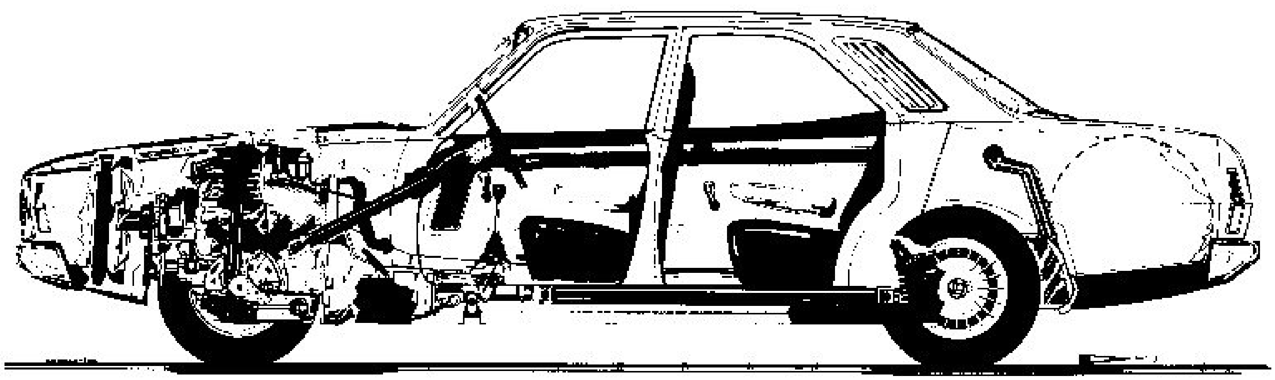
Leylines

Canberra and Districts Leyland P76 Club Newsletter - July 2004

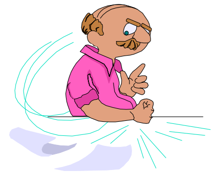


Next Meeting:

Monday 12 July at Weston Creek Labor Club

Meeting starts sometime after 7.30pm

Presidential Pearls



I'll start with a reminder that next months meeting will be our AGM.

So it *will* be safe to come to this weeks meeting …

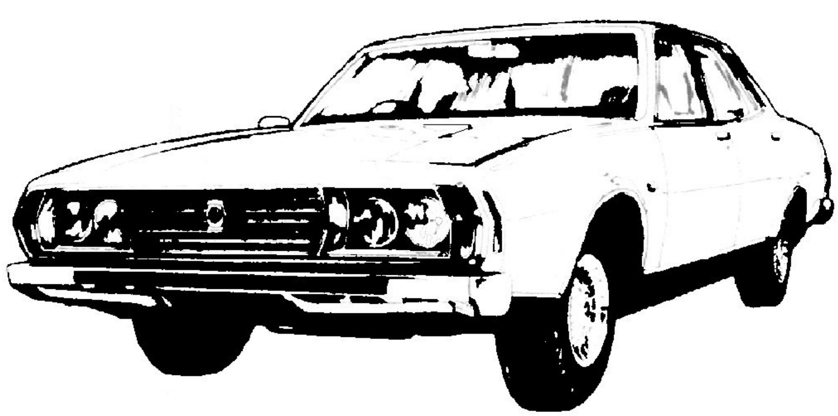
My Peel Me a Grape Exec had a power steering haemorrhage as I took it out of the garage to wash it, before the Tuggeranong markets display day. So I disconnected the drive belt from the pump and drove it to the Display then put it back in the garage in disgrace for a month or two whilst I investigated a solution. Since it was sitting idle but still fully registered I decided to fit it with a manual steering rack. Geoff and Paul assured me this would be quite acceptable….

LIARS.

Obviously they have never driven a power steering equipped P76, with its super light, zero feel steering system. Since every P76 I have ever owned has had P/S the world of armstrong steering did not sit well with me. I would come up to a corner and gently attempt to move the wheel, then remember things have changed and frantically heave on the wheel with all my might, desperately trying to wind on the additional 32 turns of the wheel to negotiate the intersection, each time running wide, only just missing the kerb or looking the whites of the eyes of startled on coming traffic.

So I want my power steering back.

