

Removing rust from steel by electrolysis

Jan Reksten 2019

Occasionally, kind and well-meaning people have given me old tools that they have either inherited or have never used and don't want for whatever reason. These tools are often rust-affected and in need of restoration before they can be tuned and used again. Some years ago, I had a sizeable collection of these things and decided that I would do something about bringing them back to life.

An article was drawn to my attention on rust removal using electrolysis and this method proved to be very effective. The method uses the effect of a small, low-voltage electric current and a suitable electrolyte solution and it works by returning surface rust to metallic iron. The rust scale is loosened and can be easily wiped or brushed off, leaving remaining 'healthy' metal unaffected in any way. Importantly, the method is completely safe to use as the voltages and currents are low, there are no noxious fumes or hazardous solutions and it is impossible to 'over-clean' an object. Rubber gloves can be used to protect the hands if you feel the need.

The equipment required is a 12-volt car battery charger, a large plastic tub, a stainless steel (or iron) electrode, water and washing soda. The advantage of using a stainless steel electrode rather than an iron one is that an iron one will be eaten away with time. The electrode should ideally be about 30mm wide and as long as can be submerged below the surface of the water in the plastic tub. Use about one good tablespoon full of washing soda to every five litres of water and dissolve it in the plastic tub. When connecting the battery charger, the polarity is crucial. The electrode is connected by an insulated wire (of the same general capacity as that on the output terminal of the battery charger) to the positive (red) terminal and the object being cleaned is connected with the same sort of insulated wire to the negative (black) terminal. Good contact is important and a spring-loaded metal clip attached to the object being cleaned is ideal for this purpose, especially when dealing with heavily-rusted objects. In the case of the wire from the positive terminal, it should be connected to the electrode by drilling a hole in the electrode and connecting the wire to it with a small nut and bolt to ensure good contact. The object to be cleaned is submerged in the water solution. Wooden handles etc should be removed where possible and tools such as, for example, chisels should be submerged in such a way as to keep the handles above the surface of the solution. The electrode works best if it surrounds the object to be cleaned as the cleaning is, to a certain extent, 'line-of-sight'. When the power is turned on, as long as there is good contact, fine bubbles will rise from the object.

The time taken to complete the process will depend on a variety of factors including the size of the electrode and the object being cleaned as well as the amount of rust involved. The typical cleaning time for objects that are moderately rusted is a few hours. Objects can be tested by trying to wipe off the rust. If it is not completely clean, continue the process for a while longer and test again until it is clean. Heavily-rusted objects can be left overnight. The loosened rust is rubbed off with a rag under running water or, if need be, a plastic pot-scrubber can be used.

The solution will last more or less indefinitely but becomes fairly disgusting-looking after continued use. It is however non-toxic and can be disposed of easily, although it is probably advisable not to clog drains with the junk that is produced.

It is obviously important to remember to dry the object thoroughly immediately after rust removal to avoid surface rust forming again. Cleaned objects can be dried by wiping with an old towel and blow-drying with a hair-dryer. The process will not remove pitting caused by rust, only the rust in immediate contact with unrusted metal. The surface of the previously-rusted metal is left black in appearance and the unrusted metal is untouched.