

# Removing rust with your battery charger (electrolysis method)

By Paul Nelson (reprinted from *Ferguson Furrows*)

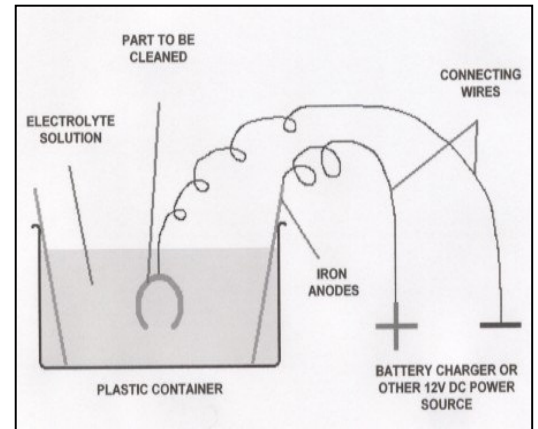
Sandblasting and paint remover have been two of the most commonly used methods for removing rust and paint from tractor parts. However, both of these methods have their drawbacks. Sand can get into critical areas and sandblasting may damage fragile sheet metal. The use of phosphoric acid to treat sandblasted surfaces can also damage some surfaces. Paint removers are labor intensive, messy, and toxic.

On the Internet I recently ran across a description of a method to remove rust (and paint). I was intrigued by the prospect of trying it. I did so and am very pleased with the results. I am presently restoring a 1957 Ferguson F-40 and have de-rusted most of the removable parts, including several pieces of sheet metal. This article is a combination of what I've read and what I have personally experienced.

How does your battery charger come into the picture? Well, it supplies 12v power for the electrolysis process. Electrolysis has been used for many years by professional restorers. Anything that is made of steel, cast iron, or wrought iron can be de-rusted by the electrolysis method.

What is electrolysis? Strictly speaking, it is a method of using electricity to break down water into hydrogen and oxygen. To use this process for rust removal requires the water to contain an electrolyte, such as washing soda or lye. An electrical current running through a solution of water and electrolyte will convert red rust into black rust (black oxide). Black oxide is a stable compound that doesn't want to react with oxygen any longer as does red rust.

When black oxide dries it can be painted, but it is preferable to brush and wash the surface with water before drying and priming. When the black oxide is removed, the bare metal is revealed.



## Safety precautions

The solutions used in this process are relatively weak but lye, for example, is still caustic. Proper steps should be used to protect skin and eyes. Store all chemicals in proper containers. Disposal of the solution will be discussed later.

## Washing Soda

Washing soda is simply *sodium carbonate*. Do not confuse washing soda with baking soda! Baking soda is *sodium bicarbonate*. Arm & Hammer® washing soda can be found in almost any grocery store. *Do not use baking soda.*

## Lye

Chemically speaking, lye is *sodium hydroxide*. You can purchase it at some grocery stores or at some hardware stores. However, it is not as readily available as washing soda. Do not use Drano® as it contains metals and fouls up the electrolysis process. ***If you use lye for this process, be sure you use rubber gloves and eye protection.***

## How does the process work?

The electrolysis method involves putting water into a suitable heavy-duty plastic container and adding either washing soda or lye. One wire from a battery charger is hooked up to an anode placed in the water and the other wire from the battery charger is hooked up to the metal piece from which the rust is to be removed. How this is done is very critical.

**Step 1** – Select a container. You can use any heavy-duty plastic container but its size depends upon the size of the parts or number of parts you wish to place in the solution at the same time. For small parts, a five-gallon pail will work. For larger parts, a large heavy-duty plastic storage unit (such as those made by Rubbermaid®) is desirable. If you wish to treat a long piece, treat one end and then the other, overlapping if possible. Fill the container you use with water but keep the level at an appropriate distance from the rim of the container to prevent run-over.

**Step 2** – Add the chemical. ***Use one tablespoon of either washing soda or lye for each gallon of water.*** Add the chemical slowly in small amounts so as not to cause splashing.

