

# Exiting Times Ahead for the Land Based Division



Smoltanlegget til Sisomar, Straumen.

■ The salmon industry is rapidly moving a larger part of the production on land, a trend seen in all regions round the world.

In order to serve this growing market, and being able to take on large projects in a secure way, AKVA group recently consolidated all land based activities in one large LBT division. So far, this division consist of Plastsveis in Norway, AKVA group Denmark and Aquatec Solutions in Denmark and Sistemias de Recirculation in Chile.

We have since been focusing on how to organize this as a uniform unit going forward. Today we can proudly present ourselves as AKVA group LB (land based). Even though division still contains the legal units, we will implement AKVA group LB as the united brand going forward.

Norway will have its own organization for Land based lead by Sten Roald Lorentzen. Sten Roald is also acting as MD of Plastsveis at the time being. We are considering a similar setup in Chile, being another important Salmon region in the world.

Being more than 150 dedicated people in AKVA group LB worldwide, still growing at a high pace, allows AKVA group to consider itself as one of the major players in supplying Land Based systems worldwide.

Significant order backlog and new exciting projects where all the companies in AKVA group LB are working together as "one" to supply the clients "best practice" systems, is the evidence that AKVA group LB is on the right track.

By **Morten Nielsen**  
COO, AKVA group LB.

## Highly strong focus on work related english



Norwegian class NAZA has given high priority to learning aqua-related English.

■ "As a teacher it is quite satisfying to see how the students' motivation has been growing stronger".

In addition to working through the mandatory chapters in academic English, we have for the three years that this study track has existed, been focusing actively on giving the students solid professional skills in Aqua English, says teacher Rolf M. Johnsen to AKVA group Norway.

It all started with a good dialogue with Aqua group Norway back in early autumn 2013 when we were given free booklets in English for both cage farming and land-based farming. We have also been granted the same booklets in a Norwegian translation; something that has made the learning process and the understanding of the work-related English much easier for the students.

We have also received plenty of copies of AKVA News, which we have been studying thoroughly in class.

As a teacher it is quite satisfying to see how the students' motivation has been growing stronger and that they also see the great value in having a good command of relevant professional English within the aquaculture business. We have regularly had tests in aquaculture English, and at the same time been testing their

ability to communicate in English on a relevant subject.

Those students who pass all the tests has been awarded a Certificate of proficiency (COP) in Aquaculture English, stating the different business-related subjects they have studied. At the same time the students have acquired a priceless update on the latest of equipment in the business – from feed barges to computer-related software for monitoring f.ex. feeding processes.

We want to give our unconditional praise to AKVA group Norway who has developed this. There is very little relevant learning material in English for the aqua culture study track. Thus this is a good example of how schools and businesses can cooperate as to using highly relevant learning material for the students.

All this has culminated in an annual study tour to Scotland for the students where we have visited the AKVA group sites in Inverness, among many others. The students have consequently been able to practise their aquaculture English.

My dream is that once in the future we shall have developed pedagogically facilitated learning material for the aquaculture study track in the upper secondary school based on AKVA group's booklets and AKVA News English newspaper.

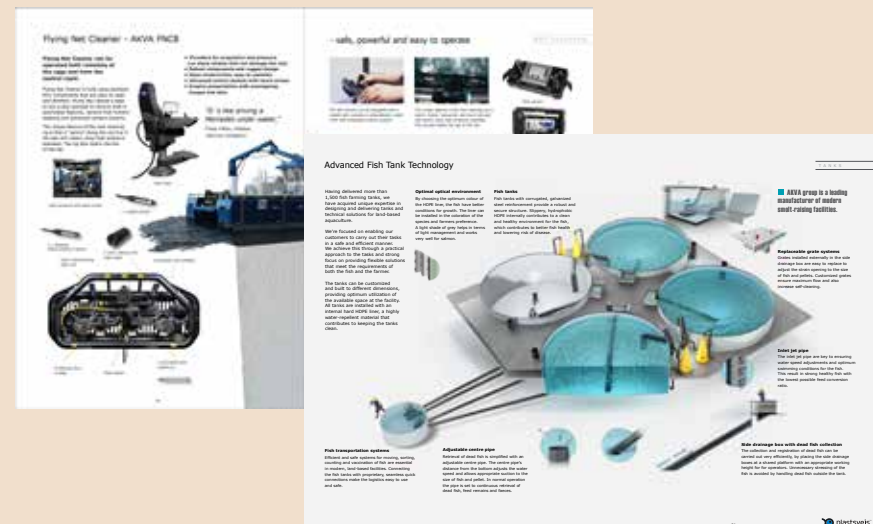
## Land Based and Cage Farming catalogues



### Download our two new product catalogues

Our updated catalogues are currently available in English and Norwegian. Open our web sites to download our new cage farming and land based product catalogues.

[www.akvagroup.com](http://www.akvagroup.com)



# AKVA NEWS

Visit us at Aqua Nor Trondheim, 15. - 18. August - Stand 331 in Hall D and Skansen Docks

## Cloud computing and "Big Data" - PAGE 5

The technology will make it easier for different software solutions to exchange data; and you will not need to punch data from the feed system on the barge.

## Visit a new feed barge - PAGE 4



## Safer anchoring - PAGE 16



## When technology meets biology

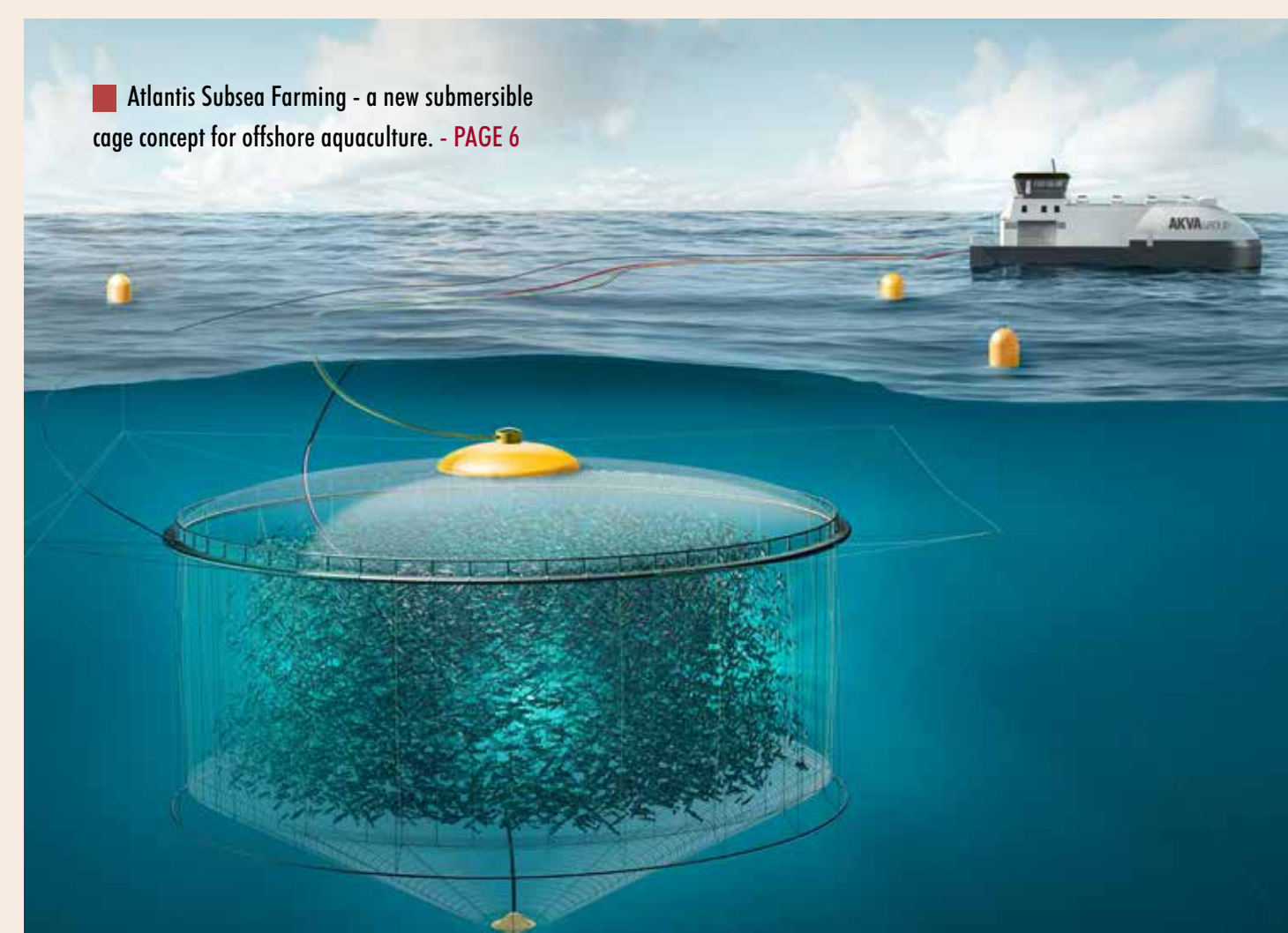
Aquaculture will be an essential factor in the challenge facing food production for a global population, which according to WHO will reach 9.7 billion in 2050. - PAGE 3



## New "magic" lamp

Unique combination of white, blue, green and ultraviolet contrast light in one unit will keep the fish in deeper waters most of the time. - PAGE 16

■ Atlantis Subsea Farming - a new submersible cage concept for offshore aquaculture. - PAGE 6



# Breakthrough for Atlantis

## "Like driving an underwater Mercedes"

■ New effective, gentle and remotely controlled washing rig from AKVA group and Sperre. The unique feature of the new cleaning rig is that it "swims" along the net line in the pen and cleans using high-pressure seawater. - PAGE 7







Hallvard Muri,  
CEO  
AKVA group ASA

■ **“Excitement, is the best word to describe our feeling in AKVA group as yet another Aqua Nor is getting underway”.**

We are excited because we are part of an incredible aquaculture industry, playing a crucial role in sustainable production of healthy food to a growing global population.

At this Aqua Nor we launch our new core message! “We supply technology but deliver biology”. The link is as strong as ever. Some of the environmental challenges that faces the industry are limiting growth and it is more important than ever to develop new technology focusing on solving these challenges, improving bio-performance and fish welfare. The technology have to adapt to the species needs and not the other way around.

To AKVA group this focus is paramount and we are committed to be a true partner to our customers and make meaningful contribution to the ongoing development of an industry that efficiently produces food to a growing population in a safe and sustainable way. WHO estimates that we will surpass 9.7 billion people in 2050 and food production is critical to prevent hunger and malnutrition.

Every Aqua Nor is an important milestone for AKVA group. This year’s exhibition is no exception. We will present and launch our newest solutions, both for cage based and land based aquaculture. Solutions we strongly believe can support the industry to continue develop and grow.

We are fortunate to work with customers all over the world, providing a wide range of technologies and services. In this edition of AKVA News we are proud to give you some insight into the variety of projects we continually are working on. It shows an aquaculture industry in constant development and with substantial untapped potential.

In AKVA group we define ourselves to be a Technology and Service Partner to the global aquaculture industry. We strongly believe we have a lot to offer and are eager to contribute in mutual beneficial partnerships with our customers. We have been fortunate to have such partnerships with many of you over the years. You know us. For others AKVA group represent something new. We hope to meet all of you during Aqua Nor.

The AKVA group team is well prepared and looking forward to meet with you, strengthening existing partnerships, discussing new solutions, or starting new partnerships and possibly opening new opportunities.

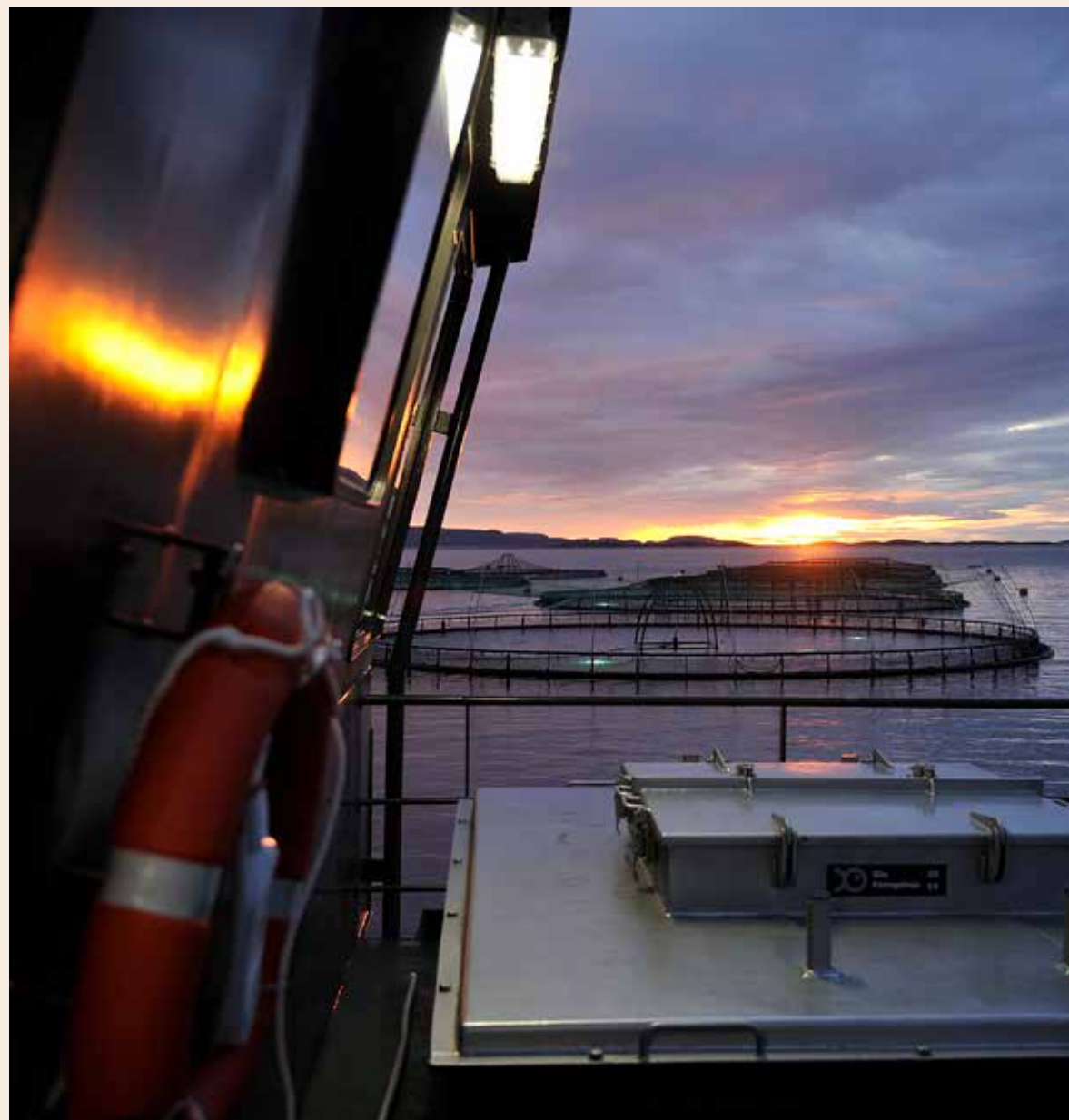
**Customer focus, Aquaculture knowledge, Reliability and Enthusiasm.**

We CARE!

