



CCI Notes

15/7

Rubber Components in Industrial Collections

Introduction

Rubber components are common in industrial collections. They serve many functions in artifacts such as automobiles, railroad cars, airplanes, and military vehicles.

Rubber components	Functions
tires, bumper pads, engine mounts	reduce shock and vibration
foot pedals, handgrips, floor mats	prevent slipping
weatherstripping, gaskets, wiper blades, grommets	repel water
brake and wiper hoses, radiator hoses	conduct air and liquids
drive belts for pulleys	transmit power

Although these parts were originally designed for rigorous outdoor use, they have a limited life span. They deteriorate through physical wear and natural aging, and they are attacked by sunlight, heat, oxygen, pollutants, and motor oil.

Indoor Settings

The rubber parts of an artifact will survive well in an indoor environment with only a few simple precautions to

slow down deterioration. Try to avoid the following:

- direct sunlight
- excessive heat
- constant, heavy loads
- air pollutants
- contact with oil

With the exception of pneumatic tires, no active maintenance is required.

Pneumatic tires

Pneumatic tires require special attention because they have to support the entire weight of the vehicle. Tires that are continuously under a load eventually lose their pressurized air. As they deflate they become distorted and develop flat spots. The bulging sidewalls crack and eventually the steel wheel rims cut into the rubber. Inner tubes are usually destroyed at the same time. There are two ways to deal with this problem.

The first option is to top up the air at least every other week with a portable air compressor. However, this is a labour-intensive program that can be difficult to sustain. Moreover, flat spots will occur unless the wheels are rolled to a new position on a regular basis.

A better solution is to take the weight off the tires by raising the vehicle on jack stands. These are available in different heights [51–61 cm (20–24 in.)]

and capacities [(2.7–5.4 t (3–6 tons)] from automotive suppliers. Place four stands under the axles or chassis of the vehicle, raising it until the tire treads just clear the ground. Cushion all areas of contact between the jacks and the vehicle with rubber pads at least 0.64 cm (1/4 in.) thick.

The same measures apply to vehicles with solid rubber tires, which are common on early electric cars, bicycles, and horse-drawn carriages.

Newer vehicles with independent suspensions require extra care to prevent the wheels from hanging down. Support the body with stands and place auxiliary stands under the control and suspension arms.

It is also worth noting that dust caps on the valve stems of pneumatic tires are easily stolen. If security is a problem, fix the caps in place with a small amount of Loctite *Threadlocker*.

Outdoor Settings

Display, storage, or operation of an artifact demands more planning and intervention in an outdoor setting than in an indoor environment. It is necessary to balance the preservation of original materials with the function of the rubber parts and the artifact's appearance.

Some of the agents of deterioration that can be avoided indoors, such as direct sunlight and air pollution, may be inescapable outdoors. Water in the form of rain, high humidity, dew, and snow is another potential problem. Many rubber components are composites of rubber and cotton. Some of these are made of alternating layers of rubber and cotton canvas or cord (e.g. early automobile tires, the vestibule diaphragms of railway cars, and drive belts for threshing machines) whereas others are made of rubber with a canvas backing (e.g. automobile running board mats). As the rubber of these components breaks down, the fabric is exposed;

once exposed it can absorb water, then swell and rot.

Whenever possible, protect artifacts from the elements by storing them in a shed or under a roof. This will go a long way in slowing down deterioration of the rubber parts.

Assess and replace

Before an industrial artifact goes outdoors, or as soon as it arrives on site, conduct a systematic inventory of its rubber parts. Ask the following questions:

- Is the rubber component original (i.e. installed during the working life of the artifact)?
- What is its function?
- Can you remove the part without destroying it?
- Can you replace the part without damaging the parent artifact?

In many cases, the best approach is to remove and replace original rubber parts with modern replicas. Consult the original shop manuals for removal and re-installation instructions, determine if the parts are available and affordable, then decide how to proceed. Installing new replica rubber parts makes it possible to store and preserve the original parts indoors while protecting the parent artifact outdoors.

