Tuning Stability into your Client's Pianos

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Don started working on pianos in 1979 and joined PTG in 1981.

Why do pianos go out of tune?

1. Environment
    a. Humidity
    b. Temperature
        i. Warm up or cool down a string and listen to the change
2. Heavy Use
    a. Certain players play hard, and know they must tune more frequently
    b. Recording studios
3. Previous Tuner
4. Problems with the piano
    a. Unstable strings
        i. This is particularly applicable to new pianos
    b. Unstable wood
    c. Loose tuning pins
        i. Settled tuning pins will hold
        ii.
    d. Termination points
        i. Cracked bridge
        ii. Loose tuning pins
        iii. Rough capo bar
        iv. Loose bridge pins
        v. String not seated
    e. Structural problems
        i. Pin block
        ii. Loose plate
    f. Poor piano design
    g. Worn hammers
        i. A flat surface deflects the string differently from a round surface
        ii. Tone is brighter
        iii. Worn hammers add to string breakage by increasing the stress at the capo bar
        iv. The hammer is an efficient lever point, pulling on the agraffe so the energy goes into the bridge
    h. Loose plate bolts and screws
        i. There are screw and socket heads that can fit into a tuning hammer
        ii. Kawai bolts and screws are waxed (lubricated), so be careful not to strip or break the bolts when tightening them
    i. Insufficient tunings in first year
        i. This is a common problem with dealers

ii. "Sufficient" means "enough to keep the tuning stable."; about 4 tunings the first year.

5. What to do about these problems?
    a. Environment
        i. Move piano; room choice
        ii. Control environment in room if possible
        iii. Install climate control in piano if necessary, e.g. humidifier
    b. Use
        i. Tune & service more frequently
    c. Tuner
        i. No problem: now you're there!
    d. Piano
        i. Be patient
        ii. Recommend repairs
        iii. Recommend replacement
    e. Tuning Pin Coils and Stability
        i. Coils which are loose and too low will not stay in tune well, causing drifting unisons.
        ii. Coils which are pulled too high in the factory will gradually settle down, causing the pitch to drop.
            1. The coil on a pin is an oval, not round
            2. Tap the coil down
        iii. Coils which are correct cover ½ of the becketr hole.
6. Pitch changes and stability
    a. What are the fundamental reasons that a pitch raise leads to instability?
        i. Compression of the soundboard structure
        ii. Plate flex
        iii. Case flex: racking
            1. as you rais the tension of the piano, the plate can lift
        iv. Small parts flex
            1. Tuning pins are steel
            2. The thinner the pin, the more potential for flex
    b. Changes from string Movement
        i. Bridge roll
        ii. String bend relocation
            1. String bends at capo bar
            2. Termination point or range?
        iii. Different strings
            1. Old vs. new strings
            2. Stiff vs. soft wire
                a. Ductable wire takes a set faster & is more flexible
            3. Lift the string with a hook to seat the string & sharpen the bend
                a. Improves tone
                b. Makes the string more stable
            4. String bends at the bridge

   a. Seating the wire in towards the bridge sharpens the bends
   b. Sharpening these bends makes the pitch more stable

Pitch Raising and Tuning Stabilizations

Pitch raise after the piano has been restrung and it is ready too leave the shop

1. Evaluate the condition of the piano. Don't raise pitch if strings are badly rusted, structure of piano is questionable
2. Inform owner of what you are doing, any risks, and fee.
3. Tighten all plate screws
   a. Tighten all plate screws and bolts\
   b. Check plate horn bolt/wedge
4. Evaluate pitch level and string stability, and decide on over-pull factor
   a. Test pull up/settling on one string
   b. Note the pitch change
      i. How stiff is the piano?
      ii. How does the pitch settle?
5. Raise pitch
   a. Aural method
      i. More stress on the wire because requires more over-pulling, but less stress on the structure of the piano
      ii. One string at a time
      iii. Temperament strip the whole piano
         1. Do one string all the way to the top
         2. As you pull the strip out, tune just all the right strings; leave the left strings
         3. Play the piano so the customer can hear the piano is out
         4. Then tune the remaining strings and the difference is clear
   b. ETD method
      i. Less stress on the wire, more stress on the structure
      ii. Normal over-pull is 25%-30%, from tenor break to the treble
   c. Procedure
      i. Be sure to include extra over-pull to allow for string seating.
      ii. The goal is to end up with piano at A=440 after the strings are seated.
      iii. On the Cybertuner, reset the pitch raise to A=441 or 442. Make sure the spinner is always going sharp.
      iv. Fix any bad tuning pin coils before starting to raise pitch and seat strings; also tighten plate bolts; these make big changes
      v. Tune the piano three times, each in less than a half an hour.
      vi. Default would be one beat sharp
6. Seat strings
   a. Pliers
      i. Grind the outside tips of the pliers to make them easier to go between the strings & pins
      ii. Squeeze the coils around the pin, tap coils of single loop

