FAQs: Decentralized Control

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What is Decentralized Control?

Q. How is control decentralized?

A. In a decentralized control system, motor control functions are removed from a central control cabinet and distributed out on a machine, so that control devices are located closer to the machine's motors.

Q. Is there more than one way to decentralize control?

A. There are many levels of decentralization, from a motor starter or drive located at the motor to a fully decentralized system with a variable frequency drive, overload protection, motor disconnect switch, I/O and bus module, all combined in a single package that is installed on or near the motor. This package is often called a field distributor.

Q. What are the advantages of decentralized control?

A. There are many benefits that can be gained by decentralizing motor control. Chief among these are significant cost savings in engineering time and materials, including less wiring and smaller control panels, reduced installation times through drive and motor pre-commissioning, improved machine performance, less maintenance and fast replacement of electronic components without wiring.

Q. How long has decentralized control technology been available?

A. Decentralized control was first implemented in Europe beginning in the early 1990s. The automotive industry was the first to adopt it in the U.S. because it simplified production line changes and reduced engineering costs. Now it's being considered in many different applications like material handling and logistics.

APPLICATIONS

Q. Is decentralized control the right solution for every application?

A. As a rule of thumb, decentralized control is best for applications involving ten or more motors. These include the large conveyor systems used in material handling applications such as logistics or packaging or automotive assembly. Typically, those systems cover large amounts of floor space and require extensive wiring with a centralized control scheme.

Q. What are some typical applications?

A. Applications that require multiple motors and take up a large amount of floor space are best suited for decentralized control systems. These include any conveying process, such as rotary and lift tables, as well as automotive assembly, food and beverage processing, packaging, warehouses, logistics and other materials handling applications.

SAVING MONEY

Q. How much money can be saved by using a decentralized control system?

A. In our field tests, total savings of up to 30 percent were achieved compared to a centralized control system. The savings were due to less engineering time, fewer components and less wiring, smaller panels, smaller PLCs, and faster installation, debugging and commissioning.

Q. Can you give an example of a typical application and how much savings can be achieved by using decentralized control?

A. Consider a bottling line that uses 600 feet of conveyor and 50 1 HP motors. In wiring alone, for example, a decentralized control system would reduce the amount of power cable from 9,700 feet to 1,200 feet. Field installation time would decline from 300 hours to just 40 hours because there are fewer components. The estimated cost for building and installing a centralized control system for this bottling line, including panel construction, cable, cable tray, components, drives and labor, is $150,000. In contrast, by using decentralized control, the cost for the same system would be $90,000. So you can see there are huge potential savings for both OEMs and their customers.

Q. Why are control panels smaller?

A. Panel building costs are particularly significant in centralized systems because of the large number of components required, including overload protection, drives and bus gateways, as well as the larger panel size needed to accommodate these components. As more electronic components are added, the more heat is generated. Expensive fans and heat sinks are required to dissipate the heat, adding to the cost of building a control system. They also add to the energy costs for operating the system.

In contrast, in a decentralized system, the motor disconnect switch, overload and bus capability are built into the drive, which is mounted near the motor. Local I/O can also be collected without adding the hardware normally associated with doing this, such as terminal blocks, junction boxes and remote I/O modules. Costs are lower because there are fewer components to purchase and panel size is smaller.

Q. How is wiring reduced?

A. Complex wiring systems that run from the control cabinet to the motors are eliminated in a decentralized motor control system. With fewer wires, there is less potential for cross-talking noise and EMC interference, a major source of machine downtime. That means less wire to install and less rewiring when production lines must be changed or equipment needs to be upgraded to add sensors or other control devices.

Q. Are maintenance costs also lower with decentralized control?

A. Maintenance of a decentralized control system is significantly less. Commissioning is less complex, there's less wiring to change or repair, and it's easier to troubleshoot and replace a failed component rather than an entire system if problems arise.

PROGRAMMING

Q. Is it difficult to program a decentralized control system?

A. Programming should be simpler, which makes this another source of significant cost savings. In contrast to a centralized control system, which requires a large PLC to accommodate the complex programming needed to govern the entire machine, in a decentralized control system each field distributor carries only the code necessary for a specific set of activities. Since it is possible for all control functions to reside in the drive or field distributor, the PLC can be smaller, which means it is also less expensive. The PLC's primary function becomes system monitoring over fieldbus or Ethernet.

