

Principles of Tack Welding and the New Granulation Method in Platinum

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INTRODUCTION

The employment of the tack welder in the jewelry industry has exploded in the past five to 10 years. One thing that has made the tack welder more accessible to the bench jeweler is the great increase in the flow of information about new technology and their applications. This information is being disseminated through large numbers of trade journal articles, seminars, books, videos and an unprecedented general openness on the part of the jewelry industry at large to share what they know for the benefit of others and the industry as a whole. Much of the demand for this technology has been driven by the economic necessity of being able to perform the tasks of assembling jewelry components more quickly and efficiently. In days gone by, the worth of a hand craftsman was limited by the amount of work his hands were manually able to perform in a given period, and the proficiency of his work. Only long years of experience and practice allowed craftsman to increase their economic value. The tack welder has been one item of technology that has allowed the bench craftsman to increase his speed and proficiency in a fraction of the time it once took a large part of a career to attain.

TWO OF THE MOST TEDIOUS AND FRUSTRATING ASPECTS OF JEWELRY ASSEMBLY ARE:

1. Holding components in place for soldering.

2. The manipulation and placement of solder beads and chips in preparation for torch work.

THE TACK WELDER USED IN THIS PRESENTATION IS THE ABI TACK II. SOME OF THE REASONS THIS MODEL WAS CHOSEN ARE AS FOLLOWS:

1. A compact design makes it an easy fit for the jeweler's bench top.
2. The lead attachment system provides for an infinite number of different tools to be created and employed, accommodating the unique applications of the individual jeweler.
3. A two capacitor system provides a wide range of current levels needed for repair and fabrication.
4. Both tack and fusion welding applications can be accomplished with the Tack II.
5. The voltage meter provides for pinpoint setting of voltage.

THE TACK WELDER ENABLES THE USER TO ACCOMPLISH MANY THINGS:

1. Temporarily fixture jewelry components in place prior to soldering.
2. Examine from all angles the alignment of a piece prior to committing to a permanent soldering.
3. Reposition a component by quickly and easily pulling pieces apart and re-tacking until perfect alignment is achieved. This is especially helpful when working with platinum.

4. Eliminate the need for jigs, soldering investment, and other traditional holding devices typically used in soldering operations. Many traditional methods threaten contamination to platinum during torch work.
5. Tack multiple parts in place. This not only makes the placement of solder and components much more efficient, but also decreases the number of times a piece must be subjected to the torch.
6. Manipulate and tack solder beads and chips in place with the use of the Vac-Tool, a tack welder accessory. With this tool an infinite number of solder pieces can be fixed in preparation for one torch operation.
7. Quickly and profitably perform granulation with the use of the Vac-tool.

Often jewelers who take up the tack welder after many years at the bench, wonder how they ever made or repaired jewelry without it. As this technology equips the jeweler to improve his work quality, and move through his or her tasks more quickly, his profitability is automatically increased.

One of the benefits most appreciated about the tack welder is how it greatly decreases the stress and frustration level associated with tedious fixturing and soldering operations. This greatly heightens the enjoyment of bench work. Once the basic operating principles of the tack welder are in hand, the jeweler begins to see the innumerable applications possible. They are also saddened to remember all the time spent struggling in the past with projects that could have easily been accomplished with the aid of the tack welder.

WHAT IS A TACK WELD AND WHY IS IT PARTICULARLY USEFUL FOR THE PLATINUMSMITH?

A tack weld is a temporary working weld of medium to low holding power caused by electrical resistance created at the point of contact between two parts being assembled.

Tack welding is very beneficial in platinum work. The potential for contamination from tweezers or other holding devices is very great due to the high heat used in soldering or welding platinum. Once platinum parts are soldered or welded together, it is often very difficult to separate them without damaging the workpiece. This step allows you to check the alignment of parts from all angles prior to committing to a permanent soldering. If parts are misaligned, they can easily be pulled apart and re-tacked until perfection is achieved.