**Step 3** – Insert into the plastic container a piece of steel or iron that will be used as an anode. It should be long enough so that one end will stick up out of the water. It should also have a fairly large surface. Fasten it to the side of the plastic container with a squeeze clamp to hold it in position. You can use rebar, old metal, and pieces of steel fence posts, heavy sheet metal or pipes (nothing galvanized, however). Remember that the anode will gradually deteriorate so don't use something that you will want to use again for other purposes. A flat surface seems to work better than a round one. ***It is recommended that you not use stainless steel anodes. The use of this material in***

***this way can lead to the release of cancer-initiating Hexavalent gas compounds especially dangerous in confined areas.***

**Step 4** – Each part to be placed in the solution to be de-rusted should be hooked up to a 10-14 gauge iron, steel, or copper wire that will be hooked up to the battery charger. Using electrical squeeze clamps, such as those found on battery charger cables will work for smaller parts. Larger parts can be wired directly without a clamp by twisting the end of the wire around the part. ***Make certain that the parts to be cleaned and the wires connecting them do not touch the anode(s).***

**Step 5** – Hook the wires to the battery charger. ***Polarity is critical.*** The **BLACK WIRE** from the charger is hooked up to the wires from the piece or pieces to be de-rusted. The **RED WIRE** from the charger is hooked up to the upper end of the anode protruding out of the water. This is important. If hooked up the other way, the anode will be cleaned and the parts will be corroded. Take precautions here also as the charger is to be hooked up to a 120v circuit. Water is a highly conductive medium so it is important to use a GFI outlet or one that has a proper circuit breaker.

**Step 6** – Plug in the battery charger. You will begin to see bubbles rising up from the part or parts to be cleaned as well as from the anode. These bubbles are hydrogen and oxygen gas bubbles created by the proper flow of current and it means current is flowing just fine. If you have a lot of current flowing, or the meter goes off the scale, you probably have the part touching the anode. Shut off the power, reposition the part, and try it again.

Once you have determined that the process is working properly, let it work for several hours. Since this process will only work on the red rust, you can leave the part in the bath for weeks, and as long as the electricity flows, the part will not rust in the solution. If the power stops, it will begin to rust in seconds.

### **Positioning the parts**

The chemical reaction is somewhat line of sight, so the placement of your anode is important. Feel free to add as many anodes as your charger can accommodate. I use four in my tub. You can even link parts to be cleaned together with wire until you reach the capacity of your batter charger. If you use a piece of wide diameter steel pipe for an anode, you can also pass a rod down into the interior to clean it but you may have to play around with insulating parts of the anode so that it doesn't short against the part. I also constructed a small basket of 1/4" wire mesh to treat very small parts, such as nuts and bolts. Hook the black wire to the basket.

### **Removing the parts**

After it appears that all of the rust on the part or parts has been converted to black oxide, unplug the charger, take the parts out and place them under running water, scrubbing with a wire brush or some Scotch-Brite® to remove the loose black oxide. Don't work too hard. If it still has paint or rust on it, cook it some more and work on something else. You'll note the pits will remain, as there is nothing you can do to replace the rusted metal that is now gone, but now the part is rust-free. If it needs more time, put it back into the bath. On a particularly rusty piece or one that has a lot of paint, you will find that if you remove the part and give it a good scrub, and then put it back in, it will speed up the process. Then dry the part thoroughly and prime it (or oil it if it needs to remain natural) soon before it begins to rust again. A pressure washer may be useful in washing up the parts after they are "cooked."

### **Miscellaneous Points**

You can use this procedure on exhaust manifolds, cylinder heads, engine parts, wheel hubs, spindles, break pedals, tie rods, sheet metal, and even bolts with rusted nuts on them.

Because almost any piece of iron or steel has some rust on its surface, even under the paint, soaking in an electrolytic bath can and probably will damage or remove paint. If you use lye as the electrolyte, this can almost be guaranteed. The lye electrolyte does the best job on grease also.

The water will slowly evaporate and break down so you must add a little from time to time to maintain the initial level.

The solution can get pretty nasty looking, but it really doesn't ever need to be changed, though sometimes you may want to do so. You can strain it or skim off the large pieces of debris and foam. It's mildly basic, so you can pour it out in the yard, and hose things down well. The grass will like it as it normally likes to be limed anyway. But please check local ordinances first!

You can scrape off the crud from your anodes with a paint scraper or a wire brush. Do this frequently (daily) as this helps it to maintain peak conductivity. If you really want to clean the anode well, put it in the bath hooked up as the part to be cleaned and use another anode. That really makes the rust fly off of the anode! Eventually, the anode can rust no more, and must be replaced.

This method of removing rust is inexpensive, and you can just relax and pick lint out of your navel waiting for the rust to slowly disappear!

*If you wish to use lye (sodium hydroxide) and are unable to locate any locally, it can be ordered from Chem Lab Supplies, 1060 Ortega Way, Unit C, Placentia, CA 92670, phone 714-630-790.*