            iii. Check if the pitch changes
        b. Seat strings at aliquot bars
            i. Find the spot where the wire will move the most
            ii. Tap in front and behind the aliquot
            iii. Use a plastic/wooden jack & small hammer for tapping
        c. Seat strings behind bridge
        d. Seat strings in front of bridge
        e. Raise stings lightly at capo bar/agraffes
            i. Do a little tug & slide
        f. Seat strings at counter bearing bars
            i. Pianotek makes a string hook on a roller for removing agraffes; this is a great tool for lifting strings
        g. Check for high strings on hitch pins; tap them down
7. Retune the piano
    a. Now that the strings have been moved around, the tuning will be wild
    b. Do at least a quick tuning
    c. Align hammers to the strings
8. Schedule follow-up
    a. One month later
    b. Three months later

Tuning Technique

1. In the factory
    a. First tuning is a half sep sharp
    b. The second tuning is 445
    c. The final tuning is 443
    d. Every step of time or money in the factory is multiplied by 4
2. Elongation
    a. Elongation is quick
    b. Wire loses its elongation by tuning, bend settling and wood movement
    c. Franz More tunes new strings a whole step sharp.
    d. Normally tune a new wire a half step sharp and leave it there as long as possible before tuning
3. What makes a successful tuner?
    a. Must be able to get along with customers
        i. People must feel that they are getting their money's worth
    b. Must do a fundamentally good tuning, in 4 dimensions
        i. Height
        ii. Width
        iii. Depth
        iv. Duration
    c. Two characteristics of stable tuners
        i. Pound the keys hard
            1. A hard whack should happen at least once on each note
            2. If the string renders well, use the hard blow as a test

3. If your arm has stress or your finger tendons feel sore, develop a different technique
    a. Once the blow is made, release the pressure – you don't have to hold it down
    b. Weighted playing tool can help

ii. Adjust tuning technique to each piano
1. Tuning up or down to final pitch

iii. Pin Movement
1. Bending
    a. Position of tuning lever for springing
        i. 12:00 (bounce)
        ii. 15 degree angle
    b. Particularly helpful with tight/jumpy pins
2. Springing
    a. Springing pin for last adjustment, (parallel to the string
    b. "Impact" vs. "pressure" technique
        i. Japanese love the pressure technique
            1. They pull it up smoothly and then push with thumb
    c. When we tune, we must move the short string sections sufficiently to move and stabilize the speaking length
    d. The pins in some pianos do not move smoothly
3. Turning
    a. Position of tuning lever
        i. Turn 3:00 (bend)
        ii. 5 degree angle
    b. Use with loose pins

d. String movement
i. Tuning pin to agraffe/capo movement
ii. Speaking length
iii. Tail length
1. make sure the string gets through the bridge

e. Pin Stability
i. No twist, pin is settled in the "tuning zone" instead of the "turning zone"
ii. Will the piano allow fine tunings by springing only?

f. String stability

Default Techniques

1. Tune the string sharp of pitch by turning the pin into position
2. Settle and un-twist the pin by lightly impacting it down, setting the string close to the final pitch
3. Fine tune the string by a combination of springing and turning

Problem examples

Six type of pianos as time allows

1. Symptoms: tunes well, piano seems stable except for mid-treble dropping on hard blows
2. Symptoms : strings move well, but pins are snapping badly
    a. Drop the pitch down & pull up
3. Symptoms: stings move well but pins are “flag-poling” badly, besides being tight.
    a. Spring tune
    b. There is no tuning pin bushing
    c. Eg. Steinway uprights
4. Symptoms: strings move well, but pins feel “spongy”
    a. Spring it out of the “marshmallow zone” where the bottom of the pin is not moving
5. Symptoms: pin is snug and firm, but takes a lot of pin motion before strings move.
    a. Jumping pins
    b. Apply Protek with a Q-tip on the friction points, not the tuning pin
    c. Avoid WD40 or silicone
    d. Over-pull, come back and spring up
6. Symptoms: loose pins, strings move easilhy
    a. Don’t spring, because it’s easy to turn the pins anyway.
    b. Use smooth

Conclusion

- Super stability starts with stable strings
- Stable tuners adjust their technique for each piano