FOURWHEELING ACADEMY

ClampTite™

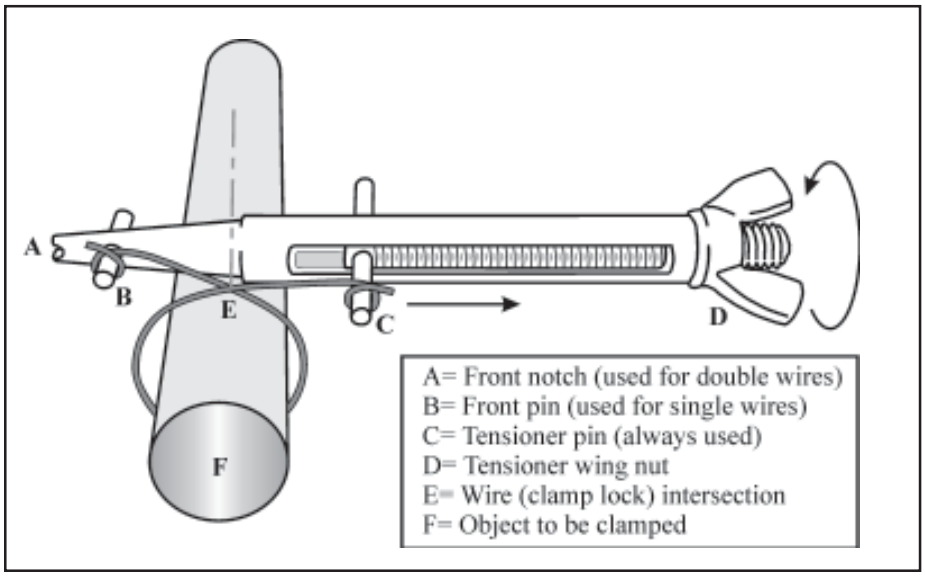

Figure 1 *The ClampTite™ tool ready to create a very effective clamp.*

Photos and text by Harry Lewellyn

At about the size of a kindergartener's pencil, it should be in everyone's toolbox. It may be just what it takes to getchaback! Figure anything you can do with a hose clamp, you can do better with the ClampTite™ tool. My tests proved that it exceeds conventional hose clamps for tightness and holding power.

HOW IT WORKS

The concept is simple: ClampTite™ gives you a way to tighten wire wrapped around anything, then securely lock the "clamp" in place. Figure 1 details the tool ready to tighten. A basic single wire, single wrap is shown; however, the wire-to-tool attachment method at B and C has been simplified for sake of illustration.

Once the wire (E) is wrapped around the object to be clamped (F) and attached to the tool at B and C, the tensioner wing nut (D) takes over. Can you see that as you tighten (turn clockwise) D, it spreads B and C farther and farther apart? When you've reached the desired tension, you give the entire tool a counterclockwise baton-like twirl (direction varies depending on which wire crosses over which) about the centerline locking the clamp tightly in place. To make stronger clamps, the tool is designed to work equally well for multiple wraps of both single and double wires (see below). You just think you don't need a ClampTite™ until you break an air conditioning hose, flexible brake line or power steering hose as I did.

WAR STORY

This was six years prior to ClampTite™ being issued a U. S. patent in 1992. My two-year-old Cherokee's power steering hose gave up way out in the boonies. Now powered by arm strong, I struggled to get back to our high Sierra fishing camp. Since the power steering pump relief valve opens at 1,540 PSI, I knew my creativity would be challenged. This valve cuts in, and is the noise you hear, when you make a full locked turn or a wheel is jammed against an obstacle.

Over the next few days, I tried various conventional clamps. One passerby traded his "super" clamps for my lesser-quality ones. Every conventional clamp, including his, broke under this very high-pressure strain. And despite my having the perfect barbed brass splice, nothing held!

Knowing I could most likely concentrate and increase the unit force on the hose with wire, I proceeded to wrap and wrap. I discovered the wire held, but like a reverse Chinese finger trap, the pressure enlarged the hose's inside diameter and would slowly creep off the barbed splice. There is more on that below.

The final cure came by laying several (axial) wires over the splice and hose, then wrapping all tightly. Once wrapped, this allowed me to bend the axial wires back and lock the ends together thus preventing axial spread (see Figure 2). Maybe ClampTite™ would have held without the axial wires?

And of course by now, I was out of power steering fluid, so I used motor oil. That worked fine until I got home and replaced it and the hose. The pump and steering box continued to serve flawlessly for another 80K miles.

TEST OBJECTIVE

Considering the above, I designed a test that would stress a clamp's axial holding force. For all practical (automotive) purposes, the power steering, air conditioning and flexible brake hoses are the only applications that would take full advantage of this. However, I felt this type of test would severly tax ClampTite™ and other clamps. Also, the materials and methods are all automotive, but again, the objective was to investigate the holding strength of various clamps, not exactly simulate automotive conditions, parts and failure modes.