Alex



Editor's Note

I thought that last month was quiet on my P76 front but this month has been even quieter. I've managed to get the Targa out for one drive in the past month and I noted that it had been five weeks since I had it out previously. Perhaps I should be thinking hard about that historic registration. Speaking of historic rego I did come across one interesting little item in the last Victorian P76 newsletter. Under the heading of 'AOMC news' was the following item (the Association of Motoring Clubs being the Victorian equivalent of our Council of Motoring Clubs):

'A Wolseley car club member using CH plates [historic registration] was recently fined $500 by a policeman when the Wolseley driver stopped in the Hastings Yacht Club on his way to get new tyres fitted. More to come.'

I think that our arrangements in the ACT are a little more flexible than those in some other States, but it's probably worth bearing in mind that there are still some restrictions that we need to observe.

A little gem that raised a smile from the Council of ACT Motoring Clubs' May minutes:

'Alec McKernan told of Austin 10 (1937) being fined for running a red light. The light went red again before the car had even crossed the intersection. The owner went to the police, who ripped the ticket up after hearing the story.'

I've had a ride in this Austin and it's certainly no ball of fire. The engine is about 1100cc, side valve, and it pushes around a weight of over a tonne. Fortunately this is one experience that we shouldn't have in a P76!

I guess that most of us have caught up with the news that Trax are selling out their stocks of P76 models at bargain prices. If you don't have any, this is your chance to buy all three colours (Corinthian blue, Hairy Lime and Dry Red) in the P76 range for just $60 plus postage. Trax said that the P76 had been the slowest seller of all the models that the company has produced.

See you on Monday

Col

Alex ‘Strips and Tips’

Something strange has happened to my wife as she actually told me of a phone message of some P76s for sale, rather than delete it from the answering machine before I got home.

Turns out the call was from two unusual brothers who pestered me for a number of P76 motors to put in their Range Rover last year and did not like my asking price. They went off and found their own P76s, a green Exec and a Corinthian Blue Super, and took the motor and transmission from the Exec and wanted to off load the leftovers.

So I went to have a look. Both cars have been out doors under a tree for many years and have a fair amount of rust and lichen growing all over them. The Exec was white but was painted green a long time ago, and they even went to the trouble of painting the inside of the car under the carpet. The Super is complete and is a six cylinder auto. There was also a box of new parts. In the end I bought the Exec without motor or box, but with power steering and air conditioning, as well as some of the new parts, for a fee slightly larger than my wife thinks I paid.

The thing that made it worthwhile was the new parts as well as the power steering and the air, which will in time find their way into my Exec.

The new parts include a power steering intermediate shaft, a heater tap, a brake master cylinder, head light adjusting screws and new top and bottom radiator hoses. All appear to be in excellent condition. The steering shaft without a worn universal joint should help the steering feel immensely. The front seats are in very good condition and are of course reclining, and so will be set aside for Damo. I will be stripping the rest of the car this week and taking it to the tip on the weekend, so if you are after spare anythings, if it has one I can keep it for you or you can come and remove it. Just let me know.

Alex 0410 575 052

Parts from Kiama

An item in the Victorian Club magazine reported:

'It's been disappointing with the parts supply from Kiama. Unfortunately, Fred, the owner of these parts has been unavailable to meet with the Club delegates and as a result, none of our member's wish lists have been able to be filled. (We will have to wait patiently until Fred is ready.)

Looks like nothing much has changed in this area, despite the high hopes that were held initially.

BMC's Rotodip Rustproofing Process

At the last meeting there was some discussion about rust in the P76 and the Rotodip rust proofing system used at the Zetland factory. The following article appeared recently in Westwords and gives a thorough description of the process.

WORKING AT ZETLAND - THE MEMORIES OF OWEN MCDONALD

Part 4: THE BMC ROTODIP

The BMC Rotodip was put into service about March 1958. It was a step function in the quality and durability of motor bodies.

At that time there were three manufacturers (as distinct from assemblers) of cars in Australia. General Motors Holden, I think Ford had an engine factory and press shop by that stage and the BMC factory. Volkswagen did not have a manufacturing plant at this time. They were assembling at Clayton Victoria where they later had a press shop.

