

Rust Removal by Electrolysis

(Note: This article was taken from the online Ford Muscle Forums at - <http://www.fordmuscleforums.com>)

Got a battery charger, a bucket, and some washing soda? If so you're equipped to bring rusty parts back to life.



What you need:

- A non-conducting container - a large plastic bucket works really well.
- Battery charger - big is better, however even one able to produce 6 to 10 amps should do.
- Sacrificial electrodes. Concrete reinforcing rod (rebar) works well. Note: Do not use stainless steel! The results are a health hazard and illegal. (Contains Hexavalent Chromate).
- Arm and Hammer LAUNDRY soda, also called washing soda.
- Wire and/or cables for connecting electrodes together.
- Water
- Small lengths of small chain or some other means to suspend the part to clean into the solution.

Washing soda is in the laundry section of your grocery store. It's made by Arm & Hammer and is NOT to be confused with baking soda or Borax, they are different chemical compounds.

Using a plastic, or non-conductive bucket (not metal), mix a solution of 5 gallons water to 1/3 to 1/2 cup laundry soda (washing soda). Mix well so all soda is dissolved. Adding more soda will not make it go faster. Do not try to use other salts. You won't get better results and dangerous effects may occur. Caustic soda, for example, is far too corrosive. Solutions of ordinary table salt can generate chlorine gas (toxic) at the positive electrode (anode).



Clean the electrodes so they aren't too rusty - especially at the top ends - they need to make good electrical contact with your wire or cable AND with the water. Place electrodes in bucket around sides so the ends stick up above the water level. Use clamps or some means to hold them in place around the perimeter of the inside of the bucket or container so that they cannot move freely or fall into center of bucket. The electrodes must not touch the part(s) to be cleaned, which will be suspended in center of bucket. Whatever you use, it shouldn't be copper, and will get messy if it gets into your cleaning solution. Tie the electrodes together with wire or cables. All electrodes need to be tied together. This will become the grid. Since the cleaning process is somewhat line of sight it's best to surround the part to be cleaned to some extent with the electrodes.

Suspend the part to be cleaned in the bucket so it hangs in the middle, not touching bottom, and not touching the electrodes. I place a piece of rebar across the top of the bucket (see photo above) and bolt a small hook (or chain) to the part to be cleaned and suspend the part into the solution below. The part to be cleaned then becomes the "cathode".

Attach the battery charger placing the **NEGATIVE LEAD** (this is critical!!) on the piece that is to be cleaned. Attach the **POSITIVE**, or **RED** lead of the charger to the electrode grid making sure that the electrodes and the part to be cleaned are not touching each other. Do not get this backwards! If you do, you'll use metal from your part to de-rust your electrodes instead of the other way around.

Now turn on the battery charger. If the current is too high, as indicated on the battery charger's current meter, there are several things you can do to reduce it - increase the distance between the part and the anode - dilute the solution by adding more water or if you are using a 6/12 volt charger set it to the 6 volt setting

Within seconds, you should see a lot of tiny bubbles rising from the part suspended in the mixture. Do not do this inside, or in an enclosed area, those bubbles are hydrogen and oxygen and the hydrogen **will** burn explosively if ignited.

The rust and gunk will bubble up to the top and form a dirty layer. More gunk will form on the electrodes and after some amount of use, they will need to be cleaned and/or replaced. The electrodes give up metal over time, that's why re-bar is such a nice choice, it's cheap. Now you just have to wait. The time required to clean a part will depend on a number of variables - the size of the part - the current used and/or how badly rusted the part is, are examples.



The process is self-halting; when there is no more rust to remove, the reaction stops. This is handy because you don't have to monitor it, and because you can do large parts where they are not totally submerged at one time without worrying about lines in the final part. If necessary leave the operation on overnight so long as it is not in an enclosed space (see the safety precautions below). You may have to move the piece occasionally for better cleaning as the best cleaning is done on the part that is in direct view of the anode (line of sight). If a piece is too large to fit in the bath you will obviously have to rotate it at some point. It may also be necessary to take the part out of the bath and clean it with a wire brush to

remove some of the now loose scale which will look like a dark sludge. Once you are done, the part should be dried immediately - the part is very susceptible to surface rust after being removed from the solution. There will be a fine layer of dark grey or black residue on the part that can be easily removed using a scrub pad and/or wire brush. Once it is removed, the part can be primed or painted as needed. You can pour the waste solution on the lawn and it won't hurt it. Do watch out for ornamental shrubs, which may not like iron rich soil.

Rusted metal part



After 3 hours - dried off with a shop rag



and 5 minutes with a wire brush



Safety Precautions:

- Make sure no spills can get to the battery charger. (Electrocution potential)
- The leads from the charger are relatively safe, but you may still get a bit of a shock if you put your hands in the solution or touch the electrodes while the charger is running.
- Turn off the current before making adjustments to the setup. Just as a "spark" can cause a charging battery to explode in your face, this process produces similar gases because this process splits water into hydrogen gas (at the negative electrode) and oxygen (at the positive electrode).
- Hydrogen will burn explosively if ignited. All flames, cigarettes, torches, etc. must be removed from the area, and sparks caused by touching the leads together must be avoided. The work should be performed outside or in a well ventilated area to allow these gases to dissipate safely.
- Washing soda solutions are alkaline and will irritate the skin and eyes. Use eye protection and gloves. Immediately wash off any solution spilled or splashed onto your body.