Referring to Figure 3, I used PVC fittings and clear hose so I could see what was going on inside. The left end of the hose (A) was "plugged" as shown. A similar plug was fitted on the right (B) with a tire valve stem. With this, and my compressor and pressure regulator, I could slowly increase hose pressure. The test was quite an eye-opener!

TEST FIXTURE

The PVC-to-plastic-hose fit was slightly loose as desired. This ensured the clamp would have to work pretty hard to prevent axial slippage.

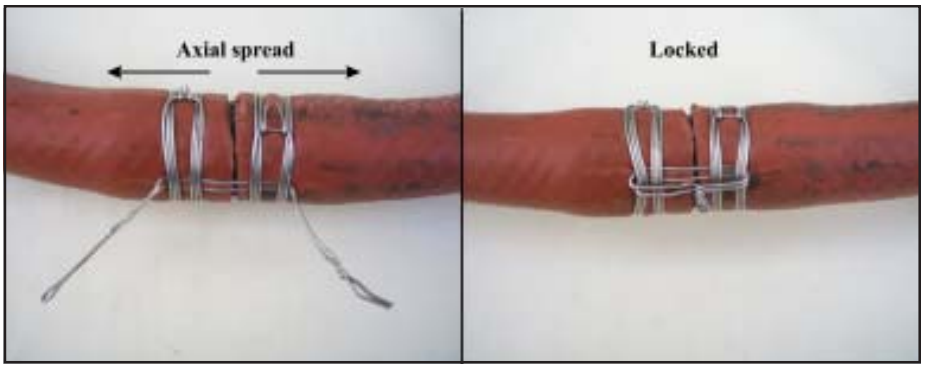

Figure 2 *This technique prevents axial spread in high pressure hose splices.*

Figure 3 *The test setup, at full pressure, on the ClampTite clamp.*

Figure 4 *Barbed hose fittings — the only way to go!*

SAFETY CONSIDERATION

So why water and not just air? The answer has primarily to do with safety. Compressed air stores energy and makes for potentially destructive explosions depending on volume and pressure. Fluids (water) do not compress and therefore store no energy. The less air in the system, the less explosive force (destruction) there would be when a clamp failed. Further, I could color the water and investigate for the reverse Chinese finger trap effect, if that was in fact happening.

You're not going to do this in a real application, but to further ensure slippage, end A's PVC outside diameter (OD) and the plastic hose's internal diameter (ID) were greased. End B's PVC was barbed with a file to prevent slippage. A conventional clamp was used at this end so I could easily remove and fill the test hose with colored water and make other adjustments. For reference, several barbed fittings are shown in Figure 4. Barbed fittings are the only thing to carry. The extreme left and right splices are worthwhile spares for your parts box. Since I do not carry spare radiator and heater hoses for all 4X that go on my trips, a variety of these little gadgets has bailed me out a couple of times.

The test setup was held vertically in place with my "clamp bench." This kept the valve stem and core out of the water.

TEST METHOD

Various clamps were used at end A and the pressure increased until the plug started to slip out of the plastic hose. All "worm" clamps were tightened to the point where I felt they were ready to break. The strap usually fails at the worm or the worm pops out at the worm holder. I could see distortion that warned failure was near. You can't go any tighter than that. That seemed fair.

TEST RESULTS

All conventional clamps failed to hold the hose axially. The plug would start to slip out at around 30 to 35 PSI. My nerves gave out before the double wire, double wrap

Figure 5 *Clamp indentation is a sign of holding force.*

ClampTite™ clamp showed any signs of slipping. As pictured in Figure 3, this clamp held until the gauge maxed out at 60 PSI (shown).

SURPRISE RESULTS

Notice the water level beneath the bench table on the right. Knowing fluids do not compress, and since I started with the hose completely full of water, what explains the air on this side?

The plastic hose changed far more than I would have ever guessed. It went from oval to perfectly round and it stretched in diameter. These changes made for a larger internal volume and hence, the water level change.

TEST OBSERVATIONS

Compare the depth of each clamp's indentation (X vs. Y in Figure 5). The conventional clamp has a larger surface area over which to spread the tightening force and does not deform the hose as much as ClampTite's wires. The wires concentrate the force over less surface area and I suspect clamp tighter. I had no way to measure this. I can only guess that ClampTite™ forced the grease away for the hose-PVC-interface and allowed the plug to hold. The conventional clamp must have left enough grease in this area to permit slippage.

Also notice how the hose at X has increased in diameter enough to allow water to separate (slip in between) the hose and PVC. This is the reverse Chinese finger trap action that I suspected. In essence, this action is enlarging the ID and trying to force the plug out of the hose from the inside. That's a slick way to escape the finger trap, but lousy thing to have happen when you're trying to fix a high-pressure hose.

As an aside, the ClampTite™ manufacturer reports that one 6,300-PSI test caused hose failure before the ClampTite™ clamp gave out. I'm impressed!