Hallvard Muri  
CEO

## AKVA group facts:

- **Renowned as a pioneer and global supplier of aquaculture technology for over 40 years**
- **Offices in 11 countries**
- **More than 790 staff**
- **2016 turnover of NOK 1.6 million**
- **Public company listed on the Oslo Stock Exchange since 2006**



# A global supplier to the growing aquaculture industry

■ **The activity in the salmon industry remains on a high level.**

## Backdrop

In the first part of 2016 the Chilean salmon industry faced another round of problems as they were hit by a severe algal bloom, resulting in loss of up to 20% of the biomass. The authorities responded to the industry’s long voiced concern of lack of a sustainable and predictable regulatory framework.

Towards the end of 2016, there were strong indications the industry was turning the corner and returning to profitability. Coupled with new regulations, we have seen a strong pick-up in the Chilean market for infrastructure, technology, services, and is carrying a solid momentum in 2017.

Expanding presence in Emerging Markets has been a strategic priority for several years. At the outset, there is undoubtedly substantial potential as there is significant interest in developing (new) aquaculture industry on all continents. However, taking

on some of the projects we have done over the last few years comes with a fair amount of challenges, such as infrastructure, competence, political risk, regulatory framework and logistics.

But, through a focused approach and concentrating on clusters, we have ambitions to profitably grow this part of AKVA group. We are now increasing our presence in the Mediterranean and Iran to ensure better execution going forward.

## Outlook

Industry experts expect some decline in salmon prices over the months to come due to increased supply. This comes partly from Chile where smolt release has been high. However, it is expected that continued strong demand will contribute to salmon prices remains on a high level from a historical perspective for the next few years.

AKVA group has experienced high activity in the first months of 2017 in all regions and segments. As anticipated Chile has recovered from 2016 and our operation is growing and we also see higher quoting activity both in North America and in Australia.

The Norwegian market for cage based technologies still remain the main driver behind the growth, supported by the growing segment for farming services were AKVA Marine Services operates.

Our land based operation has the past months received several large contracts, 78 MNOK to Tytlandsvik Aqua AS and 105 MNOK to Midt-Norsk Havbruk AS amongst others. In total the land based segment represent a significant portion of our order backlog.

In the software segment we are ramping up sales activities to further strengthen the segment going forward. Our Norwegian software business is about to launch product modules, which is, expected to strengthen our product offering.

The underlying operational performance and our balance sheet has improved significantly over the last five years. However, we have to continue keeping a sharp focus on improving current core business and believe there yet is untapped potential and will work diligently in order to realize this fully.

**By the editors, AKVA group**

# When biology meets technology



**Fish is a sustainable protein source with high nutrition levels.**

■ **By 2050 the world population will reach 9.7 billion according to WHO.**

Aquaculture will probably be the solution to future food demand and play an essential part in preventing hunger and malnutrition. Fish is a sustainable protein source with high nutrition levels. But to achieve growth and maintain sustainability it is important to invest in technology development and contribute to a sustainable and efficient industry.

The fish and seafood industry is a sustainable industry and farmed fish has a lower climate impact than meat and dairy products. The reason for this is that the fish does not use energy to maintain body temperature higher than their surroundings and that the fish therefore utilize the feed resources in a highly efficient manner.

Using the ocean as the new food chamber is essential to feed an increasing population with healthy nutrients, good protein sources and Omega-3. Growth is, however, a challenge and at the moment, the

major seafood companies reports reduction in production volumes due to biological challenges.

In order to succeed in generating the necessary growth in aquaculture, we need to apply new knowledge and implement new technology. The use of recycling technology to produce what is called postsmolt will probably be an important focus area in the years to come. One of the most interesting research findings in aquaculture shows that postsmolt has a lower infection-rate of lice and that it tolerates lice treatment better. At the same time, several manufacturers have shown that this is a competitive model of production. The Faroe Islands have been far ahead for the production of large smolt and results from their work have shown that up to 400 grams are cheaper to produce on land than in cages. Another benefit is that by growing the smolt longer on land the production time in the sea is also shortened which can enable increased overall production.

Norway is now following this trend, and it is heavily invested in post smolt production. There are great

opportunities to optimize production further if we adapt the technology to the biology and not the other way around. A very exciting project, which can be mentioned in this regard, is Sisomar AS’s new facility, where postsmolt is produced close to isosmotic conditions and where they have invested heavily in automation to prevent the fish from being stressed.

We work closely with our customers to contribute to this development, says Ole Gabriel Kverneland, Sales Manager at AKVA group. We cannot force the fish to accept our technology. We must find out what is optimal for the fish and make solutions to extract the potential that lies in the biology. It is technically demanding work, but we believe that land-based production of larger smolt will be an important instrument for growth in the aquaculture industry. As a supplier, we are actively working to facilitate this growth, “concludes Ole Gabriel.

**By the editors, AKVA group**



**The use of recycling technology to produce what is called postsmolt will probably be an important focus area in the years to come.**





The new v-bottom provides better stability and improved working conditions in rough weather.

# The latest in feed barges

■ **At the Aqua Nor trade fair Egil Kristoffersen & Sønner will take delivery of a revolutionary feed barge from AKVA group. “We’re really looking forward to taking delivery of this brand new barge, and are also inviting other interested parties to take a look,” says general manager Eva Maria Kristoffersen.**

“This is only the third feed barge ever made of this type. Numbers one and two are at our neighbouring facility here in Nordland. That was an important factor for our decision to buy this one; that we could be certain that the barge can handle the conditions here, and that we were able to see beforehand how it works and learn about benefits and drawbacks from those who already had tried it out,” Kristoffersen says.

### Innovation in feed barges

The name of the barge is “AC 600 PV.” AC is a reference to Akva Center, 600 is the approximate feed capacity – the actual figure is 640 tons, P is for panorama and means this has an extra floor with a good overview and a separate accommodation unit, while V is the shape of the hull.

“This is an innovation in feed barges. It’s actually more like a boat. The fact that it has a keel and bow instead of a flat bottom enables it to tackle tougher locations with stronger currents and greater wave heights, which will be essential in the fish farming industry of the future. AC 600 PV can handle a maximum wave height of 9-10 metre, while the old barges had an upper limit of 6-7 metres,” explains Jørn Sivertsen, regional manager of AKVA group.

The Panorama design also ensures a full overview and complete control of both barge and cage system, in addition to AKVA group creating modern living quarters and facilities with contemporary design to improve conditions during longer stays on board.

“Our employees are definitely looking forward to using this,” Kristoffersen says.

### Tailored for growth

A trend in the fish farming industry is that facilities, in addition to being located in tougher environments, are getting bigger. The fact that the new feed barge has a capacity of a huge 640 tons is another reason Kristoffersen sees the value in a NOK 21 million investment.

“We have a need for good feeding capacity and more feed lines. We’re currently in the process of expanding to a new location, so in the long

term I’m in no doubt that this will pay. We have yet to buy anything that’s too big – it’s always good to have some wiggle room. This means we’ve made allowances for future growth,” she points out.

### Attraction at Aqua Nor

As mentioned, the barge will be handed over from AKVA group to Egil Kristoffersen & Sønner on Tuesday 15 August, on the first day of the Aqua Nor trade fair in Trondheim.

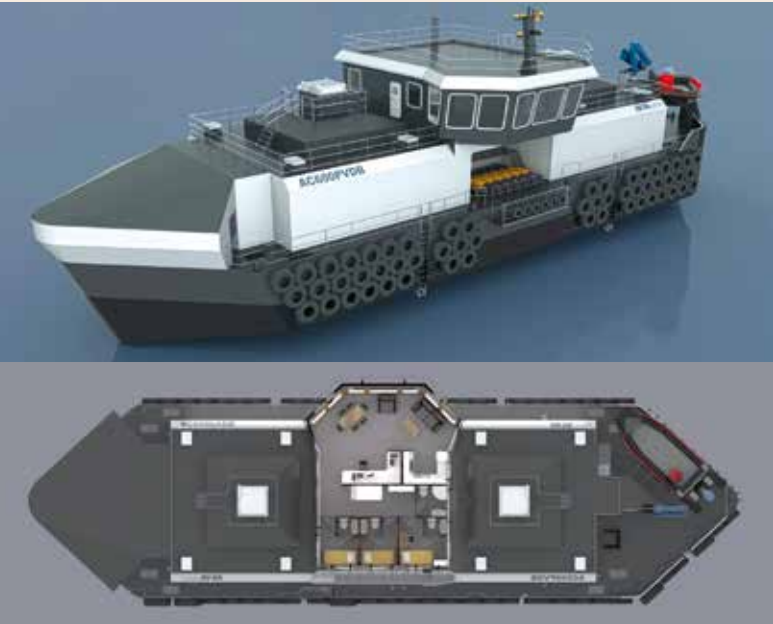
“We have been a customer of AKVA group for cages since 1984, but this is the first feed barge we’re buying from them. However, past experience indicates that this will be a high quality tool that does the job it is assigned. So we’re really looking forward to getting it into place. I think there will be a lot of trade fair participants who are interested in taking a closer look at the feed barge, and they are welcome to do so. But this one is ours,” Eva Maria Kristoffersen chuckles.

“There’s a lot of demand for both barges and cages from us. The market is hot, and we’re very proud to present this revolutionary feed barge at Aqua Nor. Showing that we’re continuously developing products to meet our customers’ needs is very important, and I believe that this barge will become very popular in the years to come,” says AKVA group’s Jørn Sivertsen, who invites interested parties to

get in touch to learn more about the feed barge and other products on offer.

By the editors, AKVA group

“During Aqua Nor 2017, everyone can visit and explore this state-of-the-art feed barge at Skansen Docks floating display area”.



We can also offer a new AC 600 PVDB version with double bow and two silo hatches.

# Cloud computing, Fishtalk and AKVA connect – solutions and ambitions



By Trude Olafsen  
Project Manager Business Development, Research & development, AKVA group

■ **This might not be that important if we can understand which possibilities cloud technologies open up for us as users of different software solutions. In common with all other software providers, AKVA group is working on these types of solutions, and we are eager to discover what these solutions may mean for our customers.**

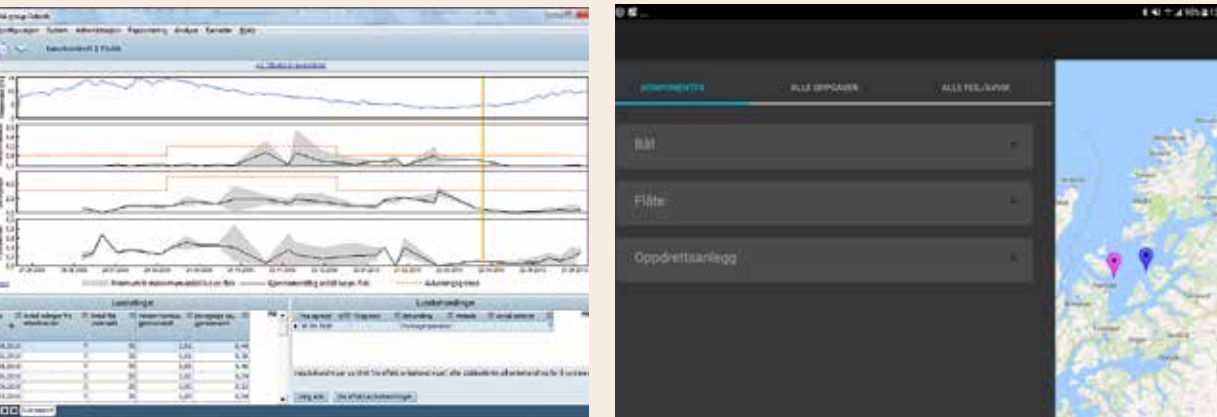
What it means short term, and what it might mean in the longer term – both for individual companies and for the sector as a whole? In this article we will describe in laymen terms our visions and ambitions related to cloud technology and how this will provide our products in the Fishtalk family and the process management software AKVA connect with better user experiences and interaction.

Short term we are convinced that Cloud technology first and foremost is about making everyday life easier for those who use our systems. The technology will make it easier for different software solutions to exchange data. Quite specifically for our customers it will mean that a fish farmer avoids entering data from the feeding systems into Fishtalk – regardless of whether the data comes from AKVA group’s own feeding software or from one of our competitors’ software. The elimination of data entry errors is important, and it also frees up time for other tasks. Checking the numbers remains important, but it doesn’t mean that they have to be entered every day.

Cloud technologies will provide a more seamless transfer of data between different products in the



Big data analyses will provide completely new stages for learning and generating knowledge, but such projects require awareness and maturity in the sector at large.



New, smart APP solutions and software eg til lice treatment and inspections are developed in close cooperation with our customers.

AKVA family, and in the longer term between AKVA products and third party software solutions. Cloud technology also allows for making data accessible by smartphone, tablet and other devices than PCs with relative ease, and to register work operations and data directly when conducting operations and inspections. One example is recording data during sea lice counts and sea lice treatment or daily inspections of pens.

In partnership with key customers, AKVA group has developed APP solutions for these work operations that are currently being launched. The APPs communicate with the Fishtalk software so that recordings done during operations are registered directly in the databases. Our future ambition is that the various digital platforms can retrieve data from all of AKVA group’s software solutions, either from the Fishtalk family, from feeding software, from fleet management, or from environmental sensors.

AKVA group has worked on establishing certain overarching

design principles for such solutions, and the principles are based on our extensive knowledge of the industry and our customers. We have received excellent suggestions from EGGS Design – a renowned bureau that has developed design criteria for other sectors and players. Finding inspiration from what other players and sectors have done in this field is a good idea. The key design principles for our APP solutions are that they are easy to use, that they are customized for the users role and that the APPs will contribute to rationalize everyday work. However, the most important insights are derived from close cooperation with our customers. Not exactly rocket science, in other words, but we and our customers will live by these principles for some time. It is therefore important that the principles are easy to understand and that they withstand the test of time. Our customers will also recognize AKVA group’s general design in the new solutions – we’re concerned with totality and solidity, while also wanting to offer new solutions. The customers should recognize AKVA group’s

design and work methodology – regardless of work interface and regardless of the role one has.

Roles are key when designing digital work interfaces. Needs differ between a production manager who is responsible for several sites and a person who is responsible for feeding the fish. There are differences between which types of information these individuals need to see, record and not least report. Our ambition is to develop tools that allow for customization for different roles in the company, and we work on solutions for this every day in partnership with our customers. We have to understand the workday of each individual, as well as the formal requirements the company faces – both internally and externally.

