

DIVERSICO'S COST SAVING DESIGN TIPS FOR TUBULAR PARTS

1. **THINK WILD – IMAGINEERING TOGETHER CAN MAKE IT HAPPEN.** Early vendor involvement is the key. We can help develop the right technique, make your parts better and save your time and money. Let Diversico's innovation tube forming experience since 1960 help you today.
2. **COMMUNICATE THE BIG PICTURE.** The better we understand the big picture, the better job we can do for you. Our goal is to help reduce your total cost, while increasing efficiency, product quality and delivering on time.
3. **TRANSITION ANGLES.** The economy of preferred tube transition angles: (A) for rotary swaging: to 7° per side; (B) for straight line forming: 15° per side. These angles produce the best surface finishes and overall economy.
4. **TRANSITION RADII.** Best rule of thumb is not to have any radius smaller than one wall thickness. In both rotary swaging and straight line forming, the larger the transition radius, the more economical it is to hold close tolerance on the diameter and the better the resulting surface finish.
5. **CHANGING TUBE DIAMETER.** For maximum economy, it is best to stay with the following: % change in tube O.D. = % elongation. If the elongation properties of a tube are 35%, this tube could be reduced or expanded 35%, usually without having to add an anneal.
6. **WHAT HAPPENS TO WALL THICKNESS.** The following is a good rule of thumb if there is no attempt to control wall thickness: $t = \{[(D/d - 1) \times .8] + 1\} \times T$
 D = original tube diameter d = formed tube diameter
 T = original wall thickness t = formed wall thickness
7. **STRENGTH OF FORM.** A swaged taper is very strong and resists bending. A form that is elongated in the direction of the bending force increases its strength. BEads, grooves and ribs increase the hoop strength of a round tube.
8. **STRENGTH OF GRAIN FLOW.** Chipless forming, as in swaging, does not decrease the part's natural strength by cutting across grains. Rather, it causes the grain to flow with the configuration of the part, thereby maintaining or increasing the parts strength.
9. **ELIMINATE ASSEMBLIES.** Often, it is possible to combine several formed tubular parts into a single-piece, formed tube. This can eliminate the need for adhesives or welding which create heat distortion and associated finishing problems.
10. **WELDLESS ASSEMBLIES.** Weldless metal-to-metal assemblies of tubular parts can offer some of these benefits: (A) double resistance to vibration fatigue; (B) be used on heat sensitive parts; (C) have no heat distortion; (D) join dissimilar materials; (E) eliminate expansion coefficient problems; (F) fast cycle time (moves metal at 700 ft./sec.).