technical

the battle

BROADLY speaking "rust" can be classified into two categories:

(a) Surface rusting or corrosion which is non- or only very slightly active but which produces unsightly appearance.

(b) Active rusting or corrosion which is a continuing chemical reaction and which leads to "rust through" or penetration of steel panels.

Extensive overseas research has shown that although many factors affect corrosion, the fundamental effect is an electro-chemical reaction. This reaction will only continue to be active provided it is supported by: (i) metal to corrode; (ii) water; and (iii) air.

By examination of cars which have been in service both overseas and here in Australia it has been possible to develop a fairly clear picture of where the two types of corrosion listed above occur on the vehicle body. These examinations range from conducting field surveys along the coastal belts of Australia, to buying old model vehicles and cutting them open to determine the cause of "rust through" conditions.

The significant factors learnt from these investigations are:

(a) That the lower 4in. of the outer skin panels of body assemblies — particularly doors — is the area most likely to "rust through", due to free water being retained in the assembly or of moisture "wicking" back up the panels. Tests have shown that water will only "wick-up" about 3in. to 4in.

(b) Tightly enclosed areas capable of holding "road throw", e.g., behind fender reinforcements, are sites of "rust through".

(c) "Dry areas" of the body, e.g., upper areas of door pillars, roof panel, centre areas, inside body areas, luggage compartment, etc., may develop minor surface rust at an early date but the corrosion reaction does not continue.

(d) Curved upper surface panels can be the site of "rust through" due, apparently, to humidity condensation. This panel failure takes longer than the lower body area corrosion sites. Examples of these are upper door outer panels near the glass opening, curved edges of roof panels, nose end of engine hoods and trailing edges of boot lids.

