A close-up photograph of a woven basket filled with golden-brown chickpeas. The basket is made of light-colored, textured material, and the chickpeas are piled high, filling most of the frame. The lighting is soft, highlighting the texture of the chickpeas and the basket.

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Transition to sustainable food through the upscaling of cultivated meat production

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## Transition to sustainable food through the upscaling of cultivated meat production

**Sweden**

Can cultivated meat become a commercially viable contender in the race to safeguard the future of sustainably produced meat? Swedish startup Re:meat is firmly convinced that the answer is “yes” and has partnered with Alfa Laval and other companies in efforts to build an industry cluster to achieve just that.



Founded in 2022 and Scandinavia's first cultivated meat company, Re:meat is on a mission to fundamentally redefine how meat ends up on people's plates. To that end, they are scaling up and commercializing a process to cultivate sustainable meat that will potentially use 95% less land and 78% less water and emit 92% fewer GHG emissions than conventionally produced meat.

The process involves taking cell samples from healthy, free-range cows without harming them. These cells are then transferred to bioreactors, in essence tanks, where they are nurtured in an environment similar to the one in a traditional brewery. Here, they multiply, nourished by a growth medium, until they are harvested as meat ready to be turned into, for instance, burgers or meatballs.

It is also possible to produce pork and chicken using the same method, allowing people to eat meat without any animal needing to be killed and with considerably smaller environmental impact.

Currently operating at lab scale, Re:meat's ambition is to scale up to commercial production over the coming years with the opening of a production site planned for 2027 in Skåne, a cluster location for food and biotech innovation in southern Sweden.

"To achieve the climate potential, cultivated meat must become affordable to the consumers. Our ambition is to reach a production cost of €1/kg. It may sound ambitious, but we are serious about trying," says Gittan Schiöld, CCO at Re:meat.

To realize their ambition to help save the planet by redefining how meat is produced, the team at Re:meat is building a community of industry stakeholders with the aim of mobilizing, connecting and collaborating at all stages of the value chain to attract the right expertise and support to this innovation hub.

"This accelerator community, as Re:meat is calling it, involves meat producers, retail, specialists in food- and bioprocessing, automation, and even farmers," says Johan Agrell, Vice President Next-Generation Food at Alfa Laval, one of the partner companies. "It's an opportunity for mutual learning for all involved and the chance to build strong connections and engage in the right way with others who want to be part of the future of cultivated meat."



### Cellular agriculture processing

Alfa Laval offers equipment and complete processing plants for cellular agriculture. We help you industrialize your process from pilot to full-scale production.

Re:meat is one of approximately 150 startup companies around the world that are blazing a trail in this rapidly developing field of food production. The challenges are many, and the regulatory framework is still not in place. Only two companies currently have approval to sell their products in the US, and while approval has been granted in Singapore and Israel, retailers are not allowed to sell cultivated meat across all of Europe, including Sweden. No one has yet entered commercial-scale production.

"It is a brave new world for everyone involved in developing cultivated meat, and when you're looking at scaling up to commercial production, you have to get the balance right between pharma-level functionality and food-processing cost levels," says Johan. "That's where we come in. We can help navigate the specific functional requirements versus the cost drivers because with our equipment portfolio we already do it in food, pharma, and biotech, so for a cultivated meat company, we are a very good partner to have."



**Foot print**  
95% less land



**Water savings**  
78% less water



**CO2 savings**  
92% less GHG emissions

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100018475-1-EN 2408



## Feeding the future: Advancing food production for a growing population

Feeding a growing world population while reducing the environmental impact of food production is an escalating challenge. The United Nations estimates we'll need 70% more food by 2050, yet our current food systems are responsible for a third of global greenhouse gas (GHG) emissions\* and impact ecosystems, land, and water resources. How can a technology leader like Alfa Laval be part of the solution?

“Food is deeply personal — it defines identity and embodies culture and tradition,” says Johan Agrell, Vice President of Next-Generation Food at Alfa Laval. He adds, “At the same time, the choice we make about what ends up on our plates is one of the most impactful things we can do for the planet.