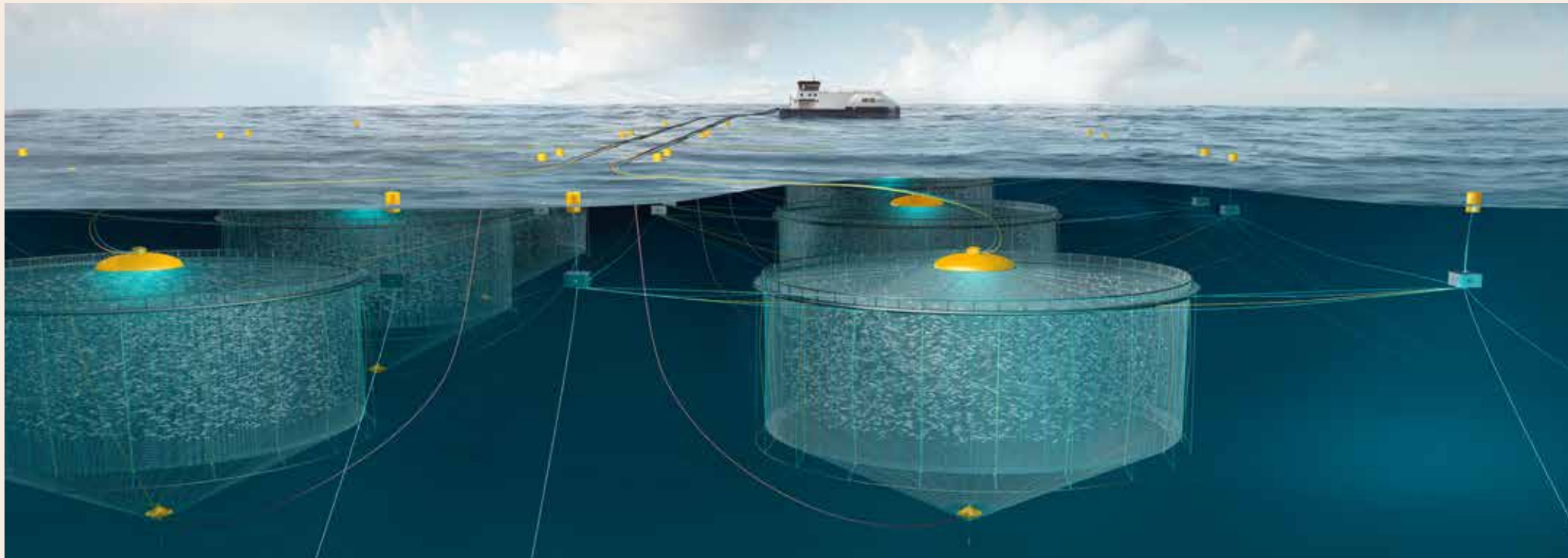
Cloud technology provides opportunities to process large volumes of data from numerous different sources, so-called Big Data. For the aquaculture industry Big Data analyses will provide the opportunity to understand complex interrelationships in a new way and generate new knowledge. One

example is to better understand the environment in the sea along the coast and around the aquaculture facilities, and how different parameters influence actual production. Cloud technology can allow for combining data sources from a number of players, processing the data, making it accessible, and providing feedback to the facilities. Although these opportunities are obvious, there are both legal, technical and strategic obstacles that must be overcome. This type of work requires a form of structure and system of agreements that must be developed, and a culture for this way of working must be established. Good Big Data projects in the aquaculture industry needs a longer perspective and require something different than the development of company-specific systems.

Short term in AKVA group, we are more concerned with what cloud technology might provide of opportunities to make every day work easier for our customers through customized solutions on different digital interfaces. The technology also facilitates greater interaction between different software solutions in the sector – both internally in the AKVA family and in relation to third party software solutions. This provides interesting opportunities, but the solutions must maintain data security and business interests – which is in the interest of both customers’ and the software providers. No doubt Big Data analyses will provide completely new stages for learning and generate knowledge, but such projects require awareness and maturity in the sector at large.



# Atlantis Subsea Farming – a farming concept designed for the future



## ■ The latest innovation in cage technology under development is submersible cages for large-scale salmon production.

In Atlantis Subsea Farming, the co-operative companies AKVA group, Sinkaberg-Hansen and Egersund Net will develop a completely new concept for submersible cages for large-scale salmon production. Atlantis Subsea Farming have applied for development licenses in order to test the concept in large-scale trials. The hypothesis is that fish welfare and production efficiency will be as good or better in submerged position as in the surface position. If the project succeeds with salmon, the concept is easily transferable to other species.

The latest innovation in cage technology under development is submersible cages for large-scale salmon production. AKVA group has worked on developing submersible cages since 1991 and has acquired the basic expertise, but it takes time to develop submersible cages at the scale required to achieve efficient salmon production. To ensure that the technology works and that development always take place on the salmon's terms, one is dependent on large-scale trials.

According to Trude Olafsen, this concerns submersible cages with circumferences of up to 160 metres. Going deeper has several benefits. One avoids the largest waves and ocean currents are less powerful, which means that the forces affecting the facility are different than those on the surface. So far the realm of salmon has been from the surface and down, but technological developments may

By **Trude Olafsen**  
Project Manager Business Development, Research & development, AKVA group

change this in the time ahead. When we arrive at the point when we are able to develop submersible cages that provide salmon with a good life below the area where sea lice typically thrive, we may solve the greatest challenge the salmon farming industry faces.

It is all about establishing a system that provides efficient operations on the salmon's terms. One has to ensure a high level of fish welfare, good fish health and good growth. "If we succeed with salmon, this system can be easily applied to other farmed species and the market for such technology in a global scale is vast," Trude Olafsen points out.

In collaboration with equipment manufacturer Egersund Net and aquaculture company Sinkaberg-Hansen AS, AKVA group ASA started work on submersible cages for the large-scale production of salmon in 2014. The three companies established Atlantis Subsea Farming AS, and the goal was to contribute to better and more sustainable use of existing aquaculture locations, in addition to exploiting more exposed areas where current technology comes up short. This work was already well under way when the authorities launched a new concept of development licenses towards the end of 2015. The authorities' goal is to facilitate the development of technology that can contribute to resolve the environmental and space issues the aquaculture industry faces. This was correlating well with Atlantis Subsea Farming AS's goals, and

the company has now applied for six such development licenses.

## Better conditions for the fish

In addition to the obvious technological benefits of submersible cages, Olafsen also believes that the salmon will benefit from being well below the surface. She believes it will be easier to feed the fish, that growth will be better, and last but not least that infection by sea lice will be greatly reduced.

Olafsen continues, "However, when all is said and done, I have to add that these are hypotheses that have to be tested before arriving at any conclusions."

A development project at this level has numerous challenges that must be resolved, and operating costs may be very high for a period, so development licenses are a good aid. Regardless, the owners will have to put up significant funds to succeed.

## Unique collaboration

The companies behind Atlantis Subsea Farming own a third each, and according to Olafsen it is uncommon for technology suppliers and aquaculture companies to team up as equal partners in this type of development company. Olafsen believes that it is important to try out new ways of working, and believes AKVA group is a good partner in this concept. She explains, "This is a new and very interesting way of working, and the future will show if it is a viable model."

When the company is working with new technology and such high risk, one also has to take a new approach with regard to business models. To achieve good efficiency from subsea production, the cage will probably have to be ten metres

Submersible cages can probably soon give the salmon a good life below the sea lice.

below the surface, and there are numerous considerations that must be taken into account if we are to succeed. However, the actual cage system is based on the same principle as the submersible cages AKVA group has supplied to the export market for many years. The plastic ring is filled with water before being submerged, and then emptied when the cage is raised. The difference in the new concept is that the entire process will be controlled from the fleet, with dedicated software programmed for this system.

Another aspect is underwater feeding, but in this area there already is a well-functioning product developed by Sinkaberg-Hansen's service company, Nærøysund Aquaservice.

## Feeding and oxygen at depth

Initially one expects the salmon to have better access to oxygen at greater depths than at the surface. However, once a day the salmon needs to fill its air bladder, and in order for this to be possible in submersible cages one is dependent on artificial air pockets. In this area AKVA group is cooperating with Frode Oppedal and his research group at the Institute of Marine Research. Through the FØRDOM project, which is funded by the Research Council of Norway, they are working explicitly on feeding at depth and the use of air domes.

"FØRDOM is a great project, and the results can be directly applied in Atlantis Subsea Farming," Olafsen points out.

## The sea lice - an incredibly smart parasite

Sea lice are a recurring problem for aquaculture, and hard work is being done in a variety of projects to prevent sea lice from attaching themselves to salmon and breeding.

So far no one seems to have come up with the optimum solution that would make it possible to claim the problem has been eradicated, but Olafsen believes large-scale trials with submersible cages may be of great help going forward.

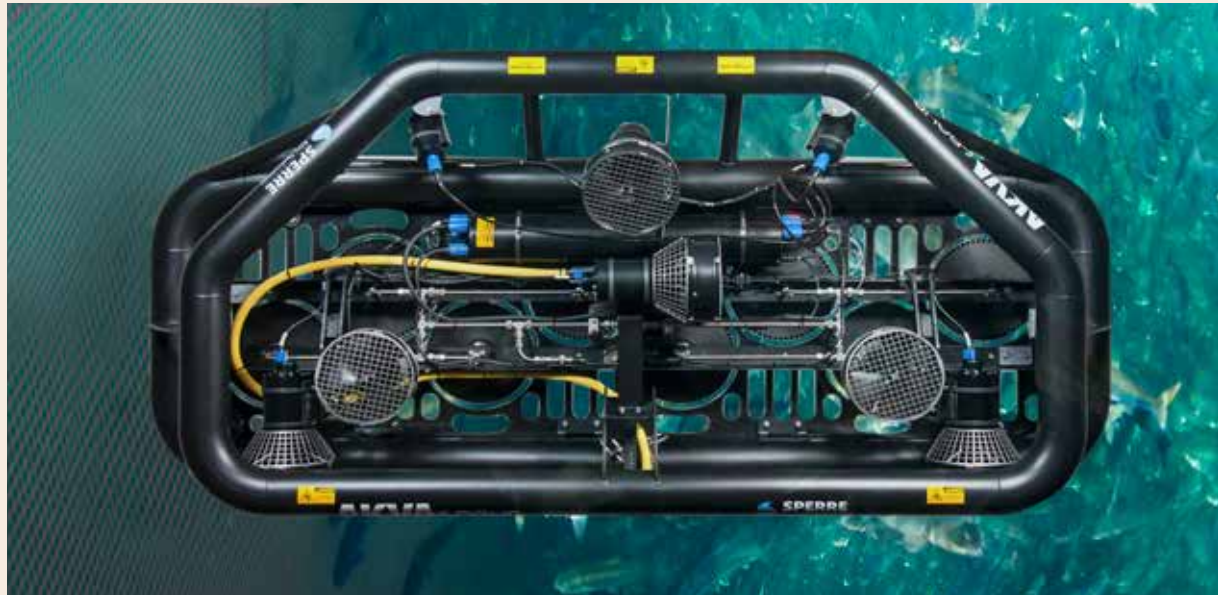
"Sea lice are very clever, and we can't discount that they could adapt to the darkness deep down, but in that case it would be a dramatic change. Regardless, a large-scale trial with production deeper in the sea will provide important documentation of how sea lice will act," Olafsen says. She also says that such production will provide new knowledge in other areas, for example with regard to avoiding algae or the spread of viruses and bacteria. But it may also be the case that salmon could contract other diseases further down the water column. If so, this will be very useful knowledge to have.

## More food must come from the sea

In the future we will depend on producing more food in an efficient way, and we have come quite far with work on developing salmon production, but a lot still remains. It is thus important that the industry has the opportunity to grow.

Olafsen concludes, "We are responsible for developing aquaculture further. The world depends on producing much of the food we need in the sea, and we have come quite far in developing salmon production. It is also a healthy and sought-after product in various markets all over the world. However, growth cannot take place without control, and although technology is decisive for developments, we are also dependent on including biology. It is essential that the fish have good welfare and good health."

# “Like driving an underwater Mercedes”



AKVA Flying Net Cleaner (FNC8).

## ■ Extremely satisfied with remotely-controlled cleaning rig.

Aquaculture service company Vikahav received its first Flying Net Cleaner 8 from AKVA group in January. "It's like driving a Mercedes under water," says Frode Viken, who has ordered a further four FNC-8s.

"FNC-8 is an incredibly practical, reliable and safe tool. To start off, the machine is without any sharp wheels or belts that could damage the net during cleaning. This reduces the risk of escapes, and the need for net repairs after cleaning. Our customers

are of course very pleased with this. Additionally, the whole cleaning disc and 100 per cent of the water is used to clean the net, instead of using up to 60 per cent to attach the cleaning rig to the net wall. This makes for more efficient and better cleaning," Viken concludes, who provides services to major players such as Salmar and Marine Harvest.

## Popular product

The cleaning rig was introduced at Nor-Fishing in August 2016, and the interest in the market has proved substantial. "We've already sold ten cleaners, and have more than 60 companies who would like a demonstration, so its reception has been excellent. We're currently work-

ing on increasing our production capacity, and aim to deliver up to 30 FNC-8 units this year," says Roy Magne Ohren, who is region manager with AKVA group and has 18 years of experience with cleaning systems.

## Reduces time spent and risk of escape

FNC-8 was developed by ROV specialist Sperre AS, and achieves a cleaning efficiency that greatly exceeds everything else available in the current market. The unique feature of the new cleaning rig is that it "swims" along the net line in the pen and cleans using high-pressure seawater. The rig also cleans the top of the net.

"It's a fairly autonomous machine with several smart features that ensure a great result. All feedback is singularly positive. This is the best cleaning rig the aquaculture industry has ever seen, and I'm certain that it will become the standard for the sector," Ohren says.

"Now we can clean and inspect a 157 net in an hour, which is an operation that previously would have taken 15-20 minutes more. But just as important is the confidence we and the customers gain with FNC-8. We have a much better idea of what we are doing with the help of advanced camera systems and sensors.

To succeed in a market characterized by tough competition, it's important to us to invest in state-of-the-art technology that ensures good, simple and safe work operations, and that's what AKVA group provides. We are extremely satisfied, and are looking forward to welcoming further FNC-8s," Viken says.

## Happier fish

FNC8 is based on a patent pending principle that ensures that the rig is in balance regardless of whether it cleans horizontally, vertically or upside down. This makes it easy for the operator to select the cleaning direction that is most appropriate, regardless of which type of net one is dealing with.

"Operating it is a dream – it's like driving an underwater Mercedes.

The ROV is controlled from an integrated pilot chair in the boat, which makes the process very comfortable for the operator. AKVA group has an excellent piece of equipment here, and there's no doubt that this is a profitable investment for us. Our capacity increases, customers are happier, and last but not least – the fish are happier," Viken says with a grin.

"Everyone working in aquaculture is concerned with delivering quality, and to deliver quality one needs proper equipment. FNC-8 is a tool that eases everyday work for the user, while also ensuring a better result for fish farmers. It's a win-win situation," Ohren concludes.



Control chair with remote.

