INSTRUCTIONS FOR USING THE USEFUL-TOOLS MANDREL HAND TUBE BENDER

- Grip Hand Tube Bender in a sturdy bench vice.
- Fit main mandrel for tube size. This involves removing the pivot pin/drive key assembly and fitting to new mandrel.
- Select the appropriate size alloy backing plate.
- Fit the correct size "bullet" to the threaded rod and adjust the position of this bullet until the machined faint line (denotes the end on the parallel portion of the "bullet") is opposite the centre line of the mandrel, with the mandrel at right angles to the work. (This is a good starting point)
- Lubricate the “bullet” well with high impact oil. (Rear axle oil is very suitable) We also find ‘Molyslip’ tapping fluid works well.
- Slip the tube to be bent over the "Bullet". The tube should slide easily and not have to be forced .
- Slide the profiled clamp plate over the protruding end on the tube and locate with M10 cap head snug against the side of main mandrel. (allow tube to protrude at least 1/4" past this plate).
- Fit backing plate over tube until the end touches the clamp and then screw in pressure adjusting knob to bring rollers up to the back of the backing plate. Apply a gentle "nip" to bring the backing plate onto tube/main mandrel. Slide crank arm into place, apply a little pressure and adjust the "nip" pressure so that the bullet threaded rod exits the rear of the tube as centrally as possible.
- Tube will then pull over the "bullet" and wrap around the main mandrel forming bend to desired angle. It may be found when bending steel tube that fitting an extension to the operating lever will reduce the effort considerably.
- Once desired bend radius is achieved, back main crank handle a trifle to ease pressure, remove clamp and backing plate & remove tube from machine. (sometimes a gentle tap with a hide mallet on the open end of the tube will help free the tube.)
- When bending larger pipes past 45^{o} I found that as the bend progressed the bending effort became higher. By backing off the back plate a little as the bend progresses you will find the bending effort reduces.

Usage Tips & Information

If the “Bullet” position is not adjusted correctly then you may have a condition where:-

- Excessive force is needed to pull the bend. This is usually caused by the “bullet” protruding a little too far with the faint line on the internal “bullet” being out past the centre line scribed on the mandrel.
- Tube flattening slightly on outer and wrinkling on inner face. This is usually caused by the “bullet” being screwed in too much with the faint line being behind the centre line of the main mandrel.

- When bending aluminium tube it may be that the tube necks and/or cracks. This is usually a result of the aluminium material being too hard and/or the silicon content too high. In most cases it is possible to overcome this problem by annealing the material immediately before use. We would also recommend 6063 aluminium as being a relatively easy to bend material, but still may require annealing before use.

- Tip 1 - Aluminium anneals at about 320/340°C. Before heating the aluminium, rub a smear of soap along one side of the tube. Use a soft propane-type flame to heat the tube and keep the flame moving to avoid local overheating. When the smear of soap turns black, then the tube should be annealed. To finish the job carry on heating carefully until the soap marks “flare” slightly. Deceptively, aluminium stays the same colour when hot so beware. If the flame takes on a faint reddish tinge also beware. You are just about to melt the tube.

- Tip 2 - When bending electrically welded steel tube we found a considerable difference in the quality of the steel tube supplied to us. One supply of 3/4" x 16SWG ERW was so 'hard' it would not bend properly, but after being heated to dull red and allowed to cool, bent perfectly. One answer to this problem is to use CFS tubing to the following specification: BS 3602 (PTI) CFS 360 NBK. This is a seamless tube that performs flawlessly and allows for perfect bends.

- Tip 3 - Bending 16SWG steel tube on a 1.5" or 2" centre line radius is technically very difficult and because of the high loadings generated, the steel tube being bent will sometimes slip back a little inside the clamp as the bending process is carried out. THIS IS A FATAL CONDITION AND THE BEND WILL BE TOTALLY DESTROYED. Tighten sufficiently to prevent the tube slipping through whilst bending. It will generally be found not necessary to tighten this clamp fully when bending alloy tubing. However, with some steel seamed tubing the bend effort is so high that the tube is dragged back through the clamp. The immediate effect is for the tube inner to buckle badly and the tube outer to stretch and split. The only answer is to either anneal the tube or change the tube to an alternate specification material or fit a second clamp.

- Tip 4 - If when bending, say, 7/8" or 1" alloy tube if you experience a slight rippling on the inner surface of the bend ease the "bullet" out a little (1/2 to 1mm or so) to remove this effect. Continue to ease out until rippling effect ceases.

- Tip 5 - The main mandrel and backing plate are machined very slightly larger than the nominal tube diameter to avoid the situation where the tube is a tight fit and possibly being “clamped” by the mandrel and back plate. If this situation does happen then there is a strong possibility of the tube being clamped down onto the internal bullet creating the situation where the tube will not slide over the bullet thus preventing the bender working properly and distorting or cracking the tube. Check that the tube fits easily into the channel on the mandrel and back plate without being forced.

- If you wish to bend seamed steel tube, then you will have to grind or linish a small flat along the side of the "bullet" to accommodate the internal weld flash. Position this flat on the inside of the bend radius.

Note. The Mk 3 bender is not designed to bend 7/8” and 1.0” x 16swg steel tube.

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