

DDE

Maximum yield of cultured
meat at scale

We make ideas flow.

bürkert
FLUID CONTROL SYSTEMS

Cultivated growth

COOPERATION WITH DDE

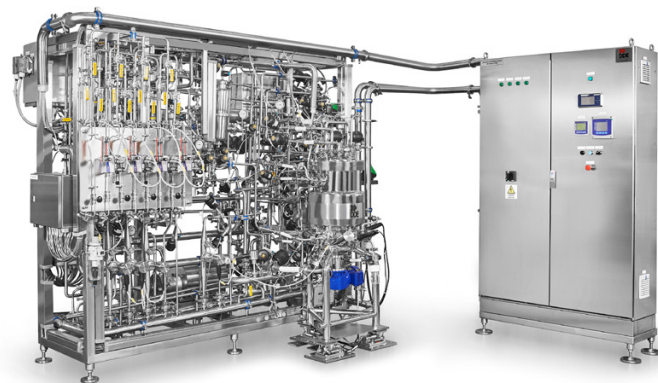
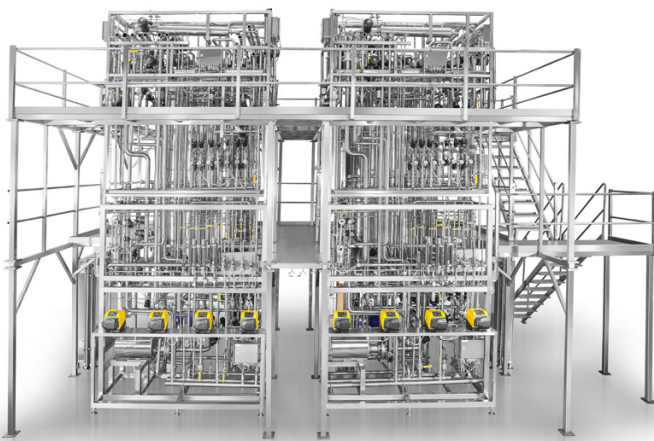
The demand for eating meat is unbroken – and continues to grow. This has obvious consequences for the environment. Cultivated meat based on animal cells is a promising alternative, if it can be produced economically. In order to achieve this, perfectly controlled fermentation conditions and intelligently managed processes are required. One answer to this is provided by D.D. Enterprises (DDE) from Pune (India), which is setting a new benchmark in the production of smart proteins thanks to its many years of expertise with bioreactors.

On the forefront

Conventional meat production has a major impact on climate and biodiversity. More and more producers are therefore focussing on the production of cultured meat that avoids these problems. This is grown from animal cells with the help of bioreactors – a process that has so far mainly been used in the biopharmaceutical industry.

DDE, a leading Pune-based company, specialises in the design, manufacturing, commissioning and qualification

of sterile process skids for the biopharmaceutical industry. The company's team of over 600 talented researchers, engineers, technicians, designers, and technology specialists have delivered reliable bioreactor solutions to leading biopharma organisations globally. Now, leveraging its 46 years of extensive expertise and track record of over 1,000 successful projects, DDE is pioneering cost-effective smart protein solutions for the emerging New Food industry.



The modern smart protein bioreactors from DDE have a volume of 20 to 10,000 litres. This makes them among the largest bioreactors for New Food applications. Bürkert's flexible solutions ensure high-precision control for any scale.

“With Bürkert’s support, we were able to reduce the usual time-to-market by 67 %.”

Ajay Dubey, Joint Managing Director of DDE, Pune, India

Fast realisation

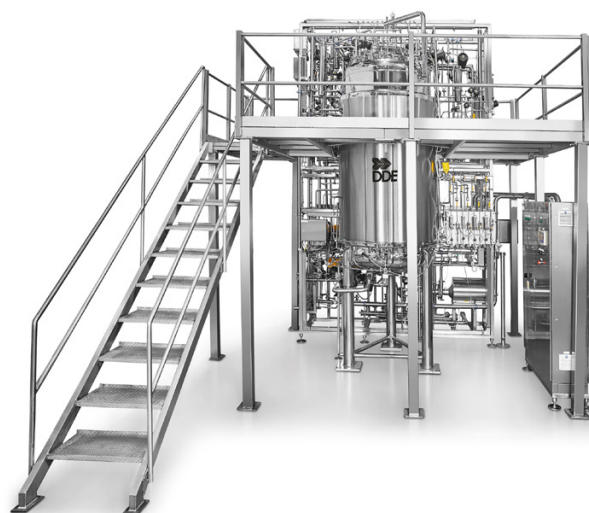
The experts at DDE developed seeding bioreactors with a capacity of 20, 200 and 2,000 litres for a start-up in California, as well as a production bioreactor with a capacity of 10,000 litres. “This bioreactor is currently one of the largest in the world within the New Food industry,” explains Ajay Dubey, Joint Managing Director at DDE.