The assemblers (and the BMC predecessor Nuffield was an assembler from CKD parts) had a very low technology approach to the painting of vehicles.

Despite the name, assemblers of Completely Knocked Down (CKD) vehicles did not work with parts at their simplest level. Many parts came to this country in an assembled condition, i.e. doors, bonnets and boot lids and any assemblies that did not have a shipping volume penalty. When these vehicles were painted there was no pretreatment. Simply a solvent wipe on the accessible exterior (including the underside) and a spray paint job on every thing that could be reached. The insides of assemblies produced offshore were not touched. Strangely these vehicles had reasonable durability if the protective oil film, that had been applied to prevent corrosion during the shipping process to Australia, remained on interior panels.

Motor vehicles by this stage had changed (in this country and Europe) from the concept where a body was bolted to a separate chassis, to the current practice of using the body panels themselves to withstand the operating forces. Corrosion in this thin, load bearing sheet metal was clearly more significant than corrosion in thick chassis members.

The cars manufactured and assembled at Victoria Park were the chassisless style.

The technology to protect low carbon steel sheet metal from corrosion was well developed. First, remove all oil and pressing lubricants from the steel. Second, deposit a thin layer of a zinc or iron phosphate which served to inhibit the spread of corrosion under a paint film. A third step was to ‘passivate’ the phosphate with chromic rinse and dry the panel(s) prior to paint.

All of this is called pretreatment.

The last step is to apply an inert paint film of sufficient thickness to keep water away from the steel panel for the mechanical life of the product.

While this technology could be easily applied to simple assemblies, its application to welded sheet metal car bodies was complex. The process had to reach inside semi enclosed box sections, reach inside the passenger compartment and prepare the exterior for a show room finish. Aggressive chemical strengths to properly clean inaccessible corners produced coarse phosphate crystals on the exterior and prejudiced the appearance of the finished enamel. Any system of applying such pretreatment had to ensure that there was insignificant carry over of liquids from one section to the next.

The only method (then and now) of applying paint to all parts of a motor body was a dipping process.

The application of finished enamel on top of this ‘primer coat’ was a matter of showroom appearance, gloss retention and resistance to marring and chipping, not corrosion performance. BMC used stoving (baked) enamels for finish painting. So did Ford, Chrysler and Volkswagen. General Motors Holden used lacquer finish. The first coat applied on top of the primer was a ‘primer/surfacer’ which filled irregularities and was designed to be easy to rub flat and smooth using abrasive material. BMC used a sealer coat on top of the primer/surfacer that ensured that the final coat of gloss enamel did not show variations in gloss caused by the texture of the substrate. Two tone vehicles were popular. BMC never followed the trend to use metallic coloured paints in the time the author was involved (1958-1971). General Motors lacquer paint finishes worked a lot better with metallic finishes particularly in terms of rectification - field durability was another question.

Painting of almost anything by dipping is difficult if the requirement includes both appearance and corrosion performance. The difficulty increases further with the complexity of shape and construction of the product being dipped.

Dip plants create paint runs which produce expensive preparation problems when subsequent paint coats are applied. The run is obviously thicker than the adjacent paint and may not be fully cured. Abrasive media used to remove the runs clogs on the undercured paint. Paint runs that stand out as obvious under a gloss enamel finish cannot always be seen in a dark brown dip coat. A lot of run removal was done on suspicion rather than on observation. The rubbing of the dark brown prime coat was done with air and electric sanders on the ‘black deck’, at the start of the paint shop - a filthy job with a lot of labour turnover. The sanding (rubbing) of the primer surfacer coat was done wet with abrasive mesh discs driven by compressed air. This location was between two overhead stoving ovens and despite ventilation was oppressively hot and humid (from the wet rubbing). This was another area of high labour turnover. Training was on the job in many cases with gestures rather than words for new migrants with no spoken English.

