

Tips for Choosing and Using Variable Frequency Drives

When selecting the most efficient and cost-effective variable frequency drive (VFD), it's essential to understand the specific considerations involved in your commercial venture. No two industrial uses are precisely the same, and even the terms used about VFDs vary. In some industries, these power converters are called variable speed drives, adjustable speed drives, ac drives, or a microdrive and inverter. For the purposes of this overview, we'll refer to it as simply a VFD. That being said, the primary VFD function is to take ac power and convert it into dc voltage. The variable speed aspect of the drive turns the converted voltage into dc pulses to power a motor outside standard speeds such as 3,600 rpm or 1,800 rpm. But before diving right into tips about how to select a VFD, let's take a closer look at how these units work.

Variable-Frequency-Drive Functionality

A VFD converter is generally made up of six diodes that facilitate the electrical current moving in a single direction. They function similar to pumping station check valves in many ways. As the flow moves through the converter, the diodes open and close automatically and keep the current flowing forward.

A VFD usually has three positive and three negative diodes. When they're tallied up, this standard configuration is often referred to as a "six-plus VFD." A VFD that uses a converter changes ac energy to dc, and units that change dc to ac are usually called inverters.

How to Select and Use a Variable Frequency Drive

Utilizing state-of-the-art VFDs in operations with highly specialized motors remains a necessity. That's largely because niche production machinery is tailored to the commercial need, not the other way around. Converting energy to feed equipment generally makes good business sense as long as you select the best unit for your needs. Consider these tips when conducting due diligence on a VFD.

1. Maximize energy efficiency

In operations that don't necessarily require an application to run at maximum speeds all of the time, a VFD can bring the minimum energy load to bear as needed. This provides substantial [energy cost savings](#) for manufacturing and other sectors. It's important to keep in mind that ac motors don't usually allow outfits to reduce energy by varying the current. In many cases, motors require upwards of 65% of the electricity used in production.

A prime example would be a blower that can be effectively used at 50% capacity rather than 100%. With a VFD, the energy use can be cut not by 50%, but by as much as 87%.

By incorporating dc machinery and a VFD, a company can slash its energy-driven overhead and improve profits. Businesses that convert to dc motors and VFDs often secure their return on investment between six months and one year. The first cost-savings tip is to switch to dc and VFDs if you haven't already.

2. Select a VFD that matches load

It's not uncommon for decision-makers to simply match the VFD with a motor's horsepower rating. That simplistic method often falls far short of the best possible selection. Sizing the VFD also includes consideration of items such as how often a motor stops and restarts, variable load necessities, or whether the VFD supports continuous operations.

It may be in your best interest to know the torque rate and maximum current required during operation. This information is usually listed as the full-load amps (FLAs) on the nameplate of the motor. One caveat to be wary of is that rewind motors often have significantly higher FLAs than initially listed on the nameplate. Getting an accurate baseline is important.

By selecting a VFD based on the horsepower and peak torque demand, you're more likely to enjoy the seamless motor performance. That unit may appear oversized at first blush, but choosing a VFD for all occasions can prove crucial when business is booming. The last thing any facility wants is a conveyor to grind to a halt because it's overloaded with a valuable product.

3. Understand VFD braking capabilities

While decision-makers often are concerned about a VFD delivering enough power to ramp up motors, so that they can operate at their maximum potential, deceleration is another calculation that should not be overlooked. When powerful loads must be swiftly curbed, the VFD may require a little help. In settings where big loads may call for fast reductions or complete shutdowns, it can be worthwhile to consider adding an external dynamic braking resistor.

A resistor provides the VFD with support to uptick braking torque by lowering the voltage quickly during the deceleration process. This scenario is prevalent in industries in which motors are tasked with powering up heavy loads coupled with frequent stops. An appropriate braking resistor can improve equipment longevity by reducing the heat shifts created by repeated stops and restarts.

4. Consider digital communication possibilities

The advanced technology incorporated into VFDs allows automatic communication with the programmable logic controller (PLC). When connected by a single cable, this interface can vacate the need for a multifaceted hardwired setup.

Many VFDs can enjoy connectivity with [standard Ethernet](#) cables that deliver seamless monitoring and efficient operation. When selecting the best VFD for your enterprise, technology and communication should play an important role in the setup and operational ease.

5. Know the installation requirements

It's important to keep in mind that VFDs may generate substantial heat while operating. When selecting the best-suited VFD for an outfit, the physical environment around the unit must meet safety standards.

Flammable materials can't be stored close to a unit that may routinely experience heat spikes.

It's also important to keep in mind that working conditions must be appropriately maintained based on [OSHA guidelines](#). The heat-throw from VFDs and other equipment require enhanced ventilation and fresh air circulation. Although VFDs meet industry safety standards, environmental considerations are part of making an informed decision about which VFD best serves your needs.

6. VFD sound in the workplace

Like other industrial machinery, VFDs will generate noise even if not properly installed and insulated from harmonic throws. Many of today's VFD specs advocate for using harmonic filters to minimize the noise in the workplace. These filters also tend to protect units from potential harm. It's always in every decision-maker's best interest to consider the acoustic considerations of the workspace and minimize potential noise.

Incorporating VFDs into operation can prove cost-effective by lowering energy usage and improving operational efficiency. The cutting-edge technology used in today's units allows industry leaders to recoup the return on investment within a single budget cycle. The key is selecting the right VFD to match your motors, working conditions, and operational goals.

- Lori Wade