



Smart Proteins – Smart Factory

Start-ups are competing with established food producers and entering the rapidly growing market for alternative protein products. To achieve long-term economic success in this sector, it is essential to combine innovative processes and lean principles with intelligent industrial design in the ideal factory. Flexibility, scalability, and expandability of production must be planned from the outset in order to respond to dynamic market developments.

Germany is a global pioneer and is considered a driver of innovation for plant-based foods. Established and powerful food producers have also recognized the trend and are serving a rapidly growing market with an expanding range of protein substitute products. According to the Federal Statistical Office, the production of meat substitutes in Germany grew by more than 16% in 2023 compared to the previous year. With price parity as a tangible goal, demand for protein alternatives is being fueled, which in turn increases pressure on producers to produce as efficiently as the meat and dairy industries.



Plant-based proteins



Algae



Fermentation processes



Edible insects



Cultured meat/lab-grown meat



"Plant-based alternatives to animal products have become popular with ordinary consumers and are no longer a niche phenomenon. The proteins used for this purpose are often obtained from legumes, grains, lupins, or mushrooms using new, complex processes."

Bernhard Zech,
Food Engineer, IE Food

The production of food from alternative proteins must be just as efficient as the production of animal-based food.

The production of "smart proteins" requires complex processes that are often not yet standardized, such as fractionation, structure formation, and rehydration. In addition, there are established, industrially sophisticated processes such as mixing, cutting, packaging, cooling, deep-freezing, and storage. Anyone planning to become a successful player in this exciting growth market must optimally combine the best of both worlds in their production facilities. Despite innovative products, economic success will not be achieved if production flows are not optimal, scalable, and automatable. Production processes with too many manual steps or excessive resource consumption lead to uncompetitive cost structures and will not prevail in the future mass market.

"The phase, in which high prices for protein alternatives can be imposed on consumers, is over. Producers must scale and automate their production in order to be successful in terms of volume and profitability."

Tobias Rosenbaum,
Managing Director IE Food



4 Success factors for the smart protein factory of tomorrow

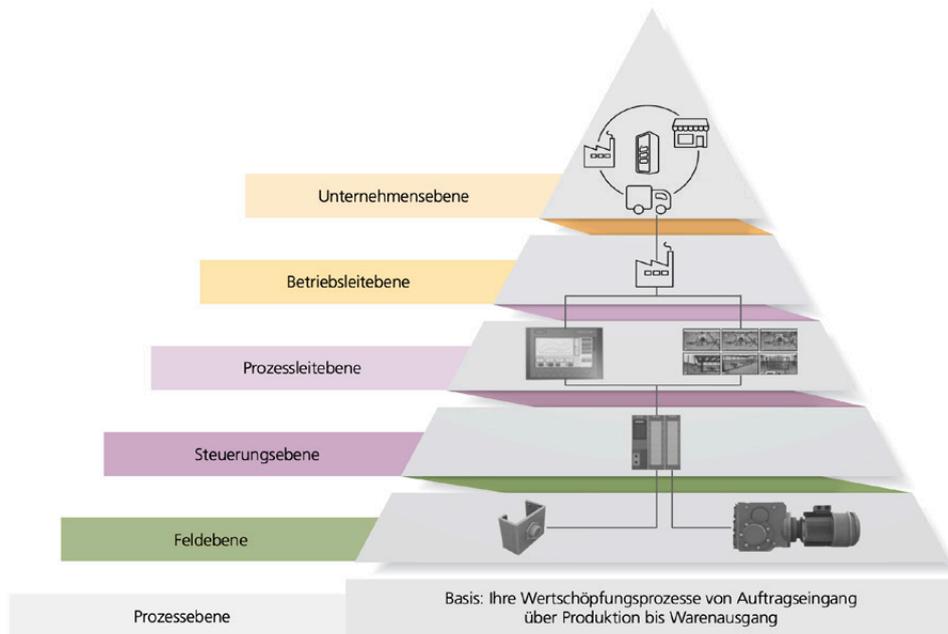
1. Intelligent and robust process design

An ideal production facility must be planned from the inside out. The selection of process engineering and technology is therefore the first step. Future planned expansions of the product range and scaling of quantities must already be taken into account when selecting the process technology. Continuous processes are increasingly replacing batch processes in many areas of processing. Often, individual process solutions can also be developed that ideally combine both types of process control.

