



Multi-touch improves data analysis

Multi-touch technologies have rapidly moved from the commercial to the industrial sector where they are being used to enhance data analysis.

Key concepts



- Multi-touch techniques can be much faster than traditional methods for manipulation and analysis of large amounts of data.

- These techniques minimize the need for training given the familiarity users have gained using consumer electronic devices.

Multi-touch technology is rapidly migrating from smartphones and tablet computers to industrial automation. One of the main reasons for this trend is that recent studies suggest that an operator accustomed to the technique can manipulate information on a screen much faster than when using a conventional keyboard and mouse combination.

In addition, multi-touch technology has almost universal familiarity due to all those devices (Figure 1). Therefore, little or no training is required to introduce multi-touch to resulting in quick adoption and immediate gains in productivity and effectiveness.

One of the main responsibilities of plant operators and other personnel is data analysis, and this discussion will show how multi-touch technologies can be used to improve the performance of this and related tasks.

Single-touch can't keep pace

One of the main ways that manufacturing data is viewed and analyzed is through data acquisition and control systems. These systems use color graphical displays to allow plant personnel to view process data and control equipment or processes. Modern data acquisition and control systems replace old recording technologies such as pen and ink chart recorders, or supplement the functions of plant-wide automation systems. The latest products can save months or even years of historical data within the device. Operators can view and study this data without having to use a separate PC and special software.

Although data measurement and recording techniques have improved dramatically over the years, producing greater amounts of useful data, analysis techniques and operator interface technologies haven't fully kept pace.

Traditional screen navigation techniques such as a mouse and keyboard have proven to be an inefficient way to view and analyze large amounts of data. Touchscreens have been used for many years now and are an improvement, but most employ single-point technologies that only allow an operator to touch and manipulate a single screen object. In many cases, a single touch will then activate a function or select a menu to move to a more detailed screen, with multiple touches often required for even relatively simple tasks.

Although a well-designed touchscreen interface allows for faster direct-selection of menu icons and other items than is possible with a mouse and keyboard, systems that produce a large amount of historical data still require the operator to constantly tap or touch a screen control to navigate to an area of interest. But a better method is at hand, and is now available in leading data acquisition systems and other related products.

Multi-touch takes charge

Some studies have characterized multi-touch screen manipulation as three times faster than with a keyboard and pointing device. This



Figure 1: Multi-touch technologies are migrating from smartphones and touch pads to data acquisition and other systems in industrial automation applications, greatly increasing productivity. Photos courtesy: Yokogawa

allows operators and other plant personnel to find, view, and analyze the data of interest much more quickly. These and other benefits of multi-touch for data analysis are listed in Table 1 and described in detail below.

A two-point touchscreen supports swipe and pinch operations. With a single finger, an operator can swipe a trend screen and traverse across the horizontal time scale (Figure 2). He or she can then use two fingers compress or expand the time scale (Figure 3). This allows trend data to be examined quickly in an overview fashion, and then investigated in detail. An operator can also rapidly scroll through historical trend text-based data by swiping the screen, in the same manner that he or she would scroll rapidly through a contact list on a smartphone. In many cases, this is a much faster way of finding data than the traditional method of typing letters or numbers and performing a search function.

As a matter of fact, the entire user experience with a multi-touch product suddenly becomes very familiar since operators are already interfacing to their smartphones and tablet devices in much the same manner. This reduces the learning curve required to master the operation of a new data acquisition product, while at the same time encouraging the use of features tailored around optimal touchscreen navigation. Finally, multi-touch imparts a fun-factor to routine tasks and operations, increasing operator involvement and productivity. But as with all new technologies, there are some caveats that must be examined prior to implementation.

Garbage in, garbage out

Any data being analyzed must be accurate, reliable, and trusted. Once trusted data is available, it must be delivered to the viewing device at intervals frequent enough for meaningful analysis. Large amounts of data also need to be stored and easily compared to current operations as this greatly improves analysis.

Poorly executed application software written to use multi-touch techniques will cause problems for users. Operators will approach an application with expectations of how it is supposed to work. If it doesn't perform the way they expect, users will lose engagement quickly.

Although multi-touch improves the productivity of many operation interactions, single-touch on-screen keyboards and pointing devices still have their place. For example, scrolling through a list of up to hundreds of variables is generally faster with multi-touch, but searching a database with thousands of entries will usually be quicker with traditional type and search.

Best results in terms of high productivity and ease-of-use will continue to be found through a judicious combination of multi-touch and single-touch technologies, so both should be supported, as in the following application examples.

Bringing multi-touch to life

A practical example of the advantages of multi-touch and other technologies for data analysis is a panel-mount data acquisition station (Figure 4). It measures process signals with high accuracy and repeatability, and provides clear visualization of this data to operators. Abundant and secure local data storage is a must for future data review and analysis. Last but not least, the station must support easy data transfer to the PC environment, so that data can be permanently stored and further analyzed.

