A CLASSIC PROBLEM, DRY ROT

by Bill Bell

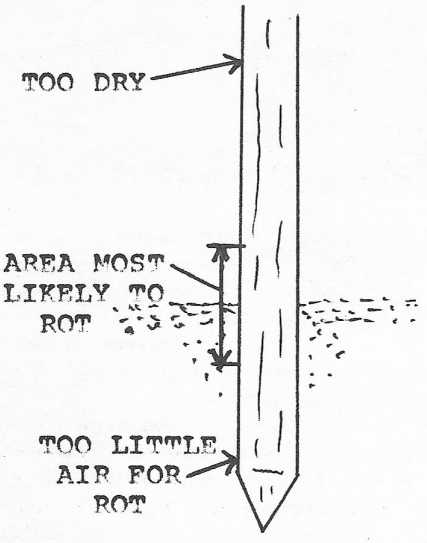
We all know the Civil War song that goes, "John Brown's body lies a moulder-ing in the grave....." These lines could be updated to apply to our classics. The question could be asked, "Does the wood in your classic body lie a mouldering in your garage?" After putting this paper together I would strongly recommend taking a few basic precautions to prevent fungi dry rot from developing in your clas-sic. In that fungi dry rot is an insidious process, we should be aware of how it develops, how it is detected, and, most important, how it can be prevented. Let's all avoid the dreaded event of removing a panel and being confronted by an ugly mound of dust that was once a beautiful piece of classic wood.

Wood rot is caused when a particul-ar type of fungi comes into contact with the surface of the wood. In order to appreciate this destructive process you should know a few things about these living organisms. Fungi are microorganisms found literally everywhere on this earth. In fact, mycologists (fungi experts), state that there are at least 100,000 separate species[1,2]; fungi seem to powder the earth. A few of these will infect wood and produce a process called dry rot. Dry rot fungi, it studied microscopically, are composed of spores and branch-ing filiments that could probably be called mold. Dry rot is a more standard term.

Fungi are living organisms that live at the expense of other living cells or their products, such as wood. Even though fungi are classi-fied as plants, they do not develop into roots, stems, and leaves. They contain no chlorophyll (like other green plants) and are biochemically quite different from your average plant. Mycology experts have identified specific fungi that cause dry-rot in frame work wood. The main culpret is a fungi subclass called Heterobasidiomycetidae[2] (can you pronounce that?). Impress your friends with this new found knowledge when dry rot is discovered. Say something like this, "Well I see that Heterobasidiomycetidae has gotten to this wood." On second thought you may lose your friends by dropping names like that. You can be safe and simply call it fungi dry rot.

Before we discuss how this fungi attacks wood, let us note a few posi-tive things about these microorganisms. Some of you reading this article would not be alive today if it weren't for a fungus called pencillin. Most of the potent antibiotics used today are deri-ved from various species of fungi. Fungi also help dispose of organic matter that accumulates everywhere. If there were no fungi, green plant life would cease to exist because fungi are an integral part of the food chain. The fungi that attack classic wood are only trying to do their job and reduce our wood to powdered humus. Our objec-tive is to somehow keep this wood out of their food chain.

What are the conditions needed to promote a wood fungus infection (Fig 1)?



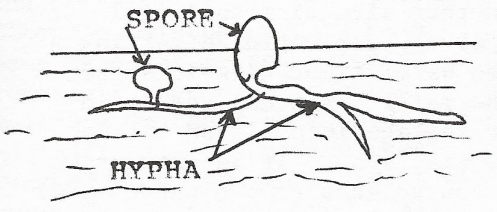
(Adapted From Blandford[3])

Fig 1. A fencepost with areas that are suscepible and resistant to rot.

As you can see, fungi will not attack wood that is dry, or submerged in water, or covered by soil; fungi need some air to survive. The wood must be moist before dry rot will develop. This implies that the term dry rot is really incorrect and perhaps a better term would be moist rot but since dry rot has such a wide spread usage we will leave the term at intact. There is such a thing as wet rot, but it is rare and doesn't occur in car wood. There are few references to wet rot seen in wood working publications; dry rot gets most of the attention[3].

When car wood is attacked by fungi the resulting damage is irreversible because wood is composed of dead cells and, as such, has no healing ability. It can be loosely compared to rust in that dry rot, like rust, can only be prevented or at best stopped and not allowed to progress.

If the conditions are favorable for dry rot infection it will begin when a microscopic fungi spore alights on the wood surface. This spore is like a seed that soon germinates, sending out roots (Hyphae) into the cellular spaces of the wood(Fig 2). These growing hyphae extract nurishment from the wood cells in the form of a cellulose (a carbohydrate). It is the cellulose that gives wood its hygroscopic properties of absorbing water which produces swelling. Conversly, if water is lost, wood will shrink. This cellulose is responsible for the "movement of wood" [4,5].



