Trombone Slide Repair

- Conference notebook p. 71
Support Materials

- Conference notebook p. 71
- Support videos
  - Mandrel Whack
  - Making nosepickers
  - Tube wall polishing
  - Wrapping cleaning rod
- At www.redwingmusicrepair.org
And Now... A Joke

Q: There is a frog driving east and a trombonist walking west. What can be surmised from this?

A: The frog's probably on its way to a gig
Show & Tell plus more

- We want to compare notes
  1. Show what we do
  2. Then: “What do you do?”
    - Compare processes and techniques
    - Learn from one another

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Reality check

- Three general repair levels
  1. Student line p.c.
     - Clean, straighten, align, bulk dent removal and out
     - Crook work/replacement as needed
  2. Pro level work
     - Quality on steroids + bearing surface polishing
  3. Bottom Feeder Survival
     - Make the thing work as well as it can without exceeding its value or snapping a rotted tube
Time vs. Quality

- Student-line work has a time frame
  - Within that frame, we want the highest quality possible
    - Drives new tools and techniques
    - Drives conversations like this
What We Address

1. Gunk and scale
2. Bends
3. Lack of parallel
4. Dents
5. Oval/out-of-round tubes/jogs
6. Stresses
7. Tube wall roughness
End Results

1. Clean
2. Straight
3. Parallel
4. Dent free
5. Round & consistent diameter
6. Stress free
7. Good bearing surfaces

See handout p. 3
Let’s Go!
Before The Chem Flush

What we do:

1. Hard cheesecloth wipe
   - Tight weave from CCP or Allied
2. Oil soak (6 hours minimum)
   - Valve/Slide
3. Scrub out
4. Dry hard cheesecloth wipe
5. Solvent hard wipe
Before The Chem Flush

What we do:

1. Hard cheesecloth wipe
   - Tight weave from CCP or Allied

2. Oil soak (6 hours minimum)
   - Valve/Slide oil

3. Scrub out

4. Dry hard cheesecloth wipe

5. Hard solvent wipe
Our chem flush

- **Traditional** - no ultrasonic
  1. Detergent soak
     - Brush with nylon or brass scratch
     - Cold water rinse
  2. “Pickle” soak
     - Phosphoric alone or w/Muriatic
     - 2 min. X as needed
     - Warm water rinse/brush
  3. Flashlight/LED Inspection
  4. Dry hard wipe
  5. Solvent hard wipe
Quick Tip

- Heat matters
  - Warm the instrument
    - Prior to acid bath
    - Hot air guns work great
Quick Tip

- Super Soak!
- Outers
- Inners
Our chem flush

- With ultrasonic
  1. Detergent soak
     - Cold water rinse/brush with nylon or brass scratch brush
  2. “Pickle” pre-soak if needed
     - Muriatic or Sulfamic preferred
     - 2 min. X as needed
     - Warm water rinse/brush
  3. Ultrasonic 2 minutes
     - Warm water rinse/brush
  4. Flashlight/LED inspect
  5. Dry hard wipe
  6. Solvent hard wipe
Our chem flush

- With ultrasonic
  1. Detergent soak
     - Cold water rinse/brush with nylon or brass scratch brush
  2. “Pickle” pre-soak
     - Muriatic or Sulfamic acid
     - 2 min. X as needed
     - Warm water rinse
  3. Ultrasonic 2 min.
     - Warm water rinse
  4. Flashlight/LED inspect
  5. Dry hard wipe
  6. Solvent hard wipe
Straightening

- Stone or sight or both
- Just get it straight
  - *Have another verify*
- Straighten constantly throughout the repair
- Overnight down time before releasing
- Prevent problems
  - Inner hand position
  - Outer hand position

Tube photos courtesy of Ken Skitch
Consequences

- If this:

- Then: Bent stockings on outers
Consequences

- If this:

- Then: Inner tube bends at solder joint
Cool Technique

- For bent stockings
  - Inners or outers
- The “Whack”

Photo courtesy of Ken Skitch
Straightening

- Stone or sight or both
  - Just get it straight and parallel
  - Have another verify
- Straighten constantly throughout the repair
- Overnight downtime before releasing
- Prevent problems
  - Inner hand position
  - Outer hand position
- Stocking bends
  - The “whack...what do you do?”
“You mean everybody plays trombone?”
Dents

- Creases
- Dishes
- Combo platters
- Kinks/buckles
Dent Tools

- There’s a bunch of ‘em
Goal

Remove dents without burnishing

- Save burnishers for fixing out-of-round tubes if possible
- Expanders are for the same, but burnish first
Our Primary Dent Tools

- Cylindrical mandrels
- “Nosepickers”
Cylindrical Mandrels

The better the fit, the better/faster our job

- Exact fit mandrels are best
  - From Votaw Tool
  - #2082
    - Bundy, Jupiter 332/432, Conn 16H/18H (old style), Selmer TB300/1523, Holton TR 602, Yamaha YSL-354
  - #2083
  - #2084
    - King 2B/605, Olds - various models - pre 1970, Conn 14H/17H, Martin Committee - pre 1970
Cylindrical Mandrels

*The better the fit, the faster our job*

- These get us close:
  - Ferree’s P88
    - 0.005” increments
    - Similar to old Erick Brand 1” or 6” threaded mandrels
  - Traditional numbered mandrels 1-14
  - Drill rod
Nosepickers