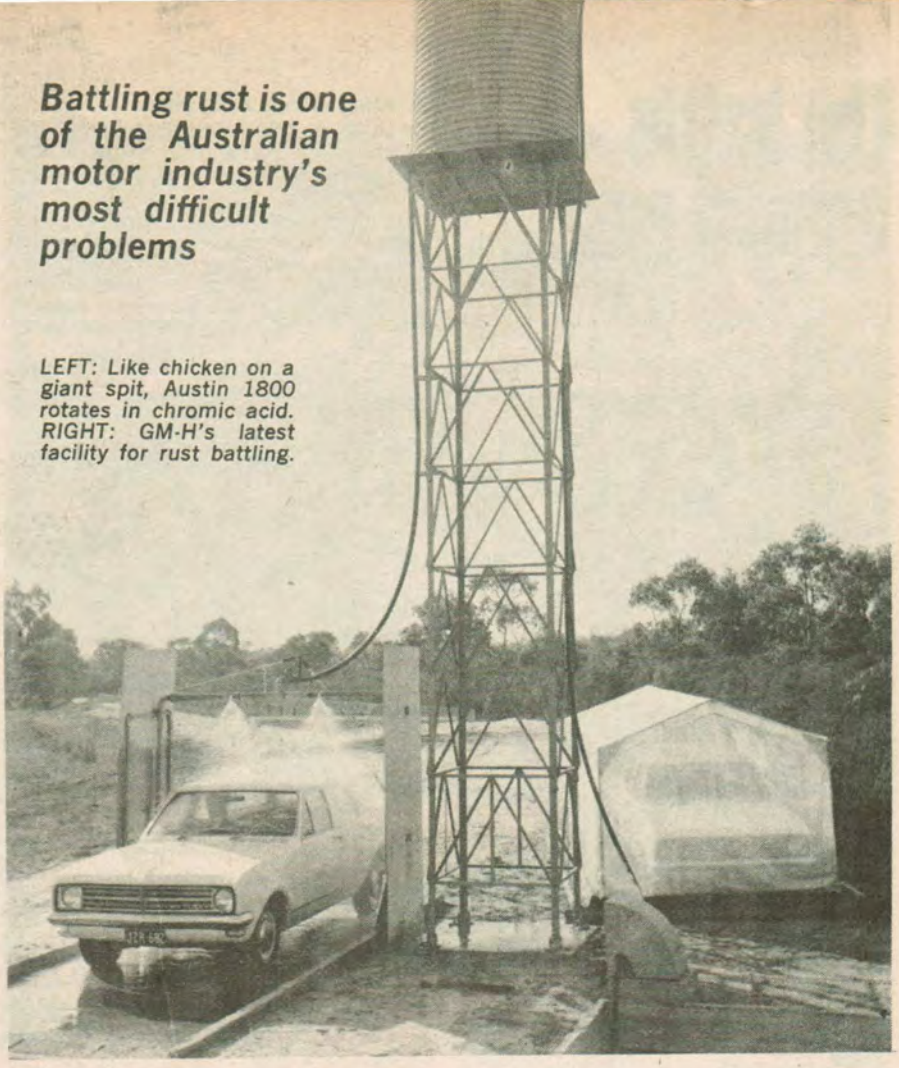
What Ford does

As a result of investigations, Ford of Australia have developed a corrosion prevention program based broadly on the following points:

(a) Is the panel an exterior or "skin"

Battling rust is one of the Australian motor industry's most difficult problems

LEFT: Like chicken on a giant spit, Austin 1800 rotates in chromic acid. RIGHT: GM-H's latest facility for rust battling.



against rust

nel and is it continually wet or cap-e of being wet?

(b) Is the panel in the lower body ea and hence a possible structural nel?

(c) Is the panel "boxed in" and pable of collecting mud and dirt m "road throw"?

(d) Is the panel subject to humidity ndensation?

Corrosion is best and most eco-mically prevented by using two types preventative primers: (a) sacrificial mers such as Zinc-Rich Welding mers; (b) barrier primers of the oxy or Alkyd type.

Applying these primers to the areas egorised above, the primer applica-n is as follows:

Body shell including doors

(a) Complete body is dipped in ck Alkyd Primer to a depth which covers headlamp and tail-lamp openings and to a height approximately halfway up the door height.

(b) All accessible interior body areas receive an epoxy primer and/or enamel spray coat during body paint operations to a film thickness of ½ thou. of an inch. This includes the door outer panels and centre of the roof panel, the inside of quarter panels under fenders, etc. It does not include the underside of dash panels, the upper inside of door pillars or the inside surface of door inner panels above the underbody dip line.

2. Body components

(a) Doors: prior to the assembly of all doors the outer panel is coated with zinc-rich primer in a 4in. band across the lower edge, up each outer edge and a 5in. band across the top edge.

(b) Boot lid and engine hood: prior to assembly of the inner to the outer panel, a 6in. band is applied to both inner and outer at the leading edge (engine hood) and trailing edge (boot lid).

On all of the above components the hem flange or clinch flange is given special treatment by applying a wet application of zinc primer immediately prior to the "clinch over" operation, which ensures that these critical seams have a primer sealed into them.

(c) Front fender panels: prior to assembly of the rear reinforcement to the outer panel, a zinc primer coating is applied to all faces of the reinforcement and to the enclosed area of the fender panel.

(d) Quarter panels: a 4in. band of zinc primer is applied to the lower edge for the whole length of the panel.

the battle against rust

3. Other critical body areas

(a) Door sills or rocker panels: the entire inside surfaces of these panels are coated with zinc-rich primer prior to assembly.

(b) Roof panel and drip rail: the inside surface of the roof panel in the area covered by the reinforcement, i.e., an area approximately 3in. wide around entire outer edge, is zinc primer coated. The contact surfaces of the roof panel and drip rail are primed with zinc-rich primer prior to assembly.

(c) Seat belt anchorages: the areas of the floor pan covered by the anchorages and the anchorages themselves are zinc primed prior to assembly.

(d) Structural areas not covered by underbody dip: inside surfaces of front end structural members are zinc primed prior to assembly. This includes the entire inside surfaces of the air plenum chamber or cowl grille area.

