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FOREST PRODUCTS LABORATORY - U. S. FOREST SERVICE - MADISON, WISCONSIN

WHEN PRESERVATIVE TREATMENT OF WOOD IS AN ECONOMY

Although any set of timbers may be made more resistant to decay by preservative treatment, such treatment may not always be economical, even though the timbers are to be exposed to the most severe fungus attack. If the timbers are to be in service for a short time only, durability is unimportant, and any kind of preservative treatment would obviously 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 for preservative treatment to show great savings. Between these two extremes there are any number of instances in which it is a more difficult problem to determine whether or not preservative treatment will pay.

If a timber user knows the average life that treated and untreated timbers are giving and the cost of each in place, he can easily compute, with the use of the following table, the relative annual costs of maintaining the two. A mine operator may have found, for example, that untreated timbers are giving an average life of two years and that their cost in place is $6 per set. Assuming an interest rate of 7 per-cent, the table shows that timbers which need replacement every 2 years cost annually $0.553 on every dollar of their cost in place. For the $6 set, then, the annual maintenance cost would be 6 times $0.553, or $3.32. Treated timbers, the user may find, gave an average life of 14 years and cost $7.50 per set in place. The annual charge on timbers with a 14-year life is found in the table to be $0.114 on each dollar of their cost in place. The annual cost of maintaining the $7.50 treated set, therefore, would be 7.5 times $0.114, or $0.86. Preservative treatment, then, would save this user annually $2.46 per set.

If a timber user knows the cost of treated and untreated timber and the average life of the untreated timber only, he can estimate how long treated timber would have to last to be as cheap as untreated timber. In the case discussed above, the untreated timber cost $6 in place; the treated, $7.50; and the untreated timber was lasting 2 years. The annual charge on the untreated set was found to be $3.32, and since the annual charge on the $7.50 treated set is to equal this, we may set up the equation, 7.5 x y = $3.32; then y (the annual charge on one dollar expenditure) = $3.32÷7.5, or $0.443. Referring again to the table and looking down the 7 percent interest rate column, we find that an annual charge of $0.443 on the dollar falls between the 2-year and 3-year line and evidently at a point equivalent to a life of 2-2/3 years. It can readily be seen from this that if treatment adds only 2/3 of a year to the life of the timbers, it would pay for itself, and the user could be sure from experience of others that it would add much more than this and would therefore be profitable.

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 with an annual maintenance charge which would compare very favorably with that of the better-grade untreated timber.

There are several advantages arising out of the use of treated timber which should not be overlooked, although they may not seem so important as cutting down maintenance costs. As decaying timbers are highly inflammable, preservative treatment, by keeping the wood sound, reduces the fire hazard. Then, a well-preserved timber maintains high strength over a long period of time, while a decaying timber rapidly loses its strength. Preservation, by lengthening the life of timber and by permitting the use of low-grade material, also helps conserve a timber user's resources and the nation's timber supply.

Annual Charges On Each Dollar of Cost of Timbers in Place

Life in years before replacement	INTEREST RATE						
	4%	5%	6%	7%	8%	9%	10%
1	1.040	1.050	1.060	1.070	1.080	1.090	1.100
2	0.530	0.538	0.545	0.553	0.561	0.568	0.576
3	0.360	0.367	0.374	0.381	0.388	0.395	0.402
4	0.275	0.282	0.289	0.295	0.302	0.309	0.315
5	0.225	0.231	0.237	0.244	0.250	0.257	0.264
6	0.191	0 197	0.203	0.210	0.216	0.223	0.230
7	0.167	0.173	0.179	0.186	0.192	0.199	0.205
8	0.148	0.155	0 161	0.168	0.174	0.181	0.187
9	0.134	0.141	0.147	0.154	0.160	0.167	0.174
10	0.123	0.130	0.136	0.142	0.149	0.156	0.163
11	0.114	0.120	0.127	0.133	0.140	0.147	0.154
12	0.106	0.113	0.119	0.126	0.133	0.140	0.147
13	0.100	0.106	0.113	0.120	0.126	0.134	0.141
14	0.095	0.101	0.108	0.114	0.121	0.128	0.136
15	0.090	0.096	0.103	0.110	0.117	0.124	0.131
16	0.086	0.092	0.099	0.106	0.113	0.120	0.128
17	0.082	0.089	0.095	0 102	0.110	0.117	0.125
18	0.079	0.086	0.092	0.099	0.107	0.114	0.122
19	0.076	0.083	0.090	0.097	0.104	0.112	0.120
20	0.074	0.080	0.087	0.094	0.102	0.110	0.118
21	0.071	0.078	0.085	0.092	0.100	0.108	0.116
22	0.069	0.076	0.083	0.090	0.098	0.106	0.114
23	0.067	0.074	0.081	0.089	0.096	0.104	0.113
24	0.066	0.072	0.080	0.087	0.095	0.103	0.111
25	0.064	0.071	0.078	0.086	0.094	0.102	0.110
26	0.063	0.070	0.077	0.085	0.092	0.101	0.109
27	0.061	0.068	0.076	0.083	0.091	0.100	0.108
28	0.060	0.067	0.075	0 082	0.090	0.099	0.107
29	0.059	0.066	0.074	0.081	0.090	0.098	0.107
30	0.058	0 065	0.073	0 081	0.089	0.097	0.106
32	0.056	0.063	0.071	0.079	0.087	0.096	0.105
34	0.054	0.062	0.070	0.078	0.086	0.095	0.104
36	0.053	0.060	0.068	0.077	0.085	0.094	0.103
38	0.052	0.059	0.067	0.076	0.084	0.094	0.103
40	0.050	0.058	0.066	0.075	0.084	0.093	0.102
42	0.050	0.057	0.066	0.074	0.083	0.092	0.102
44	0.049	0.057	0.065	0.074	0.083	0.092	0.102
46	0.048	0.056	0.064	0.073	0.082	0.092	0.101
48	0.047	0.055	0.064	0.073	0.082	0.091	0.101
50	0.047	0.055	0.063	0.072	0.082	0.091	0.101
52	0.046	0.054	0.063	0.072	0.082	0.091	0.101
54	0.045	0.054	0.063	0.072	0.081	0.091	0.101
56	0.045	0.053	0.062	0.072	0.081	0.091	0.100
58	0.045	0.053	0.062	0.071	0.081	0.091	0.100
60	0.044	0.053	0.062	0.071	0.081	0.090	0.100

Based on the formula,

$$A = \frac{P(1+r)^n r}{(1+r)^n - 1}$$

in which,

A = Annual charge.
P = Amount of initial investment.
n = Number of years in the recurring period (the average life of the timber).
r = The rate of interest expressed decimally.