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## Salmon farming in the desert

The first ever home-grown salmon in The United Arab Emirates hit the market. - PAGE 2



A potential game changer for aquaculture

In May 2019, the first fish were deployed in Atlantis Subsea Farming 's submersible pen and an exciting test period kicked off. - PAGE 10

## **Verified lice prevention**

What if we were able to prevent the fish from getting lice in the first place? - PAGE 13



## Electrification of feed barges pays off

Farmers investing in hybrid energy solutions have learned that the reduced costs related to maintenance and fuel consumption makes the investment pay off in just a few years. - PAGE 6



## **Expectations?**



## Brynjar Karlsen, CEO, Nærøysund Aquaservice

It is always useful to talk to suppliers and customers in a different environment than we normally do, and we are looking forward to checking out the various equipment news. Our employees find Aqua Nor useful for getting knowledge of the companies and people behind the products they handle on a daily basis. In general, Aqua Nor is a very good event and a nice arena for meeting colleagues.



## Leif Stavøstrand, Founder & CEO, Evoy

We are looking forward to meet lots of people and networking. We are also very excited to present our EL-boat and see the audience's reaction. Aqua Nor is generally an important venue and a good place to meet the industry.



## Oliver Skisland, CEO, WaterLinked

We expect a lot of people, and based on the 2017 success we expect a busy stand and good discussions. We are launching new products and are excited to see people's reaction as we are using Aqua Nor to get early feedback from the market. We have great expectations for Aqua Nor 2019.



This type of land-based salmon farming in a hot climate has never been done before anywhere in the world.

## Desert salmon farming becomes reality with AKVA group technology

The first ever home-grown salmon in The United Arab Emirates hit the market in April.

"It is an interesting project and a great achievement. This proves that it is possible to produce salmon in the desert - and in theory everywhere depending on the investment costs of course," says Jacob Bregnballe, Sales Director in AKVA group Land Based AS.

Fish Farm LLC, headquartered in Dubai, UAE, has set up an inland farming facility in Jebel Ali - a short drive outside Dubai. The farm is built in an existing building, and the fish bred in a controlled environment in a Recirculation Aquaculture System (RAS) - all from AKVA group including Akvasmart CCS Feeding System, AKVAconnect software and more.

"The sea water originates from the Persian Gulf outside Dubai and the system is cooled to the desired temperature. The water consumption is reduced with 99 per cent compared to a normal flow-through system," says Bregnballe.

Fish Farm has 34 tanks at its facility in Jebel Ali port, of which four are used for the salmon grow-out. Fish Farm aims to produce a total of 10,000 to 15,000kg of salmon each month, although this could increase with demand, according to The National, a UAE newspaper.

## Remarkable achievement

"We've made salmon in the desert, it's pretty remarkable. This type of land-based salmon farming in a hot climate has never been done in the world before," Bader bin Mubarak, the Chief Executive of Fish Farm, says to The National.

"Until today, to taste salmon as fresh as ours in the UAE was simply an impossibility. The only way to have this experience was to travel to Scotland, Ireland, Norway or Chile to catch a fish and eat it within a few hours. But not any longer. We have turned the impossible into a reality: We can even deliver the fish alive," says Nigel Lewis, Aquaculture Development Manager in Fish Farm.

Eighteen months ago, Fish Farm received 40,000 salmon fry from a natural hatchery in North West Scotland and thousand more salmon eggs from Iceland to its onshore hatchery in the UAE. Automatic fish transfer pumps connect the tanks with transparent pipes so the team can monitor how the fish are moving and behaving when handled.

"We control the temperature, tides, salinity and depth, and create sunrise, sunset, automatic currents as if it's a river or sea, and make it as if we have a storm or calm weather. It's the only salmon breeding system in the world with full environment control," bin Mubarak says.

UAE supermarkets and restaurants import 100 per cent of the salmon they sell, and

only about 8 per cent of all the UAE's fish is caught from local seas, according to the newspaper.

"There is huge demand here, and if we lost two of those species, we would have a food security problem," bin Mubarak says.

