

Drive & Control profile

Choosing a servo architecture: What's best for your application?



With an integrated motor/drive system, units can be daisy-chained off a single power supply, dramatically reducing the cabling and associated installation costs.

Traditional vs. Integrated Motor/Drive Systems

In the past few years, the concept of integrating servo drives and motors together outside of the control cabinet and directly on the machine has gained a lot of momentum among design engineers. But how do you know if that style of drive architecture is suitable for your application? In some cases it may not be, but consider these criteria to help determine whether you should use an integrated motor/drive approach or a traditional servo system.

What's the difference?

A typical electronic servo system consists of three main components: the electric motor itself (running a specific machine axis) a power supply module (AC or DC) and the servo drive. Conventional servo drives place the power units and drive control in a dedicated cabinet on, or away from the actual machine. Cabling runs from the cabinet and connects the drive to the motor, with one power cable and one encoder feedback cable per

IndraDrive Mi Benefits

- Servo motor and drive amplifier combined into one compact unit
- 50 percent smaller than traditional system using separate servo drive and motor
- Reduces control cabinet space requirement by up to 70 percent
- Single cable provides both power supply and communication
- Potential reduction in cabling needs by more than 80 percent
- Add drives as needed without changing the control cabinet



Integrated motor/drive systems are especially suited for modular machines, such as packaging equipment, where line extensions are added for different products.

motor. The control cabinet is used to protect sensitive electronic elements from harsh factory floor conditions such as heat, vibration, static discharge and other factors.

Advances in current-day drive electronics, which are now smaller and more rugged, have helped make integrated drive/motor units practical for location outside of the control cabinet. With integrated servo drive/motor technology, the drive electronics are relocated from the control cabinet and mounted directly on the motor at the machine.

Each style has merits to consider, depending on your goals for designing, building and commissioning your machine.

Consider using traditional drives when:

- ☑ Your cabinet is already built into the machine frame (and there is no need to consider reducing it)
- ☑ You build different cabinets for different machines and you don't want to change to one cabinet for all machines
- ☑ You require either very large or very small motor sizes for your application
- ☑ You require the motors to be used in an extremely heavy shock or vibration environment
- ☑ You require various I/O to be distributed down into the drives

Consider using integrated motor/drives when:

- ☑ You need to reduce the machine footprint
- ☑ You need a modular machine to adapt easily for future growth or custom requests without changing the cabinet
- ☑ You want to lower the costs of manufacturing your machine
- ☑ You want to consider using just one cabinet design for all the machine types that you manufacture
- ☑ You need to meet documented sustainability goals to reduce factors such as machine weight (for freight), air consumption or energy use



More and more OEMs are discovering the benefits of integrated drive/motor systems—even for rugged applications such as waterjet cutting.

Consider overall cost

Using the integrated motor/drive system may provide a lower overall cost vs. the traditional servo system, where the drives are all mounted in a cabinet. First, you should consider the cost savings in engineering time alone for the cabinet layout and for the time reduction in mounting and installing the cabinet. For a traditional servo system, each motor requires two cables (for motor power and feedback), so on a typical eight-axis system, for example, you'll need to manage 16 cables pulled through wire ways and cable tracks. By using an integrated motor/drive system, that same eight-axis system now requires only one single cable coming from the control cabinet.

Let's consider a typical eight-axis cartoning machine, with motors mounted in line with the axes of

the machine, where the first motor is mounted three meters from the control box, and each subsequent motor mounted three meters apart thereafter.

Using a traditional servo solution with the drives located in the control cabinet, each motor has two cables running back to the cabinet. For the first motor, six meters of cable (two cables @ three meters) must be run. For the second motor, 12 meters of cable (two cables @ six meters) and so on. The final cable run, from the cabinet to the eighth motor, is 48 meters of cabling (two cables @ 24 meters). The total cable need is 216 meters.

Compare the potential reduction for the same application using an integrated motor/drive system, with a single cable daisy-chained from the

control cabinet to all eight drive/motor units. Eight cables at three meters per cable equals 24 meters total—a potential 89 percent reduction in cabling alone.

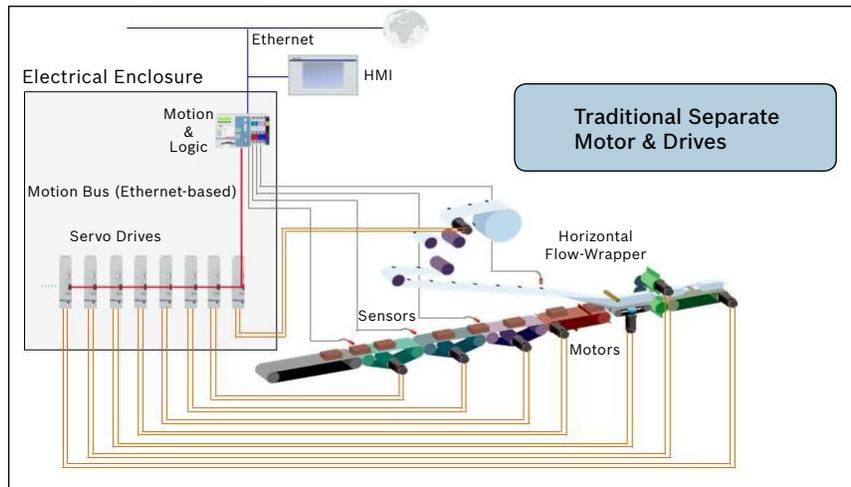
You also eliminate the need for cooling the cabinet and the costs associated with air conditioning units (AC) plus the power to run those units. Moving the drives out of the cabinet can also reduce the physical cabinet size by as much as 70 percent (for additional material savings) and can help shrink the overall machine footprint.