4. Miscellaneous application

Many areas of the body are prime coated prior to final paint operations, due to difficulty of applying spray primers on the completed body, e.g., mating faces of door hinges and pillars, rear edges of engine hoods, etc.

ABOVE: Ford technicians examine Cortina body subjected to rust tests. Causes of corrosion include industrial fall-out as well as sea-air, rain, etc. BELOW: Cortina and Falcon bodies are exposed to elements at the Ford assembly plant.

Thick paint

The film thickness of the underbody dip primer is approximately 0.005in., and at this thickness the primer is required to pass 240 hours accelerated salt spray test.

The film thickness of the zinc-rich primer is 0.015in., and while the product is required by specification to pass only 250 hours of accelerated salt spray test, actual tests show that it withstands many times this number of hours.

The protection provided by lower body areas should be particularly noted. Here the zinc primer is supplemented by underbody dip primer. This application applies to skin panels and structural members. The use of heavy gauge metal in structural members also ensures long life body strength.

While no special attention is given to the underside of dash panels and the inside of door pillars above the dip line, these areas are considered to be "dry areas", and as such do not have active corrosion. Tests detailed previously support this assumption.

What BMC does

BMC use a process called "electrocoating" to supplement their basic Rotodip rust-proofing treatment.

The Rotodip method treats and paints complete car bodies. The electrocoating plant is used to paint small components not able to be treated on the huge Rotodip machine.

The combined result provides complete rust-proofing of all painted components on BMC cars.

The electrocoating installation cost $280,000 and was the first of its kind in Australia. It has been in operation since May 1966.

Electrocoating is a similar process to electroplating. Metal is plated, rather than sprayed, with paint to give uniform and complete coverage, even inside tubes and other normally inaccessible parts.

Bodies for all Australian-made BMC saloons — the Mini, Morris 1100 and Austin 1800 — are all treated on the $2 million Rotodip machine during manufacture. On this exclusive machine, the unpainted body shell and doors are submerged and rotated in a series of baths containing phosphates and primer. This treats and covers every metal surface, both inside and out, and prevents the onset of rust.

The electrocoating plant paints small parts which cannot be treated by the

otodip process. This includes such ems as the facia, or dashboard panel, eater boxes, grille panels and numerus small sheet metal parts not welded the body itself.

Electrocoating is a major advance the technology of metal coating. involves a dip process in which aint, held in suspension by a liquid, used. The paint is deposited on the etal component when an electric curent passes from an electrode to the rticle, which acts as the other elecode.

Paint particles are attracted to the etal, coagulate and are deposited ntil an even paint film covers the ntire surface, including edges and inute crevices, and all internal surces.

When the paint film reaches a cerain thickness, it insulates the metal nd prevents more paint being eposited. When deposited, the paint fixed and cannot be removed.

Unlike spraying or conventional nontating dipping methods, electrocoatng leaves no uncoated areas in parts complicated shapes. It also gives an ven paint thickness and virtually iminates paint losses.

How Rotodip works

The Rotodip process fully immerses nd rotates each sedan body in a sixtage phosphating machine, then takes through a drying-off oven, followed

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AS WELL as complete dipping, BMC utilises heavy body undercoating to insulate against noise as well as rust. Their Rotodip features complete body imersion.

HOW YOU CAN BEAT RUST

WHAT can the average motorist do to prevent or stop rust? The only sure way is to undertake a thorough inspection of e car at six-monthly intervals and ke action at the first sign of corrosion.

The following hints were given by rropro, one of Australia's largest anufacturers of products designed to eat corrosion:

UNDERSIDE: Most cars are so dirty nderneath that it is necessary to have e underside steam cleaned to remove e mud, grease and oil.

Even if there is no evidence of rust, would still pay to protect the metalork.

The bare metal should be protected a coat of heavy duty rust-inhibiting imer. It will both protect the metal nd convert light rust to a nonrrosive iron phosphate coat.

More advanced cases of rust (proded they have not structurally eakened the car) can be treated as llows. Use a stiff wire brush to elimiete loose or flaking rust, then apply rust converter.

