

FUTURE MARKET STARCH

**Benefit from the boom in
vegan nutrition!**



Plant proteins –
a precious resource

Efficient technologies
for processing

zeppelin-systems.com

 **ZEPPELIN**[®]
WE CREATE SOLUTIONS



Introduction

VEGAN FOOD IS THE FUTURE.

Experts worldwide agree: If humankind continues to eat the way it has been eating, it will destroy the basis for its food and existence. Extensive livestock farming, which has to satisfy our constantly growing demand for meat, has played a major role in this. Environmental and climate damage from deforestation and, the enormous methane emissions from cattle are the price we pay for our appetite for meat.

This is what motivates more and more of us to switch to a vegan lifestyle. Today, the market offers a variety of comparable meat alternatives that are fully on par with the "originals". Sustainable vegan nutrition ideas based on things like protein from starch processing as a raw material that, up until a few years ago, had received far less attention. Today, plant-based proteins open up fascinating potentials for the food industry. Protein products ranging from meat substitutes to protein bars achieve above-average growth rates. Vegan nutrition is a megatrend which will continue to grow for years.

In this brochure, we take a look behind the scenes and show how you can successfully benefit from this megatrend with Zeppelin technologies.

I wish you an enjoyable read.

Ingo Pütz
General Manager Sales Food Processing Plants



GERMANS EAT TOO MUCH MEAT.

Global meat consumption per year has increased significantly over recent decades. In 1990, annual consumption averaged 33.5 kilograms per capita; in 2018, it was already 42.9 kilograms. Germany is far above this; in 2018, Germans consumed 78.8 kilos per capita. This corresponds to over 1.5 kilos per week - five times the scientifically recommended weekly amount.

MAKING NUTRITION MORE SUSTAINABLE – THE ORDER OF THE DAY.

Agriculture must find a new way.

Agricultural operations around the globe account for approximately 20 percent² of greenhouse gas emissions. This makes them a major contributor to global warming.

Carbon dioxide, methane and nitrous oxide are emitted by cattle, as well as during fertilization, tillage, burning of crop residues, etc. Factory farming earns special mention here: The production of 1 kg of beef causes greenhouse gas emissions of between 7 and 28 kg, while the same quantity of fruit or vegetables results in less than 1 kg.³

MEAT - THE NUMBER ONE CLIMATE KILLER.

The main cause for concern is the methane emissions from cattle worldwide. The greenhouse gas methane is 25 times more harmful to the atmosphere than CO₂. The amount of methane emitted by cattle could increase significantly in the years to come.

According to research published by the scientific journal "Biogeosciences", this is due on the one hand to the fact that cattle farming is rapidly increasing (currently around 1.5 billion head worldwide⁴), and on the other because the amount of methane released by the individual animal is increasing. This can be attributed to climate change.

AN INCREASE OF UP TO 4.5 PERCENT

In warmer climates, forage plants often have lower nutritional value. Since the climate in our part of the world is also warming up more and more, the nutritional value of forage plants is also decreasing here. The consequence: Cattle need to eat more, which in turn means it takes them longer to digest, creating more methane. A vicious cycle.

