Compression Cycling Method as described in Section 1b.

3. Loosening of Edge Structure

a. Place paddle with the vise clamping the bottom edge of paddle face in position B1, as shown in Figure 6. Clamp the paddle with a moderate force. The force should be larger than the normal 2 lb clamping force. An extra 1/8th of a turn of the lead screw past the normal 2 lb clamping force is considered a moderate force. The paddle should be securely held in place, but significant compression of the face should not occur.

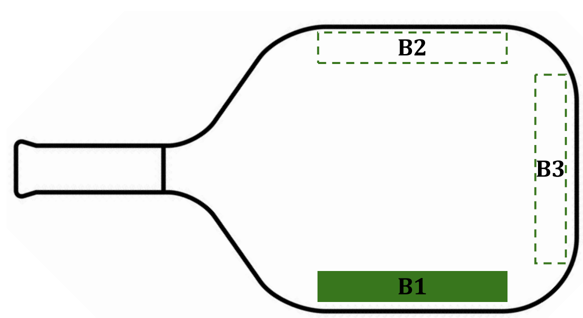

Figure 6 – *Horizontal paddle ABI placement in vise, position B1*

b. Loosen the edge of the paddle face following the Edge Cycling Method described below.
   i. Apply force to the topmost portion of the paddle in its current orientation to bend the edge of the paddle approximately 10 to 15 degrees from its original centerline, as demonstrated in Figure 7.
   ii. Apply force to the topmost portion of the paddle in its current orientation on the opposite face to bend the edge of the paddle approximately 10 to

15 degrees in the opposite direction from its original centerline, as demonstrated in Figure 7.

iii. Repeat this motion 20 times, cycling through the bending of the paddle edge from side to side.

iv. NOTE: There may be cracking and popping noises. These noises are acceptable so long as the paddle face shows no visible signs of damage.

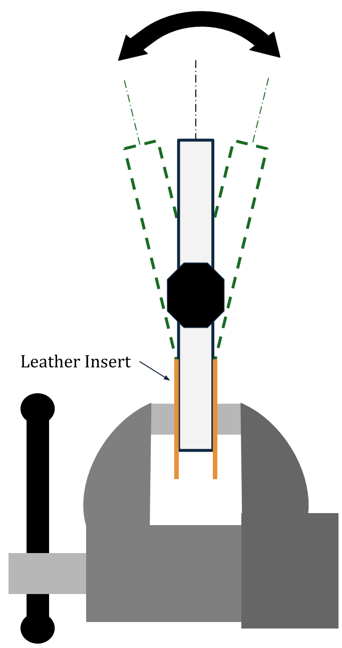

Figure 7 – *Side view of edge structure loosening motion, horizontal edge of paddle*

c. Place paddle with vise clamping bottom edge of paddle face in position B2, as shown in Figure 8. Clamp the paddle with a moderate force. The force should be larger than the normal 2 lb clamping force. An extra 1/8th of a turn of the lead screw past the normal 2 lb clamping force is considered a moderate force. The paddle should be securely held in place, but significant compression of the face should not occur.

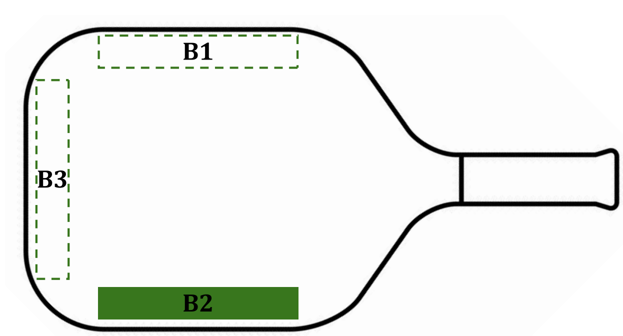

Figure 8 – *Horizontal paddle ABI placement in vise, position B2*

d. Loosen the edge of the paddle face following the Edge Cycling Method in the B2 location of the paddle, as described in Section 3b.
e. Place paddle with vise clamping tip of the paddle face in position B3, as shown in Figure 9. Clamp the paddle with a moderate force. The force should be larger than the normal 2 lb clamping force. An extra 1/8th of a turn of the lead screw past the normal 2 lb clamping force is considered a moderate force. The paddle should be securely held in place, but significant compression of the face should not occur.

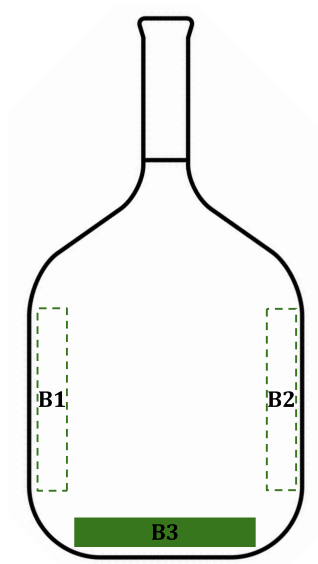

Figure 9 – *Vertical paddle ABI placement in vise, position B3*

f. Loosen the edge of the paddle face following the Edge Cycling Method in the B3 location of the paddle, as described in Section 3b. See Figure 10.

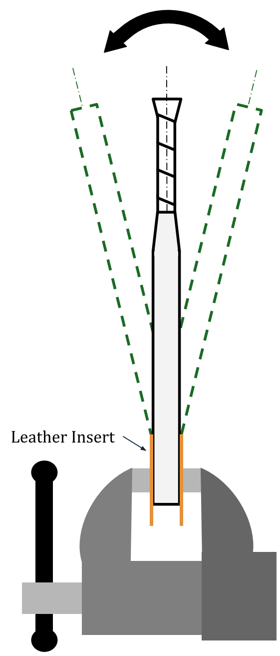

Figure 10 – Side view of *edge structure loosening motion, B3 location*

4. Remove paddle from the vise and ensure no visible damage has occurred on either face.
5. Determine post-ABI paddle ADF following PPL 'Average Deflection Force Testing Procedure' at the 3, 4 and 5 inch locations on both sides of the paddle.
    a. NOTE: the 3" location is tested following the standard PPL ADF procedure, but with a modified span of 5 inches instead of the standard 6 inches.

- NOTE-

The purpose of ABI is to break down the paddle structure in an even and systematic fashion. The process described in this document involves a human operator and inherently has variability. An operator will become more skilled in this process with repetition.

Paddles will break down at different rates. Some paddles will withstand aggressive compression cycling while others will fail under more conservative compression cycling. If a paddle breaks during the ABI process, a new paddle(s) will be processed. If a paddle model cannot withstand the full ABI process without breaking, that paddle's ABI Total Displacement Distance will be reduced in 10% increments until the paddle can successfully withstand the full ABI process.

Alternative methods exist to break in paddles. These alternatives include, but are not limited to, pneumatic compression and three point loading cycles, cyclical loading of the paddle face using a load frame, repeated impact of the paddle face by a projectile launched from a cannon and naturally breaking in a paddle through its intended use. The results from ABI studies employing these various methods show that the method of break in is not obviously discernable to an observer (ie: the paddle looks the same regardless of the break in method) and that paddle performance is not largely a function of method of break in. As such, the ABI method described within this procedure was selected based on its relative efficiency and effectiveness.

An automated ABI process that will improve the efficiency, effectiveness and repeatability of the ABI process is currently in development and is expected to be introduced in the coming months. The new method will also make it more practical to implement useful-life testing of paddles, rather than the fixed displacement process described in this document.