Alltech® COPPENS

AQUA NEXT

INNOVATING **AQUACULTURE**

EDITION
12

MAXIMIZE

AQUANEXT

CONTENT

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INTRO

Welcome to the first edition of AquaNext, the successor of Coppens Contact that has been published for 11 consecutive years. The name AquaNext has been chosen to emphasize the Next Generation of our magazine and also our future with Alltech. We will continue to lead the way as the *go-to* guys in Aquaculture to further honour and carry out Dr. Lyons' vision.

After closing the first full year under the parenthood of Alltech I am proud to share all the things that we achieved in 2017 and that we have full confidence in our contribution to the aquaculture industry in 2018.

Personally 2017 has been a very exciting and rewarding year as I have been offered the opportunity to take over the role of managing Director of the company. I am proud to fulfil this new role in a fast developing industry with a great team of colleagues and strong support from Alltech. A special thanks to Jeroen van Stokkom and Anno Galema for al the years of co-operation and wishing them all the best in their future careers.

Looking back at 2017 there are 3 major events that I like to address. The first mile stone that we reached was the development and expansion of **Alltech Coppens Research Centre**, which has been designed to be the global hub of aquaculture, leading in innovative nutritional research in multiple fish species under a wide range of conditions.

During the early months of 2017 we have started the construction of a new production line to keep up with the sales volumes. Line three has been designed to offer us more options and more flexibility in our feed portfolio to fulfil the requirement of our customers. In March 2018 we started to produce the first test batches and since the first week of April we switched to full commercial batches. The new line, in combination with the existing two lines, is able to reach a volume of 75.000 MT.

The last and most challenging project that we have started in 2017 was the preparation to shift to a new ERP system (Milas AX). This management system of core business processes, facilitates information flow between all departments within Alltech Coppens. It will improve the quality and efficiency of our business and creates a more agile Alltech Coppens that is prepared for the company's future growth.

All three major investments have been done to even beter serve our customers and partners around the globe.

RONALD FABER

is the Managing Director of Alltech Coppens, which was acquired by Alltech on June 6, 2016. Faber is responsible for the success, performance, and strategies of the company, reporting to Patrick Charlton, CEO and Vice President of Alltech Coppens.

Faber received his master's degree with a specialization in aquaculture and fisheries from Wageningen University in the Netherlands. He began his career in the aquaculture and veterinary industries and joined Alltech Coppens in 1998 as an Area Sales Manager for the Mediterranean region.

In 2003, he moved to Thailand and worked as a Nutritional Consultant for various fish and shrimp feed companies, working with customers in Thailand, Vietnam, India and Indonesia. In 2005, he returned to the Netherlands and continued his career with Alltech Coppens. Faber currently lives in the Netherlands with his wife and their two sons.

"HAVING WORKED ALONGSIDE RONALD FOR THE PAST YEAR, I KNOW HE IS THE BEST PERSON TO TAKE OUR BUSINESS FORWARD AND EMBRACE THE NEW OPPORTUNITIES THAT BEING PART OF THE ALLTECH FAMILY REPRESENTS."

Patrick Charlton
CEO Alltech Coppens

Remembering DR. LYONS

Dr. Pearse Lyons, the Irish entrepreneur whose vision for improving global agriculture built a multibillion-dollar international business, died March 8. He was 73.

In the late 1970s, Lyons immigrated to the United States with his young family and a dream. His vision — to sustain the planet and all things living on it by applying his yeast fermentation expertise to agricultural challenges — came to life in his home garage with $10,000.

Dr. Lyons was first and foremost an entrepreneur and a tireless innovator, with a keen scientific mind. His scientific expertise, combined with an acute business sense, helped revolutionize the animal feed industry through the introduction of natural ingredients to animal feed.
He was widely regarded as an inspirational leader and communicator. He lived with passion and purpose — rising before dawn to begin communicating with colleagues around the world, issuing daily motivational messages and traveling incessantly so he could meet his team members and customers in person.

He built Alltech into the fastest-growing company in the global animal health and nutrition industry through innovative technology and strong branding. Today, Alltech is the only privately held and family-owned business among the top animal health companies in the world.
The company's reach has also grown far beyond yeast-based additives for animal feed to include award-winning beers and spirits, a crop science business and even promising research into human health challenges, such as diabetes and Alzheimer's disease.

Dr. Lyons was very proud of the company's privately owned status and was resolute on keeping it. He was a man who liked to move quickly on opportunities, and he relished the agility and speed that being accountable only to himself afforded him. His business, Alltech, will remain privately held under the ownership of the family.