This is where Alfa Laval has a critical role in enabling foods with a lower climate impact and making those choices easier.”

Pioneering advancements in food production has been part of our DNA since the late 1870s, when Alfa Laval’s founder invented the centrifugal cream separator. Throughout our long history working with conventional food producers, such as in meat and dairy, we have constantly developed new ways to optimize our products and streamline our customers’ processes.

This has led to more sustainable production requiring less water and energy, therefore reducing emissions and resource use while increasing yield and output and cutting customer costs. But this is just part of the journey to more sustainable food.

One of the most critical global food challenges is the limited availability of proteins relative to population growth. To help bridge this so-called ‘protein gap,’ we are ushering in the next generation of low-climate impact protein sources.

From new ways to produce plant proteins at scale to modernizing fermentation techniques, finding imaginative uses for **by-products**, and exploring the possibilities of **cell-cultivated meats**.

We are helping to facilitate the transition of food innovations from concept to market-ready products. “What we are doing with our partners is not necessarily new,” explains Johan.

While next-generation food will not entirely solve the predicted food and protein shortfall, it will undoubtedly play a significant role, along with optimizing conventional foods and reducing food waste. Notably, by relying on new processes to produce next-generation food alternatives, some emissions can be avoided altogether. Johan underscores the significance of this field for Alfa Laval, stating,

“What excites us about next-generation food is the prospect of collaborating with food startups and established food producers who are spearheading food innovation and seeking our expertise to scale up production to bring new kinds of sustainable foods and ingredients to consumers in the future. This is where we can really make a difference.”



## The big food transformation

Feeding the world with a minimized environmental, social and governance impact by 2050 will require a systemic transformation of today’s global food system. Alfa Laval’s development of next-generation food plays a key role in re-inventing food and the transformation that must happen.

Today it is in its infancy, and conventional food will continue to play a critical role to secure sufficient and nutritious food in decades to come.

Alfa Laval builds on a legacy of enabling the production of more food from the same with less water, energy and waste. Today, a third of all food is lost between farm and fork, and Alfa Laval’s focus on the upcycling of by-products to food suitable for humans as a first priority is critical to our role in the systemic transformation of food.

## Learn more about Alfa Laval next-generation food solutions

Alfa Laval’s innovative solutions deliver sustainability in food production with a product portfolio that supports the safe, hygienic, and energy-efficient production of food and beverages. [Read more ...](#)

“Plant- and fermentation-based foods have been around for a long time, but we are taking these processes to the next level”.



**Johan Agrell**  
Vice President of Next-Generation Food at Alfa Laval

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100019033-1-EN 2411

# Global food challenge offers exciting opportunities for the future of protein



With the growing challenges facing global food supplies, the protein sector has never been more in the spotlight. For Sumit Pingle, VP of Agro & Protein Systems at Alfa Laval, it is an exciting time to be in the industry, full of opportunities – alongside challenges, complexities and a huge sense of responsibility. By 2050, there are set to be 10 billion people in the world – and the need for new sustainable protein sources is absolutely central to the future of the planet, with Alfa Laval at the heart of meeting the challenge alongside our customers.

“In terms of the future of food, the need for proteins is getting more and more attention – the increasing awareness of providing more food has become synonymous with providing more proteins, and I am certain that will continue as the population grows and demographics change,” says Sumit. “We have a growing number of mouths to feed, but how do we do that considering our current food chains will probably not be able to cope? How far can we take technologies to secure food for a growing population in the face of the current limitations?”

Finding innovative food production technologies to secure the future drives Sumit’s vision and is the core challenge that he and his team are rising to meet for customers, with a number of different areas offering fascinating opportunities. “There are many interesting things happening here,” says Sumit. “There are the high attention-grabbers like cell cultivation, where you take a stem cell grown in a tank and grow it -- imagine eating a steak without the carbon footprint impact or the need to kill an animal.