(Adapted from Blandford[3])

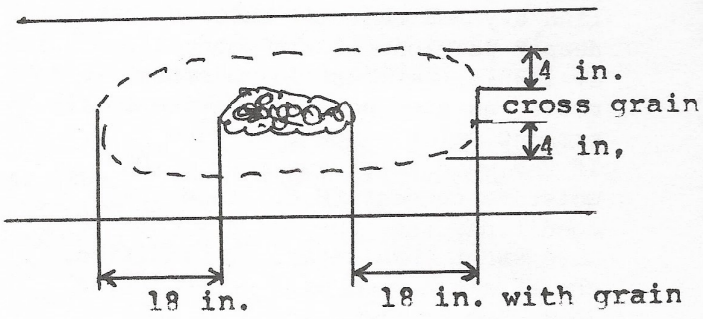
Fig.2 A fungi infecting wood that is suscepible.

The growing fungi deplete the wood cellulose and absorb the intercellular glue called lignin. The loss of these substances greatly alters the physical and chemical character of the wood. The infected wood becomes soft, less dense, and usually discolors. There is general agreement that the best way to detect the presence of dry rot is to check the wood resistance to puncture by a sharp instrument like a thin knife or sharp pick. Dry rot wood is soft with a spongy consistancy that contrasts with the uninfected wood[3]. During a probing check, moderate pressure should be used to possibly find dry rot that may involve the deeper portions of the wood. If available, an electric moisture meter can give some indication of the present water content of wood[4,7]. If the wood reads out over a 20% moisture content (M.C.) then the conditions are ripe for dry rot[3,4,5]; more about this later. In addition, the affected wood will change color depending on the species of wood involved. It may be black, red, blue or yellow. The most common finding is a lightening of the overall tint[3]. As the dry rot continues, the fungi produce new spores and hyphae. In an advanced case of dry rot the breakdown is so complete that the wood actually becomes a powder. This powder is teaming with spores that can continue to attack any remaining healthy wood. Blandford[3] stresses the importance of trying to avoid infecting good wood with spores from a contaminated area. He recommends preventive measures like cleaning any contaminated tools and (carefully) using a blowtorch to kill any remaining spores. This should be done before the new wood is positioned.

Once dry rot is detected it should be replaced even though the process can be stopped if the wood can be thoroughly dried out. How much good wood should be removed from the interface between the good wood and the infected area?

continued

One expert[3] recommends a procedure that could best be described as a wide local excision (Fig 3). Since dry rot in a classic usually involves wood of the body framework, most restorers favor complete replacement of the separate pieces. If you see surface fungi, does this always mean there has been invasion? No, say the experts[5], there are some fungi that grow on the surfaces that require sugars and starches but cannot digest cellulose. Fungi like this produce surface stains but don't invade and destroy like typical dry rot.



(Adapted from Blandford[3])

Fig. 3 The size of the piece of wood that must be removed to insure that there will be no further fungus infection.

Now that we know what causes dry rot and how the wood is affected, we should have a general idea where to look for dry rot on our classics. A few locations will be listed, but I am sure every classic model with wood has a few locations that are especially prone to develop wood dry rot. Find out where these particular areas are and give them special attention when inspecting for dry rot. I consulted Dr. Quentin Krafka about where one should check for dry rot and he put together this list:

1. The body rails under the sill plates
2. The door and cowel posts
3. The lower door frames
4. Remove the back seat to check the dog leg wood
5. Rear trunk rails

*Dr. Krafka uses a sharp penknife and relies on softness and wood flaking to determine the presence of dry rot.

How can we prevent the development of dry rot? An ounce of prevention is worth 10 pounds of cure when dealing with this problem. First of all, the moisture content of the wood must be under 20% of the total wood weight. Any time the moisture content exceeds 20%, wood rot fungi germinates and progressive dry rot infection begins. Ideally, we should keep our classics in a controlled environment that will keep the wood mositure content below this critical 20% level. How this is done is somewhat difficult because we must start dealing with relative humidity, air temperatures, and species of wood.

Wood will readily absorb and release moisture to keep a state of equilibrium with the environment. This hygroscopic property makes wood vulnerable to attack by fungi[4]. If you study the graph (Fig 4) it is evident that if we don't want to exceed a moisture content of 20%, then your classic wood should not be exposed to a humidity of over 85% for any extended time period. There is, however, some variation as started in the graph concerning temperature and the species of wood used. Cooler air tends to be less moist than warm air and vice-versa. A chart like this should reinforce the danger of dry rot development if you store in a damp environment. Keep the humidity down.

Another situation that will trigger dry rot would be getting a not so water tight classic soaked in the rain. This may result in water leakage into closed spaces containing wood. It is imperative that you somehow remove these water collections because a set up like this just invites dry rot. Damp wood with no ventilation must be avoided[6].

