

Drive & Control

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Technical Article

Avoiding HMI Headaches: Key Factors for Selecting the Right HMI Early in the Process



Customers might not know of all the requirements at the start of a project, so it may be wise to leave a little expansion room for additional memory or function keys, or providing a color display even though the project may not explicitly call for it.

As the key component standing between a factory employee and the automated production line, the Human Machine Interface (HMI) must be suitable for every class of user, from the new employee running a machine for the first time, to the manager seeking diagnostic or output information.

Unlike PLC selection, which is often determined by customer specifications, HMI selection is usually more flexible. A quick Google™ search reveals hundreds of HMI manufacturers and most offer a wide variety of products to cover any functionality. Rexroth's IndraControl V HMI series, for

Key Factors for Selecting the Right HMI

The selection of a Human Machine Interface (HMI) is an important step in streamlining any automated production line. One should consider the following factors before deciding which type of HMI to use:

- The type of operating environment, such as rugged, washdown, etc.
- What is the application and what else may the customer want it to do?
- Connection with other components
- Multi-touch
- Preference in programming software
- Control options
- Scalability of programs
- Technical support availability

Working through these factors will result in a better decision. Pricing should be the last factor to consider once the other factors are determined. Selecting an underpowered HMI based on price will eventually result in much greater costs in the long run.

example, offers operator panels, embedded PC panels, and a wide range of PC-based HMIs and industrial PCs to enhance operator control and manufacturing productivity.

So if you're responsible for selecting an HMI, how do you decide what model to use? The following considerations can help with the decision-making.

What is the operating environment?

A key factor to consider right away is the operating environment. Any unusual environmental conditions will narrow your HMI selection. For example, an abundance of electrical noise or vibration may require you to select a ruggedized or hardened industrial panel. An HMI operating in a washdown environment such as a food processing plant might require a high IP (ingress protection) rating. What about extreme temperatures or temperature ranges, such as an HMI placed near a blast furnace? If the HMI is to be used outside, will it require a daylight readable HMI? It's better to plan ahead and consider a heavy-duty HMI than to go back later and replace a unit because it didn't hold up.

What is the application and what else may the customer want it to do?

This may sound obvious, but often it's not discussed up front. How many customers know ALL their requirements at the beginning of a project? It may be wise to leave a little expansion room for additional memory or function keys. To help with HMI selection, there are many different applications, but for purposes of evaluating, most fall into two broad categories:

The Data Handler: Applications here might include functions such as recipes, data trending, alarm handling/logging and data logging.



An HMI that operates in washdown environments such as food processing plants will likely require a high IP rating, which will narrow your selection.

In a flexible manufacturing line that runs multiple products, for example, a mid-level HMI will be required to handle this functionality, probably with a minimum of a six-inch screen to display all necessary data and graphs. Ease in moving data in and out of the HMI may need to be considered – will the recipes be stored onboard, or downloaded from a SCADA (Supervisory Control and Data Acquisition) PC? Will logged data be offloaded somewhere for analysis and storage? Is such data handling going to be automated or manual? Answering yes to these questions will require an HMI with appropriate network connections and software tools. The answers to these questions will depend on the other components in the system and company specifications.

The Overseer: Does the application involve SCADA or maybe even MES (Manufacturing Execution System) functions such as data warehousing, database transactions and interfacing with an enterprise-type system? With the current emphasis on the Internet of Things (IoT), the appropriate HMI could add significant value. An “overseer” application is usually going to

require a full-fledged industrial PC that runs an equivalent operating system.

Another consideration here would be the desirability of a handheld or mobile HMI. A standard handheld HMI is connected to the machine via a cable and can be moved to a better vantage point to troubleshoot a problem. For large machines, a mobile HMI can be unplugged from one section and plugged in at another. Mobile HMIs, such as tablets or other wireless devices, can save on overall costs by reducing the number of HMIs to operate the equipment.

Drawbacks to handheld HMIs usually involve cost, plus the potential for damage when moved around. Note that reducing the number of HMIs will reduce the number of employees that can work on a machine.