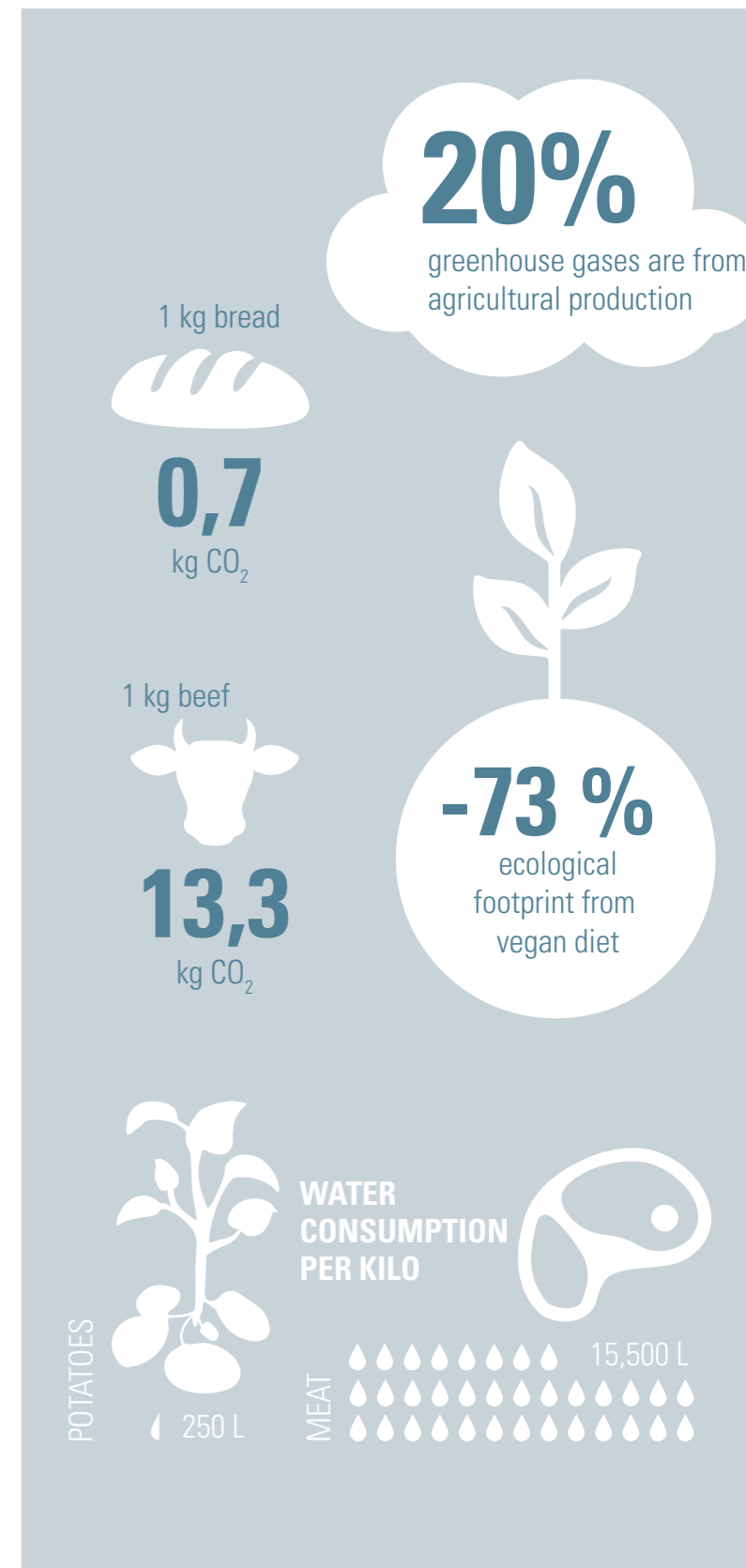
Scientists say that methane emissions per head of cattle could increase by up to 4.5 percent⁵ on average by 2050. In combination with the drastically increasing livestock population on earth, a catastrophic climate impact is imminent: The model calculation prepared by researchers shows that cattle herds would then emit an amount of methane⁶ equivalent to a warming potential of 4.7 gigatons of CO₂, over 70 percent more than at the present time.

DEFORESTATION COMPOUNDS THE PROBLEM.

The methane problem is aggravated by the clearing of tropical forests to obtain agricultural land for grazing and feed production. This releases CO₂ stored in the forest and forest soils; another significant contribution to global warming.

THE SOLUTION: CUTTING DOWN ON MEAT CONSUMPTION

Eating less animal products: This is the solution to eliminate the risk of rising greenhouse gas emissions. A full switch to a vegan diet could reduce our ecological footprint by up to 73 percent⁷.





