Case Study

BIOREACTOR BASED ON THE HMI SANTARO 7.0 BX

SOLUTIONS THAT COMPLETE!

GARZ FRICKE

Case Study

According to the old saying, too many cooks spoil the broth. But not with the Minifors 2 bioreactor. Ingredients from all three companies combine to make a visually and technically appealing product.

A good beer and tasty bread have one thing in common. Both can succeed only with the perfect strain of yeast. To make sure it comes out right, companies use tools like the Minifors 2. This bioreactor from manufacturer INFORS HT is good for more than just perfect yeast breeding conditions. It has many versatile fields of application.

A bioreactor ensures that the organisms in the reactor vessel thrive as much as possible and that they have optimal conditions to grow and reproduce. The temperature and pH level must always be maintained in the correct range, and lab personnel and scientists should be able to monitor and directly correct the processes meticulously as needed.

Teamwork: Only the close cooperation made it possible to create a bioreactor that is both technically and visually convincing.

The Minifors 2 is a smaller bioreactor that is used primarily for developing understanding of processes and characterizing organisms, in the pharmaceutical field or at colleges. When the processes are functional on a small scale, they can be scaled up in various scenarios and the bio-organisms can reproduce on an industrial scale.

The target group for the design was primarily academia, with a focus on simple operation. The developers took inspiration from smartphones and tablets.

©INFORS HT

Just about everyone is familiar with touchscreen controls these days, and we wanted to find a way to eliminate users' reservations as much as possible.

Dirk Hebel, product manager at INFORS HT.

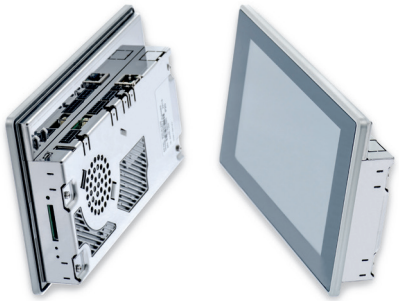
So the basic conditions were clear: a touchscreen user interface with optimized graphic controls

Garz & Fricke offered the perfect combination

The search for suitable hardware for the touchscreen interface brought the manufacturer many options that did not meet their expectations. „We wanted a display that not only fit our design, but was also able to be integrated properly," continues Hebel. This eliminated many manufacturers. „In some proposals, the frame was not adjustable, and in others, the connections were fixed and in the wrong position. Other solutions are complete, finished, non-variable units." At Garz & Fricke, the manufacturer finally found the right combination.

Fingers, not stylus

Based on earlier products and the typical usage scenarios in the lab, the developers at Infors HT initially assumed that the touchscreen would be based on resistive technology. This technology reacts best to inputs with a stylus. Capacitive touchscreens are more modern and easier to operate. They can be operated with a bare finger and recognize when several fingers are being used at once, such as with gestures.



The problem is that capacitive screens have always been difficult to operate with gloves, as are usually worn in the lab. This is due to the functional principle that low currents flow when a finger makes contact with a capacitive touchscreen surface. These signals are used by the electronics to determine the position of one or more fingers. By improving the screens and the electronics, Garz & Fricke was able to work with its suppliers to eliminate this problem. The touchscreen components can now detect inputs from gloved fingers as well.

Another aspect in favor of the „Santaro 7 inch boxed“ system is its ability to be integrated perfectly into the planned bioreactor. The standard assembly was used except for the glass panel, but the 3-mm thick, chemically hardened glass was adapted. The customer‘s logo was printed on the back side and it has a white border instead of black.

Hardware and software as required

The available hardware interfaces and connections were another point in favor of the system. For example, the operator interface and the actual controller work separately and need to communicate with each other. The processor is also network-capable. This is an important point, as the device will be connected to the company‘s proprietary EVE bioprocess platform software. One or more bioreactors and many other products can be controlled, networked together, and monitored.

Computing power can be used for the actual applications, thanks to optimized software, and is not used up simply by displaying and controlling the graphic user interface. This is partly thanks to the embedded Linux system. „We adapted the firmware specifically for this customer, with a boot logo and a few special technical features in this case,“ says Alexander Stade. Garz & Fricke uses the „Yocto“ GNU/Linux toolkit in combination with the Qt graphics framework. Yocto is not a stand-alone Linux system, but rather an ecosystem from which developers can help themselves.

From the Garz & Fricke developers‘ point of view, Yocto is primarily beneficial for its standardized architecture and high level of adaptability. Sensible templates for hardware support and for integrating complex libraries for application support are managed in so-called recipes. The generated configuration contains all of the information needed to reproduce the Linux image in the same version at any time.

High flexibility thanks to QT

Dirk Hebel has special praise for the board-specific adaptations by his embedded partner.

> They delivered the Yocto already perfectly adapted to the board and the functions. We did not need to learn how to create and convert certain functions first. Instead, there are tools that take care of this for us.

Dirk Hebel, product manager at INFORS HT.

The Qt framework is the graphic user interface (GUI) of choice for the software partner, e-GITS. Qt is involved in the Yocto project and makes programmers' work easier because QML can be programmed partially on an HTML basis since Qt5. With QML declarative programming, screens can be described intuitively.

When creating the GUI, „Qt Quick 2" was used for the graphic interface, which met all the requirements with respect to the design and an intuitive software package that is easy to control on the touchscreen. For the software architecture, the e-GITS programmers separated the front end and back end, which makes subsequent expansions in both the GUI and in the back end very easy.

Networking in the lab and beyond

One major requirement for the Minifors 2 software development was support for multiple languages. Qt supports programmers innately with multilingual capabilities, which enabled e-GITS to implement language changes „on the fly".

Users can change the language on the device directly, without restarting. If a language does not happen to be available in Qt yet, the technical maintenance team for the Minifors 2 can add it via a new language file, using an external tool, which can then be easily loaded onto the device from a USB stick and initialized there, also without any sort of restart.

Ideal conditions in a localized manner: The Minifors 2 is a smallish bioreactor, which is mainly used at university laboratories.

Datatransfer with EVE

Networking via the EVE platform was also solved in Qt. To do so, e-GITS implemented the OPC UA machine communications interface. The developers incorporated appropriate libraries in the system and led special interfaces to the outside via Qt. Parameters, event messages, and functions can now be transferred and forwarded across devices.