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WHEN PRESERVATIVE TREATMENT OF WOOD IS AN ECONOMY

Although wood may be made more resistant to decay, insect attack or damage by marine borers by preservative treatment, such treatment may not always be economical, even though the material is exposed to the most severe deterioration. When material is to be in service for a short time only, durability may be unimportant, and preservative treatment would be a waste of money. If, on the other hand, the wood is naturally of low durability and is to be used in a permanent location, it is easy to show that great savings can be achieved by preservative treatment. Between these two extremes are any number of instances in which it is a more difficult problem to determine whether or not preservative treatment will pay.

Table 1 makes it easy to compare costs of treated and untreated material for users who know the average life of their product. This table takes into account the annual charge for interest on investment that must be considered, as well as the initial cost for purchasing and installing the product in order to arrive at the true annual cost of such material. The charge shown in table 1, of course, varies with the rate used by management to figure its cost of interest on investment and the average life of the wood; thus, both factors are integrated to form the basis for table 1.

Take railroad ties for example. A railroad may have found that an untreated tie, which costs $1.98 installed, has an average life of 8 years. If management uses 5 percent as its rate for cost of interest on investment, the annual charge for each dollar invested in such ties amounts to $0.1547, according to table 1. This $0.1547 is multiplied by $1.98, which results in an annual maintenance cost of $0.3063 per tie.

Treated ties, which cost $3.61 in place, might have a 54-year life, according to railroad records. The annual charge for each dollar invested in these ties amounts to $0.0539 (table 1). The annual maintenance cost per tie therefore would be $0.1946 ($3.61 multiplied by $0.0539).

By comparison, therefore, the railroad would be saving $0.117 per tie annually by using the treated ties ($0.3063 minus $0.1946).

Table 1.--Annual charges[1] on each dollar of cost of timbers in place

Life in years before replacement	Interest rate				
	2 percent	3 percent	4 percent	5 percent	6 percent
1	1.0200	1.0300	1.0400	1.0500	1.0600
2	.5150	.5226	.5302	.5378	.5454
3	.3467	.3535	.3603	.3672	.3741
4	.2626	.2690	.2755	.2820	.2886
5	.2121	.2183	.2246	.2310	.2374
6	.1785	.1846	.1908	.1970	.2034
7	.1545	.1605	.1666	.1728	.1791
8	.1365	.1424	.1485	.1547	.1610
9	.1225	.1284	.1345	.1407	.1470
10	.1113	.1172	.1233	.1295	.1359
11	.1022	.1081	.1141	.1204	.1268
12	.0945	.1004	.1065	.1128	.1193
13	.0881	.0940	.1001	.1065	.1130
14	.0826	.0885	.0947	.1010	.1076
15	.0778	.0838	.0899	.0963	.1030
16	.0736	.0796	.0858	.0923	.0989
17	.0700	.0759	.0822	.0887	.0954
18	.0667	.0727	.0790	.0855	.0923
19	.0638	.0698	.0761	.0827	.0896
20	.0611	.0672	.0736	.0802	.0872
21	.0588	.0649	.0713	.0780	.0850
22	.0566	.0627	.0692	.0760	.0830
23	.0547	.0608	.0673	.0741	.0813
24	.0529	.0590	.0656	.0725	.0797
25	.0512	.0574	.0640	.0710	.0782
26	.0497	.0559	.0626	.0696	.0769
27	.0483	.0545	.0612	.0683	.0757
28	.0470	.0533	.0600	.0671	.0746
29	.0458	.0521	.0589	.0660	.0736
30	.0446	.0510	.0578	.0651	.0726
32	.0426	.0490	.0559	.0633	.0710
34	.0408	.0473	.0543	.0618	.0696
36	.0392	.0458	.0529	.0604	.0684
38	.0378	.0444	.0516	.0593	.0673
40	.0365	.0433	.0505	.0583	.0665
42	.0354	.0422	.0495	.0574	.0657
44	.0344	.0412	.0487	.0566	.0650
46	.0334	.0404	.0479	.0559	.0644
48	.0326	.0396	.0472	.0553	.0639
50	.0318	.0389	.0465	.0548	.0634
52	.0311	.0382	.0460	.0543	.0630
54	.0304	.0376	.0455	.0539	.0627
56	.0298	.0371	.0450	.0535	.0624
58	.0293	.0366	.0446	.0531	.0621
60	.0288	.0361	.0442	.0528	.0619

[1] Based on the formula,

$$A = P\left[\frac{r\,(1+r)^n}{(1+r)^n - 1}\right]$$

In which,
A = Annual charge.
P = Amount of initial investment.
r = The rate of interest expressed decimally.
n = Number of years in service (the average life of the timbers when a group is considered).

Table 1 can also be used if the railroad is interested in learning how many years would have to be added to the life of a tie by treatment for the treatment to pay for itself. This can be determined, using the same two ties as an example.

Since the annual charge on the $3.61 treated tie is to equal the annual charge incurred by the $1.98 untreated tie, the following equation can be set up:

$$\text{Annual charge per dollar invested} = \frac{\$0.3063}{\$3.61} = \$0.0848.$$

Reference to table 1 in the column listing annual charges based upon a 5 percent interest rate shows that an annual charge of $0.0848 on each dollar invested means a life span of approximately 18 years can be anticipated from the treated tie. It is obvious that, if treatment adds only 10 years to the life of a tie, the treatment would pay for itself. Experience has shown that the life span would be much greater; thus, the railroad would be assured of making a profit as a result of using the treated ties.

If untreated timber is giving long life, treatment might not result in great savings. However, very often it might be possible to substitute for such timber a treated lower grade material that would give as long or longer life and a lower annual maintenance charge.

Several other advantages arise out of the use of treated timber that should not be overlooked, although they may not seem so important as cutting down maintenance costs. An increase in the life of a tie means fewer replacements per mile of track and less interruption in railroad traffic. In other types of installation, such as construction timbers, preservative treatment reduces the fire hazard by keeping the wood sound. Furthermore, a well-preserved timber maintains high strength and greater safety over a long period of time, while a decaying timber rapidly loses its strength and could contribute to accidents. Preservation, by lengthening the life of timber and by permitting the use of otherwise unsuitable material, also helps conserve a timber user's resources and the nation's timber supply.