

ANNEALING (SOFTENING) ALUMINIUM PLATE

Intro

A student brought some Aluminium plate to me recently that he wanted to use to make a scaled up Zippo™ lighter. Judging by sharpness of the edges and it's resistance to being bent I guessed it was a machining grade, something like T6, however he wasn't able to clarify this.

It was clear that in order to achieve what he was attempting the material would need to be annealed.

What is Annealing?

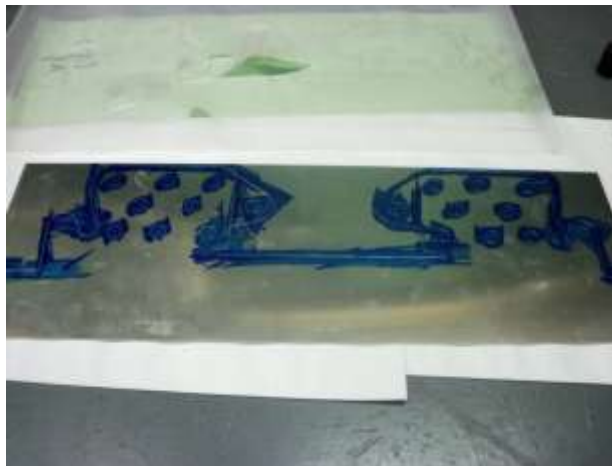
There is much written technically about annealing (which I won't repeat here) however, in this case it involves heating the Aluminium close to it's melting point and then letting it cool slowly. The heating process 'relaxes' the crystalline structure of the material making it more malleable (bendy).

In certain circumstances, if the material is to be used structurally, I would recommend paying for pre-annealed material.

My advice to anyone who needs to anneal Aluminium as part of a more complicated process is to complete as many of the machining processes as possible while the material is still hard.

You've brought a hard machining grade so therefore use its' properties. Annealed soft Aluminium is difficult to machine and by this I mean; drill, mill, turn, cut etc.

- It is more likely to fold-up whilst being held in the vice.
- Twist drills tend to pull themselves into annealed material as it has little resistance to being cut. This can result in the work being ripped out of the vice, the drill snapping or the drill chuck being pulled out of the drill.
- Also, soft annealed Aluminium has a tendency to clog the teeth of cutting tools as it no longer 'chips'.



Above: The drawing was transferred to the sheet of Aluminium by placing it on top of the sheet and piercing through with a 'scriber' in critical places which were then joined up. Permanent blue marker is used as 'engine blue' to highlight the 'scribed' lines which will be used to cut to.



The sheet was worked 'hard' before annealing. Here the profile is being cut with a metal cutting blade in a jig saw. If necessary, an excellent cutting oil for Aluminium is WD40 or a similar light spray oil.

The cut lines are kept close to the bench to provide as much support as possible.

The wooden blocks prevent damage to the sheet.



The Annealing Process

Above you can see the areas which are to be bent are marked with permanent marker. The trick with annealing Aluminium is NOT to melt the metal. The temperature for annealing is so close to its' melt point that it's easy done.

If you look closely you can see that in some areas the permanent blue marker are beginning to fade due to the heat burning the marker away. Coincidentally, when all of the permanent marker has been burned off, you have reached to correct temperature for annealing this material. Other systems metal workers use as an indicator for annealing Aluminium; to cover the joints with bar soap and burn the soap to brown or applying a smokey carbon surface to the metal with a candle flame or oxy torch and burning all the carbon away.

When you have reached the correct temperature and burned the permanent marker away, let the metal cool slowly. If the Aluminium is quenched the metal will not necessarily regain its' strength, but it will become brittle.



The soft annealed Aluminium is beaten over various diameter pipes with a soft mallet. You can see that welding clamps were also used for tight short bends.



The sheet work is now nearing completion and the zippo top is taking shape.

Source: <http://process.arts.ac.uk/content/annealing-softening-aluminium-plate>