We are honoured to have worked with Dr. Lyons, we will remember him as a visionary leader and very dear friend.

> "HOW LONG BEFORE YOU BUILD A BUSINESS, NOT FOR SOMEONE ELSE, BUT FOR YOURSELF?"
>
> **Dr. Pearse Lyons**
> President & Founder of Alltech


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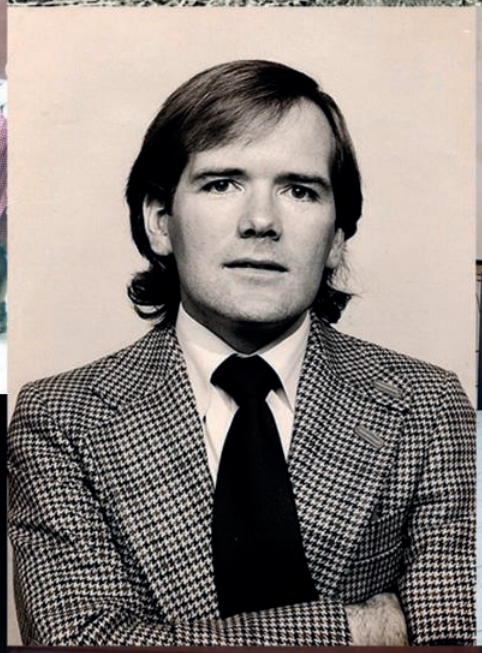



PEARSE
LYONS
at St. James


Altech
...naturally

MAXIMIZING
ALLTECH COPPENS AQUA CENTRE

FULL OF TRIALS, A BREEDING SEASON AHEAD.

Now the trials for validating the capacities of the new **Alltech Coppens Aqua Centre** systems have almost been completed, it is time for the last few finishing touches and settings. It is only a few weeks before this has been rounded up and the systems are running on full operation with a new set of trials. With the breeding season on the doorstep it is prone to be busy at the **ACAC**!

Frits Berkers | Manager **ACAC**

One of the extra investments we are making to the research facility is an automatic feeding system. In the second half of April we expect to have our automatic Arvotech feeding system running in **ACAC** 6 B. The proven method of the Arvotech feeding system allows us to feed a wide range of pellets at the desired feeding level in any time and frequency. Both restricted and ad libitum feeding regimes can be put in effect. After these investments the system is fully operational and can perform at maximal capacity.

A total of 1120 trial days on 24 different trials are planned to be executed in 2018. Next to adjusting the systems, time has also been invested in training both new staff and very experienced colleagues of the **ACAC** in working with this new system. A manual was written to cover the technical features of the new systems and the most common trials in order to make the whole team aware of the information and to synchronize all working procedures training were held every week.

Two colleagues prepared an one hour speed course on a specific subject and took the whole group to the systems for instruction and discussion. The technical capabilities and degree of control over the trials are higher in the new systems. This offers greater possibilities but also puts a higher demand on the technical skill of the **ACAC** colleagues and in maintenance. Another goal for the staff of the **ACAC** is to be further integrated in the activities of Alltech Coppens.

Ben Lamberigts - Manager QRN

> “WE NOW HAVE A NEW JEWEL IN ALLTECH’S RESEARCH CROWN. WITHOUT EXCEPTION, EVERY RESEARCHER I TALKED TO ADMITTED TO BEING ENVIOUS OF THIS FACILITY. THERE IS NOTHING LIKE THIS ANYWHERE IN THE WORLD. I HOPE WE CAN WELCOME THIS FACILITY AND THE TEAM HERE AT ACAC AS ONE OF OUR NEWEST BIOSCIENCES CENTERS.”
>
> **Karl Dawson**
> Vice President and Chief Scientific Officer Alltech

MAX PERFORMANCE

The first weeks of April are definitely the best period of the year to witness the artisanal process of fish reproduction at the **ACAC**!

Frits Berkers | Manager **ACAC**

With this being said about the new systems, it must not be missed that the existing systems are running on full capacity as well. A growth trial has started with adult trout in the **ACAC** 4. At the same time **ACAC** 1 and 2 are combined to form one system which holds a trout starter diet trial with not less than 28 tanks! But it's not all research that is happening.

The **Alltech Coppens Aqua Centre** is also still a commercial producer of ornamental fish and the breeding season is coming up! At the moment there are 500.000 fish waiting in the outside ponds eager to be sold to our customers. As soon as the ice melts, the fish will be caught and stored, ready for sale. The carp and pikeperch brood stock are taken in from the ponds and prepared for reproduction. Also carp brood stock used for reproduction is selected. These are the fish with the most beautiful physique, brightest colours and most appreciated scale pattern.

