Converter Surgery 101

By Ed Lee

Some basics to remember before you start cutting

When the first automatic transmissions were introduced in the late 1930s, the fluid coupling was routinely serviced as part of a transmission overhaul. The fluid coupling was bolted together and servicing it didn't require any more skills than a regular mechanic had. When the fluid coupling evolved into the torque converter, it was still a bolt-together unit and the only new challenge for the mechanic was to learn about stators.

Then everything changed. The torque converter became a sealed unit and even the best mechanics weren't equipped with the machining and welding skills necessary to rebuild these new units. It's not hard to see why in-house converter rebuilding facilities were so slow to develop.

Most of the early torque converter technicians were self-taught, and passed that knowledge along over the years. Being able to cut a converter apart in a manner that makes reassembly as easy as possible is one of the first skills new technicians learn. Industry veterans will tell you they relied on their senses when cutting a converter apart. A veteran cutter can tell you when the tool bit stops cutting the harder weld material and starts cutting the softer material of the cover or impeller by the feel of his hand on the cross feed. He can also tell you how deep to cut by looking at the weld. The veteran knows that the discoloration of the metal next to the weld is about as deep as the penetration of the weld, and that you will see oil when that line disappears (*see Figure 1*). Unfortunately, it takes years to develop these skills, and new technicians need to know what to do now. So here's a primer on some basic techniques.

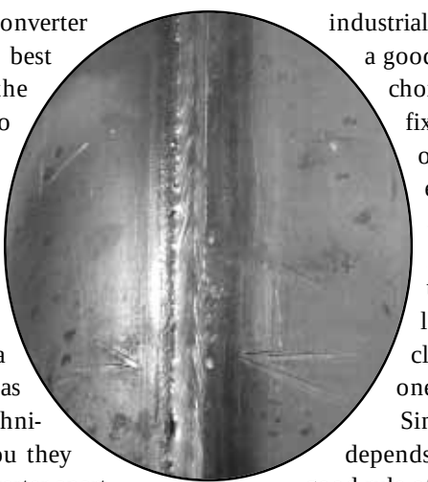

Figure 1

The tools

The fixturing for cutting a converter apart must be as rigid as possible. An industrial or military-grade lathe has the mass for a good solid base. A CNC lathe is also a good choice because of its mass. How rigid your fixturing is will not only dictate what grade of cutting bit to use, but also the life expectancy of your bits. The experts agree that a roughing grade of carbide is your best choice, and most agree that the tool bit should have a 0° relief and that less radius on the bit will result in less clean-up work. There is little else that anyone in the industry agrees on.

Since the grade of carbide that works best depends on how rigid your fixturing is, here's a good rule of thumb. Start with as hard a grade of carbide as your fixturing can handle with as little breakage as you can handle. Work down to as soft a grade of carbide as necessary for the longevity of your cutting bits. It would be a good idea to make friends with your tool supplier since the price of carbide is a factor! The shops that are cutting their converters apart on CNC lathes report they are cutting between 400 and 500 converters with a single side of an insert.

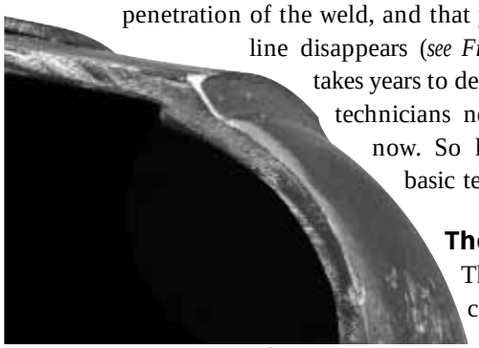

Figure 2

How to cut

Where to start your cut? How deep to cut? Which direction to cut? These are your next concerns.

With the possible exception of the BM25 converter, the mating parts of all

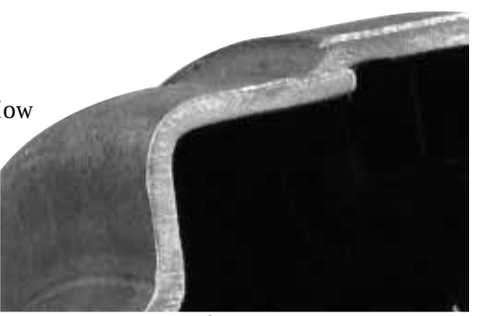

Figure 3

converters are joined by a single fillet weld and, with the exception of the ring gears or mounting rings, the largest diameter of a converter is usually the overlapping member of the fillet weld. Figure 2 illustrates a converter with a cover that overlaps and Figure 3 illustrates a converter with the impeller as the overlapping member.

The point where the overlapping member and the weld meet is where you start your cut, but before you start, you may want to remove any high points that might protrude above the weld. Carbide does not like interrupted cuts, and any high points will only widen as the tool bit is plunged into the weld, causing increased pinpoint resistance with each revolution.