“Then there’s the whole fermentation sector, which has a lot of potential and is very thought-provoking. It’s not a new technology, of course – we have enjoyed fermented food for centuries – but applications seem to be limitless as we create new food.” Sumit is keen to highlight another key area that needs to be addressed in order to ensure future food supply – how we avoid waste.

“Historically, byproducts that we didn’t want to eat had low value purposes like feed and fertilizer or were even thrown out,” he says. “But with the looming food supply challenge, we are compelled to use these byproducts for food.

“So we are looking at what more can be done to avoid waste at various stages; during the food production process, after the process, at the retail stage, at the consumer stage – all of this offers potential as well, and Alfa Laval is perfectly positioned to tackle these and the other challenges.”

Indeed, as a leading innovator in food production, Alfa Laval has long been at the forefront when it comes to researching and developing creative solutions to meet the global food challenge. “The footprint of some brewery sites is akin to that of small cities,” says John Kyle. “We are in that energy space already – and I’m bringing in some of this portfolio and offering it to breweries because, in some instances, they are not aware of this potential that they could tap into.

“Alfa Laval was among the very first to look at processing insects at an industrial scale as a source of sustainable proteins when it was perceived as a novelty,” says Sumit. “We saw insects as an interesting source of protein for feed or food that has the benefit of a lower environmental footprint.

Now it’s an established industry and will undoubtedly form part of the long-term solution, not just as a source of feed. Soon, we may see insect flour used in areas of cooking, as it has real nutritional value.



**Sumit Pingle**  
Vice President  
of Agro & Protein  
Systems

“There is a challenge of perception here – who is going to eat an insect burger? People will tend to go for plants and fermented proteins rather than insects, but it is an area with intriguing potential that we will continue to explore and develop.” Another element to consider in the complex global food landscape is the way that societies are developing more of an interest in personal health and diets, and so the need for different ingredients and unique flavours increases .

“Alfa Laval can play a huge role here because our versatile core technologies – such as heat transfer, separation, and fluid handling – can be applied in the processing of these foods. So, alongside our constant focus on sustainability, we need to be fast and agile in adapting to customers’ needs, as things are changing quickly all the time with new tastes, new feedstocks and new consumer demand,” says Sumit.

“Rapid testing is key to helping us hand-hold our customers from pilot stage to industrial-scale production, and we to guide our customers through this ever-changing landscape and advise them on what’s prudent to move things forward.”

Reflecting on the challenges to come across the sector, Sumit says: “There are so many drivers and influences on food production heading into the future. We need more food, and we need more diversity in our food. “In the Protein field there are major things happening: new feedstocks, new end-products, more volume, more processes, technology developments. When you talk about food tech, most of it is related to proteins. It’s the best place to be for anyone in the food industry.

**“I feel the challenge of this complexity very strongly, but without the complexity, anybody can do it. It’s where Alfa Laval should be because it is complex. We are built for this.”**



#### Highlighted industry: Protein processing

The demand for protein is booming as the world’s population continues to grow and the globe are shifting to a more protein-rich diet. As a result, protein producers are implementing new processes, raw materials and production methods to maximize production volumes. **Read more...**

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100018576-1-EN 2409



# Setting the standard for water recovery and circular reuse in oat drink production

**North America**

As plant-based drinks producers look to increase production in a global market predicted to rise to USD 71.46 billion by 2030 (Facts & Figures Research, 2023), innovative leaders in the industry are incorporating 'sustainability as standard' and building circularity into their expanding operations.





One such plant-based food and beverage producer in North America has made sustainability and operational circularity the foundations of their approach, driving day-to-day operations and strategic expansion.

Since 2000, the company has been solely focused on the manufacture and sale of organic food, with a focus on plant-based food and beverage. Two years earlier, the company had entered the oat drink business in response to booming consumer demand for plant-based products.

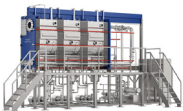
The venture was an opportunity to incorporate leading-edge design and innovation in engineering at a new plant to optimize process efficiency from the outset. And to do this, they worked with Alfa Laval, initially at the pilot scale, to fine-tune the design of the full-scale installation, which was commissioned and fully operational in 2020.

