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COMMON USES OF ELECTRICITY ON THE FARM

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Electricity on the farm is either supplied from an individual plant which usually is of the direct current type or from a high line which supplies a single phase alternating current. Although three-phase service offers some advantages for operating motors in excess of one horse power, the cost of distribution is so much higher than single phase that its use on the average Minnesota farm is not justifiable.

The National Rural Electrification Program which was started during the past year has aroused a great deal of interest in the construction of distribution lines to serve farms not now electrified. A great deal has been done by the national organization to set up standards of line construction and to determine a fair estimate of line construction costs. So many variables enter into the problem of determining line costs that only a survey of each proposed line will enable one to arrive at a solution. The contour of the land, type of soil, the number and size of trees along the proposed route, the number of customers per mile, and the power load all influence the cost of line construction and rates.

In this brief letter an attempt will be made to discuss only the last of the above factors, namely, the power load together with an estimate of the energy requirements for the various farm jobs.

Electrical energy is usually contracted for at a rate made up of a fixed charge and an energy charge. The energy is usually sold at a step rate, i. e., the cost per kilowatt hour decreases with an increase in energy consumption. Whether a farmer should attempt to increase his energy consumption in order to gain the advantage of lower energy rates is a problem which only each individual can solve. This problem should be carefully considered before purchasing electrical equipment, and especially such equipment which would replace machinery now operated by other sources of power.

ELECTRIC MOTORS

Direct current. Individual direct current lighting plants are usually limited to one-half horse power motors. For general purposes the compound wound motor is recommended. It has a high starting torque and draws a relatively low starting current.

Alternating current. Fractional horse power, single phase motors of the split phase type may be used to operate ventilating fans, tool grinders, washing machines and other devices which require a low starting load. The main advantage of this type of motor is its low initial cost. Its disadvantages, however, are that it requires a large starting current and that it tends to burn out when started under a heavy load. Motors of this type must not be connected to pumps or compressors of any type.

Repulsion—induction motors are somewhat higher in cost than split phase machines but they require a relatively low starting current and have a high starting torque. This type is the ideal motor for general purpose use about the farm.

Motor sizes. The size of the motor which can be used on a rural line is determined by the capacity of the line and the size of the transformer. The latter usually has a capacity of 1½, 3, or 5 kilovolt-amperes and would allow one to operate motors equal in horse power to the kilovolt-ampere rating of the transformer. Transformers may carry a considerable overload for short periods of time and one often finds a five-horse power motor operating from a 3 kilovolt-ampere transformer.

Power Requirements for Various Farm Jobs

Job	Average size of motor
Ensilage cutting	5-7½ H.P.
Feed grinding	3-7½ H.P.
Wood sawing	3-7½ H.P.
Water pumping	¼-1 H.P.
Cream separating	½-¼ H.P.
Milking machine	¼-1 H.P.

The amount of energy consumed per hour by electric motors is approximately one kilowatt hour for each horse power of the motor. A five-horse power motor will therefore require about 5 kilowatt hours per hour of operation.

Approximate Energy Consumption for the Various Farm Jobs

Use	Kilowatt hours consumed
Ensilage cutting	½-1 per ton
Feed grinding	5-10 per ton
Wood sawing	1-1.5 per cord
Water pumping (for all purposes)	20-40 per mo.
Cream separating	¼ per cow per mo.
Milking (portable machine)	1-2 per cow per mo.
Milking (pipe line)	2.5-4.0 per cow per mo.

HOUSEHOLD EQUIPMENT

Heating appliances. The amount of heat available from one kilowatt hour of electrical energy is 3415 British Thermal Units. This is approximately one fourth of the amount of heat available from one pound of coal of average grade. It can readily be seen, therefore, that the use of electric heating appliances must largely be justified from a convenience and labor saving standpoint rather than from an economic one.

Energy Consumption of Various Household Appliances

Appliance	Kilowatt hours consumed per month
Range	100-200 per month
Water heater	65- 85 per person
Refrigerator	30- 60 per month
Ironing	1¼ per person
Washing	¼ per person

Lighting and the operating of small household appliances such as the sewing machine, mixer, radio, and vacuum cleaner require about 50-75 kilowatt hours per month.