Plant-based proteins

THE VIABLE PATH TO ENVIRONMENTALLY SOUND NUTRITION.



Our concept of nutrition is facing a crucial transformation across the globe: Away from wasting resources toward efficient food production. Above all, this means less animal products and more plant-based food. A transformation that doesn't just mean doing without: because there are now vegan products that are almost completely indistinguishable from meat in flavor.

OUR DIET IS CHANGING.

In recent years, the development of alternative protein sources has made great strides. In addition to protein from algae, the focus is primarily on plant-based proteins (e.g. from wheat, soy, corn, peas, etc.). Plant-based protein foods are becoming more attractive - as evidenced by changing dietary behavior in industrialized countries.

PLANT-BASED PROTEINS CONSERVE RESOURCES AND SAVE COSTS.

In economic terms, the conversion to vegan nutrition offers fascinating prospects for the food industry. Protein-containing plant foods are incomparably more efficient than animal products. With meat substitutes, enormous savings in resources, high economies of scale and thus also considerable cost reductions are possible in the future. Not to mention the positive health benefits for consumers.

BENEFIT FROM THE MEGATREND OF VEGAN NUTRITION.

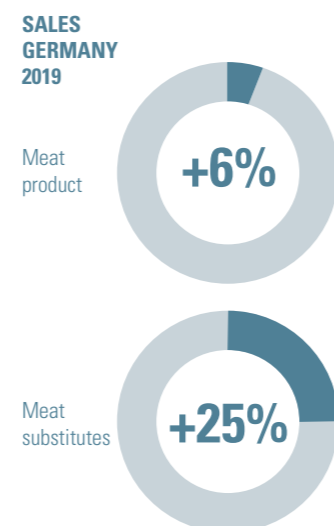
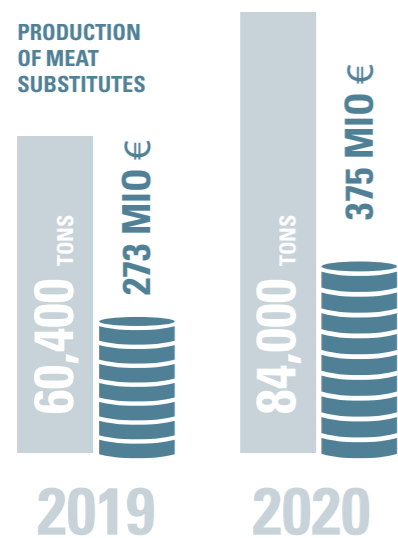
In 2020, the production of vegetarian and vegan foods increased by almost 40 percent over the previous year: the production volume grew from 60,400 tons in 2019 to almost 84,000 tons in 2020. The value of the products climbed by 37 percent from 273 to 375 million euros.⁸

MEAT SUBSTITUTES ARE BOOMING.

Sales of meat products in Germany grew by six percent in 2019, while meat substitutes grew by 25 percent. The meat market comprises the conventional meat market as well as plant-based meat substitutes.

The German food industry is reporting a tremendously strong growth in the meat substitute products segment. For example, one of the leading sausage manufacturers recorded increases in sales of up to 100 percent for its meatless products, and even sold more meatless products than meat-based products in 2020. A competitor's vegan products also increased by over 44 percent over the previous year. One of the world's largest food companies also increased its sales of plant-based products by 40 percent in the first half of 2020.

It is not surprising that experts are forecasting double digit growth rates in the medium range for plant-based sausage and meat alternatives in the coming years.



Source: www.n-tv.de/wirtschaft/Ein-Drittel-mehr-Veganes-und-Vegetarisches-article22553967.html



GOING VEGAN'S WORTH IT!

The rise of vegan foods will continue. Market researchers estimate that within the next ten years, 30 percent of animal proteins could be replaced by plant-based proteins. This market share is to grow to 60 percent by 2040. This promises extraordinary growth - something the food industry has also recognized: Almost every manufacturer has included vegan products in their range, or are at least working on developing them.

