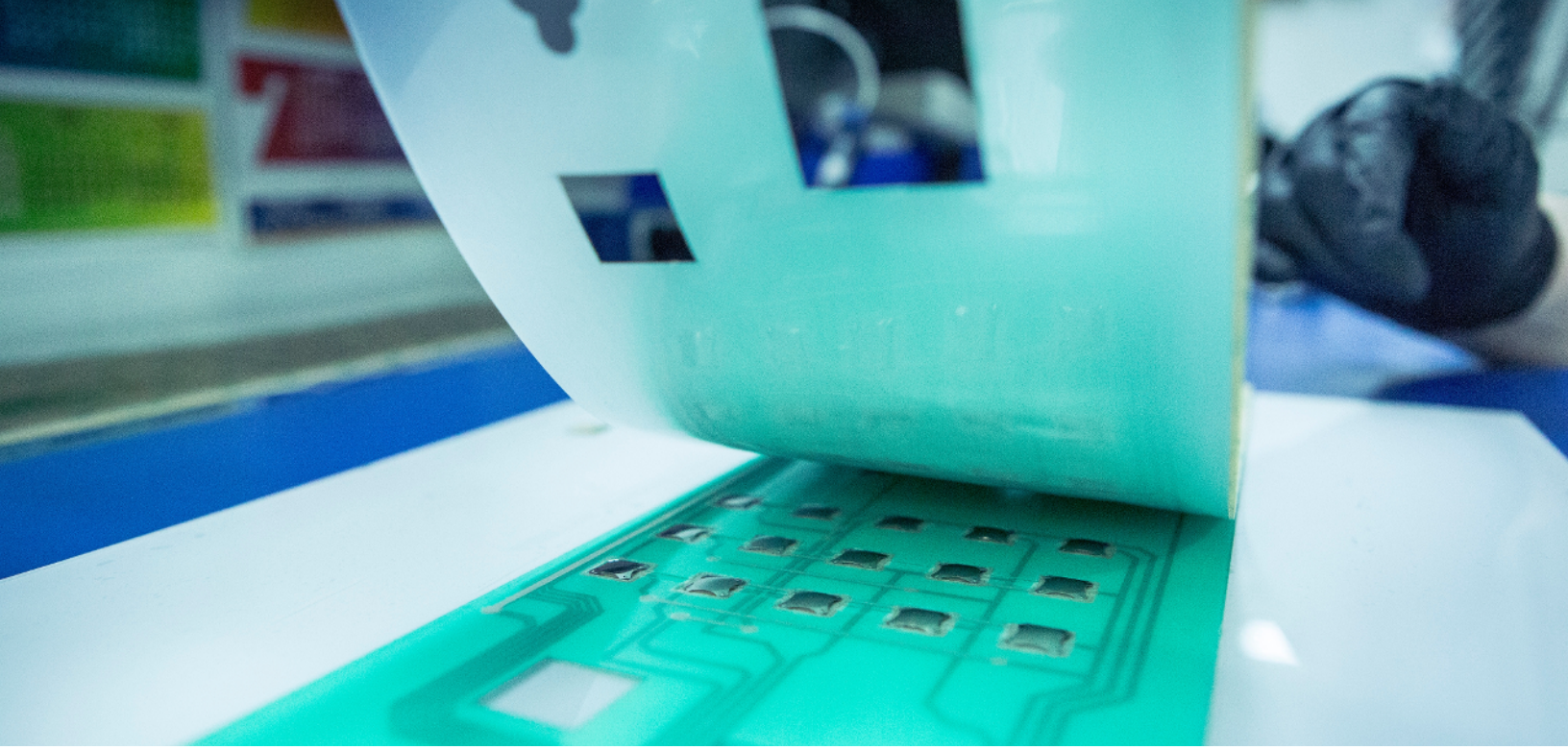

Membrane Switches vs. Touchscreens

For Medical Device Applications

Membrane switches first debuted in the 1980s, as low-cost and fairly low-tech user interfaces. Though many still hold this perception of them, membrane switches have advanced significantly over the last 30 years to the point where today's applications are virtually unrecognizable from their first uses.

As people have become fully accustomed to using touchscreens in their day-to-day lives, we are seeing the use of these interfaces expand into other areas, including the medical device market. Though touchscreens are slick and offer a familiar user experience, the membrane switch offers significant advantages over touchscreens, with high durability, and a more precise and pleasing user experience.

In advance of the American Medical Device Summit, we spoke with Ken Boss, VP of Sales & Marketing and resident interface guru at **JN White**, about why membrane switches are still the ideal user interface for the medical device market.