A robust process design is characterized by lean and simple processes. For example, the number of moving axes should be reduced to a minimum. Or, with a vertical process arrangement, gravity can be used to convey and produce gently and with little effort. Every sensor and actuator that can be eliminated reduces investment costs and, above all, maintenance costs, resulting in a robust and intelligent process design. Flexible and automated delivery and premixing of raw materials at an upper production level is often a good start. In reality, however, we often see attempts to plan systems into existing buildings, resulting in avoidable complexity.

It is essential to examine and utilize existing experience from mature segments of the food industry. There is usually no "off the shelf" process design for the production of protein alternatives, but the combination and adaptation of known and robust process technologies (e.g., from bakery or dairy processes) often lead to excellent solutions. This greatly increases the robustness of the processes. A slightly higher investment in systematic factory planning thus leads to perfect, highly efficient solutions and will be the decisive competitive advantage in the future. Only production facilities that are scalable and expandable will be able to meet the expected market growth and are future-proof. Ideally, a factory developed in this way can become a blueprint for further production sites.

Homogeneous and harmonized automation is another important component for high robustness. Successful integration of automation into ERP systems is essential and must be taken into account in the early stages of factory planning.



2. Efficient intralogistics

The influence of efficient goods and material flows on the overall efficiency of a plant is often underestimated. Until a few years ago, a high degree of automation often conflicted with flexibility, but modern logistics systems now often resolve this conflict: In order to make the right system decisions for conveyor technology, warehouse logistics, and storage systems, it is essential to carry out a thorough analysis with source-sink analysis and process time calculation. This is not time-consuming, helps to reduce production costs, and avoids potential bottlenecks with regard to later scaling.