Salmon is the second most eaten fish in the UAE, raising the need to develop a sustainable source of salmon at home.

"We have the freshest, best salmon available here, it is 100% traceable, sustainable, free from chemicals and antibiotics and totally conforms with the strategic Food Security criteria for UAE," Nigel Lewis says.



Inspection of the new desert project.



## **Back to waterborne feeding**





Waterborne Feeding has more than twice the capacity of an ordinary feeding system with air transport.



**By Tore Obrestad Business Development Manager,** AKVA group

Increased feeding capacity, a significant cut in energy consumption and minimal wear of feed pipes. These are just some of the reasons why AKVA group is now reintroducing waterborne feeding.

At Aqua Nor you can see a demonstration of the system inside AKVA group's game-changing AC 600 VR exhibition barge at Skansen Dock. The system has 10 direct feed lines and also includes Flexible Feeding, which makes it possible to distribute feed from all silos to all pens.

## System overview

The waterborne feeding systemwhich is installed in the exhibition barge has two water inlets at the bottom of the barge. From there, the water passes through a filter before it is distributed to the 10 feed lines. A pump has been installed at each feed line, sending the water through the gate valve where it picks up feed before continuing to the pen. The Flexible Feeding concept ensures optimal operations and efficient feed logistics. It comprises one buffer tank for each feed line that is filled with the use of a conveyor system that transports feed between the silos and buffer tanks. This makes it possible to combine various feed types, pellet sizes and similar with just a few keystrokes.

## Many advantages

Waterborne feeding has several advantages. For one, water transportation does not impose the same requirements for antistatic feeding pipes, meaning you can switch to more affordable standard pipes. Waterborne feeding is also considerably gentler on both the feed and the feeding pipe, making sure that feed breakage, noise and micro-plastic

discharge are reduced to an absolute minimum. With ordinary air transport, the counterpressure in the feed pipes will increase in correlation with the pellet density. By replacing air with water, the pellet density will no longer be an issue, and the capacity is more than doubled. The system that is on display during Aqua Nor has a capacity of 1.6 kilo feed per second over a distance of 600 meters.

## Green and profitable

The fact that waterborne feeding will almost eliminate micro-plastic discharge, is an important environmental benefit. At the same time, you will also experience a significant drop in energy consumption by replacing air with water – which is a big win both for your wallet and the environment. For more details, please look into the chart on this page where we have illustrated energy cost per hour by use of various feeding principles.

## What about the feed quality?

Preliminary tests show that waterborne feeding has no significant impact on feed quality. More thorough tests, that also look into the digest

The waterborne feeding system is combined with Flexible Feeding to ensure optimal operations and efficiency. One buffer tank is installed for each feed lines, collecting feed from all silos onboard. Load cells provide control of the amount and rate of the feed.



Waterborne Feeding will earn you major saving when it comes to power costs.

ibility of the feed, will be carried out and published in the time to come.

## Under the surface

To eliminate the influence of wind and surface currents, ensure good growth and keep the fish below the lice belt, more and more farmers are now looking into subsea feeding.

The demand for submersible pens is also picking up speed, and through the Atlantis Subsea Farming project, AKVA group is taking part in the development of a concept for deep operations. Waterborne feeding is an important success criterion and have been successfully operating at the Atlantis project's test pen for several months. The next system for commercial use will be delivered next spring, when Arctic Offshore Farming receives its new AC 600 PVDB feed barge with waterborne feeding from AKVA group.



Proof of concept is seen in deliveries round the world where Aquatec RAS and Plastsveis tanks and PE systems are delivered as one package.

## **AKVA group Land Based shaping up**

Recently Land Based in Chile has

allowing Land Based to grow safely

in Americas. Our efforts have been

signed up for new office lease,

well received in all the markets

where we operate. It has been a

complete package.

clear benefit to our customers that

Land Based is able to deliver a more



By Morten Nielsen **COO AKVA group Land Based** 

Back at Agua Nor in 2017 **AKVA group Land Based** was set up as a division in AKVA group with the aim of working as "one group".

