

The Care and Preservation of Historic Motorized Vehicles

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INTRODUCTION

The information in this fact sheet has been compiled to assist in promoting the responsible care of historic motorized vehicles. The first step in the care of collections is to understand and eliminate or minimize conditions that can cause damage. The second step is to follow basic guidelines for care, handling, and cleaning. These steps assume that the vehicle will be maintained in a temporarily inoperable state, but the functions of the vehicle will be preserved for potential future operation.

RESTORATION VERSUS CONSERVATION

While many people collect historic objects such as furniture or books, very few expect, or want, those objects to be used with the frequency that the collectors of historic motorized vehicles aim for. Consequently, the pressure to restore to original operating condition rather than conserve vehicles has meant that many original surfaces and materials have been replaced or altered. If you restore a vehicle with historic associations, you are left with a generic example of a vehicle type rather than a vehicle that can be regarded as an unaltered historic document.

However, the restoration of a mass-produced vehicle without any significant historical associations can be justified, if it is in poor and unstable condition or if a restored condition is required for educational purposes or interpretations. This document will outline the steps required to maintain a vehicle in its existing condition with the goal of preserving original materials. The aim of these steps is also to preserve the vehicle's intended function so that the possibility of operation in the future is maintained. All the conservation treatments are reversible and are intended to maintain the vehicle in its current condition.

CONSERVATION TREATMENT STEPS

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 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. You must have at least a basic knowledge of motorized vehicle

mechanics to use this information correctly, the steps should be taken with appropriate personal protection equipment (PPE).

REMOVE THE BATTERY

If the battery is old or dates to the period of use, you may consider keeping it and storing it separately. Even though batteries are classified as consumable parts, historic batteries are rare and should be preserved. Some companies are making reproductions of historic batteries for exhibit displays but the variety is limited.

- Drain the old battery and neutralize the acidic 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.
- 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. Surfaces that are already corroded will need to be thoroughly cleaned to expose and neutralize all acidic residues.

FUEL TANK AND CARBURETOR LINES

Drain the fuel tank and clean the lines to the fuel pump and 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 light, moisture-displacing lubricants such as WD-40 or CRC 3-36. This will reduce the chance for condensed moisture to cause corrosion and will lubricate any internal mechanical components.

DRAIN ENGINE COOLANT

Moisture left in the cooling system will promote corrosion. Most vehicle engines have dissimilar metal parts bolted together where galvanic corrosion will quickly consume the less noble metal. Use a commercial brand cooling system flushing compound to clean out residues from the system. Flush the system with a garden hose until the drained water runs clean. Fill the system again with distilled water, then drain. Leave the drains, hoses and filler cap open until the system is dry. The addition of a water pump lubricant leaves an oily film on the internal metal surfaces that acts as a corrosion inhibitor.

DRAIN HYDRAULIC SYSTEMS

DOT-3 hydraulic fluid is extremely hygroscopic and risk the development of corrosion within the system. This fluid should be drained and completely flushed with ethanol (denatured alcohol).

- If the brakes need to be operable, refill it with DOT-5 fluid (silicone), which has a long life and does not absorb moisture.
- If DOT-5 fluid is going to be used, the rubber components should also be replaced.
- 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.
- Motorized vehicles with anti-lock brakes are incompatible with DOT-5 and the system should be closely monitored for continued operation or be completely drained of its fluid for long term storage.

The parking brake should be left off to prevent the brake pads from adhering to the drums. A light application of synthetic assembly oil to the brake surfaces will help prevent corrosion.

BRAKE SYSTEMS

With the switch of the DOT-5 fluids and rubber components that should be replaced, failure of the functional components can include brake cylinders. Historic cylinders can be preserved by avoiding the necessities of an invasive disassembly and rebuild. Instead the part can be stored separately, and an appropriate replacement can be used to maintain the safe operation of the brake system. The same process can be done to the brake master cylinder.

When taking apart brake drums, it is important to consider the manufacturer's possible use of asbestos on the brake pads. Proper PPE and cleaning methodology should be considered to prevent exposure of the asbestos and a trained conservator and asbestos abatement professional should be consulted.

BRACE CLUTCH PEDAL

Install a bar to hold down the pedal or brace the linkage from under the vehicle. Depending on the type of clutch, the faces could adhere to the flywheel if they are not separated.

GREASE FITTINGS

Oilers, Grease nipples, Alemite fittings, Zerk fittings fall into the category of grease fittings. It is recommended to fill all the grease fittings with fresh grease. Use a synthetic grease since their rate of degradation is slower over time. Make sure that the fittings are cleaned before you add grease to prevent contamination.

Old metal-soap based greases can become hard and block the flow of fresh grease. Remove all blocked fittings and clean out the old grease. Some greases are not compatible so if the existing type of grease is not known, it is advisable to continue adding fresh grease to the pivot until the old grease has been thoroughly “flushed”. 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 tend to stay in the pivot longer. Ideally, all fittings should be re-greased every four years.

DRAIN TRANSMISSION OIL

The small shavings of metal that accumulate in the bottom of the manual transmission accelerate the degradation of the oil. Refill these components with new oil. If the vehicle is Front Wheel Drive or Rear Wheel Drive, raise the driven side with a jack.