The paint used in dip tanks must be heated (stoved) to ‘dry’ the paint after application. Apart from the chemical process that occurs, the paint solvents are released as the work is heated. This is obviously necessary and is not a problem if the solvent vapours can be removed as fast as they evaporate from the paint film. Complex spot welded assemblies do not heat up evenly, the thicker parts (e.g. the double thickness at joints) taking longer to come up to temperature. Inside box sections, the solvent evaporating from thinner parts condenses on the cooler thicker parts and runs off, taking the deposited paint with it. This condition is known as ‘solvent washing’. Solvent washing can remove all the deposited paint and leave the panel unprotected. On a joint the fine white line of the metal substrate can be seen on many parts dipped with stoving enamel.

Even with ventilation, gravity will cause a dipped paint film to drain down from the upper surfaces of a vertical panel and make the lower film three times thicker than the upper film. The lower part can show runs while the upper parts are short of paint.

The BMC RotoDip addressed a number of these problems in a manner that gave a dipped motor body a corrosion durability almost as good as test panels individually pretreated and hand sprayed with paint.

All BMC cars were designed to be ‘spitted’ on a long steel tube (125mm dia.) and clamped in position. The spit passed through the centre of gravity of the vehicle.

The spit had a fixed wheel at one end and a removable wheel at the other. The removable wheel was positioned after the spit had been run through the body.

After spitting, the spit (and body) was lifted onto a steel track. The ends of the spit fitted into dogs on parallel conveyor chains (6 inch pitch?). The wheels and the smooth track carried the weight of the spit and body and the conveyor chain provided the force to move the body forward.

The end with the fixed wheel had a gear wheel which engaged a fixed rack and rotated the vehicle in the parts of the process where rotation was required.

PRETREATMENT

Rotation was used throughout the pretreatment. The entry position to any dip had to ensure that the body did not meet the dip in road position where it could float off the conveyor dogs if it did not sink fast enough. The exit of any dip had a similar problem. The body had to leave the dip at an angle that allowed the water to drain from the body and not throw the weight of many litres of water (or paint) onto the panels where the spit was clamped. The rotation and the departure angle minimised carry over from tank to tank. (Carry over would dramatically increase operating cost and affect performance).

This attitude requirement for entry and exit meant that the minimum travel length of a tank was the length required for entry and exit plus a number of full rotations of the body. The author has a vague recollection that the first stage tank (the alkali clean) and the phosphate tank had two full revolutions of the body while the other tanks were one revolution only (a plant layout drawing would confirm this).

The body coming from the body shop was a ‘White metal body’. There were no door locks or boot/bonnet locks (they would fill with paint). These panels were wired shut with soft welding wire. On one occasion a door came open and hung down as the body approached the stainless steel phosphate tank. The door propped the body enough to climb out of the drive dogs and the body was left suspended at the tank ledge. The next body pushed the disconnected body and spit into the tank and continued on until it jammed and the conveyor shear pin (a safety device) failed and the plant stopped. The stoppage cost half a days production. There were no other major failures with the plant in the period 1958-1971 (the limit of the knowledge of the author).

Prior to pretreatment there was a manual solvent wipe using white spirit. This was designed to soften any pressing lubricants or preservative oils films on panels requiring the full colour enamel treatment. These panels were mainly outside but sometimes included some interior panels. This always remained necessary despite efforts to increase the strength of the cleaning process. Stronger cleaning liquids or more aggressive sprays produced a coarser phosphate crystal with paint adhesion problems.

The pretreatment was in six dip stages, some dips being supplemented with overhead sprays. The position of sprays was a concern initially and they were set in different positions to optimise the interior cleaning of the first bodies (the Morris Major) that were processed in the plant. There was less concern about the detailed position of these as the process was better understood.

The sprays and the agitation of the rotation were not as aggressive as a spray-only type machines. Spray machines needed to deliver enough liquid to flush off grease in areas that were not directly contacted by the sprays. The submerged agitation of the Rotodip was more effective than sprays for enclosed areas and generally less aggressive cleaning could be utilised.

BMC always had the problem of manufacturing cars from panels that had been in storage for up to three months giving time for the pressing lubricants to harden. If it had been possible to paint panels within days of pressing the cleaning problems would have been much less.