Q. Does decentralized control require a different programming language than ladder logic?

A. If your supplier's system is compatible with the IEC 61131 standard, you have a wide choice of programming languages, including function block diagram (FBD), sequential function chart (SFC), structured text (ST), instruction list (IL) and ladder diagram (LD). Most drives today come with pre-programmed application routines, which reduces programming and debugging time and makes commissioning much faster and simpler.

FIELDBUSES

Q. Do you need to use a fieldbus with decentralized control?

A. Not always. It depends on the unit selected for the application. Many fieldbuses are available with decentralized control.

Fieldbus allows for a more extensive and complex exchange of important data which can include control data, speed, ramp, unit status and other information. The use of fieldbus networks for monitoring and control is widespread in Europe and in the automotive industry around the world, and is now being adopted by many other industries, particularly for material handling applications.

Q. Will I have a choice of fieldbuses?

A. It varies depending on the manufacturer, but many suppliers offer a wide range of common fieldbus options, including Modbus Ethernet TCP/IP, Profibus and Profinet, EtherNet/IP, DeviceNet and ASi Interface.

Q. Can binary control be used in a decentralized system?

A. Binary control using discrete I/O as an alternative to a fieldbus is also possible.

Q. Will I need a PLC for decentralized control?

A. When using a fieldbus it is necessary to use a PLC. The size of the PLC and program can be reduced if the decentralized unit has programming capability that allows control routines to be carried out in the drive. This decreases the program size of the PLC and the scan times of the system.

MOTORS AND DRIVES

Q. I've heard that drives used in a decentralized control system should be oversized to withstand 150 percent of the normal motor operating current?

A. That's not true. The drives in a decentralized control system should be sized exactly the same as in any control system. If you have a 1 HP motor, you need a 1 HP drive. In most cases, you need to size the motor and drive for the application. The only time you might need to oversize the motor and drive is in a high cycling operation where a high starting torque is required, but this type of application is very rare.

Q. Will I need an external motor disconnect?

A. Most decentralized systems come with an integrated UL-rated motor disconnect switch unless you are building an IP 69K rated system, which requires that a UL-rated disconnect be placed away from washdown areas.

Q. Should I use a variable frequency drive or a starter for my system?

A. It depends on your application. A starter, even a soft starter, will not modulate starts and stops as well as a variable frequency drive. There is very little price differential between starters and drives today.

Q. Can you govern multiple motors with one drive?

A. An SEW decentralized control system like MOVIFIT® enables one drive to control up to three motors. The three motors are addressed as one node on the fieldbus, but each is individually controlled by the drive. With 62 potential nodes, an SEW system can control up to 186 motors. Other systems require a drive and a fieldbus node for each motor. This means the maximum number of motors that can be controlled on those systems is 62.

Q. How is motor brake control handled?

A. Motor brake control is integrated into SEW systems. With other systems, you will need to add a separate brake relay. A brake resistor can also be used to dissipate regenerative energy created when a motor is decelerated.

RELIABILITY

Q. The equipment in my factory has to stand up to a lot of abuse. Are decentralized control systems designed for that kind of environment?

A. Look for components that are specifically designed to withstand industrial environments, not just a drive placed in a metal enclosure. SEW, for example, uses an aluminum alloy that resists corrosion rather than standard aluminum for its housings. The housing needs to be rugged so that it can stand up to the abuse typically received by equipment in a factory, including contact with moving equipment like forklifts or maintenance people standing on it, as well as corrosion, dust, oil and moisture. System components also need to be compact enough so that they don't stick too far out into the aisles between machines.

Q. What type of IP rating should I have for my decentralized control system?

A. A minimum IP 65 rating is needed for an industrial environment. In a washdown environment, an IP 69K rating is recommended.

Q. What does the IP 69K rating mean?

A. The IP 69K or hygienic version of decentralized control systems is designed to resist corrosion on the outside and stay dry on the inside. Sharp edges that tend to collect contaminants and moisture are eliminated and coatings will not scratch or wash off under high-pressure water sprays.

COMMISSIONING

Q. How do I commission the variable frequency drives in my system, and how much time should I expect that to take?

A. With an SEW-EURODRIVE system using optional dip switches, commissioning is as simple as setting the fieldbus address of the device. Drives can also be programmed using software. Because the control code is divided among a system's drives, commissioning typically takes much less time, even when programmed with software, compared to a centralized system with complex programming.

