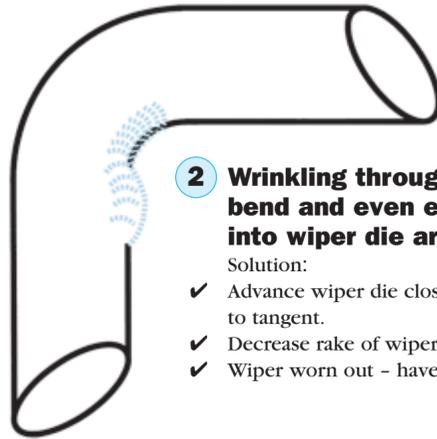


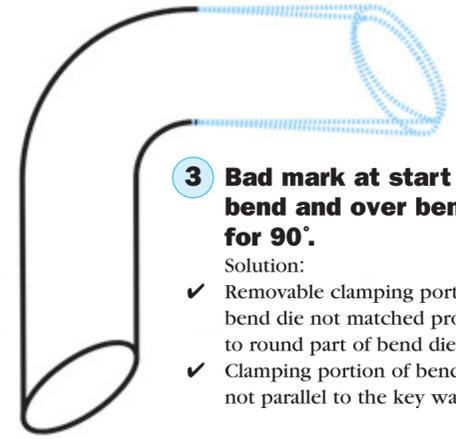
1 Hump at end of bend.

- Solution:
- ✓ Relocate mandrel back from tangent until hump is barely visible (this is a good system to find the best location for a mandrel.)



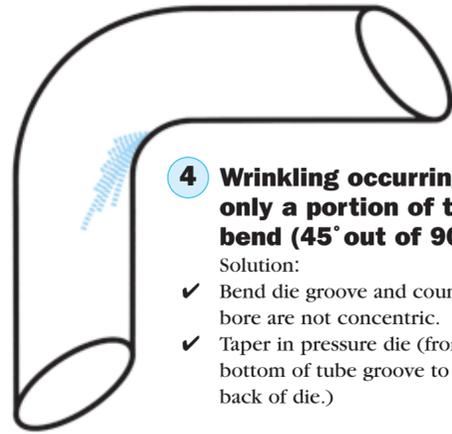
2 Wrinkling throughout bend and even extending into wiper die areas.

- Solution:
- ✓ Advance wiper die closer to tangent.
 - ✓ Decrease rake of wiper die.
 - ✓ Wiper worn out - have replaced.



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

- Solution:
- ✓ Removable clamping portion of bend die not matched properly to round part of bend die.
 - ✓ Clamping portion of bend die not parallel to the key way.



4 Wrinkling occurring for only a portion of the bend (45° out of 90°.)

- Solution:
- ✓ Bend die groove and counter-bore are not concentric.
 - ✓ Taper in pressure die (from bottom of tube groove to back of die.)

Rotary Draw Mindbenders and their Solutions

When it comes to making perfect bend, several factors come into play:

- Determine that the bender you will be using is operating properly.
- Make sure the clamping and unclamping of dies, rotation of swing arm, and extracting of mandrel are all occurring in the proper sequence.
- Make sure the tube you will be using is clean, both inside and outside.
- Check the tooling, making sure it is clean, burr free, and compatible with the tube to be bent.
- Confirm that the mandrel is the required distance past the tangent.

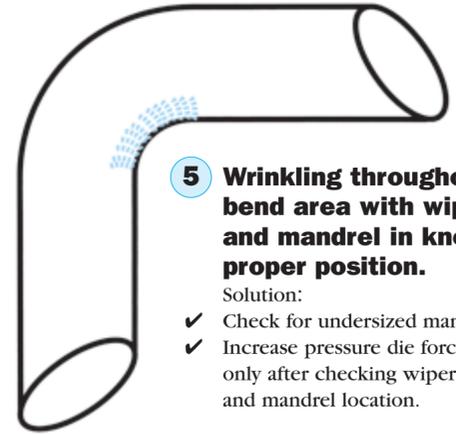
This chart will assist you in correcting some of the more common bending mindbenders. If you should need further assistance please find us at:

OMNI-X INC.

USA
www.omnibend.com

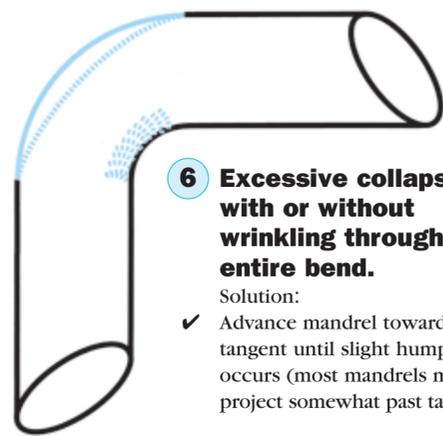
OMNI-X CZ

CZECH REPUBLIC
www.omni-x.cz



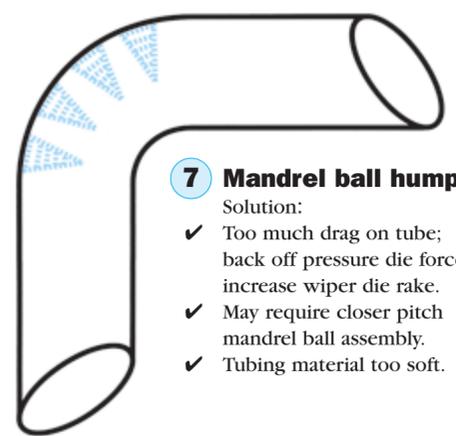
5 Wrinkling throughout bend area with wiper and mandrel in known proper position.

- Solution:
- ✓ Check for undersized mandrel.
 - ✓ Increase pressure die force only after checking wiper fit and mandrel location.