As a rule, fungi spores are not injured by light, by freezing, or even drying. Fairly temperate

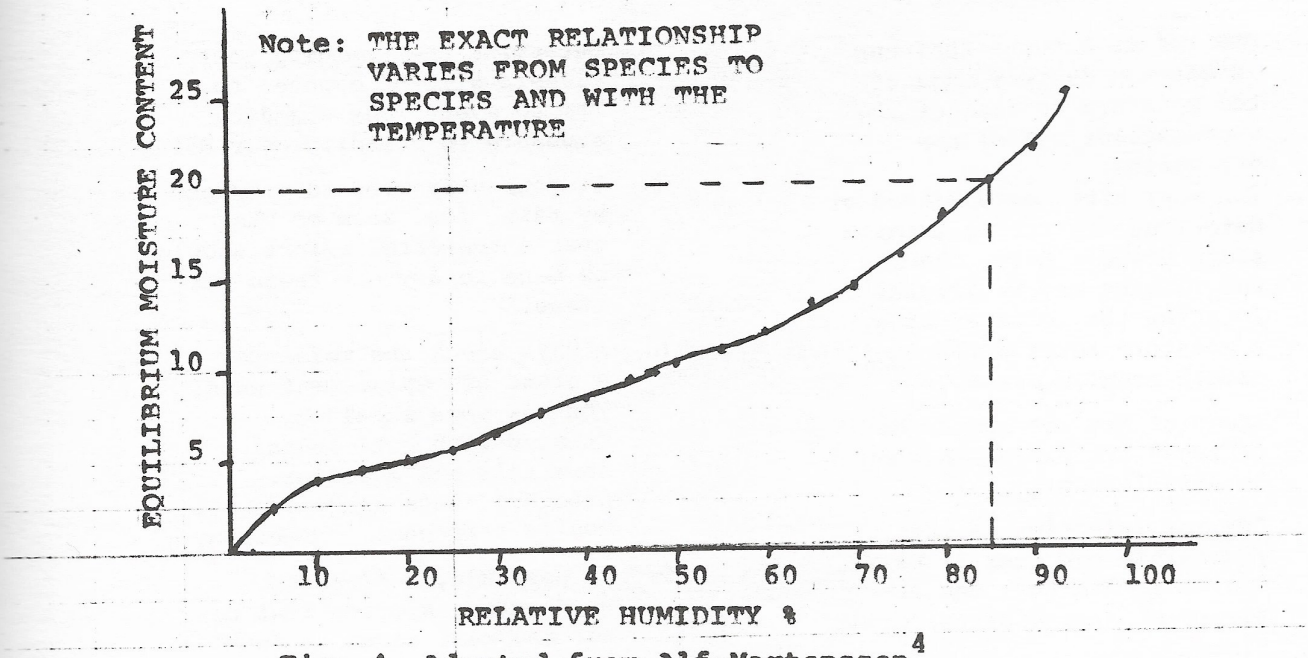


Fig. 4. Adapted from Alf-Martensson[4]

surroundings are most condusive to fungi development, although extreme heat will retard fungi growth[3]. Fungi are not very resistant to chemicals or heat and are easily destroyed by their application. Circulating fresh air is also an enemy of dry rot but in most instances our classic wood is deep in the body, making it difficult to avoid stagnant air spaces.

If wood is being replaced, be sure to check the mositure content of the new wood. It should be well seasoned (dried), and if possible, the moisture content should be checked with a moisture meter. The ideal moisture content should match the average humidity that the car will be exposed to (Fig 4). Electric moisture meters have been used for years. Packard routinely used them to check moisture in their body wood[7]. I couldn't help but notice that Packard used top grade bird's eye maple in their body wood. All that beautiful wood was painted black and hidden from view. Packard went first class.

It is possible to apply protective anti-fungal agents or sealers to the wood. There are many of these available from organic solvents to water soluable chemicals like sodium fluoride[3,4,5] (it's the same NaF that prevents cavities). One should not place too much faith in any of these protective chemicals because, and I quote, "Protective coatings reduce but do <u>not</u> entirely prevent moisture absorption and, therefore, should not be relied upon to compensate for poor drainage and poor ventilation."[8]

Our final comment on dry-rot prevention and that concerns using wood that has natural resistance to fungi. Hoadley[9] describes how this occurs and mentions that red wood is especially resistant to fungi infections. Adams[8] states that in addition to red wood, locust, white oak, cedar and Douglas fur have some natural resistance to dry rot. It would seem that if given a choice of replacement wood, you should select a wood with built in resistance to fungi.

Dry rot is like rust, it's always there lying on the weeds. It can be prevented. Here is a summary of findings that concern dry rot as it relates to our classics:

continued

1. Dry rot is a fungi that can infect and destroy wood if the moisture content of the wood exceeds 20% of the dry weight.
2. The most often used method of detecting dry rot is using a sharp probe. Color changes and flaking may be helpful in locating the infected area. A moisture meter could indicate problem areas.
3. Areas of dry rot should be replaced and the space should be disinfected.
4. Dry rot infection is not reversible and even if dried, spores remain they can activate when conditions permit.
5. All classics with wood areas that are prone to develop dry rot, know where to look.
6. Determine the humidity your classic will be exposed to. Try to avoid long standing exposure to humidity over 85%.
7. If your body wood is dampened by rain, fog, snow or what ever a concerted effort should be made to dry out these wet areas.
8. Always check the moisture content of replacement wood. The new wood should be treated with anti-fungal chemicals and a sealer. However, these agents do not confer permanent protection.
9. If possible, replace the wood with a species that has natural resistance to fungi infections. Make it hard for Heterobasidiomycetidae to have a free lunch on your classic wood.

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