What will the HMI be connected to?

Choosing the appropriate HMI depends on other components in the system. Does the machine have a single PLC, several PLCs or perhaps just a variable frequency drive that needs to be started/stopped and given a speed reference? Are all

the products from one manufacturer or several? What are the connection methods – Ethernet or USB? Your HMI will need to support the connection methods required by the selected components.

Many systems mix products from several different vendors, and for these applications an HMI from a company that offers a large number of 3rd party drivers or connection to many controllers may be the preferred option. In this case, you need to consider a few key points: Does the company website provide self-service for manuals and drivers? How about for HMI driver updates or new HMI drivers?

Check the manual for the desired driver. How easy is it to configure? Is there information on how fast the driver executes? What are the connection protocols? Compare with other vendors under consideration. Not all drivers are created equal!

What data entry tool best meets your needs?

For most HMIs, you will need to choose one of two methods for using the HMI: multi-touch screen or keyboard.

With today's technology, capacitive screens, or the multi-touch option, provide users with the familiarity of tablets or smart phones. So the decision here is mostly a matter of preference of the user. There are a couple of situations where a keyboard HMI may be the clear favorite. If a large amount of numeric data is to be entered, a keyboard HMI could allow quicker entry than the virtual keyboard offered by most touch screens. A keyboard might also be easier to use in a work environment requiring the operator to wear gloves.

What are your programming software preferences?

The complexity of the application and the preferences of the programmer will dictate the software required and therefore the HMI to be selected.

Proprietary Software: Most pushbutton replacers and data handlers can be programmed by standard software provided by the HMI vendor. Proprietary software tends to be simple to use and allows for quicker development times. One drawback is that the program developed will only run on that specific hardware platform. If another HMI vendor is specified for a future project, the application will need to be completely redeveloped.

Hardware Independent Software w/Prebuilt Functions: A popular example of third-party HMI software that can run on different types of HMI hardware is InduSoft

Web Studio™. Unlike proprietary software, an application created with this type of software can be run on any open platform. This gives the programmer greater freedom to select an HMI based on features, quality of service, or other considerations important to the user.

Independent software often has many common prebuilt functions, such as pushbuttons and recipes. However, because it has to accommodate a wide variety of platforms, it maybe less user-friendly than proprietary software and may not have as many specialized functions.

Open Software: For power programmers who want complete freedom to develop their own functions, there's always the option of programming with open software. With Rexroth's Open Core Interface, for example, users experience PLC



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programming and flexibility with device platform selection and high-level language integration (from Java to C++).

With this type of software, the sky's the limit! Applications created by this type of software are hardware independent, thus allowing the machine designer to select a best-in-class HMI with flexible programming. While the programmer may have to start from scratch, there are a number of online communities where advice can be offered or where code can be downloaded.

Disadvantages include initial development time, including debugging and testing, and support after the project is completed. Despite the power inherent in this method of development, many end-users may lack the capability to support a project developed in this method. Projects created via open tools are going to require staff with more software engineering expertise. More time may be required to alter or troubleshoot such a program. These costs could offset the initial software savings realized from purchasing open software tools.

Other considerations

Another factor to consider is the end destination for the machine. Some HMI vendors have a stronger presence in certain regions of the world. This may influence the HMI selection since strong local support can be a sales strength and reduce the support requirements of the machine designer.

A final consideration is tech support. Can you call and talk to an individual, or is e-mail required? Is the support free or is there a charge? Is support available 24/7 or only during office hours? Does the website provide easy-to-use self-service options for support (downloadable manuals, knowledge base) or is it strictly a sales tool? Determining your requirements for tech support will help narrow your choices for an HMI.

Summary

Working through these factors will result in a better decision. Notice that price comes last. There are so many other considerations that need to come first in order to make a proper decision. Choose the functionality you need and then compare pricing. Selecting an underpowered HMI based on price will eventually result in much greater costs in the long run, and a dissatisfied customer.

The Drive & Control Company

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