The males and females are separated and they are kept at low temperature to not make them lose their eggs too quickly. In the actual process of reproduction the eggs and sperm are stripped from the selected brood stock. They are mixed and water is added. In nature fertilized fish eggs are supposed to stuck to aquatic plant or other substrate in the water. Therefore the eggs become very sticky direct upon fertilization. This is something that is not desirable when farming fish, the eggs would coagulate to one big clump. To prevent this from happening, the eggs are supposed to be stirred for at least 1 hour.

At the moment the breeding hall in the **ACAC** is empty, but soon it will be full of activities.
You will see a long big table with up to 10 people stirring their bowl with eggs. The first weeks of April is definitely the best period of the year to witness the artisanal process of fish reproduction at the **ACAC**! When the fish are inside and the ponds are drained it's time to clean them out and let them dry. As soon as the weather gets more sunny and a little warmer the ponds are filled with water again.
The water is fertilized and natural algae and plankton are allowed to grow. In the first few weeks of April they must be ready to receive the just hatched ide and pikeperch larvae and give them the best environment possible in their early life stages.

GLOBAL HUB OF **AQUA CULTURE**

A total of 1120 trial days on 24 different trials are planned to be executed in 2018, which allows us to further develop our already strong aqua research programmes.

We have achieved global recognition for our RAS systems. We will continue to build upon this and to expand our work into different species, such as saltwater fish.

Together with our other advances in our research programmes, we will continue to provide a range of high quality nutritious products that will guarantee customer satisfaction.


Alltech COPPENS
AQUA CENTRE

RAISING FISH

Gijs Rutjes | Technical Sales Support Manager
Niels Jeuken | Aquaculture Marketing Co-ordinator Alltech

A good start for fish larvae is crucial and therefore good performing starter diets are essential. Especially because we know that weaning on dry feeds with an unbalanced diet can result in deformities and high mortality rates. Providing nutritional solutions for the specific needs of larvae in their most critical life stage will be beneficial for the fish' its entire lifecycle. Supporting the healthy development of all organs including the skeleton for an optimal start, begins with feeding the highest quality feeds.

Extensive studies at the **Alltech Coppens Aqua Centre** have step by step revealed the essentials for a weaning diet which significantly minimise deformations in sensitive fish species. It is now possible to wean fish larvae with confidence knowing that the vast majority will fully develop into healthy fry without any abnormalities. In addition, Alltech Coppens' starter diets result in an optimum growth rate after this first critical period.

BENEFITS FOR HATCHERIES AND FARMS

By delivering nutrients in a way that can be handled by the maturing digestive tract of fresh water larvae, **ESSENCE** offers hatcheries more security when weaning fresh water larvae from artemia onto a dry diet. Deformities can be brought back to a minimum with a more even growth rate resulting in less frequent grading. This means healthy larvae and fry, more revenue, more efficiency and less work.

CONTINUOUS INNOVATION

Alltech and Coppens together are continuously innovating to bring a new generation of fish feeds to the marketplace. A truly unique starter diet that needs to be highlighted is the Alltech Coppens' **ESSENCE**, which is designed with Alltech's Total Replacement Technology and Gut Health Technology containing **BIOPLEX®** and **BIO-MOS®**.

EXCELLENT PERFORMANCE

Through the highly available organically bound trace elements that ensures an optimal skeleton development this special larval diet can largely replace live artemia. Next to an extremely low deformity ratio, **ESSENCE** promotes optimal tissue development and a high fry survival rate which makes this feed truly unique.

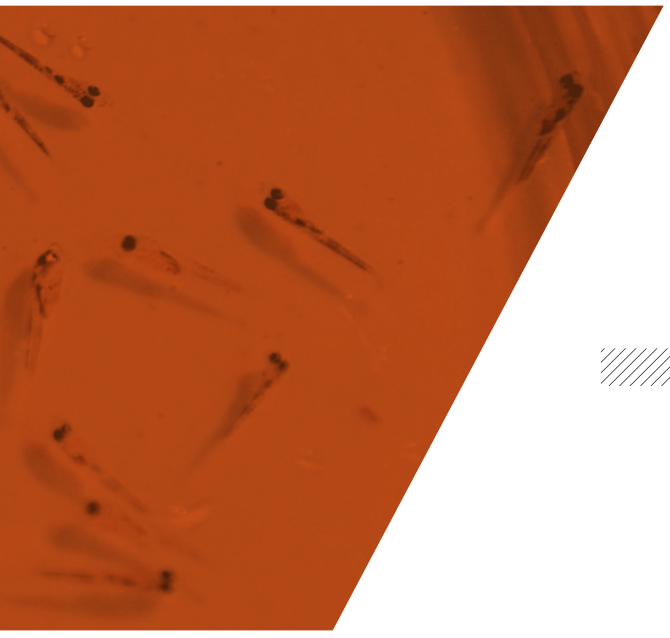
PERFECT FOR RAS

Due to its high digestibility and excellent performance this diet is perfect for RAS farming conditions. **ESSENCE** is tailored to the specific needs for the early life stage of fresh water fish like cyprinids, pikeperch, catfish, tilapia and koi, characterised by many as living jewels.