It is not only its dimension that is impressive. The production time of just 6 months is also unrivalled. The usual period is 16–18 months: “Thanks to Bürkert’s support, we were able to reduce the time-to-market by 67 %. Not even our customer believed that this was possible – also because no other company in the world was willing to accept such a short manufacturing time. No standard solution was sought here: The piping and instrumentation diagrams had to be developed from scratch,” Ajay Dubey explains the challenges and adds: “Thanks to the simple configuration, calibration and operation of the Bürkert products, we were also able to carry out the final factory acceptance test very efficiently.”

High cost pressure

From a technical perspective, fermentation in bioreactors is not a problem for smart proteins either. However, the prices at which cultured meat can currently be produced are still far too high, Ajay Dubey illustrates: “We’re talking about a factor of 50 compared to conventionally produced meat. The focus of the entire industry is therefore on being able to produce cultured meat much more efficiently.”

Manufacturers are thus urgently seeking new solutions to increase production yields. However, the manufacturing costs of the bioreactors themselves also need to be optimised in order to make cultured meat more widely available. “Bioreactors today are built to the standards of the biopharmaceutical industry. These are among the highest that exist. With smart proteins, on the other hand, the requirements from the food sector apply. That’s why we have to redefine processes and concepts in a completely different way than before,” Ajay Dubey points out.



“With Bürkert, we have realised a turndown ratio of 2,000 to 1 for the gas supply. This provides our customers with a high degree of flexibility.”

Ajay Dubey, Joint Managing Director of DDE, Pune, India

Challenging scalability

Yet the difficulty is that the New Food industry is relatively young and standards and empirical values, such as those familiar from the pharmaceutical industry, are not yet available to a comparable extent. “Many things still have to be determined experimentally. This requires scalable solutions. And the Bürkert products are unbeatable in this respect,” says Ajay Dubey enthusiastically. For example, the optimum gas flow to achieve the highest possible product yield was still under development. Therefore, a gas control solution with a correspondingly high operating range was required to maintain the exact flow rate for all different reactor sizes, even at extremely low flow rates. Compact, calibratable type 8741 mass flow controllers (MFCs) are

therefore used for the precise control of fermenter gases. “We usually work with gas flow rates of up to 70 % or gas flow coefficients of 1–2 vvm when it comes to bioreactors. In this project, we have enabled our customer to achieve coefficients as low as 0.1 vvm. These levels are unprecedented in this industry,” says Ajay Dubey. To achieve this, DDE used two parallel gas control loops. An algorithm specially developed by Bürkert selects the appropriate control loop depending on the required flow rate.

The excellent measuring and reproducibility of the MFCs also ensures that a recipe can be reliably replicated as soon as an appropriately optimised mixing ratio has been applied.

Did you know?

The combination of the type 8098 FLOWave SAW flowmeter and the type 2380 bellows control valve enables nutrient supply flow rates of 1 to 100 litres per minute. Precise dosing is guaranteed even at very low rates. The CIP/SIP-capable solution ensures hygienically safe operation.



Hygienic nutrient dosing

A space-saving and lightweight system solution consisting of the type 8098 FLOWave flowmeter and the type 2380 control valve with positioner ensures a continuous, reliable supply of nutrients. Here too, the customer required a wide range of flow rates between 1 and 100 litres per minute. The chosen solution allows precise dosing even at very low flow rates and hygienically safe operation thanks to CIP/SIP capability, explains Ajay Dubey: "Compared to peristaltic pumps, this solution is robust and much easier to clean. We are talking about over a million cell lines. Excellent cleanability is crucial here. Bürkert's blocks and diaphragm valves have an excellent sterile design with no hold up. This enables our customer to turn around batches faster with no risk of cross contamination."

Reliable cell growth

DDE developed a redundancy solution together with Bürkert to ensure that the cell cultivation process is not interrupted even if an analytical instrument fails. "The comprehensive communication possibilities of Bürkert products are very helpful here. This enables us to react more quickly to unwanted changes and increase process quality."

Joint optimisation

In a transparent, open collaboration at eye level, DDE and Bürkert have jointly achieved an impressive breakthrough in the scaling of New Food production processes. And the cooperation continues with the aim of finding even more efficient solutions that will enable the New Food industry to grow further, emphasises Ajay Dubey: "The meat industry is exploring more cost-effective and sustainable alternatives to traditional bioreactors. Together with Bürkert, we continue to explore ways to optimise control loop designs that meet the application requirements and automate processes more efficiently. We have ambitious plans for the future."

About DDE

DDE, based in Pune, India, is one of the leading turn-key EPCM firms specialising in high-purity biopharmaceutical, vaccine, and sterile formulation manufacturing systems. The company offers comprehensive design, construction, automation, digitalisation and qualification services for pharmaceutical and biopharmaceutical organisations and renowned research institutes.

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