

A smarter approach to simplifying motion architecture

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In motion system design, a great deal of attention goes into choosing the right motor and the right drive. Far less tends to go into what connects them, or into where those drives are placed. Yet these decisions shape much of what ultimately matters about a machine – what it costs to build, how much space it takes up, how quickly it can be commissioned, and how easily it can be adapted years later.

For a typical one-kilowatt axis, a cable with a representative run of ~15 meters can comprise nearly 20% of the total cost of just a single axis. This is compounded by the fact that unlike the drive and motor, the cost of cables climbs steadily with current and distance. More current means more copper and longer runs add up quickly across a machine with many axes.

These compounding factors change how we need to think about “simplifying the cabinet.” It is not a tidiness exercise. Approached deliberately rather than by default, simplifying a machine's wiring and architecture is one of the most powerful levers an engineer has, and recent advances in drive technology have only widened the opportunity.

From two cables to one

We can start by examining the connection between a single drive and its motor. For a brushless servo motor, the classic arrangement uses two cables. One carries power from the drive to the motor. The other carries feedback – the encoder or resolver signal

that reports rotor position back to the drive so the motion can be controlled. If the motor has a holding brake, that adds wires of its own.

Over the last several years, digital feedback devices have changed the picture. Rather than running a separate feedback cable, modern position sensors communicate digitally, combining the encoder's power and its position data onto just a few wires. That makes it possible to carry power, feedback and brake control together inside a single hybrid cable.

The payoff is immediate. One cable instead of two means fewer connections to terminate, faster commissioning, and less wiring to route, label and protect. The cable diameter may grow a little, but rarely enough to matter on the machine. And because a hybrid cable replaces two separate runs, its cost can come down to close to half.

Kollmorgen's AKD2G drive is built around this approach, using single-connector, single-cable technology so that the wiring between cabinet and machine comes down to one run per axis.

Rethinking where the drive sits

Single-cable wiring simplifies the link between a drive and its motor, but the drive itself still lives in the cabinet, with a cable running out to the machine. The larger opportunity is to question that layout altogether.

This is where a modular system such as Kollmorgen's MKD comes in. Instead of a cabinet packed with standalone drives, the MKD uses a central power supply that creates a shared DC bus. Drives can sit in the cabinet alongside it, or – more interestingly – they can be mounted out on the machine itself, close to the motors they serve. These “nearby” AKD-N drives connect back with a single cable that carries both

DC bus power and the fieldbus signal telling each drive what to do, and they daisy-chain from one unit to the next.

The effect on cabling is dramatic.

Picture a machine with ten motors. The conventional approach would put ten drives in the cabinet, each with its own cable out to a motor. This requires perhaps 20 meters apiece, meaning 200 meters of cable in total.

In contrast, when the drives are distributed on the machine and daisy-chained together, a single run leaves the cabinet and hops from drive to drive. The quantity of cable you need is drastically lower – likely somewhere around just 30 meters in total.

Smaller cabinets, and machines that can grow

Of course, simplifying cabinets can offer benefits beyond cutting down on cabling. Sensible, well-planned designs can make maintenance easier, reduce the risk of component failure, and speed up installation. Beyond this, there's also the fact that moving drives onto the machine shrinks the cabinet, and cabinet space is rarely free.

After all, a customer buys a machine because they need the machine; the cabinet is just something else they then have to find room for, and in an existing plant that can be a real headache. A smaller cabinet – small enough, in some cases, to sit on the machine rather than beside it – means the installation asks for little more floor space than the machine's own footprint.

There is a longer-term benefit too. Machines are often expanded after they are installed, with extra axes or optional units added a few years down the line. When everything is

wired back to a central cabinet, that usually means opening the cabinet, finding space, and rebuilding part of the wiring – work that takes the machine out of production while it is done.

With drives distributed on the machine, a new axis can often be added by taking the signal from the last drive in the chain and making a single connection to the next. The machine can be designed to grow, with far less disruption when it does.

A design decision, not an afterthought

It's key to note that there is no such thing as a universally “best” architecture. A standalone drive with a hybrid cable is the right answer for plenty of machines, while a modular, decentralized system earns its keep where axis counts are high or cabinet space is tight.

The point is that wiring and cabinet layout deserve to be treated as design decisions in their own right – made deliberately, against the real demands of the machine, rather than decided as an afterthought or inherited from the way the last system happened to be built.

Approached that way, simplifying the cabinet can soon become a practical route to lower cost, a smaller footprint, quicker commissioning, and a machine that is easier to live with for years after it ships.

Images:

Images 1: In motion system design, a great deal of attention goes into choosing the right motor and the right drive. (© iStock)



Images 2: In motion system design, a great deal of attention goes into choosing the right motor and the right drive. (© iStock)

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