- **Allied T1429**
  - 2: Standard + modified

OR Homemade

- ½” diameter 1144
- Two ends
  1. Broad
  2. Uber-punch
Let’s Take Out a Dent

**Crease-type**

1. Slide is clean
2. Tubes are straight
   - Unless the dent is caused by the tube.
3. Let’s Take Out a Dent

**Crease-type**

- Rough out on cylindrical mandrel
  - Mandrel best fit to tube
    - Delrin or teflon mallets
    - Flat side
    - Displacement to dent center
    - Work it till it stops moving
Cool Idea: Bill Pritchard

- For “peppered” areas
  - Bent butter knives
  - 3rd position bell bonks
4. Let’s Take Out a Dent

Crease-type

- “Nosepickers” or Allied T1429’s
  - Draw dents
    - Broad end first
    - “Uber” end second
Check Our Work

*Crease-type*

5. Straighten
6. Hard wipe
7. Inspection – are dents out?
   - Visual/touch
   - With inner, in playing position, with alcohol
   - *Pro Bones: Inspect with an expander?*
8. Hard dry wipe
9. Solvent hard wipe
10. Buff and clean inner stockings (white lime)

On some instruments we may be done
Dent(s) Not Out Yet?

Option: tap with steel hammer
1. Ferree’s F10C hammer
   - Round side
2. On broad end of picker
   - Or Allied T1429
3. OR on a mandrel
   - With Paraffin?

⇒ Non-negotiable: NO WALNUTS ⇐
Check Again

**Crease-type**

5. Straighten
6. Hard wipe
7. Inspection – are dents out?
   - Visual/touch
   - With inner, in playing position, *with oil this time?*
8. Hard dry wipe
9. Solvent hard wipe

On some instruments we may be done
Dents out, but no go?

- Handout p. 3B or p. 4D

**Causes:**

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>A. Dent not out</td>
<td>C. Jogged tube</td>
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<tr>
<td>B. Oval tube</td>
<td>D. Buckled tube</td>
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**Solutions for B/C/D:**

1. **Preferred:** Burnish to round tube
2. If necessary: Expander
Burnishing Options

- Ferree's N12 slide ring
- Double-handled rollers
- Ferree's double post roller
- Votaw #2070 lever action dent roller
- Ferree's N87A trombone burnishing pliers
- Can opener type by Mike Webb
Our Burnishing Rules

- Tight fitting mandrel
- As light as is necessary
  - Start with traditional downward-pressure
  - C ring or single roller
  - Go to compression burnishing
- Burnish only where necessary
- Inspect often
- Don’t make things bigger
  - Compression burnishing with
    - can enlarge tubes
    - can elongate tubes
  - Clue: bent tube after burnishing
Expanders?

- Still useful
- Ball-end type rock
Check Yet Again

5. Straighten

6. Hard wipe

7. Inspection – is tube restored?
   - With inner, in playing position with oil

8. Hard dry wipe

9. Solvent hard wipe
If Good To Go...

- Let set overnight
- Did tubes bend?
  - No = hooray for our side
  - Yes = stress relief/crook off

  **Constraint:** instrument condition, quality, end use, etc…
Why This Way

- Speed and quality
  - Highly skill dependent
  - Highly inspection dependent
- Burnishing dents out can cause trouble:
  - Enlarged tube sections = “uber walnuts”
    - Jogged tubes
  - Elongated tubes
    - Requires re-setting crook
Why This Way

- Speed and quality
- Highly skill-dependent
- Burnishing alone can cause trouble
- Enlarged tubes
- Elongated tubes

What do you do?
Special Problems

- **6th and 7th position drag**
  - Handout p. 5, Item 1
    - Inspect lug and brace
      - Telescoping gauge to check inside
    - Ensure consistent bore – pro-level
      - Warped from soldering/bending?
        - No expander!
        - Lap on mandrel?
        - Buff wall with tripoli
Special Problems

- 6th and 7th position
  - Handout p. 5
  - Inspect lug and brace
  - Repair as shown
  - Ensure consistent bore – pro
- Warped from soldering/bending?
  - No expander!
  - Lap on mandrel?
  - Buff wall with tripoli
Special Problems

- 1st Position Drag
  - Handout pg. 3 item C
    - Was it there before I started?
      - Hidden bend in cork barrel?
    - Inner slide skew?
    - Spread or closed crook?
      - Calipers to check
    - “Phantom” bends near crook?
    - Outer slide skew?
Special Problems

- 1st Position Drag
  - Handout page 3 item C
  - Was it there before I started?
  - Hidden bend in cork barrel?
  - Inner slide skew?
  - “Phantom” bends near crook?
  - Outer slide skew?
Pro-level

- Buff outer slide bearing wall
- Tripoli + oil
- Max 1725 rpm
So ask, is it...

1. Clean?
2. Straight?
3. Parallel?
4. Dent free?
5. Round & consistent diameter?
6. Stress free?
7. Good bearing surfaces?
If yes…we make $
Thank you!

- Greg Beckwith, John Huth and Lucas Pemberton
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Resources

- Videos at: www.redwingmusicrepair.org/band/resources
  - “Slide whack”
  - “Making nosepickers”
  - “Buffing outer tubes”