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Electric Motors for Large Farm Loads

Fred M. Crawford
Agricultural Engineering Department
College of Agriculture

Electricity is the ideal type of power for large farm loads (25 to 100 horsepower) such as irrigation systems, grain dryers, and feed mills. Ordinary single-phase power-driven units above 10 hp are not usually available. However, there are alternatives that in some cases permit large motors to be used.

The alternatives on the type of power need to be considered. The types to consider include (1) three-phase power (2) static-phase converters (3) rotary-phase converters (4) mechanically started electric motors and (5) petroleum-powered, engine-driven units.

In every case where electric power may be used, one of the first steps you should take is to consult with the electric power supplier on availability of power, rates, annual costs, and any local regulations.

Listed below are the various types of power that might be available. In each case, consider the cost of purchasing and operating the equipment as well as its availability for purchase. Also review installation and maintenance costs.

Three-Phase Power

Three-phase power is ideal for irrigation, grain dryers, or feed mills. Three-phase motors are readily available, motor maintenance is low, and they start with the flip of a switch.

However, at many locations, three-phase power is not available without building an electrical line extension, which is usually expensive. Review the cost of line extension because it is usually charged to the customers. Also, consider the actual rates per Kilowatt-hour, annual costs, or demand charges. The power supplier has information on line construction costs, rates, and demand charges.

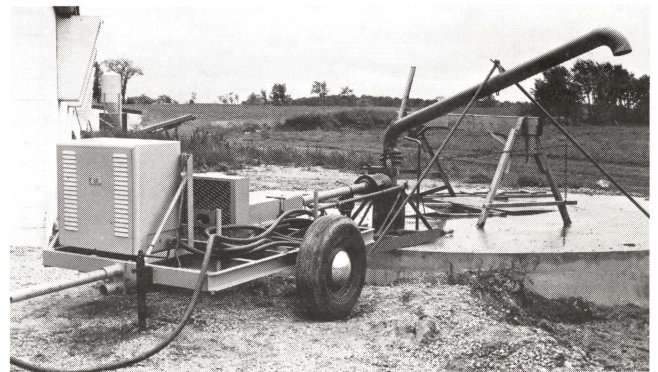


Figure 1. Static-phase converter (Wisconsin Electric Power Co. photograph).

Phase Converter

A phase converter is another possibility. A phase converter is a device which when connected to a single-phase line will generate a third phase, which makes power suitable for driving a three-phase motor. The advantage of a phase converter is that motors larger than the ordinary 5 to 10 horse, single-phase motors may be driven from a single-phase line. Consult with the power supplier to make certain they will permit the use of a phase converter and a motor of the size needed for the job under consideration. There are two types of phase converters available:

Static-Phase Converter. A static converter (Figure 1) is a device consisting of capacitors and a transformer that generates a third phase and in turn generates power suitable to operate three-phase motors of large horsepower. These units are not usually designed to operate more than one motor.

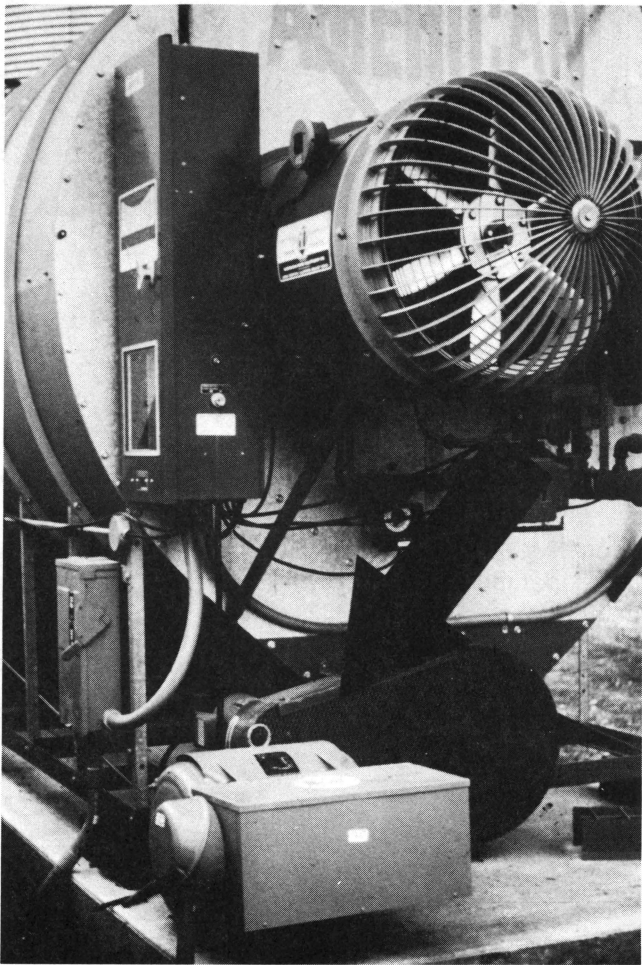


Figure 2. Rotary-phase converter (Arco Electric Products Co. photograph).

Rotary-Phase Converter. A rotary-phase converter (Figure 2) looks like an electric motor without an exposed shaft that is wired into the single phase source. When properly connected, it generates a third phase, which again will permit the operation of a three-phase motor. One of the advantages of the rotary phase converter is that in most cases it will permit the operation of one or more motors, with each one started and stopped independently of the others. They have rather low starting torque capacity.

Mechanically Started Electric Motors

The mechanically started electric motor (Figure 3) is a new piece of equipment which permits a large, single-

phase motor to be used, but the motor has no internal starting mechanism. A power take-off unit is connected to the motor drive shaft so that the motor and its load are started and brought up to operating speed with an engine. The single-phase motor is then connected to the line and picks up the load, eliminating the starting inrush of high electrical current that often creates a problem on a single-phase line. These units are available in 50 to 250 horsepower. This system is well suited to pumping water at point where single-phase power is available but at some distance from the pumping point.

Some of these electric motors have been designed to operate at 2300 volts. Often the pumping point is 1500 feet or so from the transformer location, and the wires must run underground from the transformer to the center of the field where the pump is located. You can greatly reduce line losses in the conductors by buying wires rated to carry a voltage of 2300.

Engine-Driven Units

Engine driven units may be powered by gasoline, liquefied petroleum gas, natural gas, or diesel fuel.

When electric power is available as an option, compare cost and convenience between electrical and engine power. Of course, there are many situations where the only option is engine power.

Even with engine power, a cost analysis should be made on the cost of the engine and maintenance, and cost of the various fuels that are available.



Figure 3. Mechanically started electric motor (Central Power Systems photograph).