The six stages were

- Degrease in hot alkali detergent solution - this was carried out in two tanks where the overflow from the second tank ran into the first tank.
- Hot rinse in town water
- Hot zinc phosphate. (A complete 312 stainless steel construction)
- Hot Rinse in town water.
- Acidulated Chromic Rinse.

At this point the rotation was stopped (no fixed rack) and the acidulated rinse allowed to drain as the body travelled through a ‘dry off oven’. If rotation had continued there was the risk of water containing soluble salts creating ‘snail trails’ as it dried and moved with the rotation. These snail trails could later cause ‘osmotic blisters’ under the finished paint. The drying water pooled on the floor pan. As the pool evaporated in the dry off oven soluble salts concentrated at the point where the final evaporation occurred. This was never a problem but salt concentrations on the exterior caused field problems. A sweaty fingerprint on an outside panel exposed to high humidity could get outlined by osmotic blisters.

PAINT DIP

The paint used was a very dark brown with a standard stoving type hydrocarbon solvent. The free surface of the dip tank was about 6 metres square. The length allowed for one body to be in the tank while one entered as another left. The body was submerged within 50 mm of the outside diameter of the spit.

The fire hazard, as with any large solvent based dip tank was considerable. A storage tank beneath the dip tank could hold the entire quantity of the dip tank. Fusible links above the dip tank would, if melted, open the dump valves and dump the paint into the enclosed storage. C02 gas bottles were installed to flood the area with gas so that oxygen was excluded. There was never a fire with this plant so the precautions were never put to the test. Dumping the paint would not have had an immediate effect on any fire. The dip tank walls when empty presented a larger surface area than the liquid surface of the paint when full and the initial effect of dumping the paint would have resulted in an increase in available fuel. The C02 flood should have quenched that!

Make up paint was pumped from the paint mix house directly to the storage tank beneath the dip tank. Solvent losses by evaporation were corrected by adding solvent to the make up.

A circulating pump agitated the tank and continuously filtered the paint though a screen.

ROTATION WITHIN THE DIP.

The body rotated within the paint dip to remove air bubbles and allow all surfaces to contact the paint.

On leaving the dip there was a short period with no rotation and then the fixed gear wheel on the spit engaged, not a fixed rack, but a conveyor chain moving in the opposite direction which doubled the speed of rotation. The body continued to rotate at this speed as it entered the stoving oven. This period of quick rotation coincided with the period when solvent washing was expected to be a problem. The analogy that was used to describe the process was 'treacle on a spoon'.

At a point where the paint was 'set up' and not capable of further flow the rotation ceased and the stoving continued in 'road position'.

The gases in the stoving oven were hot enough melt the eutectic component of the 'lead loading' used on one of the models that required lead (the Morris Minor). In normal processing this was not a problem but if there was a 'stoppage' and the bodies were soaked in the oven this sag could be seen in the lead and those bodies required rectification.

On leaving the stoving oven there was a section where the underbody was sprayed with an air dry under body sound deadener.

Finally the body was de-spitted and transferred to an overhead conveyor which transported the body to the paint shop proper.

A separate conveyor took the spits back to the start of the Rotodip. There were about 18 spits on the return conveyor and about 60 within the plant. Spits collected paint drips and in time had to have the paint stripped in a caustic bath. There were enough spares to clean a portion on a regular cycle. The same caustic bath also cleaned the ‘Skuks’ used to transport bodies within the paint shop.

This overhead conveyor that took the primed bodies was also a storage for about 60 minutes of production which allowed some cushion to prevent a minor stoppage in one section causing an immediate effect in the down stream section. This type of conveyor was known as ‘Power and Free’ which allowed trolleys to be held at a location while loading and unloading continued.

Both the dry-off oven and the stoving oven were heated using light fuel oil (ships diesel) and heat exchangers. The pretreatment tanks were steam heated with steam coming from 5 x 10000 pounds per hour steam generators. Some of this steam was used to condition air for spray booths but most was used in the Rotodip.