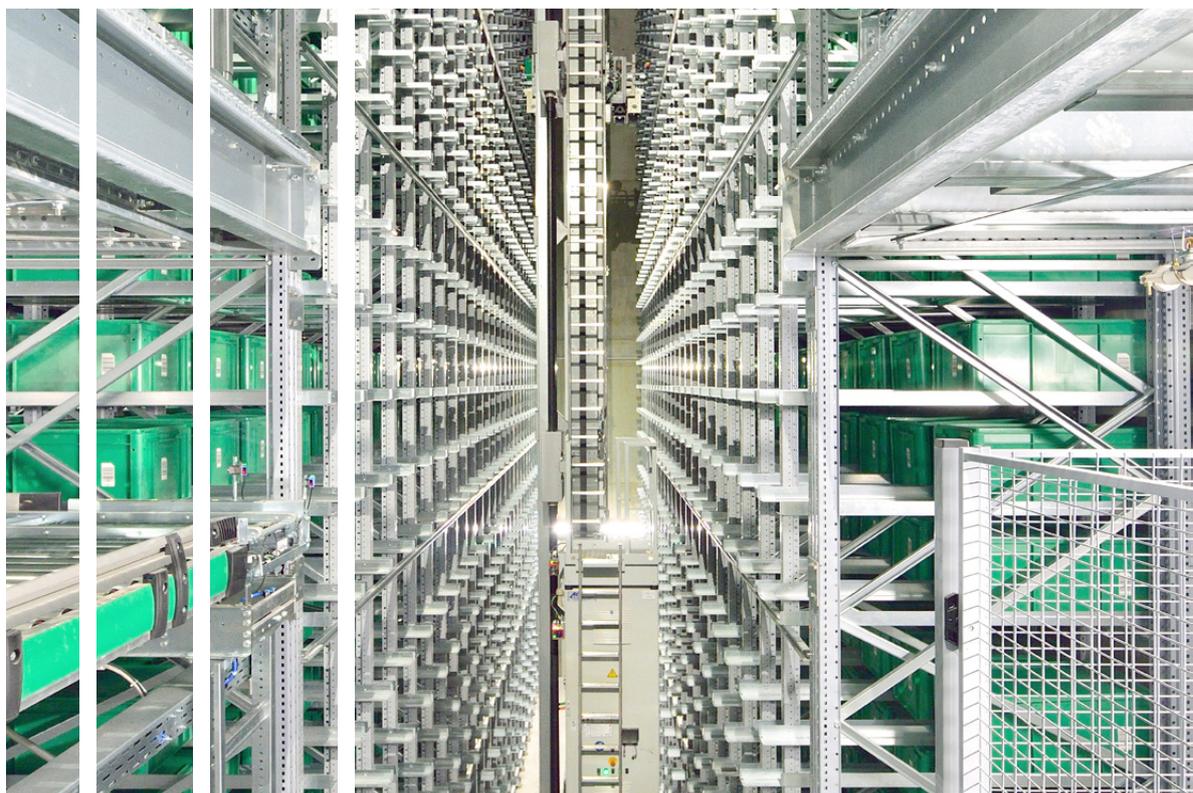


"In new construction or expansion projects, food manufacturers often pay too little attention to their own efficient warehousing and intralogistics. As a result, food companies often find themselves in a dangerous long-term dependency on external logistics service providers."

Florian Alexander,
Head of Logistics, IE Industrial Engineering Munich GmbH

The use of fully automated transport systems may seem like a massive investment at first glance, but it can be the decisive factor in ensuring uninterrupted 24/7 operation, even in situations where there is an extreme shortage of personnel.

Logistics and hygiene concepts must be planned together, especially in the food sector, to ensure that the flow of people and goods remains as uninterrupted as possible and that hygiene locks are coordinated with load carriers and internal transport. A well-designed temperature and hygiene zone concept can greatly improve throughput volumes. Manufacturer-neutral, functional specifications help to identify innovative system providers.