After the high points have been removed, zero the cross feed dial and you are ready to start your cut. The depth of your cut is determined by the thickness of the overlapping member. Knowing this thickness is the secret to successfully parting a converter on the first try. Find your converter on the following chart (*see Figure 4*) and plunge in the corresponding thickness. Please note that where it says flush on the chart, that means flush with the cover. Touch your tool bit on the cover, zero the dial, back the tool bit away, and cut in until the dial returns to zero.

If your converter is running true, you will then move the cutter perpendicular to the plunge cut, moving away from the weld, until you see oil exiting the converter at the cutting tip. If your converter is not running true, you will want to add an additional .005" to .010" to your plunge cut before moving the cutter to the side.

Some additional hints:

- On some Subaru converters (SU15) you will have to remove the ring gear before cutting the converter apart.
- On the BM25 converter with 2 welds, cut at the weld closest to the pump.
- On late-model Hondas, do not clean off the entire weld. Leave a 45° angle of weld after the halves separate. Due to

CUT OPEN LIST

GENERAL MOTORS

TC	CUT
125	0.170"
440	0.130"
4L30-E	0.130"
4L80-E	0.200"
200LU	FLUSH
350CH	0.140"
350LU	FLUSH
400	0.190"
700LU	FLUSH
BPO	0.165"
JSFM	0.150"
JTFM	0.150"
JXFM	0.150"
JZFM	0.150"
POWERGLIDE	0.150"
NORTHSTAR	0.150"

FORD

TC	CUT
5R55N/S/W	0.165"
AODE	0.150"
A4LD	0.130"
ATX	0.125"
AXOD	0.200"
AXODE	0.180"
AXODE25	0.180"
AXODESHO	0.165"
AXODE25SHO	0.165"
C4 11"	0.100"
C4 12"	0.140"
C5	0.150"
C6 EARLY	0.100"
CD4E A	0.145"
CD4E C	0.175"
CD4E H	0.140"

CHRYSLER

TC	CUT
470LU	0.170"
604 24T	0.170"
604 11" 22T	0.170"
606	0.150"
727 / 727LU	0.170"
904 / 904LU	0.170"
TC6 / TC6LU	0.170"
TC8 / TC8LU	0.170"
CUMMINGS NL	0.210"
CUMMINGS LU	0.185"
W. GERMAN JEEP	0.110"

NISSAN / DATSUN

TC	CUT
DA6	0.125"
DA7	0.125"
DA8	0.100"
DA11	0.150"
DA13	0.125"
DA16 T.C.	0.210"
DA16 T.P.	0.110"
DA18	0.150"
DA24	0.190"
DA25	0.150"
DA30	0.155"
DA34	0.120"
DA37	0.150"
DA38	0.110"
DA39	0.150"
DA44	0.160"
DA50	0.195"
DA53	0.190"
DA55	0.150"

TOYOTA

TC	CUT
TO18	0.150"
TO19	0.110"
TO21	0.125"
TO28	0.180"
TO39	0.150"
TO42	0.140"
TO51	0.150"
TO64	0.150"
TO67	0.210"
TO74	0.160"

MITSUBISHI

TC	CUT"
CT10 TP	0.110"
CT11	0.110"
CT12	0.160"
CT12-1	0.150"
CT13	0.130"
CT15	0.135"
CT15-1 / CT15-2	0.140"
CT20	0.140"
CT27	0.170"
CT27-9	0.170"
CT29	0.140"

HONDA, BMW, JAG, MERCEDES, VW

TC	CUT"
HO1	0.115"
HO7	0.115"
HO12	0.115"
HO14	0.210"
HO16	0.115"
HO17	0.115"
HO18	0.115"
HO21	0.115"
BM11	0.125"
BM17	0.125"
BM25	0.181"
MC6	FLUSH
MC10	FLUSH
MC18	0.160"
MC19	0.160"
JAG E.	0.131"
VW4	0.100"
RE8	0.190"
RE9	FLUSH
RE10	FLUSH
SU11	0.110"
SU12	0.120"
SU13	0.120"
SU16	0.125"
SU18	0.125"
SA4	0.075"
SA6	0.100"
SA7	0.100"

Figure 4

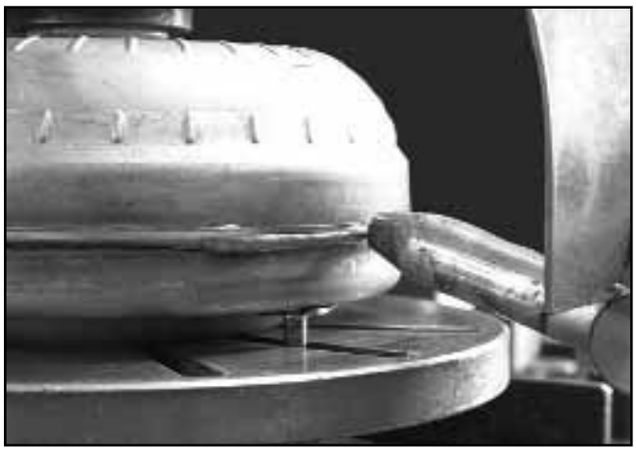

Figure 5:
The CNC lathe creates parallel surfaces for your converter.

the close proximity of the ring gear to the weld, it is difficult to get a good angle on the welder head when you are welding the converter back together. The remaining 45° angle will leave a nice area for a bead of weld.