For more information, please contact: aquasolutions@Alltech.com or coppens@alltech.com

AQUACULTURE'S TRUE ESSENCE

Contains **Bioplex®** & **Bio-Mos®**
Supports the immune respons and optimizes gut health



FOR AN IDEAL START,
THE HEALTHY DEVELOPMENT
OF FISH ORGANS BEGINS WITH
OPTIMAL NUTRITION.

A NEW GENERATION STARTER DIETS

MAXIMIZING HUMAN HEALTH

Ruben Groot | Aqua Nutritionist

MAXIMIZING HUMAN HEALTH THROUGH EATING FISH. THE IMPORTANCE OF OMEGA3- FATTY ACIDS.

Why are fish so good for you? One of the principle reasons is due to the fact that fish are rich in polyunsaturated fatty acids of the omega series. The difference between these omega fatty acids lies in the position of a double carbon bond at either the 3th or the 6th position of the molecule, where counting starts from the end (omega) of the molecule. It is precisely this bond position which therefore dictates the name of these molecules.

Both types are termed essential fatty acids as these cannot be synthesized by the body and therefore need to be supplied in your diet. Long chain omega-3 fatty acids are particularly beneficial for human health as they play critical roles in brain development, vision development and function, cardiovascular function, learning and behavior. Furthermore, research has shown that they can also modulate inflammation, minimize depression and reduce age-related mental decline. There are more different types of long chain fatty acids such as omega-9, which is a non-essential and mono unsaturated fatty acid.
The reason why it is non-essential is because it can be synthesized by the body itself and is therefore not necessarily required in the diet.

Ω - 3 FATTY ACIDS

The most common omega-3 fatty acidsare ALA, EPA and DHA. Of these fatty acids ALA is predominantly found in plant oils, while marine oils are the primary source of EPA and DHA. The main differences between these omega-3 fatty acids are the number of carbon atoms and double bonds in the molecule. ALA has the least of these, but can be used as a template to form longer chained fatty acid EPA and from there to DHA. However, since ALA is the shortest, it has also the highest rate oxidation among the omega-3 fatty acids. This means that it is readily catabolized for energy, leaving only a small portion remaining for conversion to EPA and subsequently to DHA.

EPA and DHA are considered the two most important omega-3 fatty acids. Both have a positive effect on cardiovascular function and reducing inflammation, but DHA is also involved in many other functions like brain and eye development.

Ω - 6 FATTY ACIDS

The most common omega-6 fatty acid is Linoleic acid (LA) and can be converted into a longer omega-6 fats such as arachidonic acid (ARA). The major sources of these fatty acids are palm, soybean, rapeseed, and sunflower oil. In contrast to omega-3 fatty acids, these fatty acids are primarily used for energy. ARA is also involved in cardiovascular function and inflammation, but in an opposite way to EPA and DHA. EPA and DHA produce metabolites that are anti-inflammatory, whilst the metabolites produced by ARA are more pro-inflammatory. An increased omega-6 to omega-3 ratio will thus result in an increased risk of inflammation and inflammatory diseases. It is thus very important that both types of these fatty acids are present in your diet in the correct ratio to ensure optimal health.

BALANCE IS KEY

Although omega-6 fats are essential, the modern Western diet contains far more omega-6 fatty acids than necessary. The recommended ratio of omega-6 to omega-3 fatty acids in the diet is 4:1 or less. However, the Western diet has a ratio between 10:1 and 20:1 or even higher. In these cases, it is not sufficient to just reduce the intake of omega-6, but the intake of omega-3 conversely needs to be increased. The most effective way to do this is to increase the consumption of fish in your diet, especially oily fish like salmon, trout and catfish that are rich in omega-3 fatty acids.

Are you getting enough

OMEGA-3??

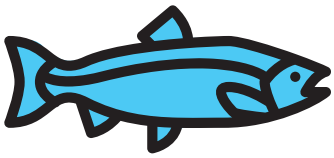
With the increase in omega-6 to omega-3 ratios in western diets, it is of vital importance that we have the correct proportion of the different essential omega-3 fatty acids in our diet.