CONVEYORS

The spits were transported through the Rotodip by a pair of conveyors. There were three sets (I think). One transported spits through the cleaning section. The second through the dryoff oven and the paint dip and the third through the paint stoving oven. Each section had a transfer point where the next ‘dog’ picked up the spit within seconds of the first dog moving clear. A single line shaft ran down the side of the machine at about 500rpm. Each conveyor was driven by a worm reduction gear box which provided the necessary increase in torque and the 90 degrees change in direction of rotation. Driven from a single shaft, there were no problems in timing dog positions for transfer. A fourth conveyor provided the moving rack which ran in the opposite direction to increase the speed of rotation after the paint dip. This too came off the single drive shaft. The main drive motor was about 5 Kilowatt (7.5 HP) which always looked too small for the size of the installation. The spit return conveyor was a stand alone installation with no need to interlock with the Rotodip.

On the exit from the stoving oven the spit was transferred to a short conveyor that allowed operators to rotate the body to a convenient position and spray the underbody sound deadener. This was not (I think) mechanically linked to the Rotodip drive and it would stop and start to match the transfer.

There was a transfer gantry that took spits from the underbody conveyor and placed them on the de-spitting truck. This gantry was identical with the load transfer gantry.

Each end of the Rotodip had a Spit Truck. The operation of ‘de-spitting’ was the reverse of ‘spitting’. A white body was placed on the spitting truck, delivered by a ‘body drop’ from an overhead ‘power and free’ or ‘dual duty’ conveyor. One end of the spitting truck supported the end of the spit (minus the removable wheel). The other end of the spit was supported on a fixed cradle and the spit was horizontal at the exact height of the body centreline. A ‘bullet’ nose was fitted to the spit and the truck moved horizontally so the body moved onto the spit. It was in this position that the solvent wipe occurred while at the same time the spit clamping gear was fitted joining the body to the spit. A short travelling gantry picked up the spit and body together and placed the spits ends on a cradle. The next pair of conveyor dogs picked up the spit and transported it into the first dip section.

CYCLE TIMES (and loading a lunch break).

The paint shop had a maximum capacity of 200 per day. It started at 160/day (a 3 minute cycle) and was increased to 200 as sales rose.

The Rotodip could not start and stop in step with the paint shop. Bodies could not be left half processed and once started had to proceed at least to the end of the dryoff. Nor could bodies be left in the paint oven or the problem of overbaking would occur. This meant that as the end of a shift approached empty spits would be loaded. (The spits had to come off the spit return conveyor as bodies were being unloaded at the other end). After the ‘oven gap’ had been loaded, a number of loaded spits would be inserted. These would spend the night between the dryoff oven and the paint dip and finally empty spits again until the last body entered the dry off oven and the conveyor could be stopped and the plant shut down.

A similar complex problem occurred with providing morning tea and lunch breaks for the load and unload crews which were spaced apart by the process time in the Rotodip. Empty spits would be loaded so that the unload crew would get their meal break. Only one operator was needed to load or unload empty spits.

Only at Christmas maintenance was the machine fully unloaded

The requirements to load so many empty spits meant that about 300 spits were required to achieve about 200 bodies. This gave a very short time to spit a body and apply the solvent wipe. It was a very tight operation - a minute of frantic work and then idle for about 40 seconds.

Bodies could not be accessed at the load point until they had dropped 'out of the roof' from a feeder conveyor. There was no work station between the conveyor drop point and the location where the spit was inserted. It would have been much less fraught if the body was safely accessible for a couple of stations prior to being spitted. The preparation work could not be done in the Body Shop especially the solvent wipe which had to be wet when entering the dip. Bodies were on the conveyor overnight and over weekends. Solvent wiped bodies would have shown rust if wiped on Friday and processed on Monday.

The feeder conveyor was, as were all body conveyors, 'power and free'. Loading at the body shop end continued at the Body Shop cycle time (whatever the daily production rate). The cycle time of the Rotodip was determined by the chemical process involved. It ran at the same rate every day and controlled output by loading empty spits. The feeder conveyor could start the day full of bodies. As the day progressed the conveyor storage would reduce and then catch up again as the 'meal break' was loaded. If the Rotodip over ran the supply of bodies they would load empty spits and lose that production opportunity.

At one time the motion of the spit truck was supplied by manpower. (Women only worked in the trim shop on sewing machines - no men operated sewing machines).