The starch processing industry is thus offered an enormous and promising scope of operations associated with great growth opportunities. So it's worth taking a closer look at the trend for meatless nutrition!

By the way, Germany is at the forefront of the vegan market in Europe. No other country in Europe has more vegan product innovations.

MORE PROFIT IN STARCH PRODUCTION WITH ZEPPELIN:

**Addition of water 3% = 3% less starch consumption
Price/kg dextrin = approx. 0.2 Euro**

$$\begin{aligned} \text{Starch saved} & 100\,000\text{ t} \times 0,03 \\ \text{/ year} & = 3\,000\text{ t} \\ & = 3\,000\,000\text{ kg} \\ & \swarrow \\ & 0,2\text{ €/kg} \times 3\,000\,000\text{ kg} \\ & = 600\,000\text{ €} \end{aligned}$$

**Savings per year
in euros!**

This example represents the savings potential in starch processing. In the area of protein processing for meat substitute production, a different approach to calculation must be taken. Please contact us about this.



The engineers at Zeppelin Systems are always at your side to help optimize your processes at any time. If you wish, also for practical tests in our technical center.

TECHNOLOGY EXPERTISE FOR BEST RESULTS.

Decades of experience in starch processing

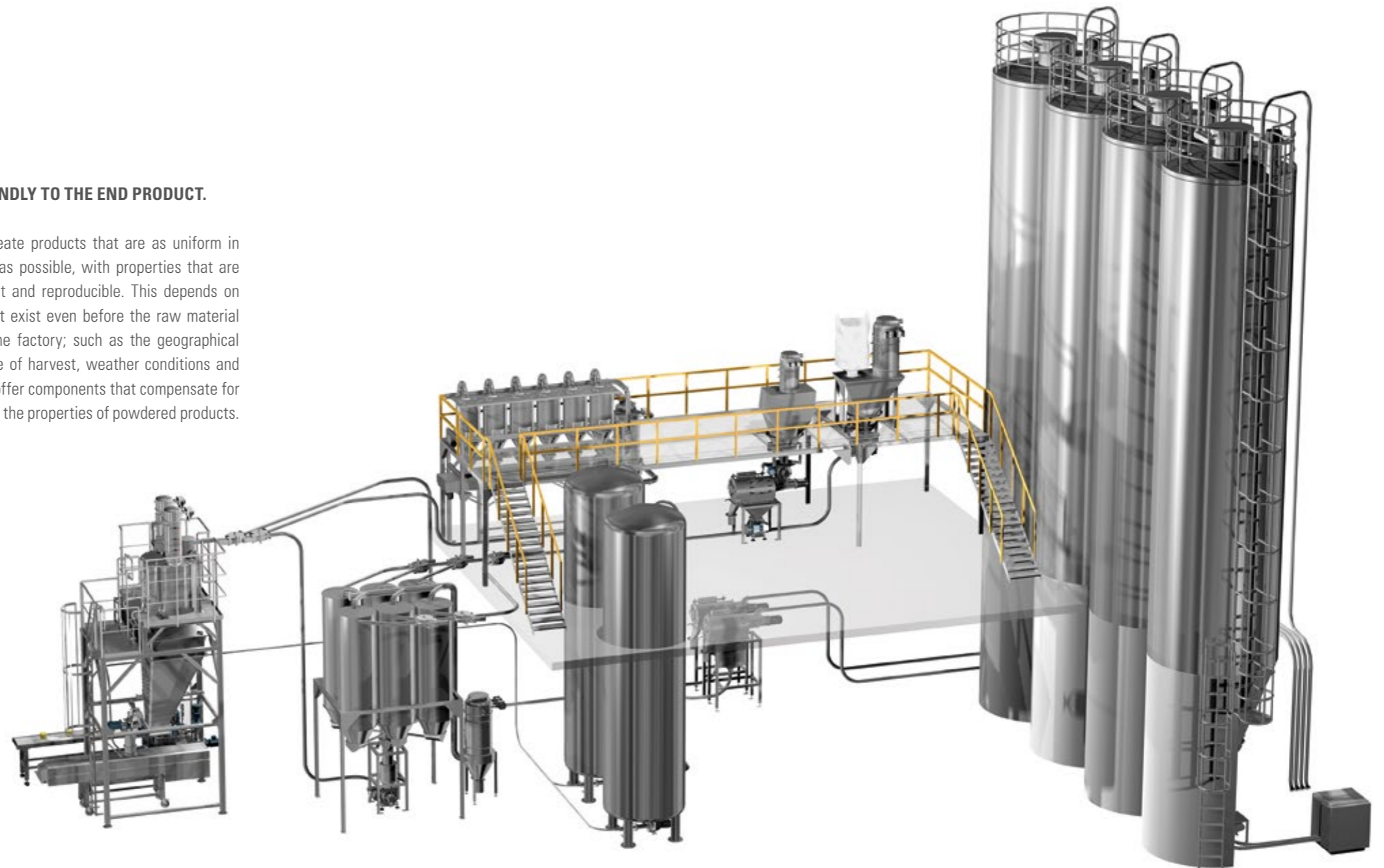
Zeppelin Systems has decades of experience in the construction of plant components for starch processing. Thus, the design of our components is characterized by a deep knowledge of the processes - which ensures maximum efficiency.