YOU NEED 3 KINDS OF OMEGA-3's

ALA
α-linolenic

Flaxseed oil is the richest source of ALA. It is also predominantly found in walnut oil, edible seeds and algal oil.

EPA & DHA
eicosapentaenoic & docosahexaenoic



Marine oils are the primary source of EPA and DHA. The European Food Safety Authority (EFSA) recommends an intake of **250 mg per day** for a healthy adult to prevent cardiovascular disease.

Maintains **healthy blood pressure**

Supports **brain health**

Supports **heart health**

Promotes **eye health**

DID YOU KNOW?

90% of the people today have too much Omega-6 and too little Omega-3.

BALANCING OMEGA-3's TO OMEGA-6's

WESTERN DIET RATIO OF OMEGA-6s TO OMEGA-3s:

Highly pro-thrombotic and pro-inflammatory ratio. Contributes to the prevalence of atherosclerosis, obesity, and diabetes.

RECOMMENDED RATIO OF OMEGA-6s TO OMEGA-3s:

1-2x PER WEEK

Eat oily fish such as salmon, herring and mackerel.

The advice for pregnant women is a daily intake of **at least 100-200 mg DHA**.

IMPORTANCE OF Ω - 3 IN FISH NUTRITION

With the increase in omega-6 to omega-3 ratios in western diets, it is important that we all eat enough fish to maintain the correct balance in our diet. It is not sufficient to just reduce the intake of omega-6, but we really need to increase the intake of omega-3 and especially EPA and DHA.

The effects of omega-3 fatty acids and the ratio of omega-3 to omega-6 within the diet are very similar in fish and are therefore very important to bear in mind in fish feed formulation. One of the main ways to meet these requirements in fish feed is through the use of EPA and DHA rich fish oil from wild caught fish. However, deriving our supply of these essential fatty acids from capture fisheries in order to satisfy the demand of the aquaculture industry is not a sustainable practice. Moreover, with the reduction of fish oil in farmed fish diets, the ratio of omega-6 to omega-3 fatty acids is at risk of increasing in farmed fish.

It is the responsibility of the feed producer to maintain adequate levels of omega-3 fatty acids in the feed and thereby ensure that the levels of these essential fatty acids in the final fillet are in line with the recommendations laid out by EFSA. One way in which we at Alltech Coppens are reducing our dependency on fish oil from wild caught fish is through the use of fish oil from fish trimmings. We believe this is a more sustainable source of omega-3 fatty acids than that of fish oil derived from wild caught fish, which may also serve to alleviate the pressure from already vulnerable fish stocks.

In fish nutrition we have also seen that the ratio between different omega-3 fatty acids is also very important in brood stock diets. In sturgeon, for instance, research has shown that a similar level of dietary omega-3 fatty acids, but with a higher DHA/EPA ratio, can improve fecundity, egg hatchability, and the overall quality of the resulting larvae. In these studies, eggs had almost double of the total omega-3 fatty acids. Thirty-five-day post-hatching larvae tended to have a better growth performance, with higher body length, body weight, weight gain and survival rate than those of larvae fed feed with a lower DHA/EPA ratio. DHA is also according to literature less easily broken down compared to EPA, leading to a higher retention in the fish and therefore partly explaining these effects.

> “ONE WAY IN WHICH WE AT ALLTECH COPPENS ARE REDUCING OUR DEPENDENCY ON FISH OIL FROM WILD CAUGHT FISH IS THROUGH THE USE OF FISH OIL FROM FISH TRIMMINGS.”
>
> **Ruben Groot**
> Aqua Nutritionist

MAXIMIZE OUTPUT

FREA GROUP

Gijs Rutjes | Technical Sales Support Manager
Danieke Ewalts | Manager of Marketing & Communications
Larissa Soares | Graphic Designer

FREA was founded in 1959 when the Jørgensen family started their first fish farm. Third generation fish farmer and today's owner Christian Jørgensen, established his first trout farm in 1983. Today, the **FREA Group** consists of 3 companies:

- FREA AQUA SOLUTIONS APS
- KÆRHEDE DAMBRUG APS
- FREA A/S

Kærhede Dambrug ApS, the original company in the **FREA Group**, consists of eleven trout farms which are based on various production technologies ranging from conventional flow-through farms to modern and sophisticated recirculation (RAS) farms. The products are variants of rainbow trout including organic trout.

FREA Aquatic Solutions was established in 1987 and until this day develops, produces, and sells all kinds of farm solutions, technology, and equipment to the fish farming sector worldwide. High efficiency, high operational reliability, simplicity, and value for money are the key words.