# New technology resolves challenges

## ■ If Norwegian fish farming is to develop further and produce more healthy food, the industry must resolve issues in both the short and long term.

Technology from AKVA group and other suppliers, in good partnership with the fish farming companies themselves and recognized research institutions, will be an important contribution.

In the short term, the industry must resolve environmental challenges related to sea lice and escapes. Escape figures have been declining for several years, and new methods and new technology to combat sea lice are constantly being developed.

"We have a hypothesis that separating host and parasite is one of several contributions to keep sea lice under control," says Trude Olafsen of AKVA group. Atlantis is a good example. The goal is to develop submersible fish farming facilities for salmon on a large scale. Submersible cages are already available, but not with the technology that can provide salmon with



In the short term, the industry must resolve environmental challenges related to sea lice and escapes.

a continuous supply of air so they may remain submerged over time. Together with Sinkaberg-Hansen and Egersund Net, AKVA group has applied for development licences to trial the concept. By submerging salmon 10-15 metres below the sea surface, one may also avoid the sea lice that occupy the top few metres below the surface. Trials will show whether the theory holds water. Underwater feeding and the use of lights deep down in the cages is another example. "The principle is the same, we believe sea lice infections can be reduced by keeping the salmon down deep during the day

by feeding in the deep, and by using lights at night. We are implementing extensive large-scale testing with partners to produce documentation on this," Olafsen says.

Another measure to reduce risk of escape is cage technology. Several years ago, in cooperation with authorities, the industry established a standard, NS 9415, which imposes requirements on how facilities must be scaled and built to prevent escapes. AKVA group was active in the work on establishing the standard, and will now take part in developing it. "Work on the stan-

dard is important and contributes to achieve the industry's visions of zero escapes," Olafsen says.

Other challenges the fish farming industry is facing are reducing discharges of nutrient salts and maintaining control of the disease situation such that the environment and fish welfare is safeguarded.

Here, technology may play a decisive role. "New technology will solve the challenges, but in order to safeguard fish welfare and sustainability, the solutions must be tailored to the salmon's biology and the salmon's

needs, that's what we're concerned with," says Guttorm Lange with AKVA group.

AKVA group wants to help develop sustainable and healthy food production and continuously works on research and development projects, and partners with both customers, other suppliers and external research institutions such as the Institute of Marine Research and SINTEF. Developing new technology for sustainable biological production that takes place in a demanding environment requires sustained hard work.

By the editors, AKVA group



# Efficiency in the Global Steel Cage Market



By **Christian Stange Smith**  
Sales & Marketing Manager  
AKVA group Chile SA



New cage project in Iran.



AKVA group's anti-predator EcoNet prevents sea lion attacks.

■ **Why bigger cages? They are more efficient operationally, have better KPI/FCR, and the quality of the fish is better.**

Steel cages are not new. AKVA Chile manufacturing steel cages is not new. But what is new is its ability to be flexible in the design of its new, bigger 36mx36m to 40mx40m cages.

These cages are engineered, designed and produced according to our customer's specific needs.

It's the emphasis on offering complete solutions that has led to the bigger, flexible design. In the last two years, we have been working with clients from Canada, Europe and Oceania and based on our clients' analyses of their sites we have designed and develop complete solutions considering location, operational needs and water conditions.

"Every customer has unique challenges and it's our job to provide the best solution for them," says Cristian Stange Smith, Sales and Marketing Manager for AKVA group Chile.

"We have seen the need in international markets to incorporate metal cages in their operations. As a result, we have done more product development to meet the local needs of those overseas customers."

The cage concept is essentially the same, but the design includes different steel products, in the beams and flooring as well as the structure, depending on needs, location - sea or lakes - weather conditions, etc.

Years ago, cages were more generic. Today each cage is specific to the client, the installation site and other challenges.

In Chile, where 98% of cages are

steel, the 40mx40m cage has an important extra benefit. It's strength makes it very effective in repelling attacks by sea lions along with AKVA's new anti-predator Econet (see Predator Solutions).

Today Steel cages are going places where historically they have never gone before as their new capabilities provide answers to new challenges in new markets and better solutions for existing customers.

## "Lions on the Move"

■ **AKVA group is working with Horizon Aquaculture Limited of Zambia to strengthen the aquaculture value-chain in the Southern African region.**

By **Adam Taylor**



We are developing appropriate and robust cage equipment for the African environment.

unavailability of hands-on practical training. Horizon Aquaculture is now developing a chain of one-stop farm shops for aquaculture at to make these inputs more accessible. Horizon is part of the Oakfield Holdings group which also owns Sub-Saharan Africa's most advanced fish farm and fish feed factory. Working with Horizon as our distributor, AKVA group is developing appropriate and robust cage equipment for the African environment. Appropriate cage technology will ensure that aquaculture in the region is both commercially and environmentally sustainable.

Horizon will help SME clients to develop reliable business plans to enable them to access financing for equipment and other inputs. The company is also building a

dedicated vocational aquaculture training center including a demonstration farm based on AKVA group equipment to ensure that aquaculture entrepreneurs maximize their return on investment. For larger farms AKVA group through Horizon will offer its full range of Polarcirkel cages and other technology solutions.

AKVA group and Horizon's new partnership will add value to African countries by improving food security and increasing the value of basic raw materials such as soy and maize through the development of a sustainable aquaculture sector.



Tilapia



Our team in Iran together with the local helpers.

## Technology far away from home

■ **Flexibility, adaptability, cultural respect, humour and planning a week ahead helped them to get the job done.**

Saying on your manifesto that you deliver solutions is one thing. Living up to your promise in the field is quite another – when the field is a remote lake in the barren mountains of Iran, with extreme temperatures. And the solution is 22 containers worth of modular feed barge shipped from Chile to be assembled piece by piece on the shores of Lake Rais Ali Delvari in the Bushehr province. That takes a special team. And a unique team spirit. Especially as what takes one and half months to build in the workshop takes three months on the ground. At 45-50 degrees centigrade. With no shade.

That was the mandate given to the team from AKVA group Chile who worked closely with AKVA group

Norway and their Iranian customers to design, build and deliver a customised feed barge. The secret to their success? Not what they expected – their expertise – but their ability to pull together in spirit a team that bridged the gap between the drawing board in Norway and the nuts and bolts on the ground alongside their Iranian counterparts. According to team leader, Lisandro Chuecas, the Iranians were incredibly hospitable, which along with their own open Latin temperament helped cement relationships.

The Team built the 2 platform bases on the concreted shore which they then rolled into the water for completion because of the weight of the completed structure. The assembly was straightforward due to the pre-constructed Lego-type design, which meant they only had to fit the structure together onsite. Which sounds easier than it is at 45 – 50 degrees centigrade.

# Major investments in store for Helgeland Plast

■ **The result of these investments will be doubled capacity for both boat and pipe production, which will benefit the aquaculture industry.**

AKVA group's subsidiary Helgeland Plast is busy rationalizing operations, where all production of boats has moved to Mo Industrial Park, while the factory premises in Båsmosjylen – both site, buildings and production facilities – now will be extended and upgraded.

Helgeland Plast in Mo i Rana is one of the country's leading manufacturers of polyethylene pipes, and several thousands of kilometres of pipes have been manufactured since 1971. The company already has one of the most modern production lines for PE pipes in Europe, and it is now making a drive to become even better.

"Altogether around NOK 100 million will be invested in modernization of our factory premises here in Båsmosjylen, where NOK 40 million will be spent to expand the site and remodel the buildings for greater storage capacity, while NOK 60 million is designated for upgrades to production equipment. This includes the installation of a new, fourth extruder line, which will boost our capacity," says Stig

Meisjord, general manager of Helgeland Plast.

**Tailored for a larger, tougher trend**

The trend in fish farming is that cages are becoming bigger and bigger, and that they are placed in more exposed locations, which places new demands on the pipes that are used.

"Although the number of cages doesn't increase, there is constant growth in volume. Previously we supplied a lot of 400 millimetre pipes, but in recent years it has become common with 450 and 500 mm pipes. We have also created a prototype for cages with 630 pipes that have been trialled at Marine Harvest, and where feedback has been very good. The cages are becoming bigger and bigger, and have to withstand constantly tougher conditions. Now we're preparing to satisfy our customers' future needs," Meisjord claims, and explains why polyethylene pipes are so common:

"Using PE pipes in fish farming cages has several advantages. No corrosion or wear due to electrolytic processes, and no risk of attack by live organisms, algae, bacteria or multicellular organisms that can attach to the pipes. There are more and more projects at AKVA that require PE pipes, so there is good potential for increased revenues, so I'm certain that the investments we are making now will pay off."



Altogether around NOK 100 million will be invested in modernization of our factory premises in Båsmosjylen.

**A completely new dimension**

Helgeland Plast's pipes are also supplied to sectors other than the aquaculture industry, and an upgrade of one of the three existing extruder lines will allow Helgeland Plast to soon increase the maximum pipe dimension from 900 to 1,200 millimetres.

"This means we can supply a number of projects we previously would have been excluded from as we couldn't produce large enough pipes. The remodelling also entails that we will have a Fast Dimension Change solution. The transition from one dimension to another takes almost a full shift on a regular line. With FDC this will be reduced

to 1-2 hours, which is a great advantage to both us and the customer. In addition, greater capacity will allow us to be a year-round supplier to the regular pipe market, while we previously have had to focus on deliveries only to the aquaculture industry in the first half of the year," Meisjord explains.

**Integrated and increased boat production**

For several decades Helgeland Plast has supplied Polarcirkel boats to businesses in aquaculture, offshore and other industries, in addition to the Police, the Armed Forces and the Norwegian Society for Sea Rescue.. Due to increased demand, there was a need to increase

capacity, which meant moving production.

"Since March all of our boat production, from hull to completion, has taken place in Mo Industrial Park. The transfer there allowed us to increase pipe production in Båsmosjylen, and also double capacity for boats, from 70 to 140 a year. We are a company increasing strong growth, much like the aquaculture industry in general, and when the factory extension is finished at the turn of the year, everything will be geared to provide first-class service to our pipe and boat customers for many years ahead," Meisjord concludes.

By **the editors**, AKVA group

## Effective predator solutions

■ **AKVA group Chile has launched the Group's highly successful Polarcirkel EcoNet as part of its innovation-driven, three-pronged solution to sea-lion predation.**



EcoNet installation in the southern regions of Chile.

new, stronger, flexible 40x40m steel cages.

And the third link in the defence chain is the autonomous underwater FNC8 net cleaning robot, which helps maintain structural integrity and strength.

A resident pilot operates it from a chair in the control room using a joy stick. Four cameras give the pilot under water views, and

ensures a quality clean. The 'rose' construction of the nozzle means that the high-pressure water delivery will not damage the net. The best thing about it? It is 8 times more efficient than manual cleaning (16,000m<sup>2</sup> per day vs 2000m<sup>2</sup> per day), which will also help producers comply with cleaning regulations.

By **Christian Stange Smith**

## Bike ride against cancer

■ **Robin Halsebakk (26) spends his summer on a bike, riding from Grimstad to Kirkenes promoting the 2017 UCI Road World Championships in Bergen, while collecting money for cancer research.**



The «Salmon is important for Norway» campaign is the general sponsor for this year's world championship in Bergen and will also make their mark on all elite races in Norway.

On the way to end destination, which is Nordkapp, he has travelled along fjords and beautiful nature visiting fish farms and aquaculture companies along the way to collect money for cancer research. In total, he will ride 4.500km and he has already surpassed 3.343km.

Wednesday, June 21, Robin took the time to come by AKVA group's office in Trondheim. So far, Robin has collected NOK 760,000 and AKVA group has decided to contribute with NOK 20.000 to this cause.

"This is a good initiative and an important cause. It is nice to see that so many from the industry seize the opportunity to show social responsibility and collectively support cancer research by financial means.

Cancer is a terrible disease that gravely influence lives and has major consequences for both those affected and those close to them. It's nice for us to have the opportunity to contribute, and we encourage everyone to do the same," says Director of Marketing and Communications, Renate Hjørnevik.



# Developing new products and support for specific markets

By Sara Bell and  
Douglas Johnson  
AKVA group Scotland Ltd.

■ **AKVA group Scotland continue to develop and adapt equipment for different markets and conditions.**

## Exposed Locations

The general trend is to farm in more exposed and challenging conditions and this is particularly true of the new sites in Scotland. The farming infrastructure needs to be more robust to withstand not only the exposed conditions but also the operational pressures put on pens with bigger boats and regular handling. The New Polar Lift System (PLS) improves pen operation efficiency.

The PLS has been designed in Scotland and is an integrated power winch system that provides a fast and even lift of the sinker using a remote control. The PLS only uses one electrical generator, ensuring boats with large lifting cranes are not required for the operation.

The PLS can be purchased as a standalone system or more often it is integrated with the Polarcirkel pen and currently used on the Catamaran (2 ring) Polarcirkel 500mm pipe pens deployed on exposed sites. The PLS makes for safer, simpler and more efficient handling of the pen net.

Remote control and monitoring of systems is now fundamental requirement for sites where access is difficult. AKVAconnect is an integrated software control platform package which controls feeding, monitoring, barge and environmental systems on the farm and remotely from the shore base. The system is scalable allowing the system to grow with your needs.

## Mediterranean

While the fundamental 'Salmon' farming model' is recognised as a way forward for developed and developing species, we know that all species and countries often require the equipment adapted for their specific cultures. As a result of feedback from the Mediterranean we have developed alternative boat feeding systems, camera models and Solar Power infrastructure for the Mediterranean. Feedboat - 14 Auger 6 line system Working closely with Culmarex who have operated feed boats with Central feed systems for many years we have designed a bespoke flexible central feeding system. The number of silos and augers



7 disc Net Cleaning Rig.

provides the operator with the vast range of feeding options required to feed as efficiently as possible on a bass and bream farm.

## Smarteye Double Camera

The new Smarteye Double Camera and Wi Fi Med Box Digital Transmission Unit option uses less power than existing camera systems making this a cost effective and power efficient system for the Mediterranean where it is often Solar powered. The Double in-water camera provides the ability to switch between look up and look down camera effortlessly via AKVAconnect process view, generating a great view of the fish feeding.

The option to upgrade to the Smarteye 360 pan and tilt cameras or mix and match is also available.

## New Support Offices Opened in Spain, Greece and Iran in 2017

AKVA group where possible have always tried to support products locally. In addition to employing over 60 people in Scotland and 20 in Turkey, in 2017 we have set up Companies in Spain, Greece and Iran. The Spanish office is headed up by Juan Ramon Prieto, the Greek office by Bruno Polichetti and Iran by Hamid Emami. All these people have long experiences with farming in these countries or have worked with AKVA for many years.

## Locally Developed Net cleaner and Environmental Systems produced at AKVA group Scotland

In addition to providing fast local support Quality assured equipment is developed locally where it is cost effective and quality approved ensuring that the equipment is adapted to the local market.

AKVA group Scotland have also developed a new range of locally produced hi-flow pumps in Inverness which are available for different applications. The increased flow rate means greater cleaning efficiency, suitable for the most demanding cleaning operations.

