



# Conserve O Gram

September 1999

Number 10/3

## Preparing Historic Motorized Vehicles For Storage Or Exhibit

Many museums, historic sites and National Park Service units have at least one motorized vehicle in their collections. Although vehicles are supposed to be treated with the same care as any other artifact in a historic collection, care of these vehicles traditionally has been regarded as an exception to conservation principles. As a consequence, the pressure to restore rather than conserve vehicles has meant that many original surfaces and materials have been replaced or altered. If you restore a historic vehicle, you are left with a generic example of a vehicle type rather than a vehicle which can be regarded as an unaltered historic document.

It is often assumed that if a vehicle looks good on the outside it must be fine on the inside. The preservation of a vehicle's outward appearance is important, but the preservation of its functional elements is often overlooked. The treatment steps outlined below should be performed on all historic motorized vehicles to ensure that their original appearance and intended function are preserved for as long as possible. Following these steps will maintain the original materials but will not allow the vehicle to run. You must have at least a basic knowledge of motorized vehicle mechanics to use this information correctly.

1. *Remove the battery.* If it is old or dates to the period of use, you may consider keeping it and storing it separately. Even though batteries are considered to be consumable parts, historic batteries are rare and should be preserved. Drain the old battery and neutralize the interior with baking soda and water. Once the battery is neutralized it can be reinstalled in the vehicle. Check the battery tray and clamps for any signs of corrosion. Be sure to check any suspension or

frame elements below the battery for corrosion, which may be caused by leaking acid. Neutralize any signs of corrosion with baking soda and copious amounts of water.

2. *Drain the fuel tank and clear the lines to the carburetor.* As fuel dries it leaves a tenacious "varnish" which will clog the system. Moisture that may be trapped at the bottom of the fuel tank will continue to cause corrosion, so leave the filler cap off for several weeks to allow for complete evaporation of any remaining fuel and moisture. When dry, spray the interior of the tank and carburetor with a light oil such as WD-40 or CRC 3-36. (Sources for all materials are listed at the end of this leaflet.) This will reduce the chance for condensed moisture to cause corrosion and will lubricate any internal mechanical components.

3. *Drain the engine coolant.* Moisture left in the cooling system will promote corrosion. Older vehicles often have copper alloy parts attached to iron components where galvanic corrosion will quickly consume the iron materials. Refill the system with distilled water to help extract coolant residues then drain. Repeat until the water is clear. Leave the drains and filler cap open until the system is dry. (The author adds water pump lubricant to the last distilled water flush. Water pump lubricant is emulsified oil that leaves an oily film on internal surfaces. It appears to inhibit corrosion, but its effectiveness has not been tested.)

4. *Drain the hydraulic systems.* DOT-3 hydraulic fluid is extremely hygroscopic and will allow corrosion to develop within the system. This fluid should be drained and completely

flushed out with ethanol. If the brakes need to be operable, refill with DOT-5 fluid, which has a much longer life and does not absorb moisture. If the brakes do not need to be operable, flush the entire system with ethanol, dry the lines with compressed air, then flush with a light oil, and close the system. The parking brake should be left off to prevent the brake pads from adhering to the drums.

5. *Brace the clutch pedal.* Install a bar to hold down the pedal or brace the linkage from under the vehicle. Clutch faces will eventually adhere to the flywheel if they are not separated.

6. *Pump all of the grease fittings with fresh grease.* Use a synthetic grease since they are slower to degrade over time. Make sure that the fittings are cleaned before you add grease to prevent contamination. Old lithium-based greases will become hard and block the flow of fresh grease. Remove all blocked fittings and clean out the old grease. Regrease all fittings every four years. Early vehicles are often fitted with oilers. These fittings will usually have the same thread size as grease nipples. Where possible, exchange the oilers for grease fittings, fill the pivot with grease and replace the oiler. Grease will serve the same function as a heavy oil but it will not seep out and cause a mess.