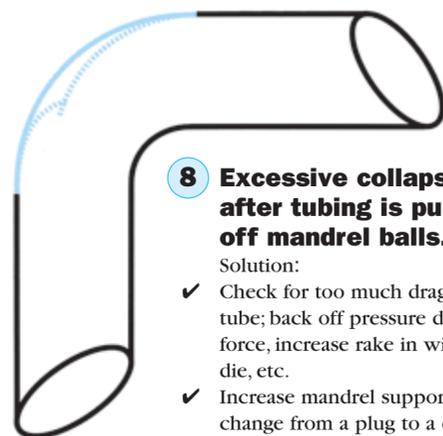
6 Excessive collapse with or without wrinkling throughout entire bend.

- Solution:
- ✓ Advance mandrel toward tangent until slight hump occurs (most mandrels must project somewhat past tangent.)



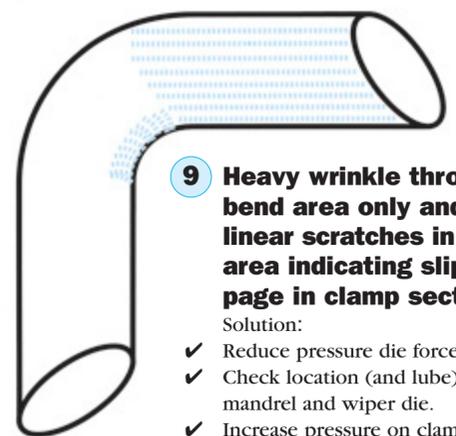
7 Mandrel ball humps.

- Solution:
- ✓ Too much drag on tube; back off pressure die force - increase wiper die rake.
 - ✓ May require closer pitch mandrel ball assembly.
 - ✓ Tubing material too soft.



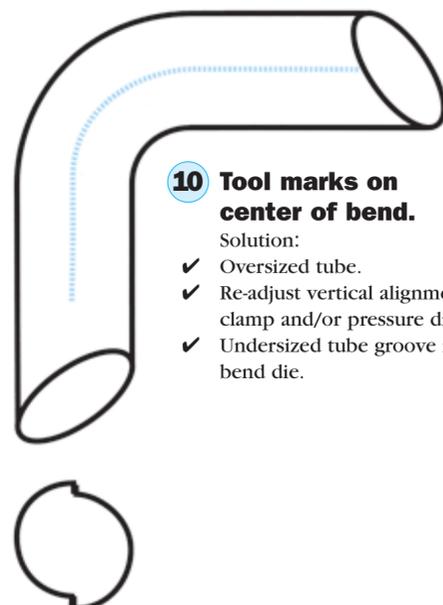
8 Excessive collapse after tubing is pulled off mandrel balls.

- Solution:
- ✓ Check for too much drag on tube; back off pressure die force, increase rake in wiper die, etc.
 - ✓ Increase mandrel support, change from a plug to a one ball, from a 2 ball to a 3 ball mandrel, etc.



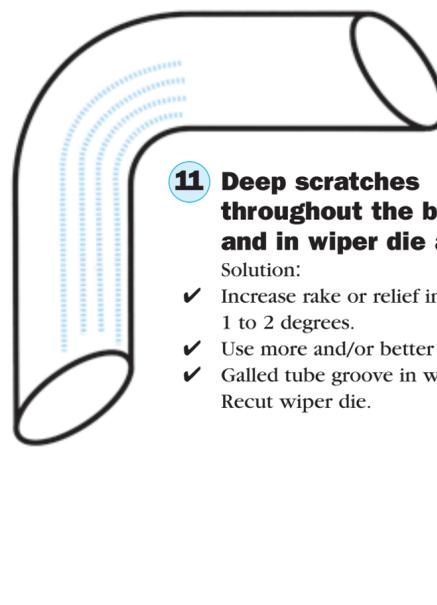
9 Heavy wrinkle through bend area only and linear scratches in grip area indicating slippage in clamp section.

- Solution:
- ✓ Reduce pressure die force.
 - ✓ Check location (and lube) of mandrel and wiper die.
 - ✓ Increase pressure on clamp die.
 - ✓ Use serration, knurling or carbide spray in clamp area.



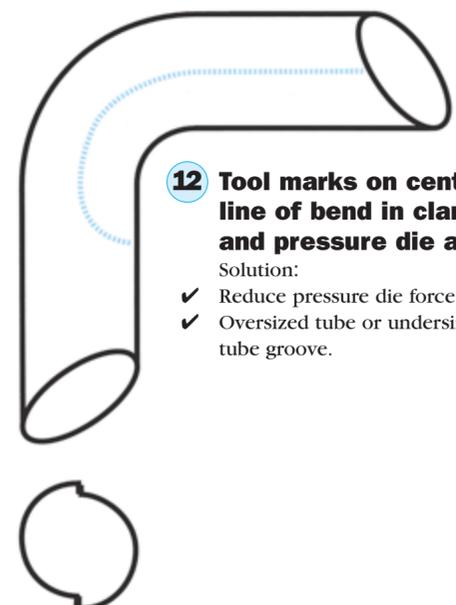
10 Tool marks on center of bend.

- Solution:
- ✓ Oversized tube.
 - ✓ Re-adjust vertical alignment of clamp and/or pressure die.
 - ✓ Undersized tube groove in bend die.



11 Deep scratches throughout the bend and in wiper die area.

- Solution:
- ✓ Increase rake or relief in wiper die 1 to 2 degrees.
 - ✓ Use more and/or better lubrication.
 - ✓ Galled tube groove in wiper die. Recut wiper die.



12 Tool marks on center line of bend in clamp and pressure die area.

- Solution:
- ✓ Reduce pressure die force.
 - ✓ Oversized tube or undersized tube groove.