The seven disc heads are a proven, lower cost and fast cleaning option and the original AKVA Dual Head system has also been upgraded to use a belt driven pump, further improving the efficiency and the reliability of the system. Both these systems are selling well in Scotland and the Mediterranean. Environmental Sensors are farming now a fundamental part of farming sustainably and the system has been developed in Scotland for specific customer's needs.

## The Akvasmart Enviro Sensor

Network is a standalone network designed to measure water quality and environmental data. The Enviro Sensor System is designed so that all data can be viewed, recorded and logged within the AKVA connect software package, allowing parameter thresholds to be set and highlighted. The new system can provide up to 24 hours a day logging through a battery backed server, which allows warning messages or alerts to be sent in real time, not after the event.

## Rentals

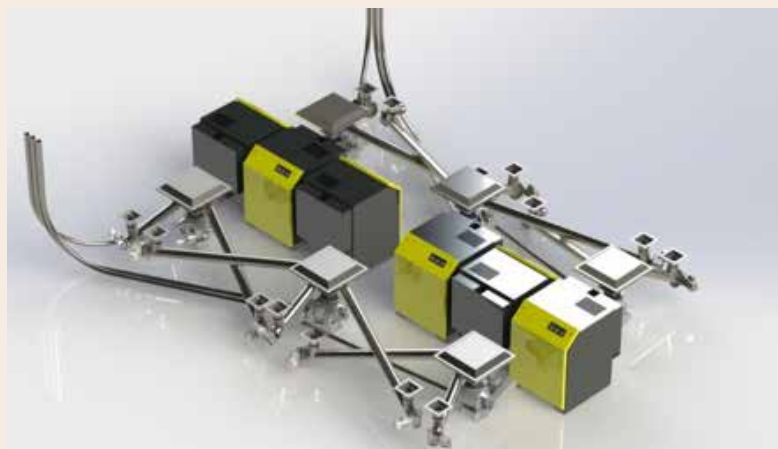
These systems add to AKVA group Scotlands range of rental equipment which includes Cameras, Lights, Feed systems, Environmental sensors, Dual and Seven head net cleaning rigs and power grids.



New Akvasmart Double Camera.



Akvasmart Environmental Sensor System.



Akvasmart 6 line Hex feedboat system.

# Microsoft Award to Wise

■ **Wise today proudly announced it has won the 2017 Microsoft Country Partner of the Year Award for Iceland.**

The company was honored among a global field of top Microsoft partners for demonstrating excellence in innovation and implementation of customer solutions based on Microsoft technology.

"It is a great honor and pleasure to earn this prize for the fourth time. The key to Wise's success and growth in the market is our excellent staff. Wise offers clients worldwide advice on development, implementation and design of custom solutions such as banking, billing, accountancy, salaries, fisheries and local government as well as the standardized accounting package.

Our focus is on Microsoft Dynamics NAV, which we build our custom solutions upon for most sectors of the industry. Integration with Office 365, Power BI and Wise Analyzer makes the Wise solutions unique, and is a major factor in achieving this award." Says Mr. Jón Heiðar Pálsson, Head of Sales and Marketing at Wise.

Awards were presented in several categories, with winners chosen from a set of more than 2,800 entrants from



Ron Huddleston from Microsoft and General Manager Hannar Erlingsson at Wise.

115 countries worldwide. Wise was recognized for providing outstanding solutions and services, as well as representing excellent subsidiary engagement in Iceland.

The Microsoft Country Partner of the Year Awards honor partners at the country level that have demonstrated business excellence in delivering Microsoft solutions to multiple customers over the past year. This award recognizes Wise as succeeding in effective engagement with its local Microsoft office while showcasing innovation and business impact, driving customer satisfaction, and winning new customers.

"We are honored to recognize Wise of Iceland as a Microsoft Country Partner of the Year," said Ron Huddleston, corporate vice president, One Commercial Partner, Microsoft Corp. "Wise is a prime example of the expertise and innovation we see in our Microsoft partner community to deliver transformative solutions."

The Microsoft Partner of the Year Awards recognize Microsoft partners that have developed and delivered exceptional Microsoft-based solutions over the past year.

By Jón Heiðar Pálsson

# Norwegian workhorses to China

■ **When the Fujian Provincial Law Enforcement Team of Ocean and Fisheries needed five new boats, the order went to Helgeland Plast.**

"We're seeing good interest from China, so this is definitely not the last order we'll see from there," says John Atle Figenschau, sales manager for Polarcirkel boats.

Helgeland Plast AS, one of AKVA group's subsidiaries, has through its distributor in China, Beijing Fitwell Technology Co. Ltd., received an order for and produced five Polarcirkel 685 Work boats with inboard Volvo D3 220 horsepower diesel engines and DPH drive units. Two of the boats have already been delivered, and the remaining three will be sent eastwards at the July/August turn of the month.

"These boats will be used for supervision of the coastal fisheries in the Fujian province. These are good workhorses that are very stable, durable and safe, in addition to being able to maintain relatively high speeds. The Polarcirkel Work boats have been tested in extreme weather conditions, and are the first choice for everyone who has their everyday workplace at sea," John Atle Figenschau claims, and says that five



boats have been inspected and certified by the China Classification Society.

## Potential for global growth

This order from China is worth NOK 3.1 million, and shows why it is important that Helgeland Plast approaches the global market, although sales figures in Norway have shown steady growth over the last five years.

"We are in a growth phase and aim to produce up to 150 boats a year going forward. For this reason it's important to increase our share of exports. Now we have orders for 10 to 15 boats a year from Chinese customers, in addition to customers from Scotland, Brazil, Africa and the Mediterranean countries. There's no doubt that there's potential for even more activity abroad. The interest is there, and the customers we have usually return with further orders.

## Broad application

The Polarcirkel boats have become a hit both at home and abroad due to their unique properties, and because they are virtually maintenance-free.

– The boat design is used for preparedness, by fish farmers, subsea contractors, the offshore industry, tourist industry and a range of other private and public players. Another reason customers all over the world prefer us is that we can tailor the boats in ways others cannot, and that guarantees that the boat is tailored for the tasks it is destined to perform," Figenschau says.

He says that the order books are quite full at the moment, but invites anyone with an interest to get in touch to enquire how Helgeland Plast can help them create an even better workplace at sea.

By the editors, AKVA group



Stig Martin Bø, AKVA group and Benedikt Ernir Stefansson, Egersund Iceland EHF.

# New agent on Iceland

■ **AKVA group steps up efforts in Iceland and has signed a formal agency contract with Egersund Island EHF.**

The company will represent AKVA group and sell aquaculture technology and associated services to Icelandic fish farmers. The contract came into force on 1 January 2017, but the companies have already collaborated for 3-4 years. The office will be based in Reykjavik.

"We're doing this to increase our presence in Iceland and to promote sales and service work. The intention is to be able to provide even better service to Icelandic customers through a dedicated representative. Egersund Island will promote AKVA group's products and look into opportunities to expand and further develop services in Iceland," says Stig Martin Bø, who is one of the sales managers in AKVA group

The aim of the collaboration is to increase turnover in time with the growth and initiatives in Icelandic aquaculture. After working towards the Icelandic market for several years, the market for aquaculture equipment has developed in leaps and bounds in the past year. The key to the rapid development has been increased investments from Norwegian aquaculture companies and funds with aquaculture backgrounds in Icelandic companies. This has led to a radical increase in technology investment.

Icelandic authorities have introduced new Icelandic regulations for sea farming, which are largely based on the Norwegian NS-9415. This is an advantage for the industry. It prevents "wild west" conditions from the start.

Further, there have been increased developments in services to the industry with smaller players that already are well-established. Larger companies have also shown an interest in this market.

Due to the increased investments, aquaculture companies are far better equipped to meet the plans for growth in Iceland. Low costs for investments in licences for salmon and no ownership limitations in companies have also been important in this respect. Furthermore, the industry's confidence in Iceland has gained, which has led to increased belief that Iceland will succeed and become a stable salmon producer.

AKVA group ASA wants to be a part of the Icelandic aquaculture boom and contribute to further develop the industry in Iceland, and this agreement is a part of this effort," Stig Martin Bø concludes.



# Good technology results in good biology

By Trude Olafsen

Project Manager Business Development, Research & development AKVA group

■ **“The difference between a clean net and a dirty one is huge, and is very important for fish welfare, health and overall performance.**

Aquaculture will be an essential factor in the challenge facing food production for a global population, which according to WHO will reach 9.7 billion in 2050. This makes it essential to enable a sustainable and efficient industry that recognizes the value of investing in development, for example in innovative net cleaning systems.

Fish and seafood are far more sustainable and have a lower carbon footprint than meat and dairy products. Research shows that one kilogram of salmon fillet from farming to wholesaler has emissions of approx. 2.5 CO2 equivalents, the unit used in greenhouse gas accounts to compare emissions. The carbon footprint of farmed salmon is thus far lower than for example the production of beef (30 CO2 equivalents per kilogram) and pork (5.9 CO2 equivalents).

“Using the sea as the new larder to feed a growing population with lots of healthy nutrients, good sources of protein, and not least Omega-3 and numerous micro-nutrients, will be one of the great challenges, yet also huge opportunities we have,” claims EAT founder and doctor Gunhild Stordalen in an interview with laks.no.

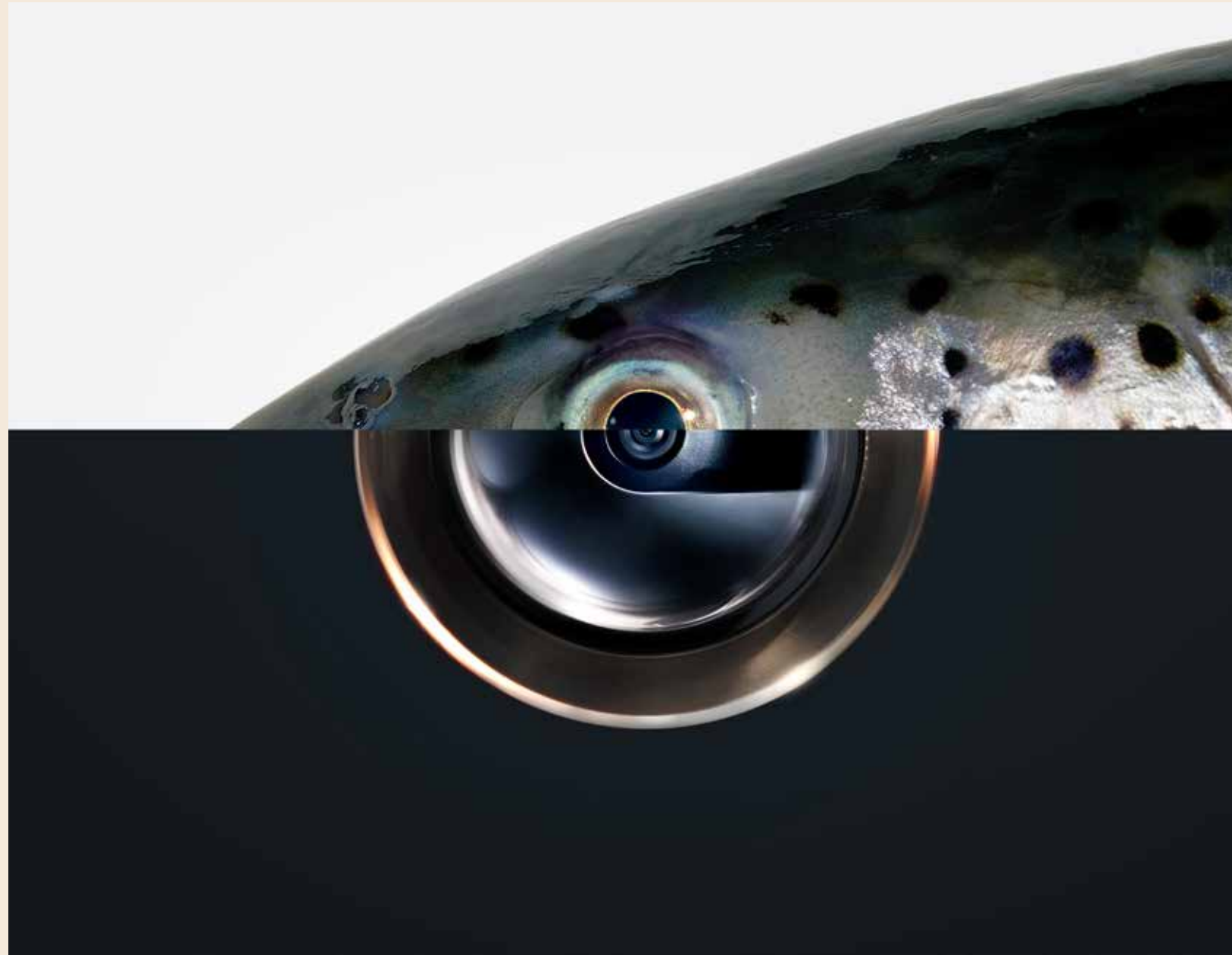
## Huge potential

More and more consumers care about where their food comes from, but many are still unaware that salmon is far more climate-friendly than all other typical meat-based meals. This has global consequences, and is definitely something one should take into account when planning dinner.

Only five per cent of food production is currently from the sea, and this means there is huge potential in a future-oriented industry. The aquaculture industry has its challenges, but these are issues that can be resolved. Technology is the foremost solution in connection with this, and currently vast resources are being spent on innovation in the industry.

## Netcleaning for welfare and value

Billions of dollars are being invested in the fish farming industry around the world. Rationalization of the operation of fish farming facilities is an incredibly important element in connection with this, and a natural



Facilitating an optimal environment in the pen ensures better welfare, increased growth and lower mortality.

step is thus to ensure improved and more efficient net cleaning, which is an area firmly in AKVA group's sights.

“Why is net cleaning important for sustainable farming of healthy fish?

“The difference between a clean net and a dirty one is huge, and is very important for fish welfare, health and overall performance. Increased net fouling reduces the water flow and may lead to oxygen deficiency for the fish. Less oxygen in the cage leads to increased metabolism and higher stress levels, which reduce feed intake and in severe case may lead to increased mortality,” Gut-torm Lange from AKVA group explains.

Profit is also at stake when nets are not properly maintained. A clean net reduce the risk of fish escapes keeping the fish safeguarded. The forces of the sea current, often constitutes 70-75% of the total forces on the whole site. The load on the nets, cages and moorings is multiplied when the nets are heavily fouled compared to cleaned nets. Clean nets prevents overloading the cages and eliminate the risk of breakdowns and ruptures in the nets.

“Another aspect of poor cleaning is the cleaner fish, who naturally feed on the fouling. If there is a lot of fouling, they become less effective

with regard to removing sea lice from the salmon. We also know that fouling may be a reservoir for various types of parasites, bacteria and viruses – and there is a suspicion that this also applies to sea lice. There's a reason we clean our homes and wash our clothes – it's to get rid of bacteria. Facilitating an optimal environment in the pen ensures better welfare, increased growth and lower mortality. Good welfare results in good health, which in turn results in good economy,” Lange concludes.

