Smaller Isn't Always Better – bylined article

Electronic products are getting progressively smaller in response to user demand, and in some cases engineers are obligated to select smaller components due to size requirements. But for many applications today, smaller isn't always better – in many cases, a smaller switch might not provide the necessary functionality or reliability for a particular design. Although size is often one key point to consider when selecting a switch, advances have also been made in power consumption, reliability, and "smart" functionality, making these features equally important to consider.

This article will examine recent advancements in design that engineers should be aware of when selecting a switch, beyond just the size. It will also show how designers can get the most out of these new "smart" switches, and what new technologies manufacturers are looking at for the future.

Reliable illumination

One of the major developments in switch design has been the growing adoption of LED illumination. LEDs present significant gains in reliability compared to incandescent or neon-illuminated switches. For example, the lamp life for an incandescent switch is approximately 7,000 hours, and for a neon switch, 10,000 hours. In comparison, An LED-illuminated switch has an estimated lamp life of over 100,000 hours – a virtually unlimited service life. LEDs are ideal for applications that require frequent on-off cycling, where an incandescent bulb would wear out much more quickly.

LED-illuminated switches can also maintain much lower temperatures than switches using incandescent bulbs. The display face temperature of an LED-illuminated switch is on average more than 50 percent lower than that of a corresponding incandescent switch. The wavelength of the light emitted by an LED can also be "tuned," allowing manufacturers (and by extension, designers) even more control over the color, brightness and temperature of the switch.

Designers are now able to use white and blue LEDs, which until recently were not available and difficult to produce. And, although there are still some concerns related to consistency, manufacturers are continually improving the process. Improved manufacturing methods are resulting in progressively lower costs and longer operating life.

High efficiency, high intensity

In addition to being highly reliable, LED-illuminated switches are also extremely efficient. A key measurement of efficiency in a light source is lumens per Watt (lm/W). White LEDs generate between 40-60 lm/W; in comparison, typical incandescent bulbs generate from 12-14 lm/W. And LED-illuminated switches consume approximately 50% less power than incandescent-illuminated switches.

LEDs have also advanced in a few areas where incandescent bulbs have traditionally held a significant advantage. For example, incandescent bulbs used to have a much stronger illumination intensity than LEDs, but now LEDs are being supplied that very nearly match their incandescent counterparts. Incandescent bulbs are inexpensive, but LEDs are becoming more price competitive.

LEDs are being used in a wide variety of applications. These include computer/networking hardware; industrial/plant controls; gaming machines and amusement park equipment; medical devices such as MRI and X-ray machines; audio/video control consoles; and automobiles, among others. Designers are now including LEDs in even more products to add to the style and functionality of the Human Machine Interface (HMI) required by many of today's applications.

Switches get "smarter"

Programmable LCD switches combine two important switch options: dedicated function keys and touchscreens. Most control panels incorporate dedicated function keys: buttons with a specific name, number or symbol to identify them, which perform one specific function. The problem here is that dedicated function keys have their limitations: each option or function added to the control panel requires another function key. As an extreme example, a panel designed to perform 2000 functions would need 2000 individual function keys.

As a result, touchscreens have become a popular method of operator input. Users can access large amounts of information with touchscreens – they are guided through a series of choices with a simple touch of the screen. Control panels incorporating touchscreens tend to be smaller in scale and more user-friendly than those using dedicated function keys. However, touchscreens also have drawbacks – the lack of tactile feedback often leads to inadvertent input errors. Users are frequently unsure if "contact" has been made with a touchscreen, and users often inadvertently touch the screen where they did not intend to. These input errors are two main factors that impede user acceptance of touchscreens.

The programmable LCD switch offers another option. They combine an LCD key cap with a switch base. The key cap has all advantages of a programmable LCD display while the base provides the functionality of a switch. As a function key, the LCD switch can be programmed to perform many specific functions. Unlike a dedicated function key, an LCD switch can be labeled with and perform numerous options.

Programmable LCDs in the real world

One example, a hydroelectric plant application, required 1,600 different switch functions from a control panel. The operators chose to incorporate a panel of 116 LCD switches in a panel with five rows of switches: 16 in the top row and 25 in the bottom four rows. The 16 switches on the top row are assigned and labeled with specific functions. Pressing any one of these 16 switches changes the lettering (or graphic) of the 100 switches below. Each of the 100 switches is capable of sending a signal to perform the function shown on the key cap.

With this arrangement, operators are able to access over 1,600 different control options in only two keystrokes. This design not only decreased the overall size of the control panel but it also reduced the number of switches per panel. In addition, each of the switches eliminated from the design had a unique part number, which reduced the number of recorded part numbers, simplifying the company's inventory.

Adoption of programmable LCD switches is increasing as more engineers view them as a viable option. The ability to perform several functions from a single switch reduces panel size and improves functionality. Programmable LCD switches in the future will offer more and more options to fit a variety of applications.

“Small” developments
One key development in the field of programmable LCD switches has been the introduction of compact models. These new compact programmable LCD switches are 25% smaller than industry standard, allowing designers to include these switches in applications where size is an issue and user interface is required. These smaller switches also consume less energy and come equipped with brighter displays.

This smaller, compact size makes these programmable switches perfect for applications including industrial control panels, communication systems, audio-video broadcast workstations and simulation equipment. In many cases, the size constraints posed by the workspace (for example, a switcher in a mobile production van) prevent designers from using traditional programmable LCDs.

Conclusion
Today’s constant advancements in technology and manufacturing are often the result of engineers’ quest to “make it smaller.” But for nearly all switch applications, reliability, efficiency and functionality are just as important as size – if not more so. LED illumination and programmable LCD designs are providing engineers with greater options than ever before when selecting a switch. And these advancements, rather than merely focusing on cosmetics, offer real gains in power savings, lower replacement costs, longer life and much greater utility. So when selecting a switch, remember that “smaller isn’t always better”