FREA A/S, established in 2014, is the latest addition to the **FREA Group**. This highly productive and modern fish farm is the first indoor RAS system for trout in Denmark. Using the latest in techniques and innovative equipment, **FREA A/S** sets a new standard in indoor RAS fish farming. **FREA A/S** produces fish for slaughter and for on-growing all over Europe. **FREA A/S** produces fish for slaughter and for on-growing all over Europe. In total, the group employs 25 to 30 skilled professionals and in 2017 the company's turnover was 11.5 million euros.

With its unique high-performance systems for RAS fish farming, the young Danish company **FREA A/S** is most certainly worth a visit. So we sent two of our colleagues over to take a peek and to learn more about the innovative processes in this state-of-the-art trout farm. But most of all, we were keen to learn first-hand about **FREA's** positive experiences with our new trout feed for RAS, **CRYSTAL**.

Trout farm **FREA A/S** is the latest addition to the well-known **FREA** Group in. Established in 2014, the company is already widely regarded as a trendsetter in indoor RAS fish farming. Although this new farm has only been running for a little more than two years, it has shown excellent results both biologically and economically, running at full capacity in its second year.

These results are largely attributable to its owner Christian Jørgensen, an entrepreneur whose head is always full of ideas of how to do things more efficiently, simpler and cheaper. His invention of the moving bed filter in the late 1980s, which used plastic shavings from another production, is a typical example of what has become the philosophy of **FREA Aquaculture Solutions**:
'Keep it simple – make it work'. Jørgensen's mission coincides neatly with our own.
We both seek to support fish farmers worldwide in farming in a sustainable yet cost-effective and profitable manner. In doing so, we try to contribute to a sustainable food production for an ever-increasing world population.

Our trout feed, for example, ensures an unparalleled and efficient fish growth whilst minimizing the impact on the environment.

Learning that Alltech Coppens has developed a special type of trout feed for RAS farming called **CRYSTAL**, Jørgensen decided to run a test last year to compare our new feed with that of a leading competitor. This was done in a test that lasted three months and comprised 100 tonnes of feed. The outcome was very promising indeed, showing a significant improvement in water quality and fish performance.

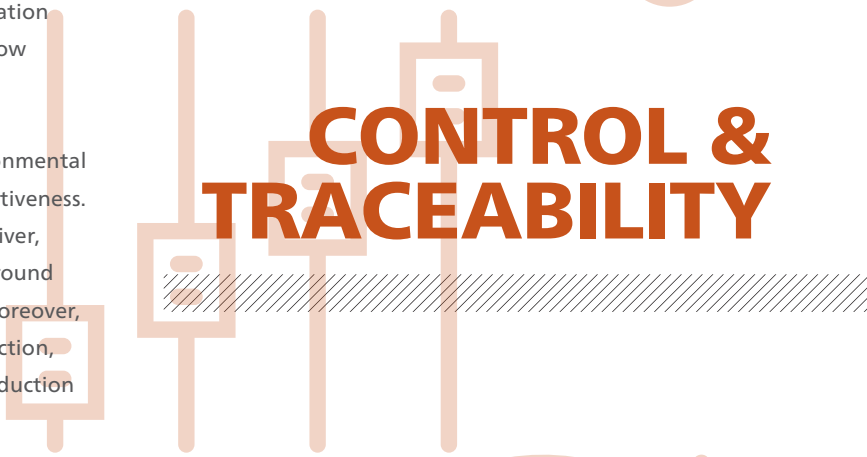
Satisfied by these initial results, **FREA** decided to run another test comprising 500 tonnes of Alltech Coppens feed in one full section of its RAS systems. The outcome of this second test was even more remarkable. Not only did our feed contribute to a better fish growth and a more efficient feed conversion, but it also allowed the biological filters to handle up to 50 per cent more feed without any decline in water quality!

> "KEEP IT SIMPLE, MAKE IT WORK."
>
> **Christian Jørgensen** | Owner **FREA** Group

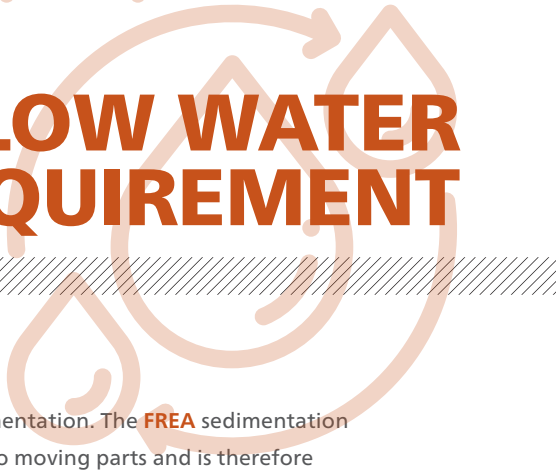
FISH FARMING & THE ENVIRONMENT

Before we enter into more detail regarding specialty feed, biological filters, and fish growth, let us first take a closer look at the specific situation of Danish fish farms and of **FREA A/S** in particular. And while we're at it, let us also get a bit more closely acquainted with Christian Ravn Jørgensen, the driving force behind this innovative RAS farm.

