beacon.
EmbeddedWorks

Helping to put control in the users hands with smart technology.

Summary

This heating and cooling customer came to Beacon EmbeddedWorks to improve the user experience of building climate control systems. As a complete product lifecycle management partner, our team created an intuitive interface that allows building managers to access the information they need when they need it.

Challenge

Building managers are responsible for a comfortable and efficient environment. When productivity can be dependent on temperature swings, inaction is not acceptable. The operating complexity of building climate control systems often prohibits managers from controlling the building environment. This leaves facilities with energy inefficiency, occupant discomfort, environmental concerns, and compliance issues. The customer, a world leader in air conditioning systems, saw this as an opportunity to put the controls in the hands of the building manager. To achieve this, the customer asked our team to design a smart control panel that would provide a flexible and intuitive user interface. With the central goal of improving user experience, the solution also had to withstand harsh environments when attached to the climate control system.

Customer Profile

The customer is a world leader in air conditioning systems, services, and solutions to control the comfort of the air for people in homes and many of the world's largest commercial, industrial and institutional buildings.

More Information

Why choose a Beacon EmbeddedWorks SOM?
See what differentiates our SOMs from the rest.
beaconembedded.com/system-on-modules/

About Beacon EmbeddedWorks
Beacon EmbeddedWorks is a full-service provider of innovative System on Modules (SOMs). Backed by a suite of customization, security, and support services, our dependable, pre-certified, and feature-dense embedded solutions serve the most strenuous applications.

Solution

The customer partnered with our team as a complete product lifecycle management service provider. Our teams assisted the customer with all the phases in a product lifecycle: Roadmapping, Development and Fulfillment. To determine the design needs for the control panel, our design engineers first conducted configuration studies. Our designs would be founded in a firm understanding of the environments where the control panel would be used. The engineers identified critical environmental factors before starting the process of designing the control panel's enclosure. The configuration studies revealed that the control panel would be used in varying harsh environments; most notably used in the chiller plant of an industrial building. Our industrial design team developed enclosure concepts that would tolerate harsh environments without compromising ease of use for those interacting with the control panel.

Our team then worked with the customer to determine the final design. The result was a durable enclosure that meets IP56 environmental protection standards. The device also features an ergonomic arm that allows the control panel to be viewed from various heights and angles. The final design included a 12 inch color LCD screen that displays all necessary operator controls. The masterful design gives the operator a more user-friendly, consumer-oriented experience by providing immediate visibility into the performance of the system.

For the brains of the control panel system, the customer sought the reliability and reduced risk that came from using one of Beacons embedded products. Utilizing an off-the-shelf solution reduces design costs and helps speed the time-to-market. Beacon's PXA270 card engine is a complete System-on-Module (SOM) that is compact and product-ready. The hardware and software offer essential features for embedded networking applications, such as the customer's control panel.

However, the customer's product specification required a single board solution. The customer was concerned that our standard two board solution – a card engine mounted on a custom baseboard – would not withstand the vibrations presented by the application. Our team returned with a solution; combine the benefits of the PXA270 card engine with the single board requirement. Better still, our team conceived of a strategy to employ this solution without having to design a new single board from scratch.

Our electrical engineers integrated the PXA270 card engine design directly into the board, ultimately leading to an integrated System-on-Module, or iSOM. The use of the iSOM eliminates the risks involved in designing a new card engine printed circuit board (PCB) to match the product specifications. Instead of sending signals out through board-to-board connectors like on a two board solution, the signals were routed through the single PCB. This implementation preserved the design integrity and continuation support of the standard SOM while addressing the control panel's unique requirements.

Solution Continued

To help make certain that the control panel communicated properly with the customer's air conditioning unit, our software engineers developed device drivers for the Windows CE board support package (BSP) to ensure flawless interaction between hardware and user interface. During development, the engineers also had to keep in mind the 24 different languages the product would support, considering each language's unique character rendering and presentation requirements.

To verify the product met the stringent design and condition requirements of its application, manufacturing and systems engineers developed a full test process. The process involved exposing the prototypes to extreme conditions. We worked with the customer's engineers to make sure the product, as designed, would withstand the vibration and thermal requirements of Highly Accelerated Life Testing (HALT). Equally important was that the device could pass all certification testing, including CE conformity in Europe and UL standards in the United States and Canada.We worked with the customer to develop product test plans, including a Gage R&R test. The Gage R&R test is a verification test before production to ensure a correct design, repeatability, and reproducibility of the control panel. The test created fixtures unique to the product to ensure the control panels coming off the manufacturing line would perform as expected. Additionally, it was imperative that the product delivery packaging be robust enough to handle rough delivery methods. We worked with the customer to design packaging that would withstand rough transport conditions.

Results

Together, Beacon EmbeddedWorks and the customer created a new reality for building managers and staff. The new operator control panel gives managers the ability to make their own decisions about temperature control based on the current, specific needs of their location. The large color display, intuitive interface, and accessibility in 24 languages made the control panel approachable for the operator. By re-purposing the PXA270 card engine design, the customer was able to keep development costs down and bring the product to market faster. The resulting control panel has allowed the customer to provide the end-user with a userfriendly option that is economically smart and environmentally responsible. Operating staff can gain insight into the system directly from the display panel, allowing for easy adjustments and performance review.

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