



RUST & CORROSION INFORMATION SHEET

Rust & corrosion – What is it?

Corrosion is the unwanted oxidation of metal. I use the term unwanted as, in the case of bare aluminium and stainless steel, it is the presence of a very thin hard layer of oxidation on its surface that prevents further corrosion forming.

Oxidation is the term used to describe the metal ions combining with oxygen usually from the air surrounding it.

Corrosion of iron, and therefore steel, is referred to as rust.

When rust forms it expands and this can cause further damage to the surrounding paint or force seams between panels apart, allowing in more oxygen and water and thus accelerating the process.

For the more scientifically minded amongst us rust is actually a mixture of:

- Hydrated iron III oxide $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$
- Iron III oxide-hydroxide $\text{FeO}(\text{OH})$, $\text{Fe}(\text{OH})_3$

I've just noticed a deep scratch on my car, what should I do?

The thing to do is act now. If you leave it, corrosion will set in and start to spread to surrounding areas and what started out as a tiny stone chip has now spread along a seam and is going to be far more expensive to repair.

What you should do is to get a touch up pen from either the car dealership or the local car accessory store; make sure the damaged area is clean and dry and then apply the paint to the damaged area. When it dries, if you're happy with the results, then job done. If on the other hand the end result is not to your liking, then at least you have sealed out the air and water before corrosion can set in; you can now contact an automotive body shop or a SMART repairer to do a professional job at your leisure.

Methods of controlling corrosion

All the principal methods of controlling corrosion work by forming a barrier on the surface of the metal to prevent contact with water and oxygen from the air.

Whatever method is selected the metal to be treated must be clean, dried and free of existing corrosion; it does no good to paint over rusty metal and, even if you are using a rust converter, it still pays to mechanically remove as much rust as possible.

Waxes

In the context of corrosion prevention we need to consider three distinct types of waxes.

- 1) **Car body wax** – the sort you use to protect the paintwork after washing the car. There is much to be gained by regular waxing of the paintwork as it encourages water to bead and run off instead of pooling around seams and seals. This type of wax also assists in preventing UV damage to the paintwork from exposure to sunlight. (Note: waxing is not the same as polishing - polishing is an abrasive process. Whoever originally combined the two products to make 'wax polish' has a lot to answer for!)



- 2) **Soft anti-corrosion wax** – this is used to protect items such as electrical terminals, fastenings and for providing a winter overcoat to chrome items. This coating can be removed easily when required to restore the appearance of a component or to allow for maintenance work. Soft waxes are also used to protect areas that will not be subject to mechanical damage as they remain pliable. They are frequently injected into the seams at the bottom of doors for example.
- 3) **Hard anti-corrosion wax** – this is usually sprayed on leaving a hard reasonably durable layer when the solvent evaporates. Clear high temperature waxes can be used to protect under bonnet components, and black or brown hard waxes are frequently used to protect the underside of the vehicle.

Paint

Typically the paintwork is comprised of a number of layers of differing types of primer, the colour coat and, in the case of modern cars, this is sealed with a clear lacquer.

In the custom car scene sometimes lacquer is used to protect polished metal and in some cases parts that have been deliberately allowed to develop a patina (or light rusting depending on your point of view); the lacquer in this case preserves the well-used appearance of the vehicle.

Note: We only undertake painting of small components (for example brake callipers), and anti-corrosion work. You will require the services of an automotive body shop for dent removal or other automotive paint work.

Powder coating *(Not a service provided by RALLY TEC)*

Powder coating is applied using an electrostatic charge to make the powder stick to the metal. The part is then baked in an oven to melt the coating and cause it to flow. This produces a very robust coating with a high depth of colour and lustre; ideal for wheels, sub frames and that sort of thing.

Plating *(Not a service provided by RALLY TEC)*

A chromium, zinc or, on very old vehicles, nickel plating can give a cosmetically appealing shiny or semi matt finish. This sort of plating is not suitable for all components and usually the item has to be copper plated first. Note: Mazak metal is especially difficult to re-plate.

Other surface treatments *(Not a service provided by RALLY TEC)*

Depending on the metal these can include Sherardizing, Parkerizing, Phosphating, Passivating, Anodising & Bluing.

Oils & greases

For items that move against each other, and thus require lubrication, grease should be applied (for example to handbrake linkages). The selection of the correct oil or grease for a particular application is a subject in its own right, so I'll leave explaining that to another time. Suffice to say that the grease must be sufficiently water resistant for the environment in which it is used as otherwise it will emulsify, trapping water in instead of keeping it out.

Making the items out of a corrosion resistant material

Items prone to rust, like metal bumpers on classic cars, can be replaced with reproduction items manufactured from stainless steel. Some replacement body panels are available in Glass Reinforced Plastic (fibreglass) but although these are totally immune to corrosion, GRP panels are thicker so may not have the grace and form of the original metal parts.