About 1963 the spit truck movement (at both ends of the Rotodip) was powered. The powered movement took some pressure off the need to clean paint drips from the spits, which jammed manual spitting and de-spitting. It also reduced the compensation injuries. Manual de-spitting was hard work for young men.

EFFECTIVENESS

Only Volkswagen produced a vehicle with the same level of corrosion performance. They used a structural floor pan as a chassis and painted this floor in a separate paint plant. They had no problems of runs or appearance with this component. The body was painted without a floor and the technical problems of cleaning and dipping a body less floor were very simple.

Their Kombi Van had an integral floor and (in Australia) was very difficult and slow to pretreat and dip paint with an indeterminate result.

Chrysler Valiant took a different approach. All vulnerable panels were reinforced with galvanised panels or zinc rich paint. They did a good job as evidenced by the number of early Valiants still on our roads.

Ford and GMH at that time were concerned with show room appearance at lowest cost. They both used 'Slipper Dips' where the lower part of the car only was dipped. GMH then used a solvent hose to wash all visible dip paint from the panels which were to be painted with finish lacquer. The dip paint they used was incompatible with their Acrylic Lacquer top coat system. This hose also washed much dip paint from interior panels and the final durability was poor. The GMH front wings and bonnet were dipped and baked separately using a different paint.

BMC was brave. The development of the Rotodip was in England by the Carrier Company (not the Air Conditioning Company, but there was some long term relationship). The trolleys that carry bodies through paint shops are traditionally called trucks. The trucks that this paint shop used had to move sideways for transfer to the next track. The trucks were skidded sideways and were called ‘Skuks’ (half skid-half truck).

Nuffield did not operate a paint shop at Oxford. The Pressed Steel Company made the Morris Bodies and shipped them, trimmed and glazed across the road for mechanical assembly. Austin did have a paint shop and it may have been the Longbridge Plant that did the Rotodip development.

It was certainly much clearer to build than to have a spray pretreatment and slipper dip. It cost more per car to operate. Most of the exterior Rotodip Paint was sanded off to meet the requirements of show room appearance, without affecting the general corrosion performance but with a significant unit cost in labour and consumable materials.

Taubmans were the only paint supplier. The other two potential suppliers (Bergers and Dulux) wished to have the work but knew that Taubmans had learned the hard way how to make a paint that worked in this unique process and never really tried to get the business even though they fought very hard for all of the rest of the paint shop business.

A COMMENT

A field complaint once dealt with corrosion on the underbody of a BMC Vehicle. The evidence was red rust on galvanised fasteners. It turned out that the owner parked above an ocean pool each afternoon and salt spray blew under the vehicle. The adjacent paint did not show corrosion.

THE LAST VESTIGE

If the fire wall behind the engine, or the forward wall of the boot of a BMC vehicle is examined a cover panel can be observed on the centreline of the body. This is the spit cover plate sealed with Bostik bituminous gun grade sealer (or possibly a material called Prestick - press and stick) and fixed with PK screws with ‘Phillips Heads’. The plate is not round. It is three quarters of a circle with a square corner. Each spit had a driving key which provided the torque to turn the body. The spit hole was not round but had an extra cutout to clear the key hence the square corner.

The pit beneath the phosphate tank may still be visible. There was a pit beneath the paint dip tank also.

CURRENT TECHNOLOGY

Every volume manufacturer now uses an electrically deposited water based paint as the first coat (the primer coat). The deposition process solves many of the performance problems of conventional dip systems as well as environmental ones. Electrocoat, as the process is mostly called, does not have the problems of runs or of solvent washing or of gravity creating a wedge shaped film. Being water based it does not present a fire hazard. It does have some problems of coating inside enclosed areas but the end user gets a standard of corrosion performance with a painted body that very few except BMC had previously approached.

Owen McDonald Revised 2 Dec 2003

Plant Engineer 1960-1964
CAB/CKID Planning Engineer 1964-1971
BMC Australia

(Owen McDonald worked for BMC/Leyland in Sydney from 1958 to 1971. He has recorded his memories in a series of articles for Westwords. We thank Owen for his kind permission to print his memories in Westwords.)

(Copied from Westwords April 2004)

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