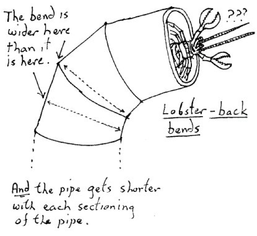
Suzuki T500 Exhaust Systems

By Glen Morgan

THE PRACTICALITIES OF PUTTING A BEND IN A CHAMBER

The tuning books will tell you what to do, but they don't tell you how. They do tell you that "lobster back" bends are not good because you get a change in section with each cut that goes right across the pipe and the pipe gets progressively shorter. So bang goes your tuned length!



This is true, but I have seen an Ariel Arrow with the headers formed with very neat lobster back bends. It went well, though it probably would have gone better with better bends.

Equally, I recently made a chamber for a large capacity post classic motocross bike because the owner was having problems with a lovely shiny imported pipe. When we measured it up wasn't anywhere near appropriate. Caveat emptor! Another pipe he had had made to solve this problem didn't work either. There was nothing fundamentally wrong with the design and it was a well built pipe, but the bends were lobster backs.

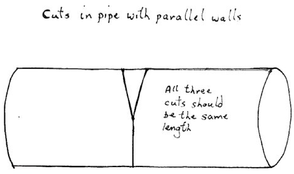
A bend in the middle of the belly section so narrowed the pipe at this point that I suspect that it was reflecting the pressure wave and that some peculiar harmonics were operating. This may have been why the owner found it impossible to tune the carb to operate over the whole rev range.

The chamber we fitted solved this problem, but the rider concerned is in the expert class and would now like more grunt higher up the rev range. Can do - but I'm glad he's riding it, not me.

So pipes can be made so badly that they won't work, but you really have to try hard to make them this badly.....

Okay, so the recommended bends are formed by "pie sectioning" the pipe with a "V" shaped cut to the centre line and a single straight cut to the apex of the "V" from the opposite side of the pipe (the cuts then form a "Y"). This is easier said than done, and the thinner the pipe and the larger the diameter (in my experience) the harder it gets.

Buy the finest toothed hacksaw blades you can if you are working with thin metal. It is very easy to snag and break coarse toothed blades at the best of times.



Some Tips:

- **Cutting chambers can be hard on your ears, so wear ear protectors.**
- **Use fine toothed hacksaw blades and lubricate them.**
- **Use softwood pads in the vice. They help to grip the chamber without crushing it.**
- **Don't rush the cutting and try to use minimal pressure as you cut.**
- **Try to use the whole length of the blade.**

Marking out keeps things on track.

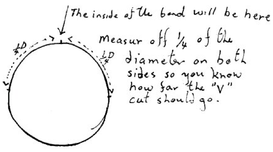
**** Make a mark where you want the inside of the bend to be.**

**** Draw a longitudinal line across the mark.**

**** Use the dressmaker's tape to measure the circumference at the mark.**

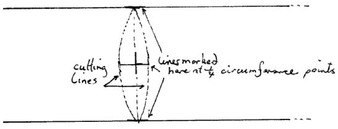
**** Make a circumference line right around the pipe where you want the bend to be.**

**** Divide the circumference by four and use the tape measure to mark the circumference line off into four equal sections, starting from your original mark.**



Now you need to decide how big a pie section you need to cut out. Because this depends on how you intend to route your pipe (and its diameter) I can't give you a firm guide on this. I have found that about the depth of a hacksaw blade seems a good place to start for less extreme bends and twice this really rarks the pipe round. I use two bends if I have to come round that sharply.

**** Mark the cutting lines out at equal distances on either side of the mark which indicates the inside of the bend.**



The half way through the pipe mark will be the quarter circumference marks in either direction. You need to position yourself above the job so that you can both cut and see how you are progressing toward both these marks. If the vice is mounted high or you are short, you may need to organise something to stand on. Try and get the blade lined up properly from the beginning and don't rush the cutting.

**** When the pie section is out, turn the pipe over and cut through the remaining pipe following the circumference line.**

In theory, all you do now is close up the "V" and weld it, then weld the pie section into the space that is now on the opposite side of the pipe. In practice, even if you have done everything to perfection, you have lost the metal in the width of the hacksaw cuts.