## Cooperation for rationalization

So, clean nets are without doubt an important factor to improve efficiency in aquaculture. The next question goes without saying; how does one ensure optimal net cleaning? AKVA group has recently invested heavily in this area, and has entered into productive partnerships with two Norwegian companies with extensive expertise that can contribute to a much more efficient cleaning; ROV manufacturer Sperre and pump supplier KCC Power System.

“AKVA group has close contact with players in the fish farming industry all over the world, and knows the challenges they are facing in this area. For a number of years we have supplied modern sensor systems that monitor the pens and that provide relevant information with regard to what

is correct in terms of the cleaning process. Now we're working to make it even easier to clean nets more frequently, more thoroughly and more gently,” says Roy Magne Ohren, sales manager with AKVA group.

## Customized high pressure cleaning

The products KCC Power System will supply to yards, fish farming facilities, service companies and other players in the aquaculture industry are high-pressure pump systems that are used for net cleaning, hull cleaning and ring cleaning, among other things.

## The market's most gentle cleaner

Sperre AS, of which AKVA group acquired 66 per cent in the autumn of 2016, has developed Flying Net Cleaner 8. This is set to be an important tool for those seeking to rationalize and modernise their cleaning procedure.

“The AKVA FNC8 net cleaner is a safe, powerful ROV net cleaner that is easy to operate. It can be operated both remotely at the cage and from the control room. This is the market's most gentle net cleaner, as it uses lower pressure and less water than all other comparable solutions. At the same time, due to a lack of sharp wheels or belts that can damage the net, it is far better in

terms of wear on the net line, mesh and risk of escape. This is something both farmers, service companies and others have been asking for,” Ohren says.

FNC8 is based on a patent pending principle that ensures that the rig is in balance regardless of whether it cleans horizontally, vertically or upside down. This makes it easy for the operator to select the cleaning direction that is most appropriate, regardless of which type of net one is dealing with.

“The speed of the cleaning rig is important Adobe Invoice No. 0821056840 t for those performing the job. FNC8 can achieve a cleaning efficiency that far exceeds what is currently available. FNC8's ease of use is also superior in that several automated features are built-in, and advanced camera systems and sensors monitor the cleaning,” Ohren says. The company is also the sole distributor of the rugged German KAMAT products, which have an excellent reputation.

“These are relatively similar pump devices to those we previously have supplied to offshore and onshore customers, but optimised for use in aquaculture. The fact that KCC does the design and assembly/production at our own premises affords the systems great flexibility with regard to necessary changes or customer requests.



AKVA FNC8 can be operated both remotely at the cage and from the control room.

We can resolve most challenges in the area, and can offer flexible, customized solutions to all, regardless of whether they are standard systems in a container or built-in pump systems on boats,” technical manager Kjetil Horve emphasizes.

“Our experience so far is that players in aquaculture have the same desires and requirements as our offshore customers: High quality, stable uptime, small footprint, minimal vibration/noise, easy installation and maintenance, a good service organization, and requirements toward good documentation. We know the working conditions in the fish farming industry and can supply what the customers need for cleaning,” Tor Paust-Andersen of KCC concludes.

## Global technology and transfer of expertise

As was apparent from the RIO20+ conference: 1 billion people around the globe go hungry, while another 1 billion people are overweight. Aquaculture can play a key role in resolving both of these global issues, but this requires the development of sustainable solutions worldwide. In many ways, salmon farming is the driving force in the development of aquaculture technology, but aquaculture is a lot more than salmon, which actually comprises just 3,6 per cent of global seafood production.

“There is a risk of a gap widening between salmon farming, which invests large amounts in developing technology and innovation, and the farming of other species. At the moment, there is little efforts from the governments to transfer knowledge and solutions to ex. developing countries. This is a challenge for global aquaculture, yet also a huge opportunity,” claims Trond Severinsen, COO Exports, AKVA group. Challenges with fouling in warmer climates are often many times worse than in salmon farming which is a cold water species. We have provided facilities in the Persian Gulf with sea temperatures up to 35 degrees, and where the nets can be completely overgrown by shells and algae within a few months. There is no other effective way to clean these nets other than utilizing modernized net cleaning technology.

Achieving global industrialization of the aquaculture industry through the transfer of technology and expertise from salmon farming to other species is incredibly difficult, but the potential is huge. This particularly applies when one considers that the development of future-oriented and sustainable aquaculture in low-tech countries, where capital is scarce, can be very beneficial to society, both by creating jobs and countering poverty, and also by ensuring better access to climate-friendly high protein food in poorer parts of the world.

# Innovative delousing technology



A new, three-stage delousing system.

■ **Salmon lice is one of the greatest challenges facing the fish farming industry and work is continually being carried out to find solutions to this problem.**

In cooperation with Fjord Solutions AS, AKVA Group have been involved in a development process that will soon be ready for large-scale testing. The system is a newly developed complete, fleet-based delousing system. “This is a prototype and some full-scale testing still remains before we enter the market during the fourth quarter, but thus far everyone who has been involved with this project has been extremely positive. Our focus is on fish health and delousing technology has been created that is gentle, smart, effective and easy to use for fish farmers,” says Per Andreas Hjetland from the AKVA Group.

The system consists of a newly-developed ejector pump system in which the flow of water itself has a major effect. This is combined with an Eilzil electrical impulse module, which causes the lice to detach without injuring the salmon. The Eilzil electrical impulse module has been tested in Chile with good results. The fish then pass through what is known as a waterfall, i.e. a sprinkler system with good delousing capabilities. Finally, all of the water containing lice is transferred to separate filter, while the clean salmon are released into the cage.

“The tests thus far have shown that the system causes insignificant mucus and scale loss, which means that we are able to maintain good fish health with this system. Even though the delousing is effective, it is gentle on the fish,” says Ole Kristoffer Torsvik from Fjord Flow.

The lifting height is only 40 centimetres and therefore without differences in pressure. The pipe has no moveable parts and there are straight and even flowlines the entire time. The treatment time is only 10-15 seconds and the fish are in a lot of water during the entire process.

Capacity is excellent, both in terms of volume and the size of the fish. Tests show that the system handles not only smaller fish, but also fish that are 5-12 kilograms in size. The system can pump up to 3,000 cubic litres of water per hour. Exactly how many fish this translates to will depend on size and other factors. A fish counter is also included in the system.

“The AKVA Group believes that good technology results in good biology. Our goal is to be part of developing technology and products that improve the fish farming industry. I am certain that Fjord Flow will be a good contributor in the fight against salmon lice,” says CEO Per Andreas Hjetland. “Many wise heads have worked together to develop this product and I believe the result is something everyone in the fish farming industry should desire,” Ole Kristoffer Torsvik adds.

# New facility for research on and breeding of lumpfish



Lumpfish

■ **Namdal Rensefisk has entered into an agreement with AKVA group and Plastsveis to build a new fish farming facility for lumpfish.**

By the editors, AKVA group

facility. It will be supplied with a fine filtration system with a drum filter and UV for water destined for the fish in the research facility.

The energy plant will ensure adjustment of the temperature to different zones, and for some tanks there will be individual temperature control up to 12 degrees. A tank system will be supplied for lumpfish from egg to adult fish, with outlet water filtering and outlet water system.

What distinguishes this facility from other facilities, and from the remainder of the fish farming facility at Namdal Rensefisk, is the filtering ratio and temperature management. Aqua Gen and Namdal Rensefisk have stringent requirements to filtering and temperature control, which greatly

impact the facility's complexity. Instead of placing a single ring pipe under all of the tanks and basic outlet water pipes from the tanks and into the sea, we will have to manage both intake and outlet water separately to numerous zones and individual tanks. Filtering requires many extra filters that are both expensive and that require a great deal of infrastructure in the shape of pipes, valves, sensors, control electronics, etc.

The energy plant comprises a heat pump and exchange system that has to be flexible in order to achieve individual temperatures in different zones and tanks. Another aspect of the energy plant is that the heat from the outlet water should be recycled, and this means that the outlet water must be treated and pumped through heat exchangers before being returned

to the sea. In order to supply even pressure and total gas saturation in the water, the water must be supplied from dedicated level tanks at the final stage of the intake system (seawater intake, filtering, energy, aerating).

“We have worked on this contract since the autumn of 2016, and it's very satisfying to have come so far in the process that the plans will become reality. It's interesting to follow the customer in this exciting project, and we will do everything in our power to earn the confidence,” says Sten Roald Lorentzen. The progress plan is not yet finalized, but a construction time of approx. 10 months is estimated. Around 9,000 hours will be used to install the facility, in addition to 5,000 hours for production at Berg.



# Bakkafrost is expanding in RAS

■ The leading salmon company in the Faroe Islands is staying in front building several new recirculation aquaculture systems to support future expansions.



By **Jacob Bregnballe**  
Business Director, M Sc,  
Land based Aquaculture  
AKVA group Denmark

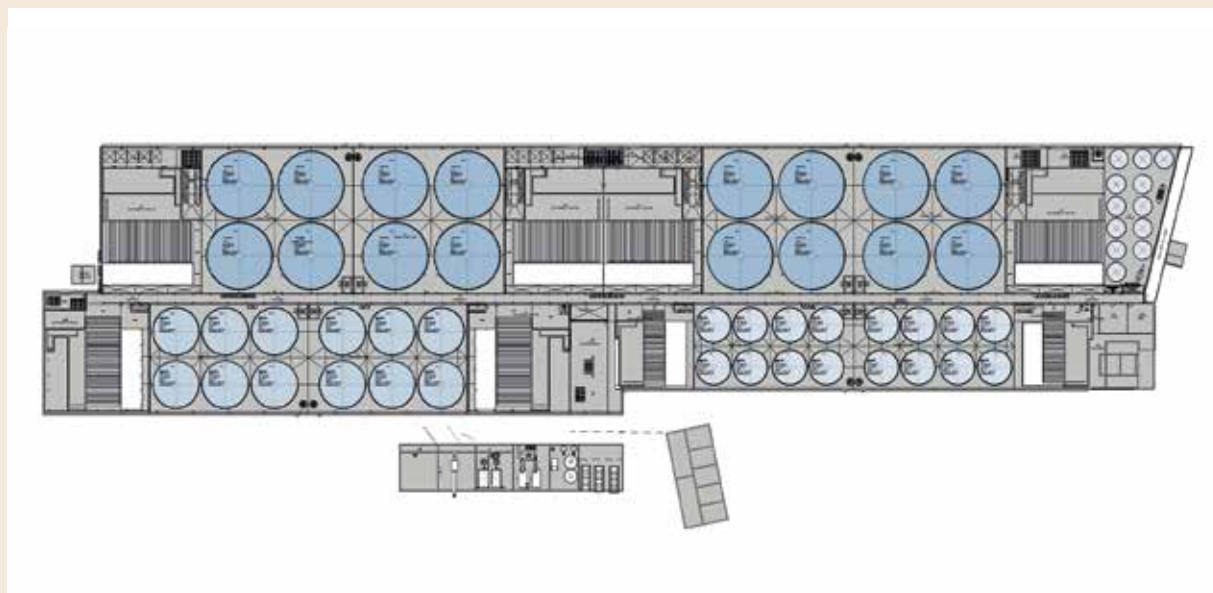
The supplier of the systems is Aquatec Solutions, a new company brand within AKVA group specializing in recirculation technology. Projects at the sites Nordtoftir and Vidareioi are in the final phase of construction and now starting up production. Construction of the largest project Å Strond began in Autumn 2016 and is expected to be in full operation during 2018.

The Strond project is probably the world's largest system of its kind, says Regin Jacobsen CEO at Bakkafrost. We want to maintain the highest standards in relation to fish welfare and sustainability building up a secure base for our future smolt production. The land based expansion is part of our aim and strategy to stay ahead as a world-class company producing high quality and healthy salmon for the world market.

The Strond farm consists of a hatchery, a start feeding system, 2 parr systems and 6 smolt systems growing fish to post smolt sizes up to more than 500 gram.



Strond began in Autumn 2016 and is expected to be in full operation during 2018.



The farm consists of a hatchery, a start feeding system, 2 parr systems and 6 smolt systems growing fish to post smolt sizes up to more than 500 g.

Tanks are made of precast concrete at diameters up to 18m diameter and more than 5m deep holding water volumes of 1200 m3 each. The maximum daily feeding capacity is some 20.000 kg metabolized by the biofilters of 9 separate RAS water treatment systems.

The Aquatec Solutions technology is widely adopted in the Faroe Islands and has been supplied repeatedly also to Marine Harvest and Hiddenfjord, the only other two salmon farming companies in the Faroes. The scarcity of water on the islands forced salmon producers to focus on re-use of water and RAS solutions were introduced already in the 1990s. The latest systems designed all use the Aquatec zero water change technology (ZWC) using as little as 60 liters of water per kg feed.

# One new development after another

■ Fjordlaks Aqua is to double production and make major investments in many areas. The latest news is about the delivery of a complete cage farm solution from AKVA group.

Last summer, Fjordlaks Aqua, along with its seven aquaculture concessions, was acquired by the Hofseth Group and the Japanese companies Yokohama Reitu and Alliance Seafood.

The new consolidation is now presenting one new development after another. Earlier this spring it was announced that it has contracted a well boat with a capacity of 1,400 cubic metres, through its wholly owned subsidiary Aqua Shipping. In addition they have entered into an agreement to invest NOK 200 million in upgrading the existing smolt-facility in Tafjord, Nordal in Sunnmøre.

## Complete cage farm solution

Upgrading the smolt facility makes it possible for Fjordlaks Aqua to grow its smolts to a larger size before releasing them into seawater, which will greatly increase production output. But this will also require an upgrade of the marine facility, and to be able to handle such a large volume, the company has now entered into agreement with AKVA group for the delivery of a complete cage farm solution.

