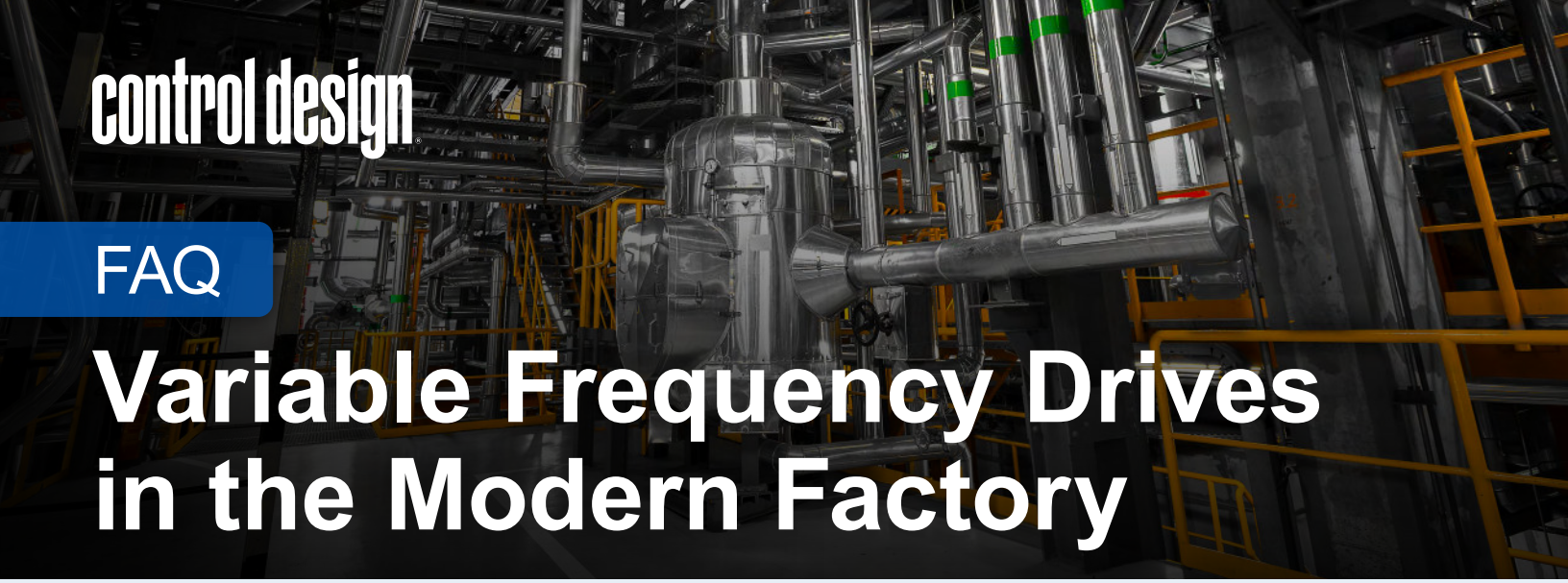


control design

FAQ

Variable Frequency Drives in the Modern Factory

Even though variable frequency drives (VFDs) have been on the market for nearly 60 years, they continue to prove themselves as robust, efficient answers to numerous applications that exist in factories, plants, ware handling, and process industries today. Ammar Al-Naseri, product manager with Fuji Electric Corporation of America, answers these frequently asked questions about VFDs. He also discusses their applications and evolution, which cements their place as a cornerstone for efficient and robust control of rotating equipment.

1. With all the varieties of motor controls available, VFDs are becoming very popular. What problems do VFDs solve for motor control that others cannot? Additionally, what qualities do VFDs have that make them uniquely able to benefit the industrial space?

Historically speaking, VFDs were an evolution of standard AC motors connected directly to mains power, which resulted in a set speed dictated by the physical construction of the motor. Because the VFD allowed not only speed control to an AC motor, but also precise control of torque, it can significantly reduce energy consumption by matching these two parameters to the actual load requirements. Mechanical wear and tear, especially from gear backlash and belt slippage, are greatly reduced as speed control provides for soft starting and soft stopping with programmable & variable ramp times.

2. What types of applications are best suited for VFDs in today's industrial and manufacturing environments?

Initially, VFDs were used mainly for pumps. However, HVAC and conveyance systems have also been a focus of VFD use. Today, as the cost of the VFD drops and performance increases, we are seeing them replace hydraulic systems for cranes and hoists and retrofitting DC drives in numerous applications. Because of the VFD's operational characteristics, they can be used as a power factor correction device, saving energy costs by increasing the efficiency of simple, steady-state AC motor applications. Furthermore, in applications where only single-phase AC power is available, the VFD can operate a more efficient three-phase AC motor, acting as a phase converter, while providing all the speed control and motor protection built into the drive.

3. What questions should we ask ourselves to identify whether VFDs are a good choice for our application?

Look at the advantages of VFDs and ask yourself if those advantages pencil out with any of your applications. Do you need energy and cost savings? Is your factory pushing for green initiatives? Do you have a large number

of motors in the plant or line that would lend themselves to having variable speed or dynamic loading compensation?