MARKET-DRIVEN SOLUTIONS.

Zeppelin Systems is increasingly focusing on the treatment of starches, derivatives and proteins. We address the ever-increasing demands of the food industry - purity, hygiene requirements and traceability, as well as product diversity. And we know that manufacturers must pay special attention to freedom from contamination (allergen-free, gluten-free and free from genetically modified organism - GMO). In addition, there is a whole range of special tasks, such as recipe changes and the simultaneous production of products of the same type and batch. We have the right solutions for all these tasks.

PRODUCT-FRIENDLY TO THE END PRODUCT.

The aim is to create products that are as uniform in shape and color as possible, with properties that are always consistent and reproducible. This depends on many factors that exist even before the raw material is delivered to the factory; such as the geographical location, the time of harvest, weather conditions and much more. We offer components that compensate for the differences in the properties of powdered products.



ZEPPELIN SYSTEMS: PROCESS COMPETENCE AT A GLANCE

Storage & Conveying

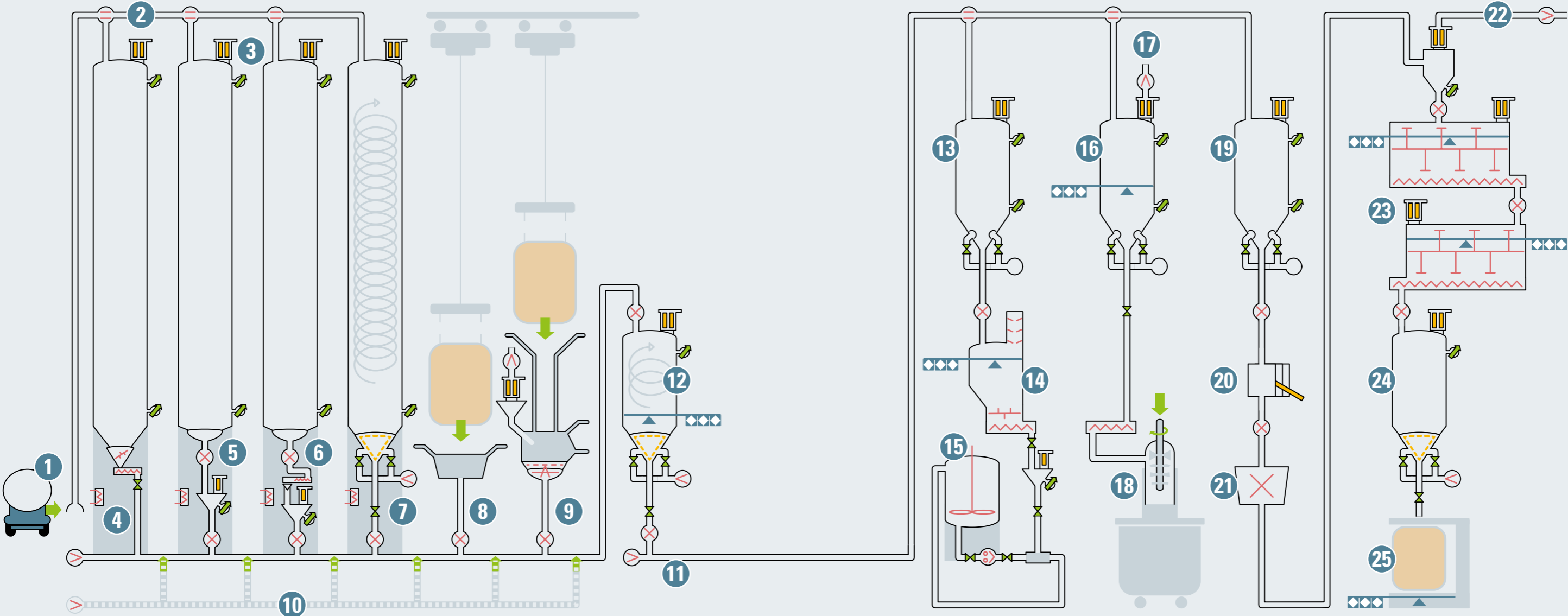
Discharge

Homogenize

Dosing

Moistening

Further processing



- 1 Intake after production, drying or delivery of bulk materials and their transfer to storage silos
- 2 Two-way diverters to control the conveying target
- 3 Filter for dust aspiration
- 4 Silo discharge systems - autocone
- 5 Silo discharge systems - vibrating bottom
- 6 Silo discharge systems - vibrating bottom with rotary valve (airlock) /screen/cone/rotary valve
