

# THE DRIVE FOR SIMPLICITY: DEFINING TRENDS IN MOTOR DRIVES

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Traditionally, the primary use of drives has been in such applications as powering pumps, fans and conveyors. And while they will continue to be used in these applications, today's end-users have a very different approach to that of a decade ago.

Drives are now fully developed and are therefore more widely accepted as a product. The need to answer the question, "what does it do?" has been replaced by the expectation that the drive will "just do it." This shift in attitude brings with it the assumption that drives are simple to buy, simple to install, simple to start-up, simple to commission and simple to own and run.

At the same time, drives are finding new applications: in exercise machines, pizza ovens, honey centrifuges and car washes. In these applications, the drive is very definitely considered a commodity, and the original equipment manufacturers (OEMs), who may not traditionally have used drives, are once again demanding pure simplicity. In fact, a recent survey showed that simple controls and set-ups (70 percent) and convenient operator interfaces (53 percent) were rated as "very important" by AC drives users.

## THE QUEST FOR MINIATURIZATION

Simplicity and ease of use manifest themselves in many ways. The mere fact that drives can now be used in domestic washing machines is a testimony to their extreme compactness. Drives have become smaller, more capable, easier to use and cheaper.



1. The drives family from ABB extends from fractional horsepower to those that control 135,000 Hp motors.

Smaller drives are easier to install. Panel builders are able to fit more drives into a standard cubicle, so the whole panel can be smaller. This allows the use of smaller and less costly control rooms. It also becomes easier for OEMs to fit drives into their equipment. A classic example of this is in cranes, an application that has always had very limited space for the drive.

The reductions in drive size have resulted from the use of fewer components, greater packing density, improvements in semiconductor technology and improved cooling techniques. In fact, there has been a ten-fold decrease in the size of drives over the past 10 years.

## DRIVING DOWN COST

An additional benefit of reducing the component count in a drive is that it cuts costs. ABB predicts that over the next

few years the parts count of its drives will be reduced by approximately 20 percent through the use of integrated electronics to eliminate separate components such as external flash and RAM memories and analog/digital converters. Mechanical parts are also being integrated, for example, by combining frames and enclosures, allowing them to perform multiple functions.

Reducing part count also enhances reliability: fewer parts mean fewer interfaces and fewer mechanical fixings, which are often a source of failures.

## IMPROVED COOLING

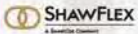
Advances in the development of power semiconductors have also helped to improve drives. A reduction in the power losses per-unit-area-of-silicon

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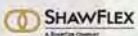
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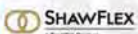
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## Motor Drives

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used means that the same silicon area is able to handle more power. This has enabled smaller semiconductors and reduced the need for cooling within the drive. This, in turn, allows the use of smaller heat sinks and reduced air volumes inside the drive – the result is smaller and smaller drives. The only limitations are the terminals because these must accommodate cables that are large enough to carry sufficient current to the drive.

But it is not just the development of power semiconductors that has enabled miniaturization of drives. Of prime importance is the technology used for cooling. Considerable R&D effort is being put into developing new cooling techniques, as well as into reducing the need for cooling.

While air cooling is likely to remain the dominant technique, liquid cooling is finding increasing use in areas such as wind power, transportation and marine applications..

### INCREASED FUNCTIONALITY

These ever-shrinking drives contain ever-expanding functionality – thanks to developments in software. Today's software monitors, diagnoses, configures and archives information and parameters concerning drives in industrial plants.

Set-ups are performed entirely using software functions, and then downloaded to the appropriate drives.

The set-up information is archived for future retrieval. To obtain the full benefit of this technology, however, operators must still refer to the user manual. ABB is striving to develop intelligent control panels that will significantly decrease the need for paper-based manuals. The secret, though, is to find an easy way of accessing this kind of functionality. Enter the keypad.

### THE IDEAL KEYPAD

ABB's R&D team scrutinized every aspect of how a user interfaces with a drive and developed what it believes is the most user-friendly keypad ever. The keypad for the ABB standard drive features only eight soft keys, through which all parameters, functionality and set-ups can be accessed.

Even the actual buttons on the key-



2. Eight soft keys set all functions and parameters on ABB drives

pad were carefully selected to ensure that just the right level of built-in resistance gives the user the feeling of stability and accurate key-press detection.

To develop the keypad, ABB compiled 11 guiding usability principles that consider all aspects of visibility and readability; the type of text and terminology, and the icons used. Based on this, ABB is now harmonizing the keypads of all of its drives.

A common look and feel allows users to switch between different ABB products easily, without having to go through a time-consuming learning process for each new product.

### THE TRUE VALUE OF THE KEYPAD

The advantages are not all aesthetic. There is a real financial incentive for customers to choose this keypad and its intuitive commands. Most equipment investment decisions now carry a proviso for fast installation to ensure that production will start rapidly and smoothly. Paramount is the speed with which a machine can be up and running after the installation of new equipment or after a maintenance shut down.

If a machine breaks down, it can cost the operator \$20,000 per hour, so easy set-up and commissioning are a priority. Such urgency increases the risk of errors in installation and commissioning. These can be overcome by eliminating manual intervention wherever possible; the keypad is central to this aim.

These guiding principles, and the fact that there are only eight keys on the keypad, suggested the need for intuitive assistance. ABB developed a series of "wizards" aimed at guiding the user through various procedures. There are "maintenance assistants," "diagnostic assistants," and, one of the most widely used, a "start-up assistant".

### THE MAGIC OF WIZARDS

With the start-up assistant, ABB provides a tool that guides the user through both start-up and commissioning by asking questions in plain text language. There are no complex parameter numbers or codes. The product's intelligence helps the user through the commissioning process.

For an OEM, who might buy 4,000 AC drives per year, the time saved by using an easy start-up system such as ABB's wizard can be significant. It can cut 15 minutes from the commissioning time of each drive, equating to a time saving of 1,000 hours per year. For an engineer working 2,000 hours per year, this is half a man-year.

A common look and feel allows the users to switch between different ABB products easily, without having to go through a time-consuming learning process for each new product.

### SPECIALIST HMI

Another tool that makes life easier for the OEM is a hand-held human-machine interface (HMI) that allows drive parameters to be installed in seconds. Called FlashDrop and available with selected ABB drives, the device can be used to select and set parameters, and to copy configurations between drives, without even powering up the drive.

FlashDrop is a patented new technology from ABB that streamlines the drive configuration process, allowing users to download a set of parameters in just two seconds. No specialized knowledge is required to use FlashDrop and the user interface will be familiar to users of ABB drives.

While the HMI is clearly important, ABB has also been looking at ways to simplify customer applications using the functionality packed into a drive. One of the drivers is the customer's interest in total cost of ownership, which includes commissioning, swap-outs and maintenance.

### THE FUTURE

AC drives are set to be smaller, more intelligent, easier to install and control, have better communications, and be suitable for many more applications – particularly at the low power end of the range.