



MOTION & DRIVES TREND WATCH

THE BENEFITS OF DECENTRALIZED DRIVES ARCHITECTURE FOR AUTOMATED SYSTEMS

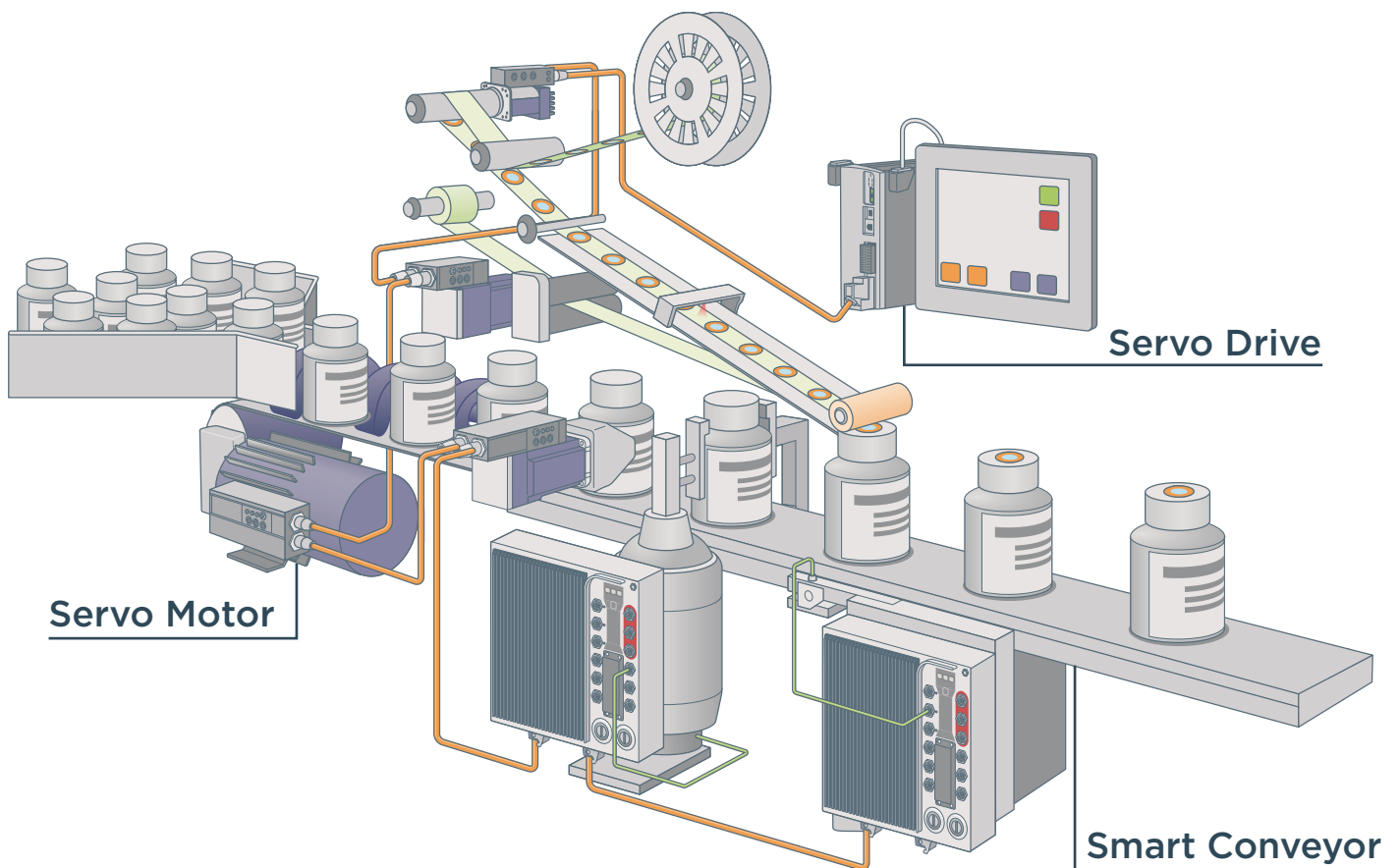
WHAT IS DRIVING THE DECENTRALIZED DRIVES TREND?

Many manufacturers today want machinery and production lines that provide greater mobility and flexibility. This allows operations to compete for more jobs, adapt to changing customer demands for e-commerce, and produce more customizable products.

As production lines and automated systems used in manufacturing facilities and warehouse operations become more modular, with adaptable, more flexible machines that can be moved around a facility as needed,

the trend toward decentralized motion and drives is also growing.

In a decentralized architecture, the drives are located on the production floor very close to or sometimes integrated into the production machinery. This provides more flexibility and agility in the manufacturing process. However, the use of decentralized drives requires more robust components and some changes in the design process for motors and drives OEM engineers.



HOW IS DECENTRALIZED DRIVES ARCHITECTURE DIFFERENT?