BASIC OPERATING PRINCIPLE OF TACK WELDING

Tack and fusion welds work on the same principle as a fuse or older model circuit breaker. In the circuit with a fuse, the energy travels through a large channel of conductive material, then through a smaller channel, and back to a second large channel (Photo 1a).

When the amount of current traveling through the circuit is more than the small channel can carry, that channel overheats and melts causing a break in the circuit (Photo 1b). The melt always takes place at the point of greatest resistance, typically meaning the smallest diameter channel the current passes through. In the case of a tack or fusion weld, the pressure we apply between the two pieces we are joining when the melt

occurs causes the two molten areas to flow together and solidify instantaneously (Photo 1c).

The amount of resistance can be regulated by energy and voltage settings and the amount of surface contact between the pieces involved. Too much resistance and damage to the piece may occur. Too little resistance and the weld will have insufficient holding power. Pieces with large amounts of surface contact to each other will have a much lower level of resistance than a piece making a small amount of surface contact when using the same level of current (Photos 2a and 2b).

Current levels have to be adjusted according to the amount of surface contact.

WHAT IS A CAPACITOR SYSTEM?

A capacitor is similar to a battery in that it stores energy and holds it until discharge. How does a capacitor system work to create a tack weld? The Tack II machine stores the amount of energy and voltage you direct when you adjust the energy and voltage settings. A circuit is created by making contact between two components you're holding with the tools attached to the machine, one to the positive, one to the negative. To discharge power to the circuit, simply depress the pedal. The

Photo 1abc

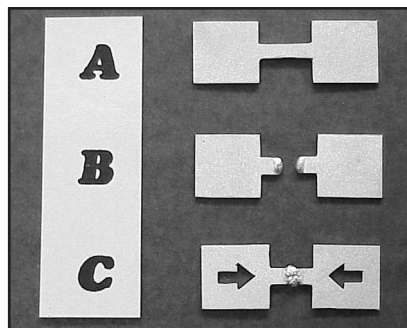


Photo 2a



Photo 2b



tack weld will take place at the point of greater resistance.

The strength of the weld depends on how much melt occurs at the time of discharge.

THE AMOUNT OF MELT CAN BE VARIED BY:

1. The energy and voltage settings.
2. The amount of surface contact between two pieces.
3. The make up of alloys involved. Alloys which are very conductive such as silver need special consideration.

When there is too much current running through points of contact, a damaging arc will often occur. When a damaging arc occurs, carefully examine your work to see if the arc took place between the two work pieces, or between the work piece and the holding tool.

IF THE PROBLEM IS BETWEEN THE WORK AND THE TOOL:

1. You may need to adjust the way you are holding the pieces to

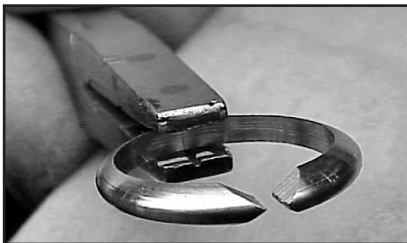
make sure you have more surface contact between the tool and the pieces than between the two work pieces. An example of this would be when sharp edges of pliers are contacting the inside of a shank.

Photo 3a



This may cause a damaging arc. Holding the shank with the flat surfaces of the pliers making contact with the flat sides of the shank is the best way to ensure the pieces tack to each other not to the tool.

Photo 3b



IF THE PROBLEM IS BETWEEN THE TWO WORK PIECES, YOU MAY HAVE:

1. Voltage and energy levels too high.
2. Improper surface contact between the two pieces.

TESTING PIECES UNFAMILIAR

Before attempting to tack pieces the operator may be unfamiliar with,

always test energy and voltage settings on scrap material of like alloy and dimension. When acceptable results are achieved, record the specifics of the application for future use. Notes should include basic dimensions, alloy of metal, amount of surface contact between the two pieces, and voltage and energy settings.

