

# From the Design to the User: Maximizing the Potential of Intuitive Operating Concepts

Using the example of a bioreactor's user interface, jointly realized by Heitec and Design Tech for biotechnology company The Cultivated B



## Introduction

Biotechnology is a dynamic, innovation-driven market. There is great hope in one area, the production of cell cultures that can be used in a variety of ways for sustainable purposes. One essential drawback has been the lack of readily available, modular and user-friendly bioreactors to take this from idea to mass production. The Cultivated B (TCB), a subsidiary of InFamily Foods Holding, therefore came up with the idea of developing an innovative type of bioreactor that combines the convenience of consumer applications with the complex technology of an industrial system, allowing users to reap the benefits after a short training period. TCB commissioned Design Tech and Heitec to realize the innovative design concept and sophisticated development of the user interface. The two partners took a completely new approach to maximizing the potential of user interfaces.

## Promising opportunities – and some challenges

According to the United Nations, the world's population surpassed eight billion by the end of 2022 and is expected to reach nine billion by 2036. Ensuring food security for a constantly growing human population while at the same time conserving the limited resources available is a crucial task for the future. Innovative biotechnology companies are increasingly taking up this challenge: The idea is not limited to using processed or produced proteins to increase food production. Biotechnology also opens the door to other groundbreaking possibilities, such as reducing greenhouse gas emissions, promoting animal welfare, better control of supply chain issues or effectively combating diseases. In addition to its numerous ecological aspects, this concept also holds enormous economic potential: the consulting firm McKinsey estimates that biotechnologies could generate up to four trillion US dollars per year in added economic value worldwide over the next twenty years (source: <https://www.mckinsey.de/news/presse/2020-05-14-mgi-bio-revolution>).

Nevertheless, there was still one important hurdle to overcome. For many products of interest regarding precision fermentation, there were no economically viable production systems or processes that were readily available, adaptable to the desired product, and easy to operate. Companies were faced with the dilemma of having a good idea, but no capacity to manufacture their product at scale and bring it to market quickly.

The Cultivated B (TCB) has recognized this need and focused its development on it. The company develops and applies breakthrough technologies in cellular agriculture, precision fermentation and advanced bioreactor technology to enable scalable commercialization of the cellular agriculture industry. The plan is to offer these solutions as physical products or licensable production know-how for various areas. TCB's R&D centre in Heidelberg and manufacturing site in Burlington, Canada serve start-ups, corporations and academic research institutions within the food, cosmetics and personal care industries. With its pioneering engineering and production capabilities, TCB enables other companies to produce alternative proteins, such as cultivated meat, at industrial scale.

Bioreactors typically consist of a stainless steel vessel in which living cells multiply in a nutrient solution that is constantly and carefully mixed by rotating blades. In addition to specific amounts of nutrients and oxygen, temperature, pH and carbon dioxide levels are critical environmental factors that must be monitored and controlled. Until now, if operators wanted to change recipes or produce a different product, it was time-consuming and may have required the costly purchase of multiple reactors, since cell strains can react differently in vessels of different sizes. In addition, laboratories and start-ups often have different requirements than industrial corporations. Another problem is that conventional bioreactors are usually operated via complex interfaces that require a great deal of expertise.

## **Breaking new ground**

TCB wanted to explore new ways and conducted a thorough analysis of existing technologies to determine possible optimization. The requirements for a new system were correspondingly complex. In order to make the technology as broad-based as possible and applicable to many industries, it had to be modular, scalable to different vessel sizes and designed for longevity.

In addition, it had to be easy to use, so that it could be operated by non-experts after a short training period, without compromising quality and safety ("operation must be as convenient as that of a coffee machine"!)). It should be possible to recall and start different recipes at the touch of a button.

In order to achieve maximum market acceptance, implement a turnkey solution quickly and all required features efficiently, TCB decided to use WinCC Unified from its industrial partner Siemens as the visualization platform. Because of its bandwidth, the new WinCC Unified version is not only suited for SCADA systems, but also for

smaller machines. It supports multiple interfaces and, unlike its predecessor, offers the possibility of implementing the desired intuitive and ergonomic operating concept at a high graphical level. The proven quality, the good support structure and the industrial partner's worldwide presence made it even easier to build on this platform.

TCB entrusted the renowned industrial design company Design Tech to create a modern operating concept. Design Tech's main focus was on realizing the hardware and software in a uniform, shared logic. Despite the technical complexity of the system, the user interface should be self-explanatory with a consistent GUI. The graphics should be as inviting as possible, clearly structured and comfortably reduced - similar to an app. For the implementation, Design Tech chose Heitec as an experienced partner to generate maximum synergies as a well-rehearsed team during the transfer phase into practice.



As a visualization platform, WinCC Unified offers many options and control elements for displaying production processes. However, to exploit the full potential, in-depth experience beyond pure control automation is required.

As a certified Siemens Solutions Partner with in-depth WinCC Unified user know-how and cross-industry expertise in the project planning of many advanced HMI interfaces, Heitec took on the task of programming and developing the user interface as an external HTML5 application and integrating it into the TIA Portal project with the help of the Custom Web Controls.