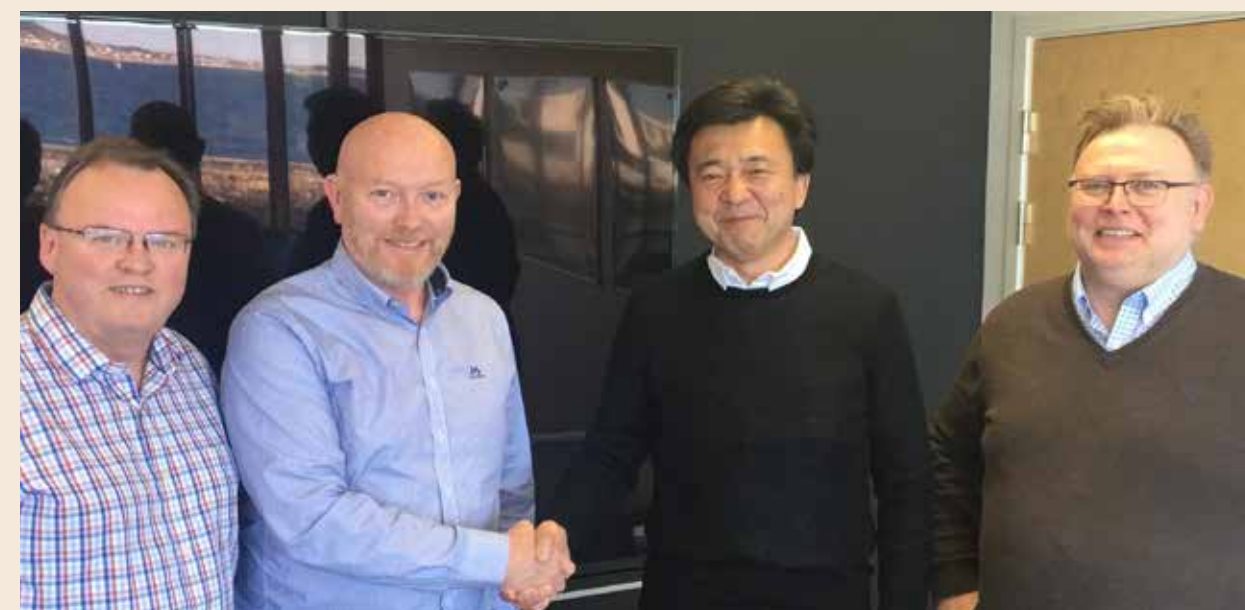
## The entire system assembled on site

Fjordlaks Aqua has limited resources that do not have the time to manage such a large project as a complete cage farm.

"We chose AKVA group because it is a reliable, well-known supplier that can deliver the whole system on site - complete. AKVA group was also able to deliver in a reasonable time, which was important to us," says Svein Flølo of Fjordlaks Aqua.

## Lots going on at Fjordlaks

A complete new cage farm solution



Roy Magne Ohren, AKVA group, Svein Flølo, Fjordlaks, Shinji Kawamura and Ola Holen.

also means a new form of operation for Fjordlaks. To date the company has only used steel cages, but now it is converting to plastic cages with feed barges and power from shore. Investing in a complete cage farm solution with feed barges and power from shore is not only good because it gives more efficient operation - it is also positive for the environment.

The combination of power from shore and feed storage capacity means less transport to and from the facilities by work boats. Another environmental aspect of the new location at Skjortnes in Storfjord is that the company is becoming established in two hygienic zones that have organised closure to prevent transmission of infection.

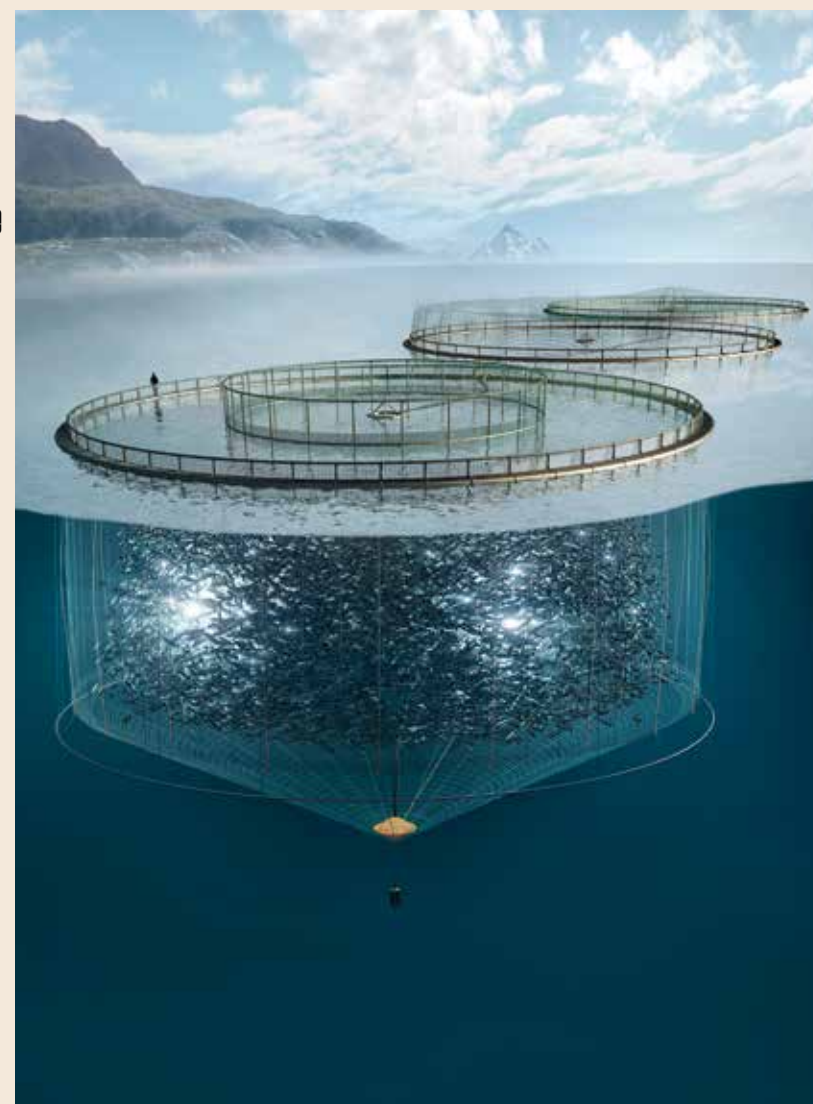
## Only needs the fish and feed

"The delivery by AKVA group is a complete solution with everything needed on site. The only thing it needs now is fish and fish feed," says Roy M. Ohren, regional sales manager of AKVA group.

By the editors, AKVA group

# Good cage systems are essential in order to achieve good production

■ AKVA group ASA's subsidiary Helgeland Plast has manufactured plastic cages for more than 40 years. The first plastic cages were launched as early as 1974 at Lovund, and the start-up is a minor entrepreneurial miracle.



AKVA group is the world's leading supplier of plastic cages.

The first plastic cages had a circumference of 40 metres and were a 1-ring cage with 160 mm diameter floating pipes, while supports and handrails rails had a diameter of 63 mm. In the 80s the cages had become so large that a new 2-ring cage was launched. Polarcirkel Type 3 (2-ring with 200 mm diameter floating tube) and Polarcirkel Gigante (2-ring with 225 mm diameter floating tube), and several major deliveries were made to export markets such as Tunisia, Greece, Shetland, Canada, etc. In 1989 the sinker tube concept was developed, and as early as 1991 AKVA group supplied submersible cages to the export market.

These were specially developed for submersion of biomass in the event of typhoons, oil spills, drift ice, algae, etc. As the first supplier to the aquaculture industry, Helgeland Plast was certified in accordance with ISO 9001 in 1993. In the 2000s the cages continued to grow in size, and since 1974 the company has supplied more than 45,000 cages all over the world. Developments have continued, and today cages as huge as 200-250 metres in circumference with floating tube dimensions of 630 mm are manufactured. The new 630 models also have new brackets with integrated attachment of crowfoot, attachment of sinker tube, attachment for glass fibre pole for bird net and attachment of main line to net.

Developments have been fast-paced, and both material quality and design have been focus areas for AKVA group.

## Lengthy experience with submersible cages

The latest innovation in cage technology under development is submersible cages for large scale salmon production. As previously mentioned, the company has worked on developing submersible cages since 1991 and has acquired the basic expertise, but it takes time to develop submersible cages at the scale required to achieve efficient salmon production. To ensure that

the technology works and that developments always take place on the salmon's terms, one is dependent on large-scale trials.

According to Olafsen, this concerns submersible cages with circumferences of up to 160 metres. Going deeper has several benefits. One avoids the largest waves and ocean currents are less powerful, which means that the forces affecting the facility are different than those on the surface.

So far the realm of salmon has been from the surface and down, but technological developments may change this in the time ahead. When we arrive at the point when we are able to develop submersible cages that provide salmon with a good life below the louse belt, we may solve the greatest challenge the salmon farming industry faces. It's all about establishing a system that provides efficient operations on the salmon's terms. One has to ensure a high level of fish welfare, good fish health and good growth.

## ATLANTIS

In collaboration with equipment manufacturer Egersund Net and aquaculture company Sinkaberg-Hansen AS, AKVA group ASA started work on submersible cages for the large-scale production of

"However, when all is said and done, I have to add that these are hypotheses that have to be tested before arriving at any conclusions," Olafsen emphasizes.

A development project at this level has numerous challenges that must be resolved, and operating costs may be very high for a period, so development licenses are a good aid. Regardless, the owners will have to put up significant funds to achieve this.

## Unique collaboration

The companies behind ATLANTIS SUBSEA FARMING own a third each, and according to Olafsen it is uncommon for technology suppliers and aquaculture companies to team up as equal partners in this type of development company.

"This is a new and very interesting way of working, and the future will show if it is a viable model," Olafsen says. She is of the opinion that it's important to try out new ways of working, and believes AKVA group is a good partner in this concept.

When the company is working with new technology and such high risk, one also has to take a new approach with regard to business models.

To achieve good efficiency from subsea production, the cage will probably have to be ten metres below the surface, and there are numerous considerations that must be taken into account if we are to succeed. However, the actual cage system is based on the same principle as the submersible cages AKVA group has supplied to the export market for many years. The plastic ring is filled with water before being submerged, and then emptied when the cage is raised. The difference in the new concept is that the entire process will be controlled from the fleet, with dedicated software programmed for this system.

Another aspect is underwater feeding, but in this area there already is a well-functioning product developed by Sinkaberg-Hansen's service company, Næroysund Akvaservice.

## Feeding and oxygen at depth

Initially one expects the salmon to have better access to oxygen at greater depths than at the surface. However, once a day the salmon needs to fill its air bladder, and in order for this to be possible in submersible cages one is dependent on artificial air pockets. In this area AKVA group is cooperating with Frode Oppedal and his research group at the Insti-

tute of Marine Research. Through the FØRDOM project, which is funded by the Research Council of Norway, they are working explicitly on feeding at depth and the use of air domes.

"FØRDOM is a great project, and the results can be directly applied in ATLANTIS SUBSEAFARMING," Olafsen points out.

## The sea lice - an incredibly smart parasite

Sea lice are a recurring problem for aquaculture, and hard work is being done in a variety of projects to prevent sea lice from attaching themselves to salmon and breeding. So far no one seems to have come up with the optimum solution that would make it possible to claim the problem has been eradicated, but Olafsen believes large-scale trials with submersible cages may be of great help going forward.

"Sea lice are very clever, and we can't discount that they could adapt to the darkness deep down, but in that case it would be a dramatic change. Regardless, a large-scale trial with production deeper in the sea will provide important documentation of how sea lice will act," Olafsen says. She also says that such production will provide new knowledge in other areas, for example with regard to avoiding algae or the spread of viruses and bacteria. But it may also be the case that salmon could contract other diseases further down the water column. If so, this will be very useful knowledge to have.

## More food must come from the sea

In the future we will depend on producing more food in an efficient way, and we have come quite far with work on developing salmon production, but a lot still remains. It is thus important that the industry has the opportunity to grow.

"We're responsible for developing aquaculture further. The world depends on producing much of the food we need in the sea, and we have come quite far in developing salmon production. It is also a healthy and sought-after product in various markets all over the world.

However, growth cannot take place without control, and although technology is decisive for developments, we are also dependent on including biology. It's essential that the fish have good welfare and good health," Olafsen concludes.

By the editors, AKVA group



# Safe anchoring in rough weather

By Bjørn Sirnes  
Sales Manager  
AKVA group ASA

**AKVA Safe Guard provides environmental data and vital weather information on the location to ensure safer decisions.**

AKVA Safe Guard is a system for risk management (of operations and operation) and decision support to increase safety in operations and prevent undesired incidents, such as e.g. escapes or personal injury.

AKVA Safe Guard is based on monitoring parameters that can detect changes in the condition of the fish and the facility at an early stage, as well as the safety level during various operations. The parameters are input to diagnostic and forecast models that have been developed in collaboration with the foremost consulting and university communities in Norway.



AKVA Safe Guard provides useful information on: Environmental strains and strains from the well boat, observed strain in ropes, enables planning of ideal mooring points, new and calculation-efficient model is validated against full

calculation models for vessel and fish farming facility. New fishfarm simulator with proprietary calculation model that simulates time for various systems of rope, chains, nets, buoys and large volume structures.



AKVA Safe Guard Sensor Bouy



All recorded data and measurements are transferred to a computer center via a powerful peer-to-peer network.

# Unique "magic" lamp - all in one unit

**A new combination of ultraviolet, blue, green and white contrast light in one unit.**

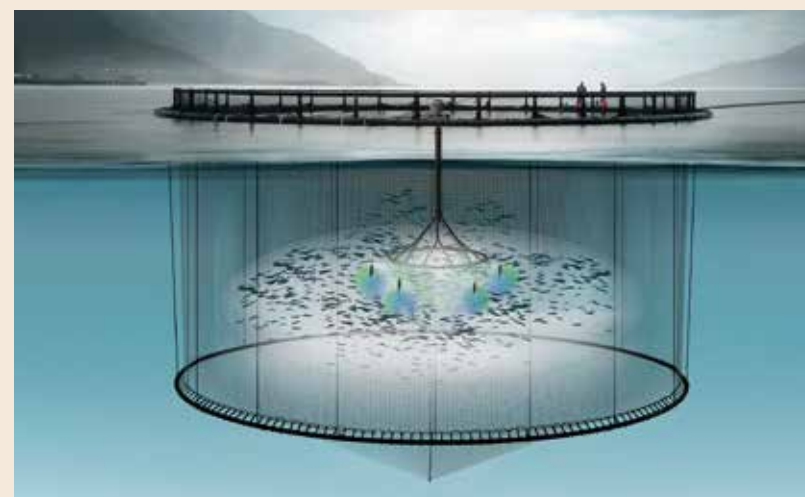
Aurora SubLED Combi 1350W, a new and unique combination of anti-maturation light and UV-light will keep the fish in deeper waters. A product for increase og growth and decrease of louse pressure.

The underwater lights are placed on approximately 10 meter depth and can then cover the whole cage. This will reduce the louse infestation and the effect will be reinforced if the light system can be combined with underwater feeding at the same depth. Recommended use: Medium and large cages.

Easy user interface allows you to set up your personal light regime in AKVAconnect. You can lit and turn off the lights for a fixed time. You can regulate the light intensity in each cage depending of the density of the fish and where you are in the production process. Our professional AKVA group staff can help you with the initial set up.



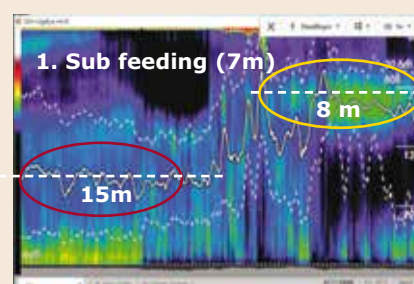
Aurora SubLED Combi 1350 with contrast lights.



Underwater lights combined with subsea feeding will keep the fish in deeper waters around the feeding points most of the time.