This will form a protective phosate film, covered with a plastic aler.

The primed surface should be proted with some type of coating which s high water resistance.

INSIDE BOOT AND FLOOR: Remove seats, carpets and sweep out loose st and grime. Signs of heavy rust ould be treated with a rust converter, after all loose rust has been removed with a wire brush.

If there is light rust, the use of a rust and grease remover is recommended. The treated surface should be painted with a water dilutable metal primer which will dry in about 30 minutes and leave a hard but tough film to keep out moisture.

INSIDE DOOR PANELS: The door trims have to be removed and should be cleaned and dried out. If there are signs of rust, similar treatment is suggested to that used on rusty floors.

If not, a special rust spray can provide long-lasting rust prevention because it contains rust inhibitors and also moisture-displacing agents.

When sprayed inside the door, it will form a flexible coating that will seal the metal for at least six months.

The same spray pack can be used for the treatment of very light surface rust that is taking place under the paintwork of any part of the car. It has the ability to penetrate into rusty areas and inhibit the rusting action and is therefore useful for reaching any inaccessible areas around the car.

BODY PANELS: It is generally accepted that owners pay more attention to rusting exterior panels than anything — obviously because of the effect on the resale value.

The proper treatment is to strip off the paint on badly affected areas, convert the rust and respray. If only small areas are involved — such as chips and marks — we suggest you clean down the metal with rust and grease remover.

The next step is to spot prime the area with a heavy duty rust-inhibiting primer.

When dry it can be sprayed or touched up with a finishing coat of enamel.

CHROME: Any rusty spots can be treated with a rust and grease remover. The surface should be dry and then polish the chrome with a wax polish.

It is necessary to wash the area with warm water and detergent to prevent any incompatibility between the wax and the remover.

The clean, highly polished metal surface can then be protected with a special clear gloss lacquer which is sprayed over the chrome to provide a highly polished rust-protective finish.

MONOFRAME AND CHASSIS: Rust in the structural parts of the car can, of course, be disastrous. To treat such rust, or to guard against it, is not very difficult.

If the member is not fully enclosed, a rust spray can be used. If the member is enclosed, it is necessary to drill two ¼in. holes at the top and two similar drain holes at the lowest point.

Having done this, the drain holes should be plugged and filled with a rust and grease remover.

Allow to stand for an hour, then drain, replug the holes and fill with the remover. Again, stand for an hour, then drain.

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RUST—AND YOU

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The same materials can be used for several applications but the job must be repeated in six months' time.

MUFFLERS: Few cars have mufflers which last an appreciable time. The main cause is that considerable condensation of moisture occurs when a muffler cools down.

Where possible, the muffler should be treated with a rust converter. After that it makes sense to coat the muffler with a high temperature resistant silver paint. This will help dissipate the heat and so reduce the condensation.

BATTERY AREA: Over-enthusiastic filling, or even over-charging, can cause the battery fluid to spill. When it does, the white, powdery deposit will be obvious. This powdery material will cause serious corrosion on the metal panels at a remarkable rate.

If, however, there are already signs of corrosion, remove the battery and the affected parts, then wash with a strong solution of ammonia, dry, then rinse with water.

Once the metal is completely dry, paint with anti-corrosive paint.

Products available for the above jobs are: Meta-Kleen—rust and grease remover; Meta-Seal — metal seal product available in a spray pack; Ferro-pro Rust Converter — neutraliser; Ferro-Kote Flat — a heavy synthetic rubber-based coating; Ferro Protector — heavy duty rust-inhibiting primer. •

RUST PROBLEMS

(Continued from page 83)

by a dip tank of special rust-inhibiting priming paint, and a primer bake oven. All these processes are continuous and automatic.

To move through the machine the unpainted car body is "skewered" on a long metal spit, which has a sprocket at one end. The sprocket runs on a toothed rack, so that the spit — and the body clamped to it — rotate as they move.