Do you need more modularity?

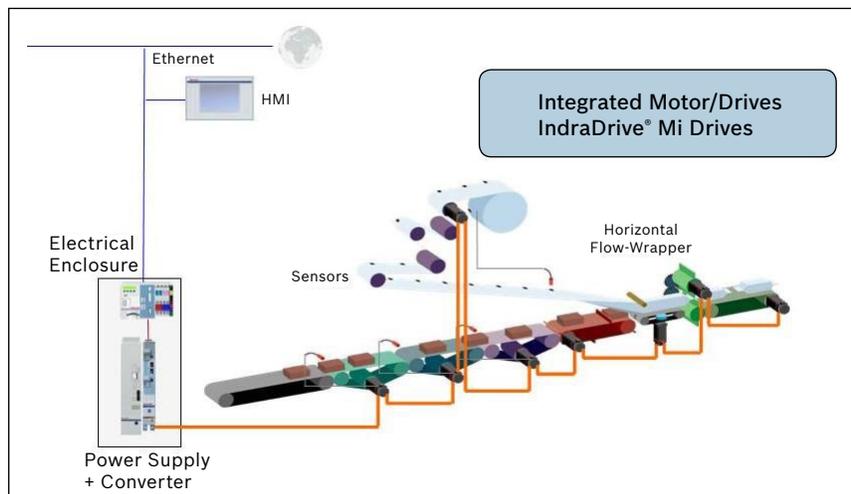
Integrated motor/drive systems are especially suited for modular machine requirements, such as packaging equipment, where line extensions are requested for different products. For example, adding more machine modules to help turn a beverage shrink packer into a tray shrink packer.

With an integrated system the modularity of a machine can be increased, creating flexible configurations for additional options without changing the cabinet layout, size, or adding components.

Integrated systems, such as [Rexroth's IndraDrive Mi](#) are capable of having 20 drives per KCU unit and up to four cable drops per single power supply. One consideration is that an integrated system may have slightly fewer options, such as four I/O per motor, fewer motor sizes available (from 10 to 100 inch-lbs continuous torque ratings and 6000 rpm applications), and less encoder options onboard. However, these options are usually enough for all but the most unique applications, and the cost of installation is significantly



When selecting a traditional vs. integrated motor/drive servo system, consider factors such as space saving, overall cost, functionality and modularity.



less. An added benefit from using an integrated motor/drive solution is a reduction in the stock of spare parts needed.

With a traditional servo system you may have more options available but at a higher installed cost. A benefit in using a traditional system, where all the drives are mounted in a cabinet, is that the technology is more widely recognized, with a large variety of sizes offered, including shock-proof versions. The option of a secondary

encoder is available and more I/O is available on the drives.

Other considerations

With the traditional motor drive system, consider if cabinet space/size is a critical issue or not, because it may already be integrated in the frame of the machine. The traditional systems may be more pertinent if smaller or larger motors are needed with the machine. Also, if the machine is susceptible to extremely heavy shock or vibration (> 1 g) the traditional system would be

recommended. However, don't forget that the traditional system can often require more engineering, mounting and wiring time, along with more space and AC units to cool the cabinet

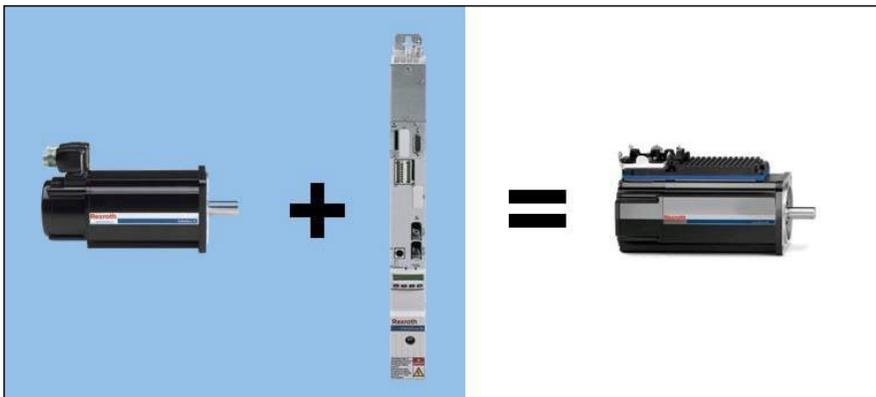
Why not both?

Note that integrated and traditional drive systems may be mixed and matched in a single application by adding up to 10 integrated motor/drives via a daisy chain cable to traditional drives in the cabinet. A combination of integrated and traditional drive systems may be used, for example, if the machine needs just one high-power motor. The drive for this axis can be used as the DC bus supply for up to 20 integrated motor/drive units. Also, this drive can be used for an optional encoder interface or additional I/O, or if you want to use a regenerative power supply or capacitive storage module for energy savings.



With integrated servo drive/motor technology, the drive electronics are relocated from the control cabinet and mounted directly on the motor at the machine.

For more details on Bosch Rexroth traditional and integrated motor/drive servo systems visit www.boschrexroth-us.com/BRC.



The Rexroth IndraDrive Mi uses 50 percent less space than conventional servo solutions.

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