AKVA Subsea Feeder is an underwater feeding system that feeds fish at a depth of approximately 7 metres. The feed is transported to the cages through a regular air hose. Water is added and passed down through a main pipe. The water is added by using a pump that draws deep water of good hygiene, in order to ensure the required speed of the feed. The feed is then spread using a dispersion unit of 17 meters in circumference with 12 feeding units so that the feed is spread about the cages in a satisfactory

manner. The feeding rate is up to 50kg of feed per minute. Experience from using the system shows that bird netting is not required.



The screen above shows that the fish now reside in deeper waters, with help of lights like UV light.

By Guttorm Lange

# West Coast moves into tilapi and baramundi

**The Indian vertically-integrated shrimp firm, West Coast Group moves into tilapia and barramundi farming, working with AKVA group to mechanization farm facilities throughout the nation.**

Westcoast, began as a shrimp hatchery 20 years ago, moving into farms and becoming a supplier to the industry, where they have now established the seafood market in India. Today Westcoast are the largest seafood brand (numbers?) in Indian with a new focus on fish, beginning with Tilapia and Barramundi hoping to expand into alternative markets with the support from AKVA group to do so.

AKVA group are working on customized cages and equipment designed for developing nations, such as India, suitable for rivers and reservoirs. India has large water bodies and a huge variety of resources, creating great opportunities to farm a wide variety of fish throughout the country which the new partnership aims to utilize.

As an integrated company, WestCoast maintains full control of their products, priding themselves on a high level of quality. West coast wanted to ensure they entered into this partnership with a company who could provide support, built strong relations and has a strong focus on research and development for the future of aquaculture. AKVA group will work alongside WestCoast to develop customized equipment solutions

for the transition to automated farms across India.

India is currently the second largest shrimp producer in the world, producing 497622 tons in 2016, and holds a great deal of potential.

WestCoast has licenses to farm up to 30,000 metric tons of tilapia in reservoirs throughout Indian regions, with the objective of this partnership to generate mechanized production across these locations. WestCoast are the largest cage culture producer throughout India (numbers?), and believe though developing and implementing customized automation solutions with AKVA group famers throughout the nation will follow. Transforming aquaculture across India.

By Sara Bell and Rahul Kulkarni



Beginning with Tilapia and Barramundi West Coast Group hopes to expand into new markets.

# Expansion in the Medeterranean marked

**As part of the aim to further expand in the Mediterranean Market, AKVA group are pleased to announce the opening of AKVA group Spain.**

AKVA group are pleased to announce the opening of their latest subsidiary company AKVA group España tecnología de acuicultura S.L., headed up by Juan Ramon Prieto, Director técnico comercial.

Juan Ramon and his team are based at a new work shop and office in Murcia. The location is central to the main bream and bass farmers to provide the same level of support as is available in our other offices. Juan has been working in the Mediterranean aquaculture sector since 1997, not only with Sea Bass and Sea Bream but also with Bivalves and Blue Fin Tuna in a wide variety of roles. Juan's extensive industry knowledge will add great experience to the company.

Sea Bass and Sea Bream are the country's main marine species with 23,000 and 14,000 metric tonnes produced respectively. Spain has an estimated demand of 1.7 million tonnes of fishery products, yet only supplying 1 million tonnes, highlighting an opportunity in the market. The Spanish government aims to increase aquaculture production by four times this amount, under the Marca Espana (Brand Spain). AKVA group



Sea Bream.

Scotland have recently signed contracts that include Camera Rentals, customised Feed system and 120m circumference Cages and opening the office there will help to increase the support, presence and relationships, with not only AKVA group's current but also future potential customers.

In 2017 AKVA group are also setting up companies and offices in Iran and Greece. The Greek company is being headed up by Bruno Polichetti who has been our agent and support person for the last 25 years in Greece, and the Iranian office by Hamid Emami, an Iranian who has worked with AKVA group in Norway for many years.

All these new companies come under AKVA group Scotland and Dave Thorburn as the new Head of Export Division. The new offices will be based on AKVA group's successful model of providing fast and efficient local support to form long term partnerships.

The new companies will help further develop AKVA group's export markets.

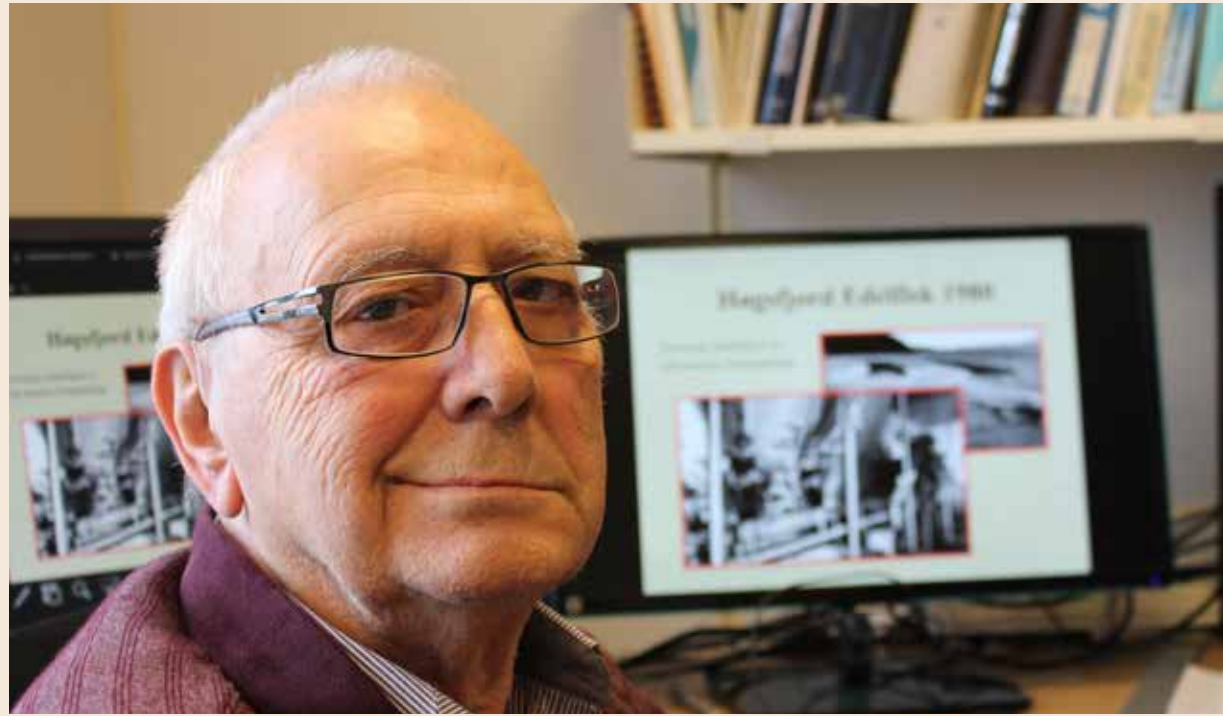
By Sara Bell and Adam Taylor



Juan Ramon Prieto Beltran, AKVA group Spain .



# The “constructor”



Ole Molaug established Akva A/S in 1980 together with 3 colleagues.

■ Ole Molaug is one of the most recognized inventors in Norway, and developed both the world's first painting robot in 1967 and the world's first centralized feeding system for farmed fish in 1979.

Now the 85-year old, who is still passionately constructing new developments, is raising the alarm with regard to both the Jæren entrepreneur mentality and automation.

Ole Molaug calls himself a constructor, and he's not the first in his family. At his home farm at Molaug in Frafjord, in addition to regular farm operations, high quality furniture was also produced. Ole's father Knut and uncle Asbjørn also established their own power plant with a water turbine as early as 1911, installed a cable car to ease transport, and built their own radio as early as 1923.

“The creative enthusiasm is definitely in the genes. If you needed something at home, you had to build it yourself. I started playing around in the workshop at an early age. My teacher said that I spent so much time there that I had sawdust on my brain. Regardless, I am in no doubt that it was a key factor in establishing my passion for finding solutions and building innovations,” says the 85-year old, whose motto throughout his life has been to ‘Find at least ten possible solutions for every challenge,’ and continues:

“Jæren, regardless of whether one considers farming, the mechanical industry or aquaculture, is based

on finding creative solutions to challenges, combined with hard work and a lot of effort. There are still plenty of people with good ideas and a good work ethic, but in a society where the norm is to buy everything new rather than being a problem solver and developing something oneself, creativity will of course suffer. I only hope those people still exist who can envision what will create the next big industry in Jæren,” Molaug says, who points out that it is one thing to develop good technical solutions, but something completely different to create jobs for a lot of people.

## Early automation

A lot of people think of automation and robotisation as a recent phenomenon and modern technology, but as far back as the early 60s Molaug was awarded a working grant by the Research Council of Norway to study automation at BIAS Bergen, and when he moved home to Bryne in 1962 upon completion of his studies, Jæren Automasjonsselskap became his new employer.

“This was a collaborative effort for industry in Jæren, where we worked for ten different companies on mechanisation and automation. We arrived at numerous interesting solutions, although nothing like what we see today. But then again that was more than 50 years ago! If you visit the patent office you'll find a lot of interesting ideas from this period that have only materialised more recently because they were ahead of their time.”

## Opportunities for good entrepreneurs

Both the painting robot that Molaug developed for Trallfa, called

Automating jobs for the sole purpose of saving money is a dangerous route to take. At the same time a greater entrepreneurial spirit is needed to develop new jobs in new industries, and that is interesting.

There are both drawbacks and benefits to almost all development. Good entrepreneurs will at least have numerous opportunities in the time ahead, they just have to find an area with opportunities and a need for innovation,” Molaug claims. Today automation is all about efficiency, and although it might remove labor tasks, it also enable and facilitate growth. Efficiency enable growth and create new jobs. Just look at the aquaculture industry, without industrialization, central feeding and other technological innovations, aquaculture would not have been the industry that it is today. A new article from the Norwegian Seafood Council says that employment in fish farming related jobs in Norway has increased by 74 per cent from 2000 to 2016!

## AKVA from idea to global player

His feeding system has certainly proved to be a huge job-creating success. Since Molaug invented the first centralized feeding system for fish farming and started a

technological adventure for the aquaculture industry, AKVA group has evolved into a large and robust company with an impressive product portfolio that ranges from individual components such as cameras and sensors, to comprehensive turn-key deliveries of complex fish farming systems.

“It's great to see that what I started along with Gunnar Kluge, Sveinung Havrevold and Odd Skjæveland in 1979 has grown into a global player that has created tens of thousands of jobs. I will definitely not take all of the credit for that – a large number of people have teamed up and worked hard to create a successful business. I honestly hadn't envisioned it becoming so big. But challenges remain in the fish farming industry, and I am confident that AKVA group will continue to be a forward-looking problem solver that continues to create new solutions,” Molaug says, who is still busy in his office in AKVA group's premises at Vardheia

By the editors, AKVA group

**AkvaMarina CCS**  
**Sentralføringsanlegg**

**Akvamarina feeding system paid for itself in one year**

CANSEN Aquaculture, which farms sea bass and sea bream in cages a few km west of the famous French resort town, recently took delivery of its second



Ole Molaug invented AkvaMarina feeding system, which was the starting point of what now is AKVA group,

# Tytlandsvik Aqua builds facility for large smolt

■ The overall tank volume will be in excess of 15,000 m³, and production capacity is 3,000 tons per year.

Tytlandsvik Aqua recently signed a contract with Aquatec Solutions AS, a wholly-owned subsidiary of AKVA group ASA, to build two facilities for the production of large smolt.

The company owns a large site and is also planning further development that has the potential of increasing the annual production capacity to a huge 9,000 tons. Aquaculture giants Grieg Seafood and Bremnes Seashore are also part of the effort.

“These types of projects involving the production of large smolt are extremely important contributions to generate much-needed development of the Norwegian aquaculture industry,” says Nils Viga, general manager of Tytlandsvik Aqua. “We are currently witnessing a politically-controlled deceleration of developments in traditional aquaculture in most regions of the country. Larger smolt with natural sea lice protection in the form of a well-developed mucous layer and shorter generation time have been an important success factor for the aquaculture industry in the Faeroe Islands. Here the Faeroe Islands have advanced developments, and we in Norway are now joining the party.”

“This is an innovative and aggressive effort that means we at Tytlandsvik Aqua are taking significant risk in that the industry's framework for development to a great extent is controlled by biology and politics. It's difficult to predict the future of an industry that is developing so rapidly, but we are nevertheless certain that a very important part of the solution for sustainable growth will be to move a larger share of production onto land in a controlled environment. The many unanswered questions also entail that we need to make extra investments in order to achieve flexibility. Time will show if the smolt is 500 grammes, 1500 grammes or even larger. The key thing for us is to ensure that we don't make choices that limit our options in the future. One of the measures we have taken is to employ technology that reduces consumption of raw water to an absolute



The entire facility can be operated with a fresh water supply of 250 litres per minute.

minimum. This minimizes the environmental footprint of the facility while also expanding our future ability to act.”

## 99.9% recycling

“The facility has been designed with our unique Zero Water Change technology,” says Jesper Lund, senior sales manager of Aquatec Solutions.

“In addition to more traditional recycling technology, further steps are included in water treatment that remove nitrate and phosphorous from the water. In practice this results in water consumption being a huge 90% lower than in a regular recycling facility, which in fact already reuses 99% of the water. The entire facility can be operated with a fresh water supply of 250 litres per minute.

This means that water consumption becomes so low that one can theoretically establish the facilities almost anywhere. This opens up a lot of options for the aquaculture industry in Norway, where the facilities have often been established in suboptimal locations in order to have access to enough water. In our view, however, the greatest benefit with the ZWC technology is that it allows for full

sterilization of the raw water that is added to the facility. Today a smolt facility manages enormous values, and it's extremely important that we do everything in our power to maintain biosecurity.”

## Massive interest in post-smolt

“At the moment there is huge interest in facilities for the production of large smolt in the market” says Ole Gabriel Kverneland, Sales Manager for land-based products with AKVA group ASA. “The aquaculture industry is undoubtedly leaning in the direction of moving greater parts of the value chain to shore by increasing the size of smolt before being deployed in the sea. A lot of our customers have already conducted extensive trials on the production of large, seawater-adapted smolt, and this has yielded excellent results both on land and at sea. The Faeroe Islands have been at the forefront in production of large smolt, and results there have clearly shown increased profitability for the industry as a whole. Interest has only increased after trials indicating that land-based production of post-smolt in recycled seawater can lead to less infection by sea lice in addition to lower mortality and faster growth.

Everything indicates that large smolt will be a key tool in the struggle against sea lice going forward.

Although we have come a long way and can show that the production of post-smolt increases profitability for our customers, we believe there are great opportunities to further optimise production if we adapt technology to biology rather than the other way round.

A very exiting aspect of this development is that the post-smolt is produced under so-called isosmotic conditions and where there is great emphasis on technological solutions to prevent the fish from being stressed. The preliminary results of these developments are particularly promising with regard to the fish's growth and survival both on land and after deployment in the sea,” Ole Gabriel concludes.

By the editors, AKVA group



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