A systematic approach

Begin the inventory and assessment of rubber components with the parts that have a weatherproofing function. These are a high priority because they must continue this function outdoors. Along with paint and caulking, they are the first line of defence against water. They prevent metals from corroding, and wood and textiles from rotting. They include:

- weatherstripping around windows, doors, trunks, hoods, hatches, and access panels
- boots around shifting levers (important for open vehicles)
- gaskets around the lenses of headlights and signal lamps

- gaskets behind door handles, side mirrors, locks, and other fittings

Make a special note of parts that are laminated with cotton canvas (see above). They are especially prone to deterioration in wet conditions.

Next, consider the rubber parts that are normally in prolonged contact with fluids (examples include flexible brake lines and radiator hoses, and the piston cups for brake cylinders) and replace them if fluids are present. Because the material of these items is thin, and often hollow, it will deteriorate faster than a solid piece of rubber. It will also be attacked from inside by corrosive fluids and fumes. If these parts will not be seen by the public, replace them with generic material. If appearance is an issue, use replica parts. Flush the removed parts with denatured alcohol and store them in a cool, dry place.

Finally, consider rubber parts — both exterior and interior — that will be exposed to long hours of direct sunlight or periods of rough handling. Exterior components can include things such as air brake hoses on locomotives and railway cars, or running board mats, small bumper pads, step plates, splash guards, and windshield wiper blades on automobiles and military vehicles. Interior parts can include floor mats, pedal pads, and gearshift lever boots; these could be subjected to extremely high temperatures in summer due to a greenhouse effect in the interior of the artifact. If possible, remove these exterior and interior parts and replace them with modern replicas for display or operation.

Other parts can be replaced at the owner's discretion. For example, those parts that protect against shock and vibration but are not in direct sunlight, such as engine mounts, require a lot of labour to replace. These could be left in place until a convenient opportunity arises, such as when a complete overhaul or restoration is under way.

Slacken all drive belts if they cannot be removed entirely. Worn belts with exposed fabric, as noted above, may deteriorate in the presence of moisture.

Small accessories with rubber parts are relatively rare, so they are difficult to replace. These include things such as window anti-rattle fittings and add-on parts with suction cups. Store these objects indoors, or make them part of a special exhibit on automotive accessories.

Whenever rubber parts are removed, clean the newly exposed areas of metal and wood that are underneath. This is a good time to smooth all sharp edges and remove any traces of rust and grit, especially on wheel rims. Touch up the areas with primer and paint before installing any new parts.

Replica parts

Accurate replicas of virtually every automotive rubber part mass-produced before 1975 can be obtained from restoration supply companies such as Steele Rubber Products, Inc. or Metro Moulded Parts, Inc. (see "Suppliers"). Their catalogues (both online and hard copy) are very useful references for locating and identifying parts on vehicles.

For newer vehicles (less than 15 years old), suitable parts are available from automotive parts stores such as UAP/NAPA Inc. which carry parts like weatherproof coverings (rubber bellows or *boots*) for constant velocity joints, struts, and rack-and-pinion steering assemblies.

Modern windshields are a problem. Instead of rubber gaskets or weatherstripping to keep out water, they rely on powerful urethane sealants. When the sealant deteriorates, it must be cut away and replaced with new material. This is an operation better left to experienced professionals.

Parts for vehicles between 15 and 25 years old are often difficult to obtain. These are too new to be collectibles, so manufacturers are not yet making replicas. At the same time, they are too old to be stocked as practical inventory by retailers. If new old stock (NOS) cannot be found, it may be necessary to resort to wrecker's yards. Parts found there will be in used, partially deteriorated condition, but they may serve the purpose until new replicas become available.

Tires

Replica tires and inner tubes are strongly recommended for vehicles that will be operating, or as replacements for severely deteriorated originals that cannot be inflated for display. Two leading manufacturers of replicas for automobiles, trucks, motorcycles, and bicycles are Coker Tire and Universal Vintage Tire (see "Suppliers").

Rubber tires for automobiles and bicycles were white, gray, or beige until around 1915. At that point, manufacturers began adding carbon black to the rubber as a filler. This made the rubber more durable and more opaque so it lasted much longer. For the sake of accuracy, install white replicas on vehicles of pre-WWI vintage.