Whether a new project or a retrofit of older drives on an installed assembly line, VFDs should always be evaluated as a first choice for rotating equipment, regardless of the application. There are many VFD uses that have yet to be explored. The overall process can be evaluated to determine the potential savings by installing VFDs. If the process is variable, the motors driving the pumps, conveyors and mechanical equipment must be operated at variable speeds.

4. For many years, VFDs have led the way in power efficiency, functionality, and cost effectiveness compared to traditional across-the-line direct controls. Obviously, evolution continues, and new features are introduced. What are some of the latest advancements in VFDs that improve the ownership experience?

The feature sets and on-board intelligence of VFDs continue to evolve. For instance, some VFDs now support position feedback and control, making them suitable for applications that, in the past, may have been served only by servo drives.

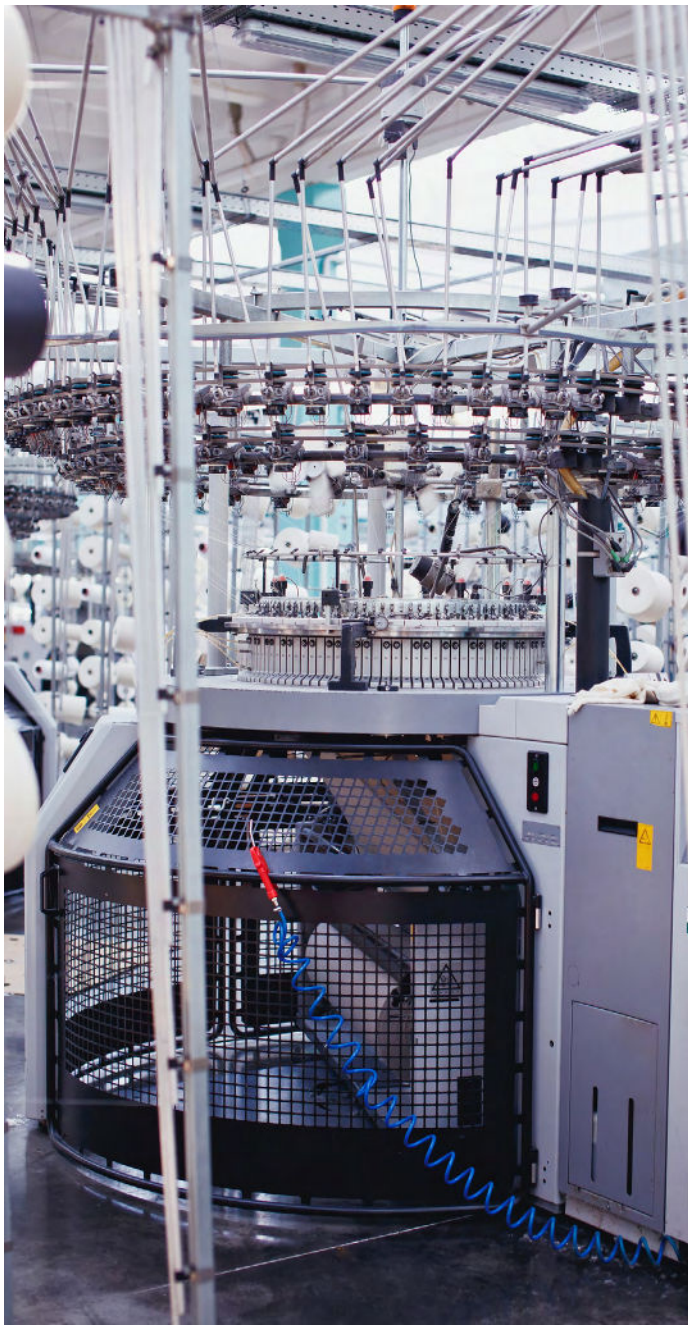
Additionally, the latest generation of VFDs has on-board processing, allowing closed-loop PID control for the attached motor and several external actuators. This eliminates the need for external PLC control for specific applications and processes, saving money and engineering programming costs. More and more, VFDs are providing the clients with enhanced process control, energy reduction and simpler programming. Many VFDs today provide specific application programming, making them much more than a “simple shaft turner.” Advanced communications capabilities allow the VFD to be integrated into a wide range of applications. Functions such as cascade control of multiple pumps provide more efficient operation of booster pump and lift station applications.

5. Can you explain more about how VFD control strategy benefits the customer through enhanced application programming?

Customizable logic functions are a new feature of VFDs that allow the configuration of simple logic operations based on external or internal parameters to execute programming steps inside the drive itself. These, combined with position control and internal PID control loops, often negate or minimize the need for PLCs. The programming steps are configured with a function block-type logic that is simple and intuitive, saving engineering and maintenance costs.

If supervisory control is needed, however, the latest generations of VFDs support a suite of real-time industrial network interfaces. These allow for precise orchestration with other drives and peripherals and diagnostic feedback to the operator and supervisory systems.

Another example of forward-thinking programming is the feature of filter clog detection and backwashing. The drive detects when the filter or pump is clogged and reverses the flow to clear the clog, thus reducing labor and downtime.



6. Looking into your crystal ball, what future advancements do you see coming to VFDs?

With a commitment to continued development and improvements, we could see advanced semiconductor technology, more application-specific functionality, programming simplicity, physical size reduction, energy-saving improvements and more user interface capabilities, making the operation and deployment of VFDs as simple and as prolific as a smartphone.