This means that you have a hole wider than the section you are about to weld in. This in turn means that if you attempt to fill the gap with weld you may get a nasty, slaggy weld ridge inside you pipe, even if you do get it to look presentable on the outside. I have opened up a few old pipes (my own as well) What I have found has led me to use the section I have removed as pattern to cut a new section that fits snugly in the hole.

If you decide that this is a bit fussy for your needs, then use the piece that came out.

**** You may find it hard to avoid dropping the piece into the pipe through the hole and having to fish around for it. You can get round this by puting two strips of masking tape across the piece, sticking it where you want it to be then putting a couple of tack welds in the middle. You then peel of the scorched pieces of tape.**

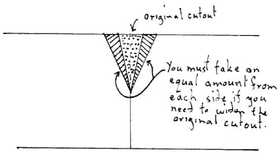
Small pieces of thin metal tend to warp so you will probably find you have to tack weld, working out from the centre and crossing from seam to seam, before you complete your welds.

You will generally find that a bit of tapping with a hammer and levering with a small screwdriver is necessary to get things to sit properly while you are tacking up.

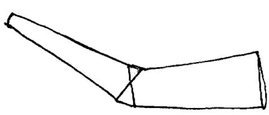
"STUFF UPS!".

The first thing of course is TTCO, but another thing is to try the pipe on the bike at every stage after you have tack welded a bend.

If you have haven't gone far enough with a bend, you can cut through the tacks and try to take a bit more out. This has to be done on both sides equally. It can be a bit fiddly or a real mess. Putting another bend in to bring it round further is sometimes a better option.



If you have gone too far, you can cut the tack welds and make up two pie sections - one for the outside and one for the inside of the bend - this looks quite tidy.



A little trick is to do cuts that stop about one sixteenth of and inch before the marks toward which you are cutting. You then have about an eighth of an inch of uncut metal on either side of the pipe. You can bolt the pipe on and bend it into position using the uncut metal as a hinge. You then make up pie sections to fit the gaps. This also makes the pipe easier to handle on your own because you are not struggling with separate pieces, and if you have got it wrong it makes it easier to measure up what size the new pieces need to be. Watch it with this "trick" though. The hinging action of the remaining piece of metal can be off centre. The result is that the edges do not butt together well when they meet.

If you do wind up having to put new eliptical pieces of metal in the holes, how do you measure up a piece to fit in the hole?

You don't - it's too much like hard work:

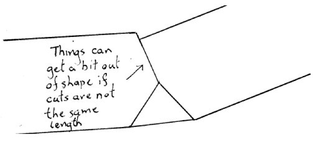
- **place a piece of clean paper over the hole.**
- **rub you workshop begrimed finger on the paper around the edge of the hole. You now have an eliptical outline.**
- **cut round the outline with scissors.**
- **place the cut-out on a piece of the sheet metal you are using.**
- **spray it with a black (or any other suitable colour) spray can and remove the paper pattern.**
- **cut round the outline that is left on the metal.**
- **bend the cut-out to fit the rounded shape of the pipe.**

You should get an almost perfect fit.

PROBLEM CUTS

If you work your way through the geometry of what happens if you take really big segments out to form your bends, you will find that distortions in the shape and section of the pipe begin to occur. This is another reason for making two bends using small segments, rather than rarking the pipe round in one sharp bend. Stick with smallish segments and you won't have to worry about this.

Try to make each arm of the "V" shaped cut the same length or they won't butt up well when you close them together.



Straight pieces of pipe are not too hard to get right, but making good bends in cones requires a little more thought because the walls are not parallel. The three cuts no longer make a symetrical "Y" shape. If they did, one arm of the "V" shaped segment would be longer and they would not butt together properly. The "V" shaped part of the"Y" tilts in the direction of the narrower end of the cone, so that its perpendicular bisector forms a right angle with the surface of the cone. I hope the diagram will make this clear! You can usually "eyeball" this about right if you are aware of the potential problem. If you are not good at eyeballing, set a square up on the surface to help you get lined up right.