Danish fish farms have been at the forefront of sustainable farming for years. Mainly due to strict environmental rules imposed by the government in the late 1980s, Danish fish farmers have had to come up with new technologies to minimize pollution. They succeeded rather nicely in this by applying the new Recirculation Aquaculture System (RAS) – firstly outdoor but now indoor as well.



RAS not only offers a significantly reduced environmental impact, but also a much higher level of cost-effectiveness. Instead of using huge amounts of water from a river, RAS farms can operate on a limited amount of ground water that is continuously filtered and reused. Moreover, recirculation secures a higher, more stable production, lower disease risk and better ways to control production parameters.



This still rather new technique implies that fish farms no longer need to be built in pristine areas near rivers or springs. In fact, the limited use of water in a modern RAS system – easily 10 to 50 times lower than in a traditional farm – means that RAS farms can be built almost anywhere. The big advantage is obviously that fish farmers can locate their farm close to the market, further reducing their costs.

INNOVATIVE IDEAS

Christian Jørgensen was among the first fish farmers to accept the challenge put up by the strict environmental regulations. With his keen eye for technical improvements, he continuously came up with innovative ideas, which he built into his traditional earth pond farms. One groundbreaking solution was to replace mechanical filtration by sedimentation. The **FREA** sedimentation system contains no moving parts and is therefore significantly cheaper to run and maintain compared to drum filters, for example. As it is, Jørgensen's **FREA A/S** is a perfect example of a state-of-the-art recirculation fish farm. In March 2014 he started building this new RAS farm for the production of rainbow trout.

The highly advanced and innovative farm is based 100% on drainage water following seepage of the outlet water. This means it does not use any river water, nor does it discharge any unfiltered water to the environment.

The **FREA** farm consists of two large production buildings of approximately 4,000 m2 each, containing separate units – and sub-units – for hatchery, fry, fingerlings, and on-growing. As an average of one million eggs are delivered to **FREA** every second week, the budgeted annual production in building 1 is 1,000 tonnes. These fish are sold for on-growing all over Europe or moved to building 2 for on-growing.

Building 2 has a growth budget of another 1,000 tonnes per year with a market size output of 1,500 tonnes minimum. The entire equipment package for the farm is delivered by **FREA Aquaculture Solutions** and consists of newly developed start-feeding tanks, feeders, settlement systems, biological filters, screens, airlifts for fish pumping, equipment for aeration, degassing and oxygenation, walkways, and so on.

AS AN AVERAGE OF ONE MILLION EGGS ARE DELIVERED TO FREA EVERY SECOND WEEK, THE BUDGETED ANNUAL PRODUCTION IN BUILDING 1 IS 1,000 TONNES

REDUCING COSTS

FREA's smart use of innovative techniques and production processes – most of which are developed in-house – allows the farm to operate in a most successful manner. Christian Jørgensen has realized that in order to stay competitive in the farming industry, you need to reduce costs - mainly labour costs. As a result, **FREA** is now producing more than 2,000 tonnes using only five people in production plus one for maintenance and technical optimizations. Another advantage of focusing on simpler technology is a lower consumption of electrical power. As an average result for 2017, **FREA**has achieved an energy consumption as low as approximately 1.5 kWh per kg produced fish. Its environmentally friendly and highly productive closed fish farming systems are effectively setting a new standard for future fish farming in a commercially viable and environmentally friendly and sustainable manner.

FREA's modern RAS system enables Jørgensen and his team to completely control all production parameters, resulting in stable and stress-free conditions for the fish and better growth. These stable conditions, in turn, result in a steady and foreseeable growth pattern that enables **FREA** to precisely predict when the fish will have reached a certain size, as it is eventually agreed upon with a customer.

Establishing such a state-of-the-art recirculation farm has significantly changed the daily routines and skills necessary for managing this newest **FREA** farm. As it is, the task of managing the filters and maintaining perfect water quality has become just as important, if not more so, as the job of looking after the fish. At **FREA A/S** it is all about constantly fine-tuning and surveying a system that runs 24/7. As the farm is unmanned outside working hours, a comprehensive surveillance system is constantly connected to a 24/7 alarm monitoring centre, which contacts the person on duty should any problem arise.