Machining

When you're parting a torque converter, a CNC lathe is the Cadillac of parting devices. With a CNC lathe, you can cut 50 or more converters apart in an hour and virtually eliminate the follow-up machine work – bowl build-ups, installation of renewal rings, and general clean-up – that is necessary with any other conventional method for parting the same converters. One of the factors that allows extra machine work to be eliminated is the small amount of material that is removed when the converter is cut. The bit of the parting tool on a CNC lathe is a .087" wide carbide parting bit held by a boring bar.

This bit only removes a .087" wide band of material and leaves two perfectly parallel surfaces. Working with parallel surfaces makes it easier to reassemble the converter and ensures that the halves run true. The life span of the cutting bit is remarkable, considering its narrow width. Operators are cutting 400 to 500 converters with a single side of an insert. They claim they break more bits setting up programs than they do cutting converters.

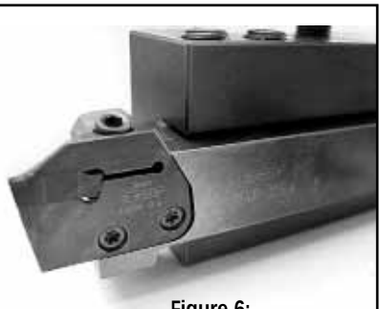

Figure 6:
The carbide parting tool is only 0.087" wide at the bit.

There are two factors that keep shops from parting their converters on a CNC lathe: fear of the unknown and the start-up cost.

The fear factor comes from a general reluctance to join the computer world, and is multiplied by the fear of a computer-run piece of machinery. This fear doesn't have much foundation. The start-up program on a CNC lathe can be set up in less than an hour, and once it is set up, additional converters can be added to the program in less than 15 minutes. For each new converter, only the dimensions for the diameter and depth of the cut need to be changed.

As for the start-up cost, a CNC lathe will cost more than most older shop owners paid for their first homes. Luckily, the machinery will pay for itself within six months to a year. The CNC lathe will continue to pay back, not only in increased production, but also in reduced tool costs and labor savings. Removing the human factor from the parting procedure is where the labor savings is most noticeable.

The run cycle time on a CNC lathe starts when the operator presses the start button and ends when the cut has been completed and the tool has returned to the at-rest position. Run cycle times usually average between 19 to 30 seconds, but do go as high as 45 to 50 seconds on large diameter converters like Allisons and 4L80-Es.

Parting converters on a CNC lathe isn't for everyone. However, if you would like to cut your converters more quickly, be more precise in your cutting, or would just like parallel surfaces to work with, you may want to consider looking into this method.

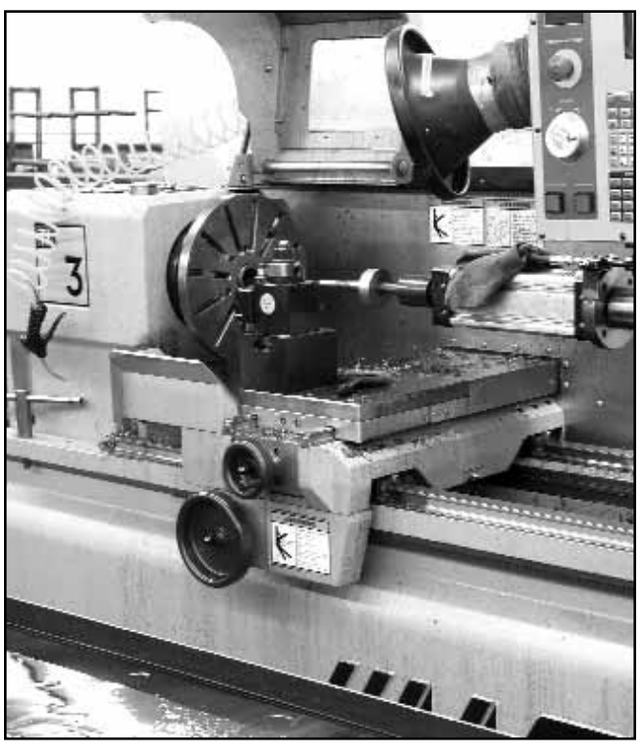

Figure 7:
THE CADILLAC – A CNC lathe is the best way to cut converters, but many builders are reluctant to invest the money.