

DETERMINATION OF WOOD FUEL "PRICE" IN STEAM PRODUCTION

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Opportunities for investment abound at a sawmill. Every kiln operator has at least half a dozen pieces of equipment in mind that would help to do a better job or do it easier. The problem, of course, is how to get management to provide the money. The best argument that can be made is a valid projection of costs and returns. With this information for each of the possible investments that management has under consideration, those which meet a minimum level of return on investment can be selected. If funds are limited, they can be allocated to the most attractive items. Frequently, this projection of values requires the consideration of intangibles. Take, for example, the installation of a dry kiln at a green mill. The costs of installation and operation can be determined fairly accurately as can the increase in sales price received. Not so easy is the value of increased mill flexibility and expanded market area. However, it must be reduced to a statement in terms of money or the analysis will be meaningless.

Recently I made a somewhat more limited study. In this case, a mill with a high pressure steam system was confronted with a fuel house which needed replacement at a cost of 60 to 70 thousand dollars. After consideration, management decided that the mill should be converted to air-electric and the high pressure system eliminated. Since steam would still be required for the kilns, installation of a low pressure system was indicated.

A few years ago, the obvious answer would have been a gas or oil fired package unit, and in fact, this was the choice the firm made at another plant a couple of years earlier. However, equipment manufacturers have developed dependable automatic feeds for wood fuel, overcoming the principle objection to using wood waste. These systems are high in capital and low in operating costs compared to equivalent capacity oil fired units. Analyzing these alternatives using the discounted cash flow method showed the wood fired unit to be much the better investment. This analysis appeared in the February 1968 issue of Forest Industries.

Wood fuel was considered to be free in that analysis. How much could be paid for wood fuel and still have annual steam production costs no more than for an equivalent oil fired system?

One way to estimate this is to calculate the fuel cost of steam produced using oil fuel and to use this as the value of the wood required to produce the same amount of steam. This was done and the values were \$7.25/unit of wood and \$1.01/cu yd of bark. However, this approach ignores any differences in other costs associated with the operation and so is usually invalid. The proper approach makes use of the same data collected for the discounted cash flow analysis.

Costs which should be considered are interest on the undepreciated balance, depreciation, taxes and insurance, and operating costs including fuel. (Tables 1 and 2) Assuming a profitable corporate operation, the investment tax credit could be considered as income in the second year. Alternatively it could be applied against the investment to reduce annual interest charges, as in this case. The difference between the total cost of steam production with oil fuel and cost of the wood fired system without a fuel charge is the value that can fairly be attached to the wood fuel. It was estimated that 6000 units of green wood fuel would be used yearly at the study operation in drying 15 million board feet of mixed pine region species. Simple division of these annual differences by the estimated wood fuel consumption yields a per unit value for wood. Additionally, where the alternative to the use of wood as fuel is incineration, a disposal charge should be added, recognizing the negative value of wood waste. R. W. Boubel at Oregon State University has estimated teepee burner operation at \$0.27/unit.

The discounted cash flow analysis previously made showed the wood fired system to be by far the better choice at the study mill. The analysis presented here indicates that if annual charges are made equal for the two

systems by charging the steam producing operation for the wood fuel consumed, the value per ton would be about \$4.50-\$4.75/ton and with credit for reduction in burner load, would add about twenty-five cents.

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Table 1. Annual charges - wood fired boiler \$115,670.

	Year									
	1	2	3	4	5	6	7	8	9	10
Interest 6%	6618	5918	5219	4519	3820	3120	2421	1722	1022	323
10%	11029	9864	8698	7532	6366	5200	4035	2869	1704	538
Taxes and insurance	3122	2821	2665	2509	2353	2197	2041	1885	1729	1573
Depreciation	10757	11657	11657	11657	11657	11657	11657	11657	11657	11657
Operating charges excluding fuel	1777	1653	1677	1766	1798	1830	1914	1949	2034	2121
Investment tax credit*		8097								
Annual charges 6%	22274	22049	21218	20451	19628	18804	18033	17213	16442	15674
10%	26685	25995	24697	23464	22174	20884	19647	18360	17124	15889

*Investment tax credit applied directly against capital to reduce annual interest charges.

Table 2. Annual charges - oil fired boiler \$28,040.

	Year									
	1	2	3	4	5	6	7	8	9	10
Interest on undepreciated balance										
6%	1604	1486	1317	1147	977	808	639	469	299	130
10%	2674	2477	2195	1912	1630	1347	1064	782	499	216
Taxes and insurance	757	719	681	644	606	568	530	492	455	417
Depreciation	2608	2826	2826	2826	2826	2826	2826	2826	2826	2824
Operating charges excluding fuel	360	360	360	360	360	360	360	360	360	360
Fuel	41000	41000	41000	42640	42640	42640	44350	44350	44350	44350
Investment tax credit*		1963								
Annual charges 6%	46329	46391	46184	47617	47409	47202	48705	48497	48290	48083
10%	47399	47382	47062	48382	48062	47741	49130	48810	48490	48169

*Investment tax credit applied directly against capital to reduce annual interest charges.

Table 3. Calculation of wood fuel value - 6000 tons per year required.

	Year										Avg.
	1	2	3	4	5	6	7	8	9	10	
<u>6% interest rate (Annual charges)</u>											
Oil system including fuel	46329	46391	46184	47617	47409	47202	48705	48497	48290	48083	
Wood system exclud. fuel	22274	22049	21218	20451	19628	18804	18033	17213	16442	15674	
Wood fuel value	24055	24342	24966	27166	27781	28398	30672	31284	31848	32409	
Price/ton	4.01	4.06	4.16	4.53	4.63	4.73	5.11	5.21	5.31	5.40	4.72
<u>10% interest rate (Annual charges)</u>											
Oil system including fuel	47399	47382	47062	48382	48062	47741	49130	48810	48490	48169	
Wood system exclud. fuel	26685	25995	24697	23464	22174	20884	19647	18360	17124	15889	
Wood fuel value	20714	21387	22905	24918	25888	26587	29483	30450	31366	32280	
Price/ton	3.45	3.56	3.82	4.15	4.31	4.48	4.91	5.08	5.23	5.38	4.44