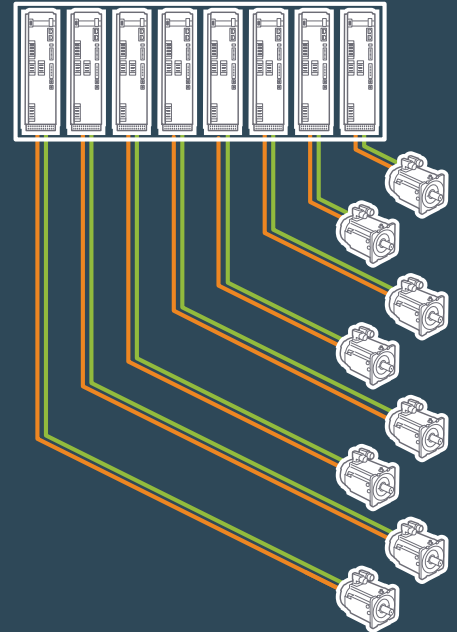
Across many industrial segments — from food and beverage production and general manufacturing to automated warehouses — any machine that involves movement requires servo motors and servo drives to control that movement. In the past, these systems utilized a centralized architecture, which housed all of the electrical components in a centralized cabinet, often far from the machinery on the production floor.

Take the example of a manufacturing operation with a 20-meter-long conveyor belt in the production line. A belt of this length will have servo motors every 2 to 3 meters, and each servo motor is controlled by a servo drive. A centralized architecture uses cabinets somewhere in the facility to house the electronic controls of the system. This requires many cables to be run from the cabinets to the motors in the conveyor belt on the production floor. The cables are typically installed underground or along the ceiling. A conveyor belt with 10 servo motors would require 10 servo drives in the cabinet, each one connected by at least two different cables (one for electrical power and one for data transmission).

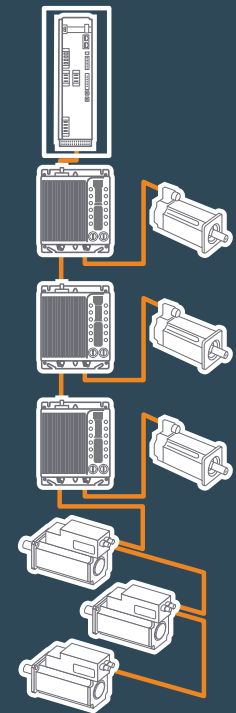
A centralized architecture makes it very difficult for production lines to be moved or adjusted, reducing flexibility in the manufacturing operation.

Compare that to a more modular solution where the conveyor belt is made up of modules that are each 3 meters in length and can be easily disconnected electrically and mechanically. This allows operations to make the production line longer or shorter depending on their needs for each production job. Decentralized architecture adds to the flexibility and ease of modularity of such systems. In a decentralized architecture, drives are moved from a centralized cabinet to the production floor, where they are placed close to or sometimes on top of or within the servo motors.

CENTRALIZED ALL DRIVES IN A CABINET

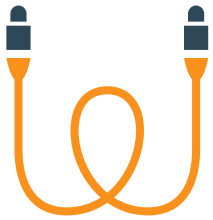


DECENTRALIZED MOST OF THE DRIVES CLOSE TO OR ON TOP OF THE MOTOR



ADVANTAGES OF DECENTRALIZED DRIVES ARCHITECTURE

Decentralized drives architecture for automated systems provides greater flexibility and enhances production line modularity, increasing opportunities for manufacturing operations. In addition to improved agility, decentralized control provides several other benefits, including:



REDUCED AND SIMPLIFIED CABLING:

Traditional centralized systems require a large quantity of extra-long cables, which are quite expensive. In addition, the need to string the cables underground or along the ceiling to connect to production machines can add significant costs for an operation. Because decentralized architecture uses a drive mounted near or on the production machine, much shorter cables can be used to connect the drive to the motor. This greatly reduces and simplifies the cabling requirements and reduces costs. In addition, some components for these systems use a single cable to send both power and data signals instead of requiring two cables to connect each drive and motor — reducing the number of cables needed.



SPACE SAVINGS:

A decentralized system minimizes or eliminates the space required to house a centralized control cabinet. Take the previous example of a production line with a very long conveyor belt. If the belt has 20 drives, it will require a very large cabinet to house the electronics. Eliminating the need for the cabinet frees up space in the production operation.



INCREASED CUSTOMIZATION:

A decentralized control system and its components can be adapted to meet individual customer requirements. This design flexibility allows customers to minimize the space requirements in a control cabinet or to eliminate the cabinet entirely by completely integrating the system into the production machine.



COST SAVINGS:

In addition to the cost savings provided by reduced cabling requirements, some decentralized control systems include preassembled system cables, which significantly reduce the time and cost for logistics, cabling, and commissioning, as well as minimizing the risk of error.



WHAT DOES THE DECENTRALIZED CONTROL TREND MEAN FOR DESIGN ENGINEERS?

Adhering to the status quo is often the biggest hurdle standing in the way of servo drive OEMs making the move to decentralized drive architecture. Decentralized control for automated systems does require more robust components and connectors, which OEM system designers must consider during the design process.

Because the drive and components are located on or near the machine in a decentralized system, the servo drive is exposed to more movement, vibration, temperature fluctuations, water, and dust from the production floor environment compared to the centralized cabinet architecture. If rugged components and connectors are not used in a decentralized system, issues can arise with system communication and performance.

