When your tractor's had its day it's . . .

TIME TO TURN IT IN

Economists W. J. Dunford and R. C. Rickard pinpoint the best stage at which to sell a piece of machinery

COSTS involved in owning and operating any machine are of three kinds:—the purchase price; the repair costs necessary to maintain it in efficient working order and the running costs, comprising fuel and servicing expenses. Of these only the first two (purchase price and repair costs) need concern us since it is assumed that repairs will include such maintenance as will render both quality of service and running costs constant. The latter are therefore considered to be unrelated to length of working life.

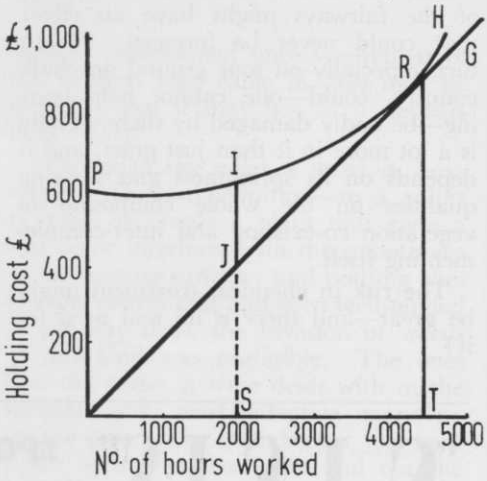
The longer a machine is kept, the greater will be the period over which its initial price is spread. At the same time, repair costs will be incurred at an increasing rate. The total of the purchase price and the accumulated repair costs at any stage in the machine's life may for our purpose conveniently be termed "holding cost".

We have taken a medium Diesel tractor costing £600 new, as an example, and we have prepared a typical schedule of cumulative repair costs over its life, measured in hours worked. The holding cost of the tractor is shown in diagrammatic form above right.

Cost Curve

The initial and replacement price of the tractor (£600) is shown at point P on the vertical axis. By adding successive cumulative totals of repair costs to the initial price, the holding cost curve PH is obtained. The slope of PH is seen to steepen over its length as total repair cost increases with age. Thus, at 2,000 hrs., holding cost is £635, and holding cost per hour worked is £635 divided by 2,000. This equals 6.35 shillings per hour.

Assuming no second-hand value to be realisable, the optimum time of replacement is seen to be at T, after 4,500 hours, at which point the lowest holding cost per hour (RT divided by OT) is achieved — £900 divided by 4,500



This diagram enables one to work out the best time at which to sell a tractor or any other piece of machinery.

equalling 4s. per hour. Replacement earlier or later than point R will clearly result in a higher holding cost per hour being incurred.

When trade-in facilities are available, the diagram shows the minimum exchange value the owner should be prepared to receive for his tractor if he decides to replace it before it has worked 4,500 hours (point T).

Holding Cost

Suppose a farmer who owns a tractor which has worked 2,000 hours (shown by point S on the horizontal axis) and is undecided whether or not to replace it by a new one.

In order to achieve an average holding cost no greater than he would have incurred had he kept it until point T, he would have to receive a second-hand

value of £235, represented by the line IJ. This restores him to the minimum average holding cost of 4s. The distance between the holding cost curve PH and the minimum average cost line OG can be regarded as the lowest exchange value which could induce the owner to consider replacing the existing machine with a new one.

Extracts at intervals of 500 hours from the data presented in the diagram are shown in Table I.

ment of machinery. In fact, provided the farmer's anticipated income would be taxed at a constant rate, capital allowances, with the exception of the investment allowance, in themselves are largely irrelevant to the timing of replacement.

Investment allowance excepted, capital allowances given prior to the machine's disposal are little more than provisional. The balancing charge ensures that the initial and annual allowances given in

Table 1.— Total Holding Cost and Break-Even Exchange Prices for a Medium Diesel Tractor Costing £600 New

Working Life	Total Holding Cost	Holding Cost per Hour Worked	Exchange Value Required to Equate Minimum Holding Cost of 4s per Hour
Hrs.	£	Shillings	£
0	600	—	—
500	600*	24.00	500
1,000	608	12.16	408
1,500	618	8.24	318
2,000	635	6.35	235
2,500	660	5.28	160
3,000	700	4.67	100
3,500	750	4.29	50
4,000	820	4.10	20
4,500	900	4.00	0
5,000	1,020	4.08	—

Over the first 500 hours, the maker's warranty will be in operation and there will be no liability for repairs.

The column on the right of the table shows the minimum exchange value required to attain an average holding cost equivalent to that obtainable had the tractor been kept until it had worked 4,500 hours.

Tax Allowances

Under present conditions there are factors other than the initial and replacement price and the cumulative repair cost which must be taken into account. Of these, the most important are probably income tax allowances, the need to keep up to date with technical improvements and the increased risk with age of mechanical failure.

The question of income tax is very much to the fore. The substantial capital allowances which are frequently available in the early years of a machine's life are thought of as a strong inducement to a more frequent replace-

excess of the actual market rate of depreciation are withdrawn at the time the machine is sold.

Market Rate

Similarly, a balancing allowance is given should the actual market depreciation exceed the total of allowances already given. It is, therefore, the market rate of depreciation (that is, purchase price less value realised upon sale or exchange) which eventually determines the amount of the initial and annual allowances finally retained.

The principles governing replacement as described earlier are thus in no way affected.

Technical improvements are likely to result in obsolescence in earlier models, and this may be a factor in the timing of replacement. Innovations will tend to depress the second-hand value of out-

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of-date models, so that there is little likelihood of the owner achieving the minimum exchange value needed to induce him to part with his existing machine.

If, under these circumstances, the owner is still prepared to undertake replacement, then the real cost to him of the improvement element of the new machine is the amount by which the trade-in value (plus the tax relief from any investment allowance) falls short of the minimum exchange value otherwise indicated.

Old Risks

The risk of mechanical failure increases as a machine gets older. Breakdowns at busy periods may prove expensive both in terms of the cost of emergency repairs and the disruption of farming operations. Although breakdowns will be minimised by proper attention to maintenance and repairs, failure cannot be ruled out entirely.

Where a farmer is particularly concerned at this risk, he would be advised to replace at the first opportunity of securing the minimum exchange value rather than defer replacement in the hope that more favourable trade-in terms might subsequently materialise.

The example used in this article is a realistic one, but it relates to one type of tractor only, operating under average conditions. Its usefulness lies in the fact that it can readily be adapted by the individual, in the light of his own experience, to suit a wide range of machinery and working conditions.

With grateful acknowledgments to the authors and the "Farmer and Stockbreeder".