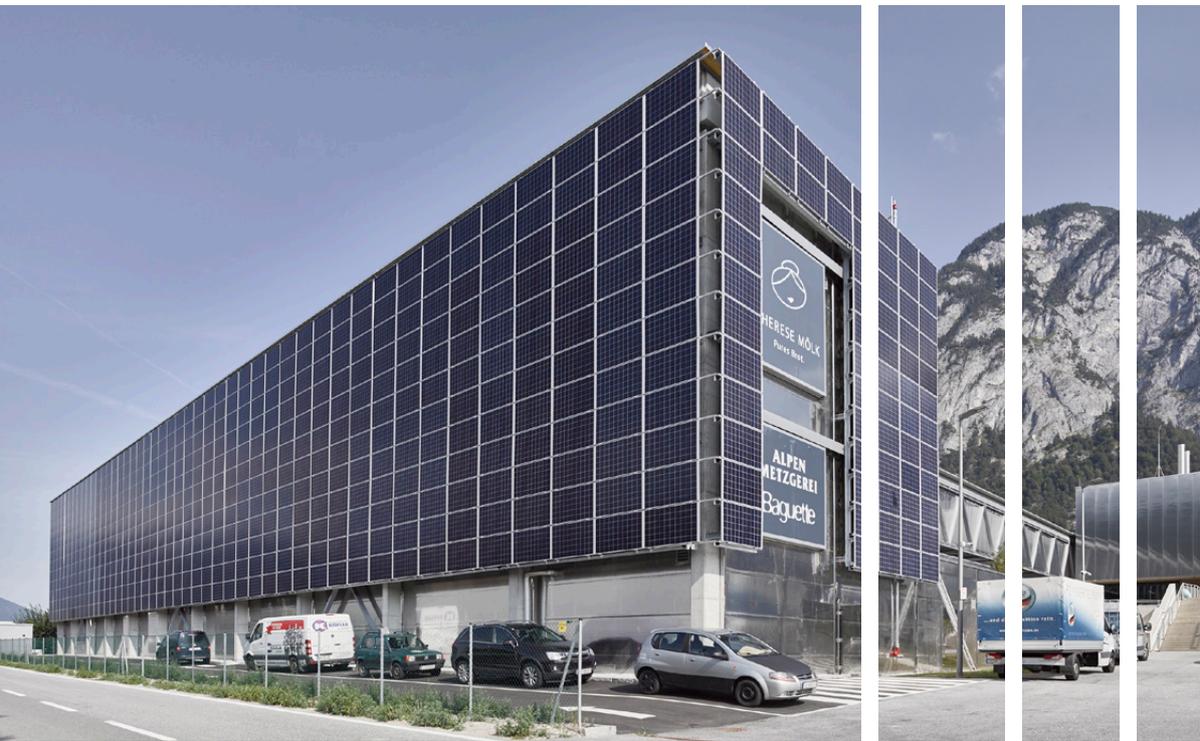


3. Sustainable products require sustainable production facilities

Photovoltaics on the factory roof alone is not a sustainability concept! To achieve a high level of sustainability, factories must be planned from the inside out. Providing the heat and cooling required for the production process at the necessary temperature levels requires combined energy systems and, in particular, must be planned holistically with energy recovery. Energy- and resource-efficient production processes are at the heart of sustainability efforts. In energy-intensive protein production in particular, the total amount of heat from all energy transformation processes, such as cooling and compressed air generation, is often higher than the heat demand.

The challenge lies in the efficient recovery and collection of all energy flows and their transformation to the required temperature level. Heat generation can be made more electrifiable and thus more flexible and CO₂-neutral by using high-temperature heat pumps. Sustainable energy supply is already required by law in many cases and is often eligible for subsidies. For new food products, this applies even more than in conventional food segments: customers have a greater interest in the topic and also base their purchasing decisions on sustainable production methods. The opportunities are diverse and always require individual analysis!

Together, these factors — which naturally vary in severity from case to case — lead to energy efficiency and, in the best-case scenario, even energy self-sufficiency, which is an important factor for the economic viability and future success of a company.



4. Projects that are safe to handle

Not only process design and industrial construction must be robust; larger investments also require robust partners. The construction or conversion of production facilities with production and logistics facilities and industrial construction are complex investment projects with execution risks. Especially in the highly innovative "Future Food" business, maximum execution reliability should be sought in terms of quality, deadlines, and costs. Every project has problems that require strong partners and the ability to solve them together.

Working with strong and experienced partners means bringing experience and foresight to the project: Identifying potential obstacles in the project at an early stage and guaranteeing a high degree of planning reliability are a major part of the success of the implementation. If investors or venture capitalists are involved, they are usually much easier to win over with low-risk contracting and clear responsibilities. Work contracts for turnkey construction with guaranteed services, deadlines, costs, and a high degree of transparency provide security for the client. Last but not least, trouble-free operation without defects is an important prerequisite for New Food companies to grow quickly.

Time-to-Market

An important success factor in the "New Food" sector is the precision and speed with which projects are successfully developed so that the new products reach the shelves on time. Highly fragmented planning involving numerous specialist planners, engineers, architects, and contractors costs valuable time in a rapidly growing market. Integrated planning with few interfaces and planning and construction from a single source is the preferred model for handling the race to market with new products.



At IE Food, architects, engineers, logistics experts, and food technologists work together in interdisciplinary teams. Together with customers, they develop projects from the inside out with seamless operations and construction planning. At IE Food, customers receive projects from a single source, with guaranteed deadlines and costs. From the initial investment idea to the handover of the turnkey industrial building. The company's performance is based on more than 50 years of history with excellent references.

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