

Rust Removal using Electrolysis

Several years ago, and I can't recall how it happened, I came into an inexpensive and easy way to clean rust and grease, and, in some cases, paint, from your rusty cast iron and sheet metal parts. Taking advantage of common household cleaning products, items many of us have laying around the garage, kitchen or laundry room, and some science, you can clean parts from a single bolt up to an entire trailer frame through a process known as "electrolysis".

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. A student recently used my site as the basis for a school project and used a computer power supply in place of battery charger.
- Sacrificial electrodes. Concrete reinforcing rod works well (rebar) cut into lengths about 4" taller than your bucket or container. Do not use stainless steel! The results are a health hazard and illegal (more on that later)
- Arm and Hammer LAUNDRY soda, also called washing soda. (see below for details)
- Wire and/or cables for connecting electrodes together.
- Water.
- Small lengths of small chain (used to suspend the rusty parts in solution) or some other means to suspend the part to clean into the solution.



The Setup:

[The science behind rust removal by electrolysis.](#)

[Want to make your own laundry soda? Click here.](#)

[Why you should not use stainless steel electrodes.](#)

[Electrolysis on a larger scale - cleaning a trailer frame.](#)

Most of my [Humdinger mudpump](#) rig was cleaned using electrolysis.

[Loosen that stuck piston with your soft drink?](#)

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. Mix well so all soda is dissolved. 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. I take mine to a wire wheel and give them just a real quick going over. Place electrodes in bucket around sides, so the clean, rust free ends stick up above the bucket. 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. I use small C clamps. Whatever you use, it shouldn't be copper, and will get a bit messy if it gets into your cleaning solution. Tie the electrodes together with wire or cables. I use copper wire twisted around the top ends, and have used old jumper cables. All electrodes need to be tied together "electrically". This will become the "anode" 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 part to be cleaned into bucket so it hangs in the middle, not touching bottom, and not touching electrodes. I place a piece of rebar across top of bucket (see photo below) and bolt a small piece of chain to my part to be cleaned, and clamp the chain on the rod so that the chain hangs from the rod, and suspends the part into solution below. The part to clean then becomes the "cathode".

Attach battery charger - place **NEGATIVE LEAD** (this is critical!!) on the piece that is to be cleaned. Attach **POSITIVE**, or **RED lead** of charger, to electrode "grid" formed when you placed electrodes, or rods, into bucket and tied them all together.

Make sure electrodes and part to be cleaned are not touching each other, then turn on charger. 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 a closed area - those bubbles are the component parts of water - H₂O - hydrogen and oxygen. Remember the Hindenburg? Well, actually that was caused in part by the explosive coating they painted on the skin of the craft, but the hydrogen will burn explosively so DO be careful!

See how the rust and bubbles are attracted to the electrodes in the photo below? You will need to clean them from time to time - they will get covered with gunk; in fact, after many uses, they will have eroded down and need to be replaced. That is why I use rebar - it's easy to get, cheap, and most of all - SAFE FOR YOU and your environment! 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, however. No use making your spouse mad!

How large an item can you clean? Well, it's up to your imagination, your budget - because it takes water, your time and wife's patience. Terry Lingle demonstrated this process on a very large scale using a tank made of plywood and lined with plastic, a DC welder for power supply and hundreds of gallons of water. You will need to use more electrodes with larger parts and a larger "tank".

The resulting photos can be seen [here](#) - along with an explanation of his setup.

How small? A student recently used the description on my web site as the basis

for her science project in school. She used a computer power supply for the power source to clean a small part in a plastic bucket on a table. (photos coming soon)

Safety Precautions:

- Make sure no spills can get to the battery charger. (electrocution potential as with any electric appliance)
- 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 remove these gases 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.



Washing soda

compounds.

If you can't find it local call Arm & Hammer at number: 1-800-524-13 they should be able to you where the closest is that you can find it. Or try Soaps Gone Buy <http://www.soapsgone.com/>

You can purchase Laundry soda online from Amazon.com as well according to some sources

Want to make your own "laundry soda"? Take baking soda, spread it out onto a cookie sheet and bake the oven at a little over 300 degrees for an hour or so it will drive away a water and CO₂ molecule thus making washing soda. At temperatures above 300° Fahrenheit (149° Celsius), baking soda decomposes into sodium carbonate, water, and carbon dioxide.