7. *Drain all of the old engine oil.* You may wish to refill the engine with new oil and crank the engine with its starter to recirculate the clean oil through the engine and flush out the old oil. Then drain this oil. Be sure to remove each spark plug and squirt in approximately two tablespoons of a thick engine oil such as 50 weight into each cylinder. Leave out all of the spark plugs, then manually rotate the engine. This will leave a protective film of oil in the cylinders. Reinsert the plugs to keep out debris and moisture. Seal off the air intake with plastic wrap to prevent humid air from getting into the engine. Lubricate the cylinders and rotate the engine once a year.

8. *Drain the transmission and differential.* The small shavings of metal that accumulate in the bottom of the manual transmission accelerate the degradation of the oil. Refill these components with a new heavy-weight oil. Jack up one of the driven wheels (typically a rear wheel). Rotate the wheel while an assistant goes through all of the gears, then drain the new oil. This will help flush the degraded oil from recesses leaving a coating of clean oil on the internal components. Any breather caps should be sealed off to keep out moisture. Change the transmission fluid on automatic transmissions and leave fluid in.

9. *Lubricate all of the hinges and other mechanical junctions.* A small amount of corrosion between two closely mated surfaces will act like a powerful adhesive and abrasive, so it is important that all junctions are lubricated with just a small amount of oil.

10. *Use axle stands.* Stands should be placed under suspension elements to keep the wheels off the ground. As tires age, they become increasingly stiff and eventually turn brittle. The only practical way to slow the degradation of tires is to keep them out of ultraviolet light. Do not bother filling tires with inert gases since the fastest rate of degradation is on the exterior, which is continuously exposed to oxygenated air. Vehicles that are stored or displayed on their tires will eventually develop flat spots and lose air pressure. Place axle stands under the suspension elements to keep the tires just above the ground. The vehicle will look "correct" and, contrary to popular belief, the suspension will not become fatigued. Suspensions will only become fatigued through rough handling and corrosion to the springs. Some vehicles may need to have custom-made axle stands to provide the correct height for display. There are several companies supplying reproduction tires but they are expensive and many historic sizes and colors are no longer available. Try to avoid moving vehicles on old tires. Use wheeled hydraulic jacks or Gojaks, which jack individual wheels.

11. *Check the frame and suspension elements for active corrosion.* Many vehicles were driven through salty roads and were never properly cleaned. Whenever the humidity climbs, these salt residues will promote corrosion which, given enough time, will destroy the structural integrity of the entire vehicle. Do not apply underbody coatings to an already contaminated surface. They will only hide active corrosion. The easiest method to simply stop corrosion from causing any more damage is to saturate it with a wax/oil solution. The efforts required to properly clean, inhibit and coat the underbody of a vehicle are significant and the costs are difficult to justify unless the structural integrity is already compromised to the point where a major restoration is required. To stop corrosion from progressing, brush off all loose corrosion. Spray all areas with a thin wax/oil solution such as CRC-350. Allow this coating to saturate and apply a second coating if needed. Allow to dry for several days then apply a more viscous wax/oil solution such as CRC-400. This treatment should prevent further damage and it is reversible with mineral spirits.

12. *Clean brightwork once, then protect it with a coating.* Every time a metal surface is polished, material is removed, so it is important that the metal surfaces are thoroughly protected to maximize the time between each polishing. All elements to be polished should be removed and disassembled to prevent polish residues from collecting in recesses and to simplify the coating procedure. The cleaning and coating of one brass headlamp can take as long as three days. Use a mild polish such as Autosol, then clean off polish residues with acetone and mineral spirits before coating. Watch out for intentionally painted areas, particularly in stamped lettering. Never use a buffing wheel or any powered abrasive methods to clean brightwork. Nickel-plated surfaces can be very thin and are probably worn thin from previous polishing. Coat all brass and nickel surfaces with an acrylic such as Incralac for the best aging properties. Since this work requires the use of solvents, as well as experience in identifying materials and how to best treat