USE DETAILS

As already mentioned, ClampTite™ can make a single or double wire clamp. Figure 6 A shows a single wire, wrapped two times, and twisted to lock. Figure 6 B shows the clipped lock. A double wire, two-wrap clamp is illustrated in C, prior to flip and lock. Note the locking action in this case is a "rear over front" flip of the tool. The inset is a closer look at the notch. B and D show it doesn't take much to securely lock either one or two wire, multiple wrap clamps.

The manufacturer's one-page instructions show how to make single or double wire, single or multiple wrap clamps, and lock them. I won't go into that.

FALLOUT

In the process of making so many connections, I decided to leave one barbed splice on my getchaback box spare heater hose. There is about a 100% chance that

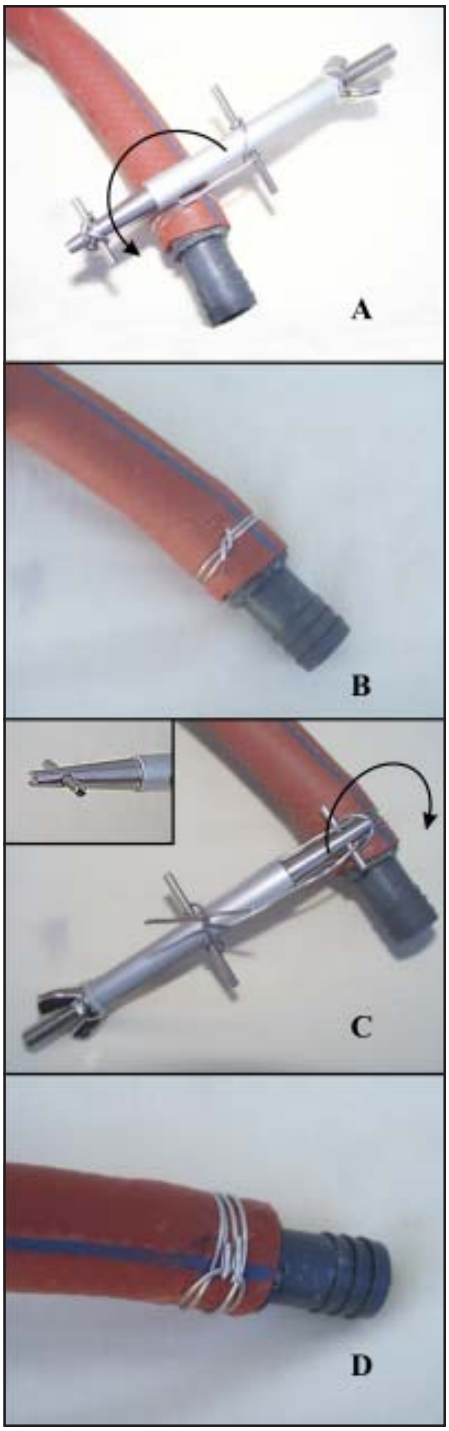

Figure 6 *Various ClampTite methods.*

will be required when used in the field, so why not start with it attached? Consider the same for your spare hoses.

DOWNSIDE

The drawbacks are few. Understanding you have to either flip or twist the tool to lock the wire, some engine

compartment applications may be space limited. However, I suspect swapping a flip lock for a twist lock, or vice-versa, may overcome this potential limitation.

The other one has to do with clamp longevity. The wire can be tightened to the point of cutting into the hose. This can be overcome two ways. Obviously, don't over tighten the clamp and, replace it when you get back to civilization. Given enough time, even a moderately over tightened clamp could eventually cut into the hose and fail.

APPLICATIONS

Let your imagination run wild. All kinds of hose fixes are obvious. ClampTite™ can also be used to repair a broken broom or shovel handle, innumerable camping items and many things around the house. I can also picture using it as a temporary gluing clamp.

Ever tried to splice a 2-0 cable in the field without a giant crimp tool or soldering iron? Here's a ClampTite™ application that should make short work of a broken starter cable. Shove the strands together and clamp it in several spots. This acts like a giant wire crimp splice as shown in Figure 7. It ain't pretty, but functions perfectly. And rather than spend half a roll of tape insulating it, temporarily slide a piece of hose over the wire before splicing, then tape at both ends.

Figure 7 *A ClampTite wire splice.*

Haig, of Haig's Automotive (see page 33 of the Bonus newsletter) offers another idea. Between flattened soda cans, and copious imagination and wire you can probably fix mufflers and exhaust system problems of all sorts. It's almost like having an on-board welder.

Regarding wire for the ClampTite™, there is no magic. Any wire will do, even clothes hangers, but consider stainless steel for permanent applications. I suspect however, if the wire is too much larger that the front notch, it may spread or break it. Large wire would stress the very tips of the notch.

CONCLUSION

ClampTite™ works as advertised and I suspect with time, I'll discover more applications. It comes in three varieties: plated, stainless steel and large. I will offer the stainless steel unit for sale for the next 60 days. Here's where you can spend some of that Christmas money you've been wondering what to do with. See page 10 to order.