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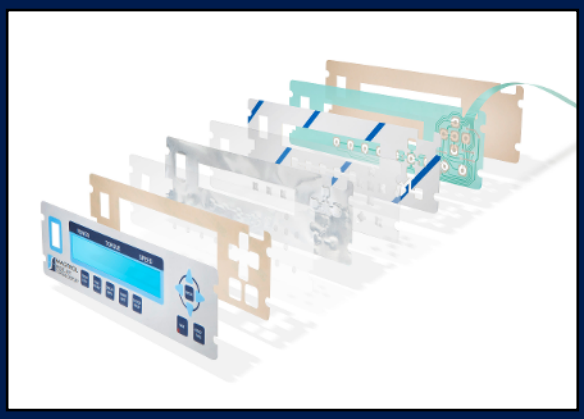

Membrane Switches

A membrane switch combines:

- The graphic layer (a printed overlay)
- A printed circuit, usually on PET or ITO
- Adhesive spacer layers
- One or more electrical switches for turning a circuit on and off

The ink used for screen printing is typically copper, silver, or graphite filled, and therefore conductive.

Touchscreens

A touchscreen is an input device layered onto the electronic visual display, often an LCD screen, of an information processing system.

There are typically four layers in a capacitive touchscreen:

- Top polyester-coated layer with a transparent metallic-conductive coating on the bottom
- Adhesive spacer
- Glass layer coated with a transparent metallic-conductive coating on the top
- Adhesive layer on the backside of the glass for mounting

What kind of medical devices use membrane switches or could use membrane switches?

A membrane switch is suited to any form of electronic medical device or medical equipment. We see membrane switches in IV pumps, oxygen concentrators, vital signs monitors, defibrillators, and on hospital beds... essentially, any medical device that plugs in has the potential to be controlled by a membrane switch interface.

What are the key benefits of membrane switches for medical devices and how do touchscreens compare on these benefits?

Durability - Durability is definitely one of the major benefits. Membrane switches last a long time and can handle a high number of actuations (or 'pushes'). Another related, but more specific, benefit is that because membrane switches are very easy to seal, they can be wiped down and cleaned frequently, as hospital and medical clinic procedures require. Touchscreens can certainly be sealed, and they can be very durable, although the top layer is often glass, which means they are more destructible than a membrane switch.

User Experience - With a touchscreen you really need a visual, haptic, or audio feedback to know that you've actually engaged a button or command. With a membrane switch, you have more of a tactile experience which allows for higher precision and peace of mind. They provide a really nice user experience - when you push a button to dispense meds, or for IV therapy, knowing that you've pushed the right button and receiving the right feedback is critical. This is even more true in medical situations, where practitioners wear gloves on a regular basis. The tactile feedback is very important.

Designability - Lastly, membrane switches have a much thinner profile which is much easier for mechanical designers to work with when creating medical devices. Touchscreens can be more difficult to integrate into an entire medical product assembly because of their overall thickness.

Are there any limitations to membrane switches?

Membrane switches are typically rated for -40 degrees celsius to 70 degrees celsius. So if you get outside of those temperature ranges, you can see failures to membrane switches, but in a medical device application I wouldn't expect that.

Are there any common misconceptions about membrane switches?

Yes, certainly.

One is that they are not durable - you do see some old ones or badly designed ones cracking, but today they can be made extremely durable.

Another is that there are only certain voltages that can be run through a membrane switch from an electrical current perspective - that's true on some standard products, but not for more high-end products. You can use materials and substrates that allow you to design around that if you have enough experience.

Also, to some extent, there is a misconception that membrane switches can look "old school" - people don't want a high-tech medical device to look like the keypad on your microwave. But there are a lot of things that can be done with digital printing, selective decoration, and selective texturing that can really make a membrane switch look and feel very modern.

I think the biggest misconception about the membrane switch, though, is that they're 'industrial,' and that's simply not true. They're being used in all sorts of applications from industrial to military to electronic equipment components, including medical equipment.

How have membrane switches evolved and modernized over the years to better suit medical device applications?

A combination of the materials being used and the processes being used to create them has made them much more durable and a lot better looking than they used to be.

With digital printing on the top layer, or graphic layer, you can do very high quality graphic enhancement right up to full photographic quality if you choose to. You can use different surfaces, like carbon fibre or diamond plate. And then you can add some selective texturing or glossing on the surface to actually feel the print.

You can include LED lights to add some visual feedback. You can go matte, or do very clean high gloss stuff like you would seen on an iPhone® or iPad®.

With today's print materials, you can transform what used to be very rugged, industrial-looking materials into materials with the elevated look and feel you would expect on a medical device.

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