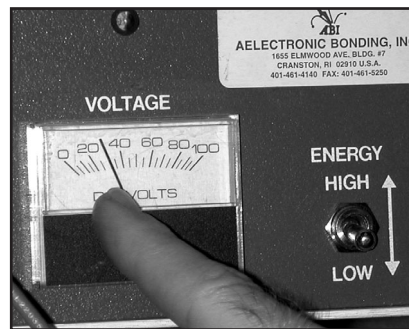
RESISTING TEMPTATION

If you have trouble joining pieces that previously have worked well at a particular setting, resist the temptation to increase current levels. A weld will eventually take place, often causing damage to the work because of excess current levels. Cleaning and lightly filing pieces at the points of contact will usually remove any material that may inhibit a weld of acceptable quality from taking place at a current level known to be appropriate.

THE WELD WINDOW

Each different application usually has a different voltage and energy setting.

Photo 4



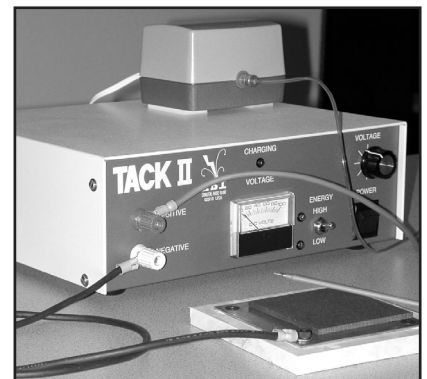
The optimum setting for a piece falls within what we will call a Weld Window. A certain voltage and energy setting may be too low to make a tack weld of sufficient strength. In that case, it falls below the weld window for that particular piece. As you

increase voltage and sometimes energy, you enter into the weld window when a light tack occurs. As you continue increases moving through the weld window, the strength of the weld increases. You know you have exited the weld window when with proper surface contact, damage between the two pieces occurs.

TOOL PREPARATION AND USE

Stock tools and attachments for tack welders are created for the ease of holding pieces in place for tack and fusion in the most efficient manner possible. Jewelers are encouraged to make modifications which will best accommodate personal applications and styles of operation. The Tack II's convenient lead attachment system allows for an infinite number of possibilities for making different tools for different applications simply by attaching a proper lead.

Photo 5

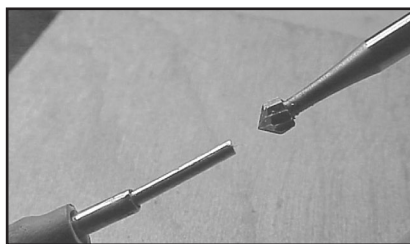


Make sure to hold parts of workpieces together firmly before discharging current. Pieces held loosely together are likely to cause damage to the work, much like a loose wire in an electrical outlet can short circuit. Apply your fingers to the work in a steady and comfortable manner

to achieve desired results. One thing to keep in mind, the tools purpose is to make an electrical connection between the work pieces and the machine in the most efficient manner possible not to keep the operator from being shocked. If we could wire our fingers to carry electrical current we could simply hold pieces with our fingers to tack parts together.

It is important when contemplating tool designs or modifications that you want to make sure and have more surface contact between the tool and the work piece than the pieces to be tacked together. This will help insure that the desired results will be achieved. To do otherwise may cause the work piece to tack to the tool. One example of this would be the Vac-tool. It is important when handling beads using this tool to concave the end of the tip with a setting burr so the bead will be hugged by the tip insuring more contact on the tool side than the work side of the bead.

Photo 6



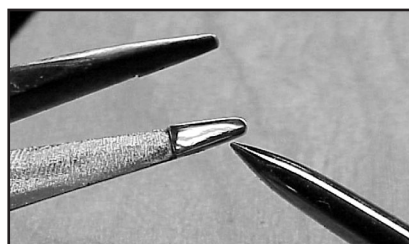
Another helpful tip is to cut shallow grooves of various angles in the face of pliers and tweezers.

Photo 7



This allows you to hold wire pieces more securely, and also facilitates better contact between wire and the pliers. Despite our best efforts there are times when you will have some sticking between your tool and your work piece, thereby leaving a spot of tool material on your work piece. As we know, this can contaminate platinum pieces. To alleviate this problem we line our tools for working in platinum with platinum.

Photo 8



This procedure will eliminate the danger of contamination. Reserve these tools for platinum work only.