- 7 Silo discharge systems - fluidizing bed (discharge system)

- 8 Discharge of big bag
- 9 Combined bag/big bag system
- 10 Overflow bypass system
- 11 Dense phase conveying
- 12 Pneumatic blender with fluidizing bed for homogenizing

- 13 Receiving hopper
- 14 Loss-in-weight scale
- 15 Dissolving tank
- 16 Scale hopper with screw dosing
- 17 Dust aspiration
- 18 DymoMix® for controlled moistening of starch and proteins
- 19 Receiving hopper

- 20 All metal separator
- 21 ATEX compliant mill
- 22 Vacuum conveying system
- 23 Conditioning container for dextrins or powdered sugar with scale
- 24 Receiving hopper with fluidizing bed
- 25 Big bag filling station with scale



ZEPPELIN TECHNICAL CENTER: FROM THEORY TO PRACTICE.

The boom in alternative protein sources is also making itself known at the Zeppelin Technical Center in Rödermark: The number of development trials has been increasing by leaps and bounds for several years.

Our Food Technology Center in Rödermark was specially designed to meet the requirements of the food industry and offers ideal conditions for trials on the handling of liquid and powdered raw materials. Here, tests can be carried out under real conditions. Together with the technology centers in Friedrichshafen and Kassel, Zeppelin Systems forms a large network of competence centers for handling high-quality bulk materials.

EQUIPPED IN LINE WITH PRACTICAL REQUIREMENTS.

In the pilot plant, we provide you with all the necessary test equipment for developing your formulas,- including the operating personnel. Zeppelin Systems' development engineers are available to advise you. Tests may be evaluated in the adjacent laboratory.

