Shop Practice X4
Resistance Soldering

Resistance Soldering is the use of a high current, low voltage electrical current usually through a carbon electrode to create heat in the part itself.

The advantage of soldering this way is that the heat is generated in the parts being soldered and not in the surrounding area. A lot of this type of soldering is used to make very fine connections like adding the details on the popular HO scale brass locomotives. The tiny wires and fittings are mounted to a large surface that would be impossible to heat precisely by any general method. Anyone who has had the occasion to try and add a little part to a big assembly will remember having other things start to come loose or burn up.

Before I go further let's define what I mean when I use the word solder. Soldering is a non fusion process, that is the base material is not melted and the solder, typically a lead tin low temperature alloy adheres to the surfaces like a glue. It just sticks things together well but the base metal does not alloy with the solder. The other criteria of soldering is the temperature is less than 840 degrees fahrenheit. There are many solder alloys for many different purposes. Higher temperature solders give higher strengths and typically are much more exotic alloys containing silver and even gold. I am limiting this to ferris and copper based metals. Certain aluminums can be soldered with special solders and fluxes but I have no experience with them.

As a note: Brazing is a process in which the base material is melted at the filler boundaries and a fusing of material is accomplished. So the terms Silver braze and Silver solder are distinct and different. The division occurs at 840 degrees f. If you overheat "solder" then the tin and lead can alloy with the base metal, but it also creates a metal boil off condition which just damages the surfaces and does not create a good bond. This can be a problem for brazing as solder pollution on a

part can dissolve or erode the surface. I have had a brazed part be destroyed by having been set on top of a un-noticed bit of soft solder. A pit formed in the bottom of the brass part as the heat was applied. But I digress. Carbon rod soldering (as it is sometimes called) can be used for very fine parts and also for very large parts. This depends on the power source. Heavy electrical cables can be successfully soldered with minimal damage to the insulation.

I have had several power units as the industrial popularity of this method of joining has diminished and the units were surplused. My favorite unit is actually something I put together using a 50 ampere transformer at 3 volts output. It was intended as a heater supply for a radio transmitter tube.

In my examples I show a copper tube being soldered in a finished area. The parts had to be soldered in place using Cemtron 430 soft silver 429 degree F solder, and "C" flux by Rectorseal. The pipe is captured and the area is in the bottom of a 4" deep bunker. So the joint was made in position, with no damage to the surrounding paintwork. Under the steam line is a piece of asbestos material to shield the paint both from heat and flux splatter. The bright light is from the carbon electrode.

Another advantage is that without an open flame fluxes are not as easily ignited and oxides are not as easily formed. It is more like using a large soldering iron. With a foot pedal control, the electrode can be used as an aid to positioning with power applied and turned off while still holding the part in place. This is a typical method for attaching tiny parts.

Consider the need to solder a part in the wooden cab of a finished locomotive. How would you do that?

The small system pictured has two electrode units and they are both two conductors. But the system functions as well with single electrode tools. The ugly box is my big unit and the other shot of soldering was sealing a threaded plug into a tank box.

Perhaps you will never have the need for this sort of soldering method but now you at least know it's a solution that's out there waiting to solve a problem.

RESISTANCE SOLDERING UNIT

1.5 VAC
51A

ON

INTERNAL FUS...

O-120 VAC