Vapour phase inhibitors

These are substances that are placed in close proximity to the items you wish to protect and the vapour released coats any bare areas of metal and prevents corrosion. However once the item is removed from the source of the inhibitors, the layer evaporates leaving the metal clean so no special preparation is required prior to painting. This technology is most suited to protecting parts sealed in



plastic bags whilst they are in storage and for protection of vehicles placed in a sealed environment like a dehumidified plastic enclosure or bubble – a method popular for winter storage of rare classic and sports cars.

Anti-stone chip paint

This is a 'rubbery' type of paint that is slightly elastic and is more resilient to knocks than other paints. The surface finish is textured and is suitable for areas like the wheel arches, or areas that will be later covered (like the boot floor or battery tray).

Underseal

A sort of 'tar' like coating that never really sets fully, needs regular maintenance, but is cheap and reasonably effective. The only issue is that it makes it almost impossible to detect rust forming beneath it.

Shutz

This is a black spray coating, very similar to the one manufacturers apply to many modern cars, which works well if applied to rust free metal. That last point is important so I shall say it again - rust free metal!

Rust converters

These are most successful if the loose rust is removed first. The rust converter is then applied and usually contains an acid that reacts with the rust to convert the iron oxide into something else and a binder that sets to stabilise and seal the surface. The acids are usually either:

- Tannic acid – that converts iron oxide to ferric tannate
- Phosphoric acid – that converts iron oxide to ferric phosphate

The binders are commonly either epoxy resin or a water based polymer resin.

Dissimilar metals – What is galvanic corrosion?

Galvanic corrosion can occur when two dissimilar metals come together in the presence of an electrolyte (e.g. salty water or acid). Metals are arranged in a Galvanic series (sometimes called the 'Anodic index') and the further apart the metals are the greater the risk of corrosion. The difference can be measured as a voltage, as what you have created is effectively a battery cell.

The way to prevent galvanic corrosion is not to have two dissimilar metals in direct contact. A plastic isolating membrane or specialist isolating coating can be installed between them to prevent contact. If you use a mix of steel or stainless steel and aluminium on your vehicle you must take sufficient steps to prevent water getting into the joint between them. The most common place this is encountered is between aluminium panels and steel frames or fastenings.

Metal tyre valve caps – an example of galvanic corrosion

Many of us have exchanged the cheap plastic valve caps for nice shiny metal ones, but if we made the wrong choice they will corrode themselves on and then the only way to remove them is to cut them off. The best choice is brass, probably chrome plated on the outside, or stainless steel. It is important to clean the threads on the tyre valve carefully and to apply a smear of copper grease before fitting. It is unwise to use aluminium valve caps as that is just asking for trouble in our damp climate!



Treating specific areas

There are numerous other suitable ways to treat the following components, but here are a few:

The battery terminals

These should be cleaned and coated with either a proprietary terminal grease, petroleum jelly, or soft wax.

Engine bay

The area must be thoroughly cleaned and degreased, then a high temperature clear hard wax can be used to treat these areas. Once dry it is hardly visible and so is a popular treatment for classic cars.

Any areas where rust is present should be cleaned, and degreased, the rust mechanically removed and a rust converter used to stabilise any areas of rust lurking in the pits in the metal; the area is then primed and overpainted.

Under body

Once cleaned, and with any corrosion mechanically removed, a rust converting epoxy primer works well. The epoxy primer is then given at least 8 hours to cure and then either a hard black corrosion inhibiting wax or anti-stone chip paint is sprayed over the top.

Door skins, cavities and box sections

The most important thing is to make sure any drain holes and channels are not blocked. The manufacturer put these drain holes there for a reason after all!

The next thing is that a soft rust converting wax should be injected into, or sprayed onto these areas. Make sure that any area where water can accumulate is fully covered.

Wheel spinners (classic cars only)

To prevent your wheel spinners seizing up the thing to do is to thoroughly clean the threads on the hub and the spinner with a suitable solvent, using a stiff brush if necessary, then coat the threads with copper grease. Make sure the threads are fully coated all the way around to prevent water ingress. Spinners are self-tightening so, once tightened by hand, a smart tap with the copper headed hammer is all that is needed.

Under body and engine bay inspection

Whilst we can all inspect the bodywork of our vehicles for obvious signs of rust or corrosion, only the most dedicated owners inspect under the bonnet or venture underneath their car. This means that corrosion can be quite advanced in these areas before anyone notices. At RALLY TEC we recommend an annual corrosion inspection for your most cherished vehicles so that these areas can be thoroughly inspected and any corrosion or damage to the protective coatings can be corrected before it has a chance to spread. The under body protective coatings are not a fit and forget thing - stone chips and debris on the road can perforate them rendering them ineffective. The only way to be sure is to properly inspect the vehicle.

Note: This information sheet applies to treatment of rust and corrosion in an automotive context. It must be borne in mind that various elements of the explanation have been simplified for easier reading and to appeal to a wider audience.

Whilst this information is offered in good faith, no liability can be accepted by its authors for any loss, damage or injury caused by errors in or omissions from the information given.

When conducting cosmetic repairs yourself follow fully the instructions on the products you are using, and ensure that the relevant Personal Protective Equipment is used. We recommend that all other work on vehicles is undertaken by a suitably qualified professional.