The first tank contains a heated alkali to remove oil and other contaminants. The second tank contains a cold-water rinse, and the third a hot-water rinse, to make sure the body is perfectly clean before it enters the phosphating tank.

In the phosphating section the spitted body is lowered into various tanks while rotating. At the same time high-pressure jets spray the solution so that every bare metal portion of the body is treated, both inside and outside. Phosphating is actually a conversion of the body steel surface so that if the paint surface is damaged accidentally during use, corrosion will not spread. It also acts as a bond between steel and paint.

The phosphating is followed by a hot-water rinse and then by a heated chromic acid rinse. The body completes two slow revolutions in each tank.

After phosphating, the body is dried in an oven. Then it is dipped and rotated in a 7000-gallon tank of primer, remaining there for 2.6 minutes. This means that every particle of bare metal receives a coating of paint. Excess paint drains away through special holes provided in body panels and other enclosed parts.

The painted body, still rotating, is baked in an oven for 30 minutes at 340 deg. F.

What GM-H does

New test procedures developed by GM-H at the Lang Lang Proving Ground have improved the effectiveness of Holden anti-corrosion production techniques.

These tests are designed to accelerate corrosion-inducing conditions.

The car is sprayed with salt water taken from Westernport Bay and is then driven for a period around the Proving Ground roads. It is then sprayed again with salt water and placed in a large, transparent soak tent. A warm, humid atmosphere is built up inside the tent which accelerates the corrosive conditions. This process is repeated a number of times over a period and the vehicle is closely examined and studied for any possible signs of corrosion.

GM-H has been working on rust-preventative measures over a number of years and the present "Rustgard" process, which provides highly effective corrosion protection, has been the result of an evolutionary process rather than a sudden change.

The treatment starts by coating key panel areas which could be subject to corrosion with a zinc-rich primer before

they are assembled. The outer door panels, for example, are pre-painted prior to assembly with the zinc-rich primer and the inner panel is then assembled to the outer panel and welded while the primer is still wet.

All panels and the basic body structure are then cleaned and de-greased before applying a hot zinc phosphate coating. The cleaning process is essential to ensure adhesion to subsequent coatings and does not remove the zinc primer applied previously. The zinc phosphate inhibits the spread of any corrosion process away from an area which may have had the metal exposed by a scratch or other damage to the surface.

The body is then dipped into another underbody primer to provide maximum corrosion protection of the entire lower body of the vehicle. Further protection is then provided by corrosion-resistant primer and an oxide primer surfacer which also prepares a base for final paintwork. Plastisol and bituminous compounds are applied to keep out water and dust.

The entire vehicle is then wholly sanded and three final coats of "magic mirror" acrylic lacquer applied.

No one likes to see chrome looking anything but its characteristic gleaming self, and these areas of the automobile are chrome plated not only to produce a pleasing appearance, but to produce a high degree of resistance to rust. The new $2.3 million GM-H plating plant at Woodville, South Australia, utilises the highly advanced process which includes an additional coat, called "Dur-Ni", in the plating process, which increases the corrosion resistance to three times the level of the best quality chromium plating previously obtainable.

Although most corrosion prevention is directed towards protective coating on the metal surfaces, there are several design factors which have also proved to be highly successful in combating corrosion. The smooth, rounded interiors of the front fender is a design feature which prevents the build-up of mud packs which lead to corrosion. Smooth joints and rounded corners and prevention of entrapment areas are of high importance. The attaching of stainless steel mouldings to body panels by means of plastic clips has been instrumental in preventing rust on the exterior of the car.

However, regular cleaning of the vehicle cannot be overstressed as the most effective precaution against corrosion. Door drain holes must be kept clear to prevent water build up; underside of fenders and underbody ledges must be thoroughly cleaned to remove mud deposits which retain moisture; washing and, if desired, polishing of the exterior paintwork will remove grime, dirt and air pollution — products which are detrimental to the prevention of corrosion. Abrasives must not be used in washing or polishing of the acrylic lacquer finish and chromework as the surface will be damaged. •