To protect against this, system designers need to select drives and components with a higher IP rating. While components with IP ratings of IP20 or IP21 can be used in centralized systems, decentralized systems require components

with ratings of IP67 or IP68 depending on the application. A component's IP rating indicates the level of protection against dust and water. A lower rating, such as IP20 or IP21, typically means components are not intended to be directly exposed to dust or water; they are designed to be used inside a cabinet or in a very clean, temperature-controlled environment.



Another important consideration for system designers is that one-cable technology requires more robust connectors that can handle power and data transmission at the same time.

In addition, mechanical requirements are evolving due to decentralized architecture. The drive may be installed inside the equipment itself or be mounted on top of the machine, where it can be mounted vertically or horizontally. As a result, system design requires more consideration and complexity.

Keep in mind that some applications may be better suited for the traditional centralized cabinet design. These include applications in extremely harsh environments, such as oil and gas extraction or cement manufacturing, since keeping the electronic components inside a cabinet can provide an additional level of protection against dust, dirt, water, and vibration and can also reduce the risk of explosion in explosive environments.



3 KEY POINTS TO REMEMBER WHEN DESIGNING A DECENTRALIZED SYSTEM



Be aware of the differences:

It may sound simple, but the first important step in designing a robust decentralized drive system is for engineers to be aware of how this type of design varies from a traditional centralized system and what that means for component selection. Standard connectors with IP20 or IP21 ratings will not be robust enough for a decentralized drive design.



Choose rugged components:

Placing the servo drives near a machine, or even on top of or inside of a machine, requires much more rugged components than those used in a centralized design. They require a higher IP rating to withstand dust and water as well as high levels of vibration and choke resistance.



Look for customizable solutions:

A wide range of components and connectors are available. Look beyond standard solutions to those that can be customized to best fit your customers' specific application and needs.

CONNECTIVITY SOLUTIONS FOR DECENTRALIZED CONTROL

As more manufacturers move to increase modularization in their operations and decentralize their automation controls, they must pivot to rugged, more reliable components and connectors. When choosing a partner for the design process, consider a component manufacturer that brings a wide range of offerings while also providing design support and customizable solutions.

TE Connectivity (TE) has a broad portfolio of components and connectors designed for decentralized control systems that can be tailored for your customers' specific needs. Robust and rugged TE solutions are reliable in even the harshest industrial environments.

Some of the TE offerings for decentralized motors and drives include:



INTERCONTEC CONNECTORS

These connectors offer a reliable and easy-to-install solution to meet a range of requirements. Whether you need to connect power, signal, or data — or all three — INTERCONTEC connectors provide a customized solution for the application, helping to reduce downtime and increase productivity.



MICRO MOTOR CONNECTORS

These connectors with a separately shielded data element and various configuration options can be customized according to your requirements to provide power and signal for the servo motor.



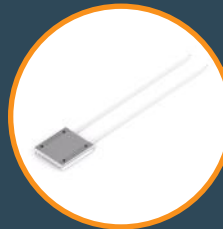
HEAVY DUTY CONNECTORS

Gain machine configuration flexibility by combining power, signal and data transmission in the toughest of conditions. In environments with vibrations, risk of dust, temperature challenges and mechanical impact, these connectors provide a reliable solution with solid aluminum or thermoplastic hoods and housings with protection degree from IP65 up to IP69k



MINI I/O CONNECTOR SYSTEM

These connectors increase reliability in high-vibration environments with two points of contact, improving the reliability of the communication



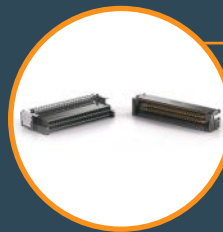
CUSTOMIZED BRAKING RESISTORS

TE has a broad portfolio of braking resistors in various sizes and shapes for decentralized drive architecture.



M8/M12 SPE HYBRID CONNECTORS

TE's M8/M12 connector system for machine industrial automation and control applications provides a solution that safely and reliably ensures communication in industrial environments. These systems provide a full solution that includes connectors, I/O modules, and cable assemblies.



BOARD-TO-BOARD CONNECTORS

Excellent signal integrity mitigates negative effects of electrical noise. These connectors also eliminate unnecessary movement in high-vibration applications with a high-force contact system. Connectors ranging from 3.96mm up to 2mm, and Fine pitch areas down to 0.8mm for smallest requirements



In addition to offering a wide range of connectors and solutions, TE experts will partner with OEM manufacturers in designing and testing servo motors and drives systems. With TE support, OEM manufacturers can design customized systems to meet customer needs. OEMs that partner with TE also get a single source for complete motion that can provide complete motion and drives solutions – making the process easier for them.

Connect with us

Take advantage of the benefits offered by decentralized control for industrial automation systems. TE's product solutions support professional decentralization, making it easier to simplify or retrofit machine architecture, save power, and reduce applied cost while increasing system reliability and productivity. Visit te.com/support or [explore the motions and drives product portfolio](#).

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