

CORRECTIONS FOR POORLY BENT TUBES

After the initial tooling set-up has been made, study the bent part to determine what tools to adjust to make a better bend. Keep in mind the basic bending principle of stretching the material on the outside radius of bend and compressing the material on the inside of bend. Make only one adjustment for each trial bend unless the second adjustment is very obviously needed. Avoid the tendency to first increase pressure die force rather than adjust the wiper die or mandrel location. Start with a clean, deburred and lubed tube with the elongation properties sufficient to produce the bend.

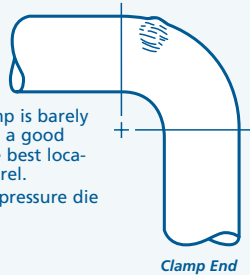
Note: There are certainly other corrections that could be made for the following problems. These illustrations are a few examples of how to “read” a bend and improve the tooling set-up.

1. PROBLEM

Hump at end of bend.

CORRECTION

- 1) Adjust mandrel slightly back from tangent until hump is barely visible. This is also a good system to find the best location for the mandrel.
- 2) Increase force on pressure die assist.

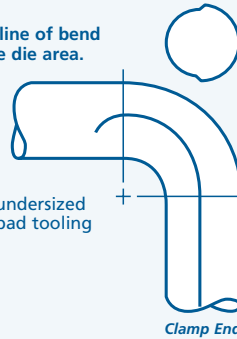


2. PROBLEM

Tool marks on centerline of bend in clamp and pressure die area.

CORRECTION

- 1) Reduce pressure and clamp die forces.
- 2) Oversized tube or undersized tube groove from bad tooling source.

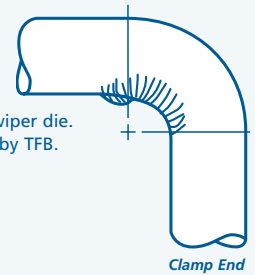


3. PROBLEM

Wrinkling throughout bend, even extending into wiper die area.

CORRECTION

- 1) Advance wiper die closer to tangent.
- 2) Decrease rake of wiper die.
- 3) Recut worn wiper by TFB.

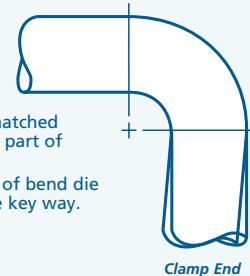


4. PROBLEM

Bad mark at start of bend and over bend for 90°.

CORRECTION

- 1) Removable clamping portion of bend die not matched properly to round part of bend die.
- 2) Clamping portion of bend die not parallel to the key way.

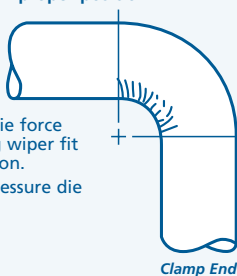


5. PROBLEM

Wrinkles throughout bend area with wiper and mandrel in known proper position.

CORRECTION

- 1) Check for undersized mandrel.
- 2) Increase pressure die force only after checking wiper fit and mandrel location.
- 3) Reduce force on pressure die advance.

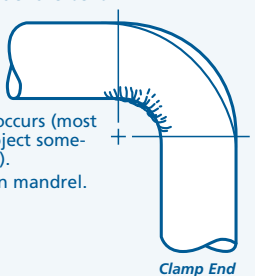


6. PROBLEM

Excessive collapse with or without wrinkling throughout entire bend.

CORRECTION

- 1) Advance mandrel toward tangency until slight hump occurs (most mandrels must project somewhat past tangent).
- 2) Need more balls on mandrel.

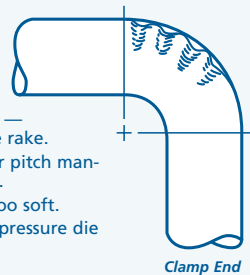


7. PROBLEM

Mandrel ball humps.

CORRECTION

- 1) Too much drag on tube; back off pressure die force — increase wiper die rake.
- 2) May require closer pitch mandrel ball assembly.
- 3) Tubing material too soft.
- 4) Increase force on pressure die assist.

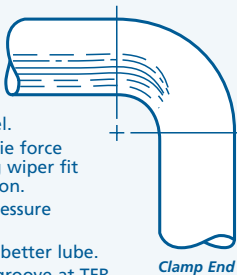


8. PROBLEM

Deep scratches throughout the bend and in wiper die area.

CORRECTION

- 1) Increase rake.
- 2) Check for undersized mandrel.
- 3) Increase pressure die force only after checking wiper fit and mandrel location.
- 4) Reduce force on pressure die advance.
- 5) Use more and/or a better lube.
- 6) Recut galled tube groove at TFB.



9. PROBLEM

Heavy wrinkles through bend area only and linear scratches in grip area indicating clamp slippage.

CORRECTION

- 1) Reduce pressure die force.
- 2) Check location (and lube) of mandrel and wiper die.
- 3) Increase pressure on clamp die.
- 4) Use serrated or carbide spray in tube groove of clamp die.