INDIVIDUAL TEST ARRANGEMENT POSSIBLE.

Thanks to its modular design, the pilot plant offers a high degree of flexibility. It has a two-story structure and can be arranged according to your needs in each case. Thus, depending on the test arrangement, we assemble your fully individualized customer test system via the process steps; filling, transporting, dosing and mixing.

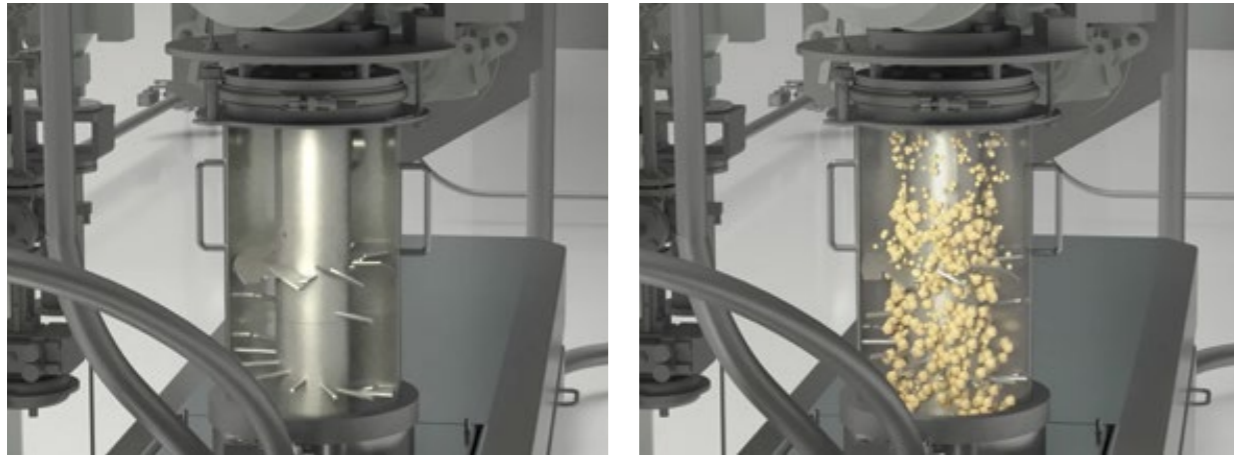
Pneumatic mixer

MIX THREE-Dimensionally.

The compact pneumatic mixer has no moving parts inside, it has smooth internal surfaces, making it easy to clean. Air flows in under positive pressure through the mixer's fluidized bed installed at the bottom. With a cyclic circulation of the gas inlet, a fluidizing bulk material-gas mixture with an upward flow is thus created. This three-dimensional,

continuous rearrangement results in an intensive and gentle mixing of the bulk material and a short mixing time. A further advantage: Emptying takes place segregation-free directly into a pneumatic system or by means of pressureless transfer into secondary containers. Further process steps, such as heating, cooling, drying or humidifying, can be integrated if required.





DymoMix®

GENTLE MOISTENING OF RAW MATERIALS.

The DymoMix® was originally developed for tempering in bakeries, but it can also realize its advantages in starch processing. The hydration system works as a pre-mixer and is used as a supplementary production step between metering and further processing steps. Powdered components are covered with water or oil, so that a homogeneous mixture is immediately formed.

A spray mist is generated inside the DymoMix® that evenly covers the powdered particles. Unlike conventional systems, hydration is not performed with a high-pressure water jet. This allows protein particles to be sprayed with flavoring agents. The particles fall through a kind of water mist created by an atomizer.



**Zeppelin components
ensure maximum
efficient processes**

Want to find out more?

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Sources:

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- ² <https://de.statista.com/infografik/20578/treibhausgasemissionen-bei-der-konventionellen-fleischproduktion/>
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- ⁹ <https://de.extraetf.com/news/finanznews/attractive-beilage-im-portfolio-durch-alternative-nahrungsmittel>