A project of this kind - with the look and feel of a consumer app in an industrial application - was something completely new. Therefore, the graphical and functional requirements were very specific in some cases, but this way, the desired user friendliness could be achieved finally.

The TCB, Design Tech and Heitec project teams from Canada, Germany and Hungary worked closely together. Progress in the project planning was evaluated in fortnightly meetings and the specifications were compared with field-tested features to ensure agreement on next steps and continuous project transparency, and to complete the project on time and on target.

## Modular design

The model-based design of the system technology of the new AUXO V and its versatile sensor technology allow the user to adapt the system for different purposes with just a few settings, so that various cell productions can be carried out with one and the same reactor. The hexagonal view on the screen (*see image*) shows the division into the two reactor vessels and their process status. This variability results in significant cost and time savings for the producer, making the solution not only attractive to smaller companies, but also a long-term and secure investment.



## User-friendliness

Thanks to the attractively designed WinCC Unified Human-Machine Interface, intuitive control panels and the programmable logic controller (PLC), a high level of automation has been achieved and the bioreactor is easy to operate, even for non-experts. The implemented touch technology with scroll functions is unique in this form. Clear graphics show the process status at a glance (*pictures - examples*).

After a short introduction, the user can maintain the growing cells without having to be familiar with biological details. Various interfaces of increasing complexity adapt to different needs and levels of knowledge, from pre-programmed one-touch processes to detailed data access.

Users can focus on other essential tasks and human resources can be optimized, which is another advantage given the shortage of skilled workers.

## Efficient handling and maintenance, ready for the future

The control software of the AUXO-V can be accessed via the user-friendly html5 interface, either locally or remotely via common devices such as cell phones, tablets, etc. The intuitive design of the AUXO-V makes it particularly maintenance-friendly and ready for quick action if any irregularity needs to be corrected.

In the future, operators will be able to download recipes for their respective products, so that the bioreactor uses the open architecture and variability of WinCC Unified for this functionality and is prepared for a cloud connection. Changing parameters no longer need to be entered manually but can be automatically loaded and distributed to all connected stations. Users can access multiple, clearly visualized projects in parallel.

## CONCLUSION

Cell culture production has enormous market potential and environmental benefits. In contrast to conventional "natural" production methods, which are subject to external uncertainties, the conditions for cell growth can be fully controlled.

As a result of the intensive collaboration between TCB, Design Tech and Heitec, the AUXO V closes a gap in the market and facilitates high-quality, fast and convenient entry into cell production. Short delivery times, modular design and operation as well as a user-oriented control system make it a real development accelerator. The simple handling opens up larger application areas and user groups.

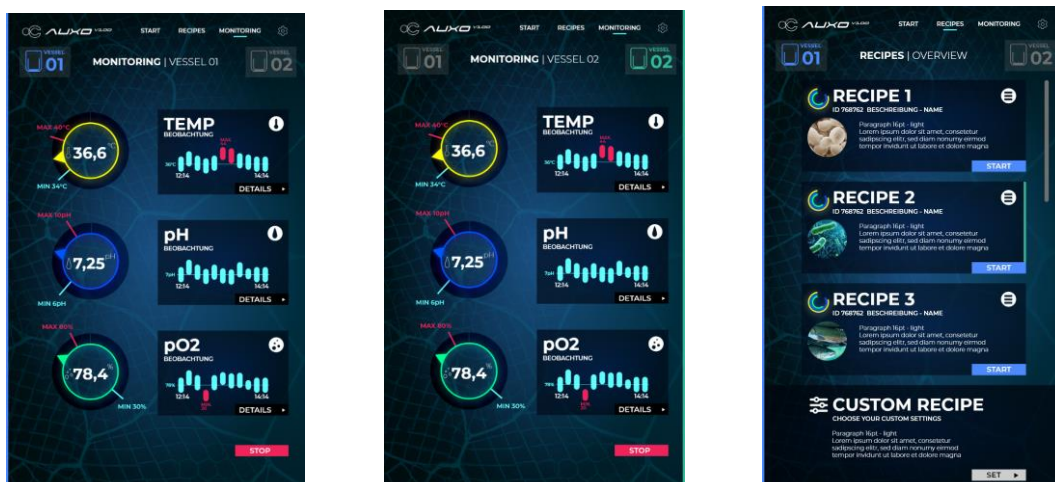
Thanks to the Siemens WinCC Unified Platform, Heitec was able to quickly and professionally implement the intuitive user interface designed by Design Tech, allowing for easy control of complex processes. The bioreactor is a successful example of a complex system with a state-of-the-art, unmistakable design and simple user guidance. The combination of a consumer app's look and feel with the high-performance of an industrial system, using the employed components, is unique in this form.

Characters: approx. 10,700

Quote from Dr. Hamid Noori, CEO of The Cultivated B

"Cellular agriculture offers great potential to transform food production. But in order to scale up, we need to reduce the level of expertise needed to operate bioprocesses. Developing an industrial-grade bioreactor in such a short time with the ease of use of an app is certainly a milestone for cell production. We were able to count on the design and technology expertise of our partners Design Tech and Heitec at every stage of the development."

## Footage:





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