Tracked vehicles

Tracked military vehicles such as tanks and personnel carriers have solid rubber tires on their suspension wheels and solid rubber blocks or *shoes* on their tracks. Replicas of these parts may be difficult to obtain and install, so the originals will often have to be left in place. Protect them from sunlight, ozone, and pollution with a coating of pigmented wax (contact CCI for latest recommended materials).

Some snowmobile tracks consist of wide rubberized canvas conveyor belts with metal cleats attached. Remove the entire assemblies and store them indoors or, if appearance

is important, replace them with expendable replicas.

Original parts and archived samples

Always try to save the rubber components of an artifact. Original factory-installed rubber parts reveal interesting details about the manufacture and design of an object (although unfortunately these are rare because they are normally discarded and replaced during the working life of a machine). The replacement parts and tires that are more commonly found on artifacts are not as historically valuable as factory originals but they are still worth saving. They tell the story of aftermarket components and repairs, and they may be just as old as the parent artifact.

Many deteriorated rubber parts, both factory and aftermarket, find their way into museum collections only to be discarded during restoration projects. As a result, very few industrial museums have original rubber parts such as automobile tires in their collections. Yet even deteriorated (i.e. brittle, cracked, or chalky) rubber components are worth saving as study material. They can be used as accurate patterns for the manufacture of replicas and they serve as a reliable basis for making comparisons between originals and reproductions.

In many cases, only representative samples need to be saved. For example, instead of saving the entire length of weatherstripping from around a windshield, cut off a small piece [approx. 25 cm (10 in.)] from the least degraded area. Store it in a labelled, polyethylene zip-lock bag, as archival material.

A set of old tires takes up a lot of valuable storage space. Therefore, keep only the best one of the set or, if space is severely limited, cut a cross section from one tire with a band saw. Choose the section that contains the most information on the sidewall, such as the manufacturer's logo and the size and inflation specifications.

Protective coatings

Deteriorated rubber cannot be restored to like-new condition. The most that can be done is to remove the chalky, oxidized surfaces and expose the fresh rubber underneath. Commercial products rejuvenate the appearance of rubber with a transparent silicone coating that also provides a temporary barrier against oxygen, UV radiation, and pollutants. Some coatings contain opaque black pigments that shield the rubber from the sun while improving the appearance. Even a soft paste wax will offer some protection.

Use these products if appearance is important. Otherwise, any opaque, tarpaulin-like cover will help to slow down deterioration.

Conclusion

Rubber components are critical parts of many industrial artifacts, both for interpretation and preservation. Unfortunately they deteriorate rapidly in most environments.

In an indoor setting, where rubber components can be protected from deterioration, original parts can generally be left in place.

In an outdoor setting, where it is difficult to protect rubber components from deterioration, replicas are generally better than originals.

Suppliers

Coker Tire
1317 Chestnut Street
Chattanooga TN 37402
USA
Tel.: (423) 265-6368 or 1-800-251-6336
Fax: (423) 756-5607
<http://www.coker.com/>

Metro Moulded Parts, Inc.
11610 Jay
Minneapolis MN 55448
USA
Tel.: (612) 757-0310 or 1-800-878-2237
Fax: (612) 757-7228
<http://www.metrommp.com/>

Spaenaur Inc.
815 Victoria Street North
PO Box 544
Kitchener ON N2B 3C3
Canada
Tel.: (519) 744-3521 or 1-800-265-8772
Fax: (519) 744-0818

Steele Rubber Products, Inc.
6180 Hwy 150 East
Denver NC 28037-9650
USA
Tel.: (704) 483-9343 or 1-800-544-8665
Fax: (704) 483-6650
<http://www.steelerubber.com>

UAP Inc.
7025 Ontario Street East
Montreal QC H1N 2B3
Canada
Tel.: (514) 256-5031
Fax: (514) 256-8469
<http://www.uapinc.com/>

Universal Vintage Tire
2994 Elizabethtown Road
Hershey PA 17033
USA
Tel.: (717) 534-0715 or 1-800-233-3827
Fax: (717) 534-0719
<http://www.universaltire.com/>

Bibliography

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Care of Objects Made from Rubber and Plastic. CCI Notes, No. 15/1.
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