With the transmission drain plug off, have one person rotate a wheel side while another shifts through the transmission to drain more of the transmission oil. This step helps flush the degraded oil from recesses and introduces clean oil on the transmission components. Any breather caps should be sealed off to keep out moisture.

For automatic transmissions, fluids are drained in a similar manner. Instead of shifting through a manual transmission, flushing and cleaning gets done by introducing new oil often and repeated drains. Alternatively, if the transmission case is removed the gears can be accessed for cleaning. This method requires the addition of a new gasket and seal.

LUBRICATE HINGES AND 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.

CHECK FRAME AND SUSPENSION ELEMENTS FOR CORROSION

Many vehicles were driven through salty roads and were never thoroughly cleaned. Whenever the humidity is high, these salt residues will promote corrosion which, given enough time, will destroy the structure of the vehicle. Do not apply underbody coatings to an already contaminated surface. They will only hide active corrosion. The easiest method to stop corrosion from causing any more damage is to saturate it with a wax/oil solution. The efforts required to properly clean, inhibit corrosion and coat the underbody of a vehicle are significant and the costs are difficult to justify unless the structural is already damaged to the point where a major restoration is required. To stop corrosion from progressing, brush off

all loose corrosion with a stiff non-metal bristle brush or low abrasive 3M Scotch-Brite nylon pad. 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 procedure should prevent further damage and it is reversible with mineral spirits.

STORAGE

USE AXEL 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 (UV) radiation. Oxygen also causes rubber to degrade. Do not bother filling tires with inert gases such as Nitrogen or Argon 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 (permanent tire distortion) 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 of 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.
- Logistics: Try to avoid moving vehicles on old tires. (1) Use wheeled hydraulic jacks that can be placed under the front of the chassis and under the differential. (2) A set of GoJak vehicle dollies lift individual wheels. (3) A height-specific Stringo vehicle carrier can load the vehicle from the front or rear.
- Complex storage and displays should consult with an engineer or a rigging and mount making specialist.
- For storage, the height of the axel stands is recommended for tires to be above ground in order to be prepared for areas that are prone to flooding.

PROTECT INTERIORS

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. Keep a “sticky trap” under a seat to monitor infestations. Pheromone traps are not recommended inside vehicles, as the traps would promote an infestation of the interior over time. 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.

PROTECT AND MAINTAIN PAINTED SURFACES

Cover vehicles in storage with a breathable, water-resistant cover (Tyvek 10G - Smooth Texture Grade). Vehicles on exhibit should be dusted as needed. Remove grime with a nonionic detergent dilution such as Orvus Wa Paste. Oxidation can be carefully removed from painted surfaces with very gentle non-silicone/dimethicone 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 “exhibitible” 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.

BRIGHTWORK

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 mineral spirits and acetone, and then coated with a microcrystalline wax such as Renaissance Wax. Apply a heavy coat of wax then allow it to dry without buffing. Use a hot air gun to heat the part slowly and evenly. 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.

Additionally– or alternatively, the brightwork can be wrapped and sealed by Corrosion Intercept film by Lucent Bell Labs. The film neutralizes corrosive gases and contaminants that passes through and blocks ozone, while slowing down bacterial growth.

SAFETY PRECAUTIONS

Obtain Safety Data Sheets (SDS) 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 PPE such as gloves, eye protection, 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. In recent years, a “Preservation Class” has been added to most of the prestigious car shows. Once a vehicle has been restored its historic value (defined by level of authenticity–not original specification) has been compromised. Vehicles that are still in mostly original condition are becoming harder to find. This implies that their historic and monetary value will only continue to rise. Some of the procedures described above can be tedious, but they are essential steps that must be taken to preserve the materials, the intended function, and the “value” of the vehicle.

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Find a Conservator

The American Institute for Conservation
<https://www.culturalheritage.org/about-conservation/find-a-conservator>

SUPPLIERS

McMaster-Carr
200 Aurora Industrial Pkwy
Aurora, OH 44202-8087
<https://www.mcmaster.com/>
Kroil, WD-40, Lithium Grease, CRC 3-36

Grainger Inc.
www.grainger.com
CRC Products, 3M

Universal Vintage Tire Co.
2994 Elizabethtown Rd.
Hershey, PA 17033
<https://www.universaltire.com/>

Coker Tires
1317 Chestnut St.
Chattanooga, TN 37402
<https://www.cokertire.com/>

T & L Industries Co.

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800/524-1504
www.gojaks.com
Gojak Vehicle Dollies

Stringo AB

Strandvagen 67, 870 52
Nyland, Sweden
<https://www.stringo.com/>

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PO Box 1411
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937-773-1824
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212-219-0770
<https://www.talasonline.com/>
Orvus Wa Paste, Renaissance Wax, Incralac,
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Note: The in-house conservation staff at The Henry Ford has developed these Preservation Fact Sheets to assist in caring for your historical materials. These fact sheets provide basic information on the care, cleaning, and handling of a particular type of artifact, referral information to other conservation organizations, and a bibliography of authoritative works. Individuals may also arrange for a private consultation with a conservator. For more information, please contact the Benson Ford Research Center at research.center@thehenryford.com.

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