them, consult a conservator. All chromed surfaces should be polished (if needed), cleaned with acetone and mineral spirits, and then coated with a micro-crystalline wax such as Renaissance Wax. Apply a heavy coat of wax then allow it to dry without buffing. Use a hot air gun to slowly and evenly heat the part. When the wax begins to melt, spread it around the surface and let the part cool down. The heating process drives off moisture that may be trapped in corrosion pits and allows the wax to flow into these pits to form a sealing plug. After the part cools, buff off the excess wax with a cotton cloth. Only do this to pieces that are away from paint and plastic and can handle the heat from a hot air gun. If there are significant areas of iron corrosion under the chrome, a corrosion inhibiting wax/oil solution such as CRC-350 should be applied before waxing to saturate and stop the corrosion. Use extreme care when removing parts for treatment. Always consider the risks involved in removing and handling a part versus any cosmetic improvement that you may be seeking.

13. *Protect interiors from light and dust periodically.* Light levels should be kept at a level (50 lux) that will protect the most sensitive organic material of the interior. Lights should be turned off when no one is present. Keep doors closed and locked to reduce the chances of an insect or rodent infestation and to keep out inquisitive visitors who may damage fragile upholstery or may be seeking a souvenir knob or emblem. Keep a sticky trap under a seat to monitor for infestations. Good housekeeping and monitoring are the best pest control methods. Do not reupholster a vehicle that has its original upholstery. It may be the only existing example left and early fabrics and leathers are difficult to match. Slipcovers can greatly improve appearances and are usually unnoticed by the average visitor.

14. *Protect and maintain painted surfaces.* Cover vehicles in storage with a breathable, water-resistant cover. Vehicles on exhibit should be dusted as needed. Remove grime with a nonionic detergent such as Orvus. Oxidation can

be carefully removed from painted surfaces with very gentle polishes such as those designed for polishing Plexiglas™. Remember that every time the paint gets polished, some of it is removed, which slowly destroys its main function as protector of the material below. Eventually, the destruction of the paint will make repainting justified. Repainting is the most common method of making a vehicle “exhibitable” and this can often be justified if the current paint layer dates from a period after its historic association or if the current paint layer is badly degraded and exposing bare metal surfaces. Original paint surfaces that are uniquely decorative or decaled should always be preserved.

15. *Safety Precautions.* Obtain Material Safety Data Sheets for all of the materials mentioned above and carefully follow the handling recommendations. Gasoline and used motor oil are particularly hazardous so measures should be taken to prevent skin contact or inhalation of vapors. Use appropriate gloves and a fitted respirator with a filter approved for organic vapors. All waste materials should be disposed of in accordance with local guidelines, however, most local service stations are willing to accept small amounts of waste for a small fee.

The general public is growing to appreciate original, unrestored vehicles and museum collections are becoming the few places where unrestored vehicles can be studied and interpreted as historic documents. Some of the treatments described above can be tedious, but they are essential steps that must be taken in order to preserve the materials and the function of the vehicle.

## Sources

### *Autosol*

Conservation Emporium  
100 Standing Rock Circle  
Reno, NV 89511

### *CRC 3-36, 350, 400*

CRC Industries  
885 Louis Drive  
Warminster, PA 18974

### *Gojak*

Unitec  
4 Larson Drive  
Danbury, CT 06810

### *Incralac*

Custom Aerosol Packaging  
P.O. Box 1411  
Piqua, OH 45356

### *Orvus Paste*

Talas  
568 Broadway  
New York, NY 10012

### *Renaissance Wax*

Conservation Emporium  
100 Standing Rock Circle  
Reno, NV 89511

Synthetic grease, oils, water pump lubricant and DOT-5 hydraulic fluid are available at local auto parts suppliers.

Malcolm Collum  
Conservator  
Henry Ford Museum and Greenfield Village  
Dearborn, Michigan 48121-1970

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