The most advanced data acquisition stations are fully integrated devices offering a long list of premium functionality such as modular universal inputs, SD card flash memory, and USB portable media support, topped off with a very familiar-feeling touchscreen operator interface. Intuitive color graphics present information clearly, with single- and multi-touch operations available for all settings and data display navigation.

Operators can watch a single overview screen showing all channel data, and then touch any channel in an alarm condition to jump to a more informative trend screen. On this real-time trend screen, a simple swipe will replay recent historical trend data leading up to the alarm, during, and after the event, with min/max data indicated. Another touch and swipe action takes the operator to deeper historical data. This performance is a requirement for many applications, made easier thanks to multi-touch technology.

The full depth of trend history, including hours, days, or even months, is now available. Add standard Ethernet connectivity that allows data monitoring using a Web browser, e-mail messaging, and other convenience functions—

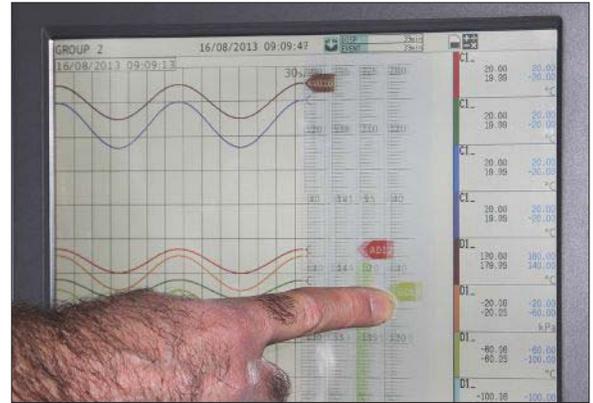


Figure 2: Using a multi-touch swipe operation, an operator can quickly scroll through a trend screen to examine and analyze large amounts of historical data.

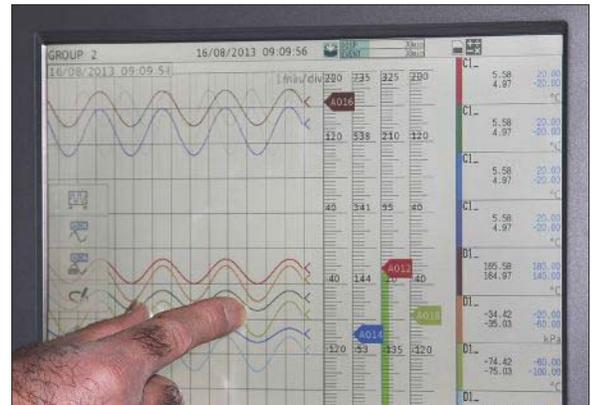


Figure 3: Two-finger pinch operation allows trend data to be quickly examined in detail with pinch in, or on an overview basis with pinch out.


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Figure 4: Modern panel-mount data acquisition stations takes advantage of multi-touch and other technologies to enable operators to quickly view and analyze large amounts of data.

and these advanced data acquisition platforms offer a very powerful alternative to complex software-based data acquisition platforms employing older single-touch screen interactions.

In one application in a heat-treat shop, a paper trend chart captured data that proved furnace temperatures were in specification during each product heat cycle. Operators would handwrite batch and other text information on the chart, associating each product batch

with the temperature data. To improve operator productivity, a digital recording system with a touchscreen was installed to acquire, store, and produce secure, tamper-resistant data files containing traceable batch and temperature data.

Data input is now performed with greater speed and accuracy, and an audit trail links the responsible operator with the batch record.

Multi-touch technology has enabled smartphones and handheld tablets to change the way people communicate, navigate the Internet, and

interact with the countless applications they use on an everyday basis. It has brought the same level of convenience and intuitive feel to specialized data acquisition and control products.

Clever design of plant data acquisition and other systems that takes full advantage of multi-touch technology, and the deployment of specialized apps in smartphones and tablets that support these products, are changing the way operators interact with and interpret plant information. **ce**

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Table 1: Benefits of multi-touch for data analysis

1. Three times faster than with a keyboard and a pointing device
2. Panning quickly locates the area of interest on a graph or chart
3. Pinching allows quick zoom-in on data of interest
4. Pinching to zoom out gives quick perspective on a longer time horizon
5. Operators can handwrite notes on a trend display

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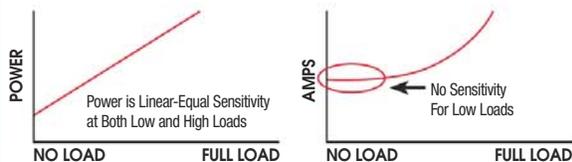
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