

ascertained by such means, because the initial cost of an equipment for handling material of any given weight does not really vary directly with the weight, although it does increase somewhat as the weight of the material to be handled increases, but this error is greatly discounted by the comparatively small proportions of the initial cost of equipment that actually enters into the question of net operating cost, being in fact only the fixed charges represented by interest on investment, taxes, insurance, etc. Depreciation, on the other hand, usually increases more rapidly than the increase in initial cost apparent when handling heavier materials, so that, being figured as a percentage of the initial cost, the inaccuracy of figuring a fixed rate of depreciation is compensated for by unduly high initial cost upon which it is figured. Power costs entering into net operating cost are, of course, directly dependent upon the tonnage handled, so that no error is apparent that is due to the high initial cost as expressed in terms of tonnage the carrier is capable of handling. In fact, the only error that appears at all is in figuring the fixed burden of interest, etc., which is but a relatively small percentage of the total net operating cost. Hence, Formulæ XXIV. and XXIV.-a, expressing the net operating cost of handling a ton of material over any bucket carrier system, may be considered conservatively accurate. More accurate results would be unattainable without most careful and complicated bookkeeping—far more systematic and painstaking than is practiced in any industrial undertaking or power house—so that the use of Formulæ XXIV. and XXIV.-a should prove of considerable value to the present operator of such a system of mechanical material handling as well as aiding his or others in forming an opinion as to the advisability of any contemplated bucket carrier installation, such formulæ giving the true economic value of the layout.

Net Operating Cost (N.O.C.):—

- W = Weight of load handled in tons per hour.
- L = Length (total) of horizontal travel of Carrier in one general direction in feet.
- H = Height (total) or distance through which load is elevated in feet.

Carriers with rigid buckets.

Average cost of chain0.2420 W(H + L)
 buckets0.2621 W(H + L)
 trough, gates, etc.0.03 WL.
 sprockets, drive, etc.5.5 W

Total average cost = 0.5041 W(H + L) + 0.03 WL + 5.5 W

Fixed charges:—

Interest .. 6% total cost } = 0.04286 W(H + L) + 0.0255 WL
 Insurance.. 1% }
 Taxes 2%—¾ cost } + 0.4675 W

Depreciation, renewals, repairs, etc. :—

Depreciation on chains0.03025 W(H + L)
 buckets0.05242 W(H + L)
 trough, gates, etc.0.01 WL
 sprockets, drive, etc. ...0.55 W

Depreciation account—0.00827 W(H + L) + 0.001 WL + 0.055 W

Total depreciation (summation) = 0.09094 W(H + L) + 0.011 WL + 0.605W

Then:—

Yearly Burden = 0.13380 W(H + L) + 0.0365 WL + 1.0725 W
 N = Number of hours (total) Carrier is in use per year.
 P_c = Price (cost) of a horsepower per hour.
 Cost of power(0.00103 L + 0.00133 H)WNP_c
 attendance(0.0000145 L + 0.000075 H)WN
 supplies(0.0000455 L + 0.000045 H)WN

Burden depending upon use of Carrier:—

= (0.00103 L + 0.00133 H)WNP_c + (0.00006 L + 0.00012 H)WN
 13380(H + L) + 3650 L + (103 LP_c + 133 HP_c + 6L + 12H)N + 107250

N.O.C. = $\frac{13380(H + L) + 3650 L + (103 LP_c + 133 HP_c + 6L + 12H)N + 107250}{100,000 N}$ Formula XXIV.

Carriers with pivoted buckets.

Average cost of chain0.2520 W(H + L)
 buckets0.4504 W(H + L)
 rails, etc.0.0180 WL
 sprockets, drive, etc. ...5.5 W
 reciprocating feeder0.25 W

Total average cost = 0.7024 W(H + L) + 0.018 WL + 5.75 W

Fixed charges:—

Interest.... 6% total cost } = 0.05970 W(H + L) + 0.0153 WL
 Insurance.. 1% }
 Taxes 2%—¾ cost } + 0.4888 W

Depreciation, renewals, repairs, etc. :—

Depreciation on chains0.0315 W(H + L)
 buckets0.06756 W(H × L)
 rails, etc.0.002 WL
 sprockets, drive, etc.0.55 W
 reciprocating feeder0.032 W

Depreciation account—0.0099 W(H + L) × 0.0002 WL + 0.058 W

Total depreciation (summation) = 0.10896 W(H + L) + 0.0022 WL + 0.64 W

Then:—

Yearly burden = 0.16866 W(H + L) + 0.0175 WL + 1.1288 W
 N = Number of hours (total) Carrier is in use per year.
 P_c = Price (cost) of a horsepower per hour.
 Cost of power(0.00028 L + 0.00108 H)WNP_c + 0.009 WNP_c
 attendance ..(0.0000145 L + 0.000075 H)WN
 supplies, etc.(0.0000455 L + 0.000045 H)WN

Burden depending upon use of Carrier:—

= (0.00028 L + 0.00108 H)WNP_c + 0.009 WNP_c + (0.00006 L + 0.00012 H)WN
 16866(H + L) + 1750 L + (28LP_c + 108HP_c + 6L + 12H)N + 112880 + 900NP

N.O.C. = $\frac{16866(H + L) + 1750 L + (28LP_c + 108HP_c + 6L + 12H)N + 112880 + 900NP}{100,000 N}$ Formula XXIV.-a.

Examples:—

1. Conditions:—

Bucket Carrier—Rigid Buckets—Rectangular Path
 Horizontal travel of load (total)I.D. = L = 100' 0"
 Load elevated (total) = H = 50' 0"
 Service:—2400 hours per year = N
 Cost of power:—\$0.02 per horsepower hour = P_c

N.O.C. = $\frac{2372000 + 1539 \times 2400 + 107250}{100,000 \times 2400}$ = \$0.02572 per ton of material handled

2. Conditions:—

Same as Example 1 except that service is for but 1200 hours per year.

N.O.C. = $\frac{2372000 + 1539 \times 1200 + 107250}{100,000 \times 1200}$ = \$0.03605 per ton of material handled

3. Conditions:—

Bucket Carrier—Pivoted Buckets—Rectangular Path
 Horizontal travel of load (total)ID = L = 100' 0"
 Load elevated (total) = H = 50' 0"
 Service:—2400 hours per year = N
 Cost of power:—\$0.02 per horsepower hour = P_c

N.O.C. = $\frac{2704900 + 1364 \times 2400 + 112880 + 43200}{100,000 \times 2400}$ = \$0.02556 per ton of material handled

4. Conditions:—

Same as Example 3 except that service is for but 1200 hours per year.

N.O.C. = $\frac{2704900 + 1364 \times 1200 + 112880 + 43200}{100,000 \times 1200}$ = \$0.03748 per ton of material handled

The examples cited are based on conditions frequently found in actual practice, and bring out two interesting and important facts: First, that the hours of service of a bucket carrier installation have considerable effect upon the net operating cost of the system, and second, that the hours of service bear a greater effect upon bucket carriers with pivoted buckets than upon those in which the buckets are rigidly attached to the chains and must therefore scrape the load over horizontal stretches. The first of these facts is because the items depending upon the cost of power are relatively small compared with the other factors entering into the question of net operating cost. The items chargeable to depreciation are by far the most important, and these vary little, whether the carrier is in use continually or only half time, for the wear and tear on a well cared for carrier that is in continual use is little, if any, greater than