Alfa Laval's **AlfaVap** evaporation systems are central to water-use optimization and energy efficiency at the plant. After mixing, cooking, and separating, the oat drink is concentrated with an AlfaVap evaporation system, which processes 16,000 kgs/hr of oat drink to produce 3,500 kgs/hr of 50-55% concentrate.



#### AlfaVap system

Compact and efficient, the Alfa Laval AlfaVap rising film evaporator concentrates low-to-medium fouling liquids as well as highly viscous liquids across a broad range of applications and industries.



#### AlfaVap Inline

Compact and energy-efficient, the Alfa Laval AlfaVap Inline climbing film plate evaporator concentrates heat-sensitive, low- to medium-fouling products, raising product quality and reducing costs.

"The concentrated oat drink is sold in bulk to customers who reconstitute it, tailor it to their market specification, repackage it and sell it to consumers," explains Ashok Shrivastava, Food Systems Service Sales with Alfa Laval. "Concentrating the product reduces the amount of packaging required and cuts all the costs and carbon emissions associated with transporting large volumes of liquid by a factor corresponding to the 78% lower volume."

The AlfaVap evaporation system generates three distinct streams: firstly, concentrated oat drink; secondly, condensed live steam, also known as steam condensate; and finally, process condensate derived from the water vapor evaporated from the product. "Given the high water-intensity of the oat drink process, effective water management is crucial for maintaining control, optimizing production costs, and ensuring sustainable water consumption," says Ashok.

Ultimately, the recovered condensate – water that can be treated and reused – amounts to 15,300 litres an hour: 8,000 litres of process condensate and 7,300 litres of steam condensate. "The process is highly efficient," says Ashok. "The steam is reused three times throughout the evaporation process, while the water or process condensate from each phase is returned for reuse in the first step of the mixing and cooking process of the oats. This is significant as the plant uses 8,000 litres of water per hour in this first step when it is working at full capacity."

The 7,300 litres/hour of steam condensate from the first effect is also reused either for Cleaning-in-Place (CIP) or in the water feed for the boiler based on the conductivity and quality. Reusing the steam condensate, which emerges at 87°C, generates significant energy savings in the process.

"In the production cycle, all the steam and water are reused at least once, which reduces the amount of new water and energy needed for the boiler - both in the first step mixing and cooking process and for cleaning-in-place," says Ashok. "Additionally, the CIP water is reused for three cycles before it is drained out and sent to the company's own wastewater treatment plant, so the efficiency of CIP water use is also optimized."

The company's satisfaction with the operational efficiency of this plant was such that last year, they opened a second plant of the same design in a highly water scarce location.

"Water use and energy efficiency were the two key elements driving these projects," says Ashok. "The customer wanted to incorporate as much circularity in water use as possible, which we have achieved. Also, by recycling the steam and vapours, there is a huge saving on energy as well."



#### Energy savings

Optimized energy consumption thanks to energy efficiency and energy recovery.



#### Water savings

15,300 litres an hour.



#### CO2 savings

Reduction in carbon emissions corresponding to the 78% lower product volume during transportation.

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100018477-1-EN 2408



## More plant-based protein: The mother of inventions



With global protein demand on an upward trajectory and the world's population projected to expand considerably by 2050, innovative solutions and advances in technology will be key in developing sustainable sources of protein to stabilize future food security. It will require new thinking and innovation to produce up to 70 percent more food by 2050. (UN, 2019).

Plant proteins are set to be a major part of the solution. They cost less to produce than animal proteins and have a smaller environmental footprint. However, they present specific challenges to processors due to their relatively poor solubility, foaming, emulsifying and gelling properties.

Traditionally, Alfa Laval's decanters have been the go-to technology when it comes to separating out plant proteins but the structure and resulting behaviour of the proteins inside these machines makes this process comparatively inefficient; with big decanters and low flow rates required to produce protein isolates of sufficient quality, and unavoidable product losses.