STRICT CONTROL

Since stable conditions are of paramount importance to a modern recirculation farm, things like water temperature, water quality, oxygen level, pH value, and so on must all be under strict control at all times. Luckily, this is much easier to achieve in **FREA's** closed RAS system than in a traditional farm, says Jørgensen. The bacteria population in the moving bed filter, however, is another story altogether.

Bacteria in the RAS biological filter do what they do best when conditions are favourable and unchanging. Any change in feed – be it in volume or especially in the recipe – will have a profound impact on the bacteria's ability to successfully break down the ammonia excreted by the fish and to turn it into harmless nitrate. It takes weeks for the biological filter to adapt to any such changes in feed.

Since everything at **FREA A/S** is focused on efficiency, practicality, and on creating and maintaining a stress-free environment for the fish – and if you will for the bacteria – the company depends heavily on stable and trustworthy feed suppliers. As the **FREA** farm is still in an ongoing learning curve, both management and feed-wise, the company makes it a policy to work with two different feed suppliers.

This approach gives **FREA** a better insight in the various effects feed has on the systems, on the fish, and on the biological filter. With **FREA** it is all about statistics, figures, and numbers. Therefore, every aspect in the entire production process is meticulously screened, analysed, and registered. This almost scientific approach to RAS fish farming helps **FREA** to find out which feed best meets their needs.

ALLTECH COPPENS' RAS FEED

This is where Alltech Coppens comes in. At the request of Christian Jørgensen, who had learned that our newly developed RAS trout feed **CRYSTAL** is ideally suited to his modern RAS systems, we shipped our new product to **FREA**. Although we understood that Jørgensen's trust in us must have something to do with Alltech acquiring our company, we were also confident about the added value we pack in our product.

To find out for himself whether our new trout feed for RAS would have a positive effect on the systems at **FREA A/S**, Jørgensen included us in the two comparative tests that we mentioned before. Both tests were a sweeping success for Alltech Coppens. Once the biological filter got used to the new feed, it became quite clear that the fish in the test system performed very well and the water quality stabilized.

Since **CRYSTAL** is specifically aimed at maximizing the protein retention in the fish, thus minimizing the excretion of ammonia into the water, this result is exactly what we expected it to be. The fact that both tests unequivocally validated our claim that **CRYSTAL** is much less taxing on the biological filter is of course most welcome news to both Alltech Coppens and **FREA A/S**.

Being able to increase the daily feed rate is obviously what every fish farmer wants. More feed equals better growth; it's as simple as that. At least as long as the biological filter, the bacteria population, can handle the extra feed and its specific composition. Offering a higher protein retention and a lower ammonium excretion, the new Alltech Coppens RAS feed **CRYSTAL** allows for just that.

OXYGENATION

What is more, **FREA** discovered that it is possible to use even more Alltech Coppens feed than in the tests and still the filters will cope. A limiting factor now being the amount of oxygen that can be brought into the water. More feed requires more oxygen, simply because both the fish and the biological filter need a certain amount of oxygen per kg feed to be able to successfully metabolize the feed and excrements.

By oxygenating the water with liquid oxygen, **FREA** manages to tackle this problem as well. Where the oxygen content of the water, as a result of atmospheric aeration, is limited to 100 per cent maximum in a traditional farm, **FREA's** indoor RAS farm is able to crank this percentage up to 200 per cent and more, simply by adding liquid oxygen to the water. More feed plus more oxygen equals more fish.

In short, by using Alltech Coppens special RAS diet **CRYSTAL** – and by maximizing the oxygen content of the water in its systems – **FREA A/S** has found a sustainable solution to farming significantly more trout per cubic metre culture volume per year. Needless to say, **FREA** and Alltech Coppens are both very pleased with this mutually beneficial result, which will most likely lead to an even closer partnership.

All of us at Alltech Coppens take pride in doing our part to help further the latest RAS techniques that are both sustainable and profitable. Having been given a chance last year to prove ourselves and our products to a trendsetting, innovative company, we will henceforth step up and combine our efforts to develop ever more productive and eco-friendly farming methods and feeds.

KEEP IT SIMPLE, MAKE IT WORK.

THANK YOU FOR READING

ALLTECH COPPENS

CONTACT

Dwarsdijk 4
5705 DM Helmond
The Netherlands

T +31 (0) 88 23 42 200
E coppens@alltech.com
www.alltechcoppens.com