Q. Do I need to use software to commission my system?

A. The answer is yes for most suppliers, but SEW provides a dip switch option that simplifies commissioning when both SEW motors and drives are used. Simply set the dip switches for control and fieldbus address

MAINTENANCE

Q. How is maintenance different?

Troubleshooting is easier and less labor intensive since technicians no longer need to be stationed at both the control panel and the machine to identify and correct problems. There are also fewer wires and external components, so diagnostics are less complex. Failures are also easier to troubleshoot because many manufacturers locate an LED display on the front of a unit.

Look for a modular system design that allows failed components to be replaced easily without sending the complete unit back to the supplier for analysis or repair. It is much more cost efficient to keep spare components on hand rather than complete spare units. Also ask for pre-wired plug connectors, which reduce maintenance time and replacement costs.

Q. What happens if I have to replace a failed drive or other component?

A. If the decentralized system you're using is simply a drive housed in an enclosure, you will have to replace the entire unit. If you're using an SEW-EURODRIVE solution, you just need to replace the failed component.

Q. Can I reset a fault remotely?

A. Faults can be reset remotely over fieldbus or manually at the machine.

OTHER CONSIDERATIONS

Q. Does a decentralized control system require overload protection?

A. Overload protection against excessive heating due to motor overload is a UL requirement for any control system. SEW integrates overload protection into its control board technology. With other systems you will have to add an overload relay.

Q. Do I have to use a safety PLC or safety network?

A. There are many safety system options, including safety PLCs and safety networks. SEW offers a safety concept that meets EN945-1, category 3 by disconnecting the 24 V safety circuit from the drive. This approach eliminates the need for contactors. This safety architecture presents an opportunity for huge savings – an estimated $650 for each 5 HP drive in components alone, for example – because you're able to use one safety relay instead of one safety relay and two contactors for each drive.

Q. What type of connection technology is available?

A. There are many connector options available from suppliers like Harting, Phoenix Contact, Amphenol and Woodhead. Customers typically have had to wire a drive to the motor during installation, but with new connector options and plug-in cables, all manual wiring by the customer is eliminated, which reduces installation time and costs and wiring errors.

Q. What are some of the standard options available with decentralized control systems?

A. One of the most common options is a keypad for manual operations, which also serves as a maintenance start/stop for diagnostics and repair. In addition, a wide variety of connector options are available for faster installation and replacement of motors.

Q. What type of cabling is available and do I need to use shielded cable?

A. Shielded cable is required for the 460 motor leads from a panel-mounted drive to protect surrounding equipment from EMC noise problems that often arise from PWM (pulse width modulated) signals sent from the drive to the motor. In a decentralized system, shielded cable is not required for the input power and is only necessary for the short distances between the drive and motor. For all other purposes, standard cables are used. When the drive is actually mounted on the motor, no shielded cables are required.

Q. What type of sensors can I use with a decentralized system?

A. Most any sensor can be used in a decentralized control system, including proximity and photoelectric sensors. Many systems treat each I/O point as a separate node on the fieldbus, which makes the fieldbus system larger. In an SEW control system, only the fieldbus distributor has its own node, so you can add more devices like sensors to your system without using additional nodes.

About SEW-EURODRIVE

Engineering excellence and customer responsiveness distinguish SEW-EURODRIVE, a leading manufacturer of integrated power transmission and motion control solutions. SEW introduced the world's first gearmotor more than 75 years ago and its systems are known for high performance and rugged reliability in the toughest operating conditions.

SEW-EURODRIVE offers a comprehensive range of electromechanical and electronic drive solutions. The company's modular product designs allow components to be quickly and cost-efficiently assembled in literally millions of different configurations to create a truly customized solution for every customer.

With its global headquarters in Germany and 2006 sales of more than 1.4 billion Euros, the privately held company has more than 11,000 employees with a presence in 44 countries worldwide. SEW operates from 11 manufacturing facilities and 61 regional assembly centers located around the world.

U.S. operations include a state-of-the-art manufacturing facility, five regional assembly centers, more than 60 technical sales offices and hundreds of distributors and support specialists. This enables SEW-EURODRIVE to provide local manufacturing, service and support, coast-to-coast and around the world.

For more information or to locate your nearest SEW field office, visit www.seweurodrive.com.