

How To Upgrade Your Farm's Electric Power

Variable frequency drives (VFD's) let you use 3-phase motors without paying for 3-phase power. What's even better, they provide infinitely variable speed control on big electric motors and the tools they drive.

"Three-phase power is typically 150 percent more efficient than single-phase and allows smaller motors to be used," says Philip Myers, Myers Machine & Mfg.

These cost savings, explains Myers, are why 3-phase motors are used almost exclusively in industrial applications. As a result, used motors are readily available and economically priced. Myers frequently finds them in good condition for \$5 to \$10 per horsepower.

To use them, Myers buys VFD's. They rectify incoming AC power to DC current and back to higher quality AC power that can be controlled.

"A VFD provides infinitely variable speed control, up to double or more than the 60 cycles the motor was originally designed to run at," explains Myers. "It also gives control of the rate of acceleration and deceleration with dynamic breaking and stopping. Another advantage is that torque doesn't drop off as speed decreases."

Standard single-phase AC induction motors switch on or off at full voltage supply. VFD's let a motor develop 150 percent of rated torque while drawing less than 50 percent of rated current.

"VFD's eliminate the need for gear reduction because of the way you can adjust the electrical power," says Myers. "We put them on all our shop equipment. It's amazing to be able to easily adjust speeds."

For a number of years, Myers used 3-phase motors on single-phase current by using static converters or rotary phase converters. However, when he switched his shop from manual controlled machines to CNC (computer numerically controlled) machine tools, the power provided by the converters wasn't high enough quality.

"They required purer 3-phase power," says Myers. "The \$24,000 estimated fee from the power company for bringing 3-phase power one mile to our farm provided the incentive to search for another solution."

The answer Myers found was the VFD. He bought a 125-hp, 230V drive for about \$6,000 and coupled it to a 50 kW, 480V, 3-phase generator. This gave him a dependable power supply for his entire shop at roughly half the cost of the electric company fee, plus it was a cheaper power with no extra demand charges.

Myers also uses individual VFD's on each motor. He has used one drive on a 3-phase, 5 hp lathe for 14 yrs. with no problems. Myers cautions that drives and motors must be connected directly without a switch or transformer between them. "Drive voltage must match that of the motor, and you need to use a drive with 30 to 50 percent higher hp rating than the motor if input is single-phase," he says. "The exception to that is 3 hp drives and under."

Myers stocks used and new surplus drives from 1/4 hp drive with 115V single-phase input and 220V, 3-phase output for between \$130 and \$150, depending on enclosure.

"We've used these drives to power our



Myers coupled a 125 hp variable frequency drive to a 50 kw, 3-phase generator to power his shop.



These big 3-phase shop tools are powered on single phase power by a VFD drive.

3-phase, 10 hp screw compressor, lathe, forging hammer and variable hydraulic pumps, pressure washers, conveyers and more," says Myers. "My nephew uses one to provide variable feed and auto reverse on his band saw. A local fire department bought one to power their 3-phase siren. We've sold them

to woodworkers, farmers and manufacturers. Any heavy power usage will provide energy savings over time."

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Mounted on top of hoist's boom, solar panel charges a car battery that powers a 12-volt electric winch. Arrow points to solar panel.

Solar-Powered "No-Hydraulics" Hoist

"My solar-powered portable boom hoist requires no hydraulics, and I can use it anywhere," says Scott Knutson, Crookston, Minn.

The hoist rides on four 10-in. high, 6-in. wide rubber wheels with another large single caster wheel on back. It measures 8 ft. long by 4 ft. wide. A 30 by 20-in. solar panel, mounted on top of the boom, charges a car battery that powers a 12-volt electric winch with a working capacity of 1,800 lbs. The operator grabs a 1-in. dia. pipe handle to move the hoist around.

A voltage regulator monitors the battery so Knutson knows when it needs recharging.

"With the combination of the car battery and the solar panel for recharging, I can let the unit set outside or under the lights in my shop and it'll charge itself. I never have to plug it in to recharge it," says Knutson.

"I use the boom mainly to lift 15-gal.

chemical containers into my pickup or semi trailer. By pulling a pin I can adjust the boom's height to different working levels. I also use it to mount quick hitchers on tractors, to move combine concaves around the shop, and to mount weights on tractors. With the large caster wheel on back it's easy to maneuver into tight corners."

Knutson says the solar panel he uses is typically used to charge RV units. He paid \$150 for it. "At the rate I use the lift, I can recharge the battery in only about 2 1/2 hours," he notes.

Scott and his brother Curtis also own KB Mfg., LLC, through which they sell other products that they use. The company's website is www.rv.net/kbmf/

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Tim Hays' auto rotisserie lets him rotate a car body 360 degrees so it's easier to work on.

He Built His Own Car "Rotisserie"

"I built it by borrowing the best ideas I could find in catalogs and on the internet. My total cost was about \$300, which is only about 1/4 as much as commercial models sell for," says Tim Hays, Oreana, Ill., about his home-built, portable car "rotisserie". It lets him rotate a car body 360 degrees so it's easier to work on.

The unit mounts on six 4-in. caster wheels and is equipped with a pair of telescoping steel rails supported by a 3-pt. stand at each end. Tim places the car body on rails and fastens it in place. After that he can easily rotate the car body to either a 45 or 90 degree angle, and then insert a pin to hold the car where he wants it. When he's done working on the car,

he can roll the entire unit off to the side and work on something else.

"It makes the car much more accessible and eliminates the need to crawl under the vehicle," says Hays. "It allows me to securely bring the car to the desired height, then rotate it to the best angle for whatever I need to do to the car. I use a 'pivot bar' on one of the 3-pt. stands to rotate the car. It's so well balanced that even my 9-year-old daughter can easily turn it over with one hand."

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