Ironing out production inefficiencies will be crucial going forward if the ever-increasing demand for healthy plant-based proteins is to be met; and for Alfa Laval, this represents a huge opportunity for innovation and process optimization.

Step forward Alfa Laval's Global Sales & Technology team in Agro & Protein Systems who, with the support of a leadership that welcomes problem-solving and encourages new ideas and innovation, have developed a more energy-efficient processing system, which produces higher protein yields of better quality at lower operating costs.

Launched in April this year and currently the subject of a patent application, Alfa Laval's new **Plant Protein Separation System** has been developed by Process Engineer Joosep Masik and his colleagues, and was born out of a determination to be more competitive in the market.

"Essentially it all started from frustration," Joosep explains. "We were disappointed that our protein separation systems were becoming expensive because we had to use two decanters and it didn't seem as though we had a competitive offering for the future. We wanted to come up with something unique to differentiate ourselves in the market."

Galvanized by the supportive environment and can-do culture, the team set to work. Brainstorming led to lab testing and confirmation they were on the right track. A more extensive feasibility assessment followed at Alfa Laval's test centre in Kolding, Denmark, until the team were satisfied, they had the right solution and the new Plant Protein Separation System was born.

"This problem really got our creative juices flowing and at the start there were a lot of ideas," says Joosep. "Eventually it turned out that the solution had already existed in Alfa Laval for a long time – it was a disc-stack centrifuge called **Alfa Laval TopStream™**."



Plant Protein Separation System  
The Alfa Laval Plant Protein Separation System improves protein isolate quality and yield and reduces energy costs and total cost of ownership. Ideal for new installations and retrofits. [Learn more.](#)

By incorporating the TopStream disc-stack centrifuge into the process for the primary separation phase with a wash decanter carrying out the secondary separation phase, the team were able to increase the production capacity and quality of the protein isolate while also reducing energy consumption and overall operating costs.

"With this system we have maximized the potential of both machines," says Joosep. "The TopStream has higher throughput and greater separation efficiency, but the decanter is an essential last step – delivering a drier product and minimizing product losses."



### Alfa Laval TopStream

Alfa Laval TopStream™ / Bactofuge™ technology is a method for continuous solids discharge used when processing products with high solids contents.



It offers higher separation output while simultaneously making it possible to preserve the quality of discharged solids for later reuse.

This innovative, continuous solids discharge method is critical in food processing, for products such as, yeast, fruit pulp and dairy products. For fruit juices, TopStream provides stable process performance while ensuring a dry pulp stream coming out of the separator and can be reused. In pharma industry gentle solids handling keeps cell lyses to a minimum.

Management support was key to the successful development of the new Plant Protein Separation System. Time, resources, and space in busy schedules were carved out to facilitate progress.

"Once we had come up with the idea, we needed to prove it could work," says Joosep. "At that point I had to take it up with my managers because we needed time and resources. It was a huge leap of faith, but they gave us the approval to do the tests we needed to do. We did two tests. The first one proved it could be done and the second one established how we could fit it into our solution. We couldn't have done with it without the backing of our managers."

As well as increased yields, higher throughput, gentle product handling and continuous solids output, the Plant Protein Separation System is also more energy efficient. The TopStream disc-stack centrifuge has a much lower power consumption compared to conventional production methods.

"Essentially this is a more sustainable solution because less power is required but we also believe the new system will result in much leaner installations, requiring less stainless steel to produce, which is another obvious benefit that enables us to reduce the carbon footprint of processing," says Joosep.

And from a job satisfaction perspective, being given the go-ahead to explore ideas with colleagues and develop a positive solution to a potentially market-limiting problem has been very rewarding.

"One of the coolest things about my job is that we are encouraged to think about innovative solutions for the future," says Joosep. "Obviously, if you want to be innovative you have to take some risks but there can be huge returns and in this case, we have made the most of a unique opportunity to be pioneers in this area."

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