EXCESS ENERGY DISCHARGE

Because a tack welder has a capacitor system, it can store an electrical charge for hours even with the machine in the off position. It is essential when you want to go from one voltage and energy level to a lower voltage and energy level, that excess current be discharged from the system to eliminate the chance of damaging your piece due to excessive power levels not indicated by the volt meter. To discharge excess voltage and energy from the system, turn off the machine, turn the voltage selection knob all the way down, and the energy selection switch to low, Turn the power back on. Holding your positive and negative tools firmly together, depress the pedal once. This will discharge all current in the capacitor. (Failure to follow this procedure when making major decreases

in current levels will result in imminent damage to your work.) Now you are free to set voltage and energy levels knowing that you have no current stored beyond that indicated by the energy setting and voltage meter and energy settings.

An illustration of this principle would be when tacking a large head in place at 40 volts on high energy, and then moving to tack a solder bead in place at the base of the head in preparation for soldering. The maximum current level a solder bead should be tacked at is 30 volts on low energy. If you did not lower the levels after tacking the head through the discharge process, damage would likely occur.

GRANULATION IN PLATINUM OR PLATINUM AND GOLD

An exciting new technique for performing granulation has been discovered. The age old method of granulation by tediously cementing each bead in place then firing at precarious temperatures can now be a headache of the past.

Beads of platinum to platinum jewelry, platinum to gold and vice versa can be permanently fused into place with a tack welder and a Vac-tool attachment. Granulation beads are held to the tip of the Vac-tool by suction. The bead can easily be manipulated into place on the piece to be granulated. Holding the bead to the work piece with moderately firm pressure, press the pedal with a setting of 40 to 50 volts on high energy depress the pedal.

Photo 9

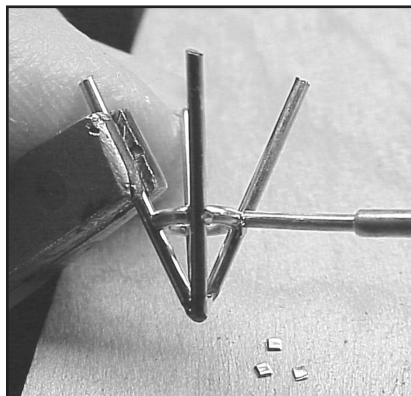


To pave a piece with granulation the above process need only be repeated as quickly as accuracy allows. The key is to adjust the voltage level to the proper level for a permanent bond. Too low a voltage level and the bond will not be permanent. Too high a voltage level and damage to the work piece may occur.

SOLDER PLACEMENT

The ability to tack solder in place during platinum work is especially helpful due to the blowing force of a typical platinum soldering flame. The process of tacking solder is much the same as granulation, but with much lower voltage and energy settings. Beads or chips of solder can be placed.

Photo 10



Bead solder being the easier of the two to manipulate. Tacking chip solder is more tedious because chips are somewhat more difficult to pick up with the Vac-Tool. Irregularities in shape create contact points which can vary between

a flat surface to a flat surface, to very sharp edges to a flat surface. Carefully observing how solder is making contact before discharge is very important. 25 to 30 volts on low energy is the maximum for tacking solder.

CONCLUSION

The tack welder is a tool of necessity for today's bench jeweler to remain competitive. Speed and quality are greatly enhanced with the aid of the tack welder. Once the general principles of tack welding are in hand, it is likely that the jeweler will be unwilling to work without it.

PICTURE INDEX

Photo #1abc

Circuit breaker effect. (Three white metal pieces)

Photo #2a

Head on top of shank.

Photo #2b

Head on side of shank.

Photo #3a

Holding ring shank with pliers on the inside of shank. Pliers perpendicular to ring shank.

Photo #3b

Pliers holding shank flat. Pliers parallel to shank.

Photo #4

Voltage Meter

Photo #5

Tack II with various tools.

Photo #6

White metal tube and setting burr.

Photo #7

Pliers with grooves in jaw.

Photo #8

Tweezers with Platinum tips.

Photo #9

Granulation in platinum.

Photo #10

Solder chip tacked to four prong head.