On a day-to-day level it can be difficult to see the change in how the Land Based companies work closer and closer together to reach a united "one group". Evaluating the process since the last Aqua Nor have though really shown the momentum we have had in shaping up our Land Based division.

Our Land Based companies have changed names to reflect the way we present ourselves and work

together. AKVA group Land Based A/S in Denmark is the head quarter while Land Based Norway AS is representing our business segment in Norway with its offices in Sømna, Bergen and recently also Trondheim. The Trondheim office

is our RAS specialist office in Norway, and will eventually handle most of our Norwegian RAS business in close cooperation with our RAS office in Denmark.

Renowned for its quality "Plastsveis" will still be our brand for tanks and other PE constructions worldwide. Aquatec RAS and Uni RAS continue as brand names for our recirculation aquaculture

In Americas, Land Based is still a division under AKVA group Chile, but is fully operational as a unit. Our presence and capacity in Americas are significant and holds a group with extensive experience in RAS technology, execution and operation.

To support the growth and development of Land Based in AKVA, our staff in Denmark and Norway have moved into modern offices and production facilities, more than doubling our office space.



Renowned for its quality "Plastsveis" will still be our brand for tanks and PE constructions.

Proof of concept is seen in deliveries round the world where Aquatec RAS and Plastsveis tanks and PE systems are delivered as one package. A milestone has been significant contracts in Norway, Chile and Canada for deliveries in 2020-2021, and an all-time high order back-log for Land Based overall

With three deliveries for land based Growing-Out systems to market size salmon, Land Based is one of the established players in this arena. Learning from these experiences we are getting more involved in new land based projects in close cooperation with selected customers.





Over the last 10 years, more than 1200 HDPE fish tanks of the brand Plastsveis have been delivered. Most of them in Norway but the last few years has been a tremendous success in the number of deliveries going to new markets including Scotland, Iceland, Faroe Islands, Chile and Canada.

## **AKVA**GROUP

## International break-through for Plastsveis tank technology



By Sten Roald Lorentzen Managing Director, AKVA group Land Based Norway

Up until recently, Plastsveis have not had time or resources to explore export markets properly. Hence, the product has been kept a "hidden secret" in the Norwegian aquaculture industry. Following the merging into AKVA group the tank concept is now refined to facilitate increased export of the products. This refinement includes investment in equipment to make the goods easy to transport as well as increased manpower to undertake installations on site. This, combined with a historically weak Norwegian currency, makes it feasible finally getting this high-quality product distributed outside of Norway in larger volumes.

"We are excited to see our efforts paying off and to see the Plastsveis brand making its way into new markets. Still, what excites us the most, is the fact that our new customers in export markets also end up as recurring customers, exactly as we see in Norway," says Sten Lorentzen, Managing Director in AKVA group Land Based Norway.

Our customers report different reasons as to why they want to stick to Plastsveis tank technology also for their next project, but of course the most common reason is the fact that the hydrophobic surface is easily kept clean. Unlike most other

tank concepts, the Plastsveis tanks are also 100 % flexible with regards to diameter, height and bottom slope. This makes it easy to adapt the tank delivery to perfectly match other factors influencing the project such as the size of the building.

## From water container to advanced fish production system

There is a clear trend towards more advanced and integrated solutions when it comes fish tank technology. In many ways, the requirements from customers is shifting from previously requesting a water container towards the modern farms equipped with sophisticated solutions turning the fish tank into an efficient production unit. In particular, our combined tank outlet and mort collection system has become a tremendous success making the life easier for any fish farmer. The modern fish farms with RAS technology and full temperature control necessitates efficient solutions for fish logistics. Our PS-coupling makes connecting fish

transport pipes safe, quick and easy. Having delivered a range of tanks we have also experienced that the

fish thrives better in some colors.

We have had many customers

reporting enhanced growth in our tanks and we believe this is related to optimal optical conditions both for controlling smoltification but also for pellet contrast.

## Strength and flexibility

In Norway, a new legislation, NS (Norwegian Standard) 9416 has been imposed on the industry to secure the quality of fish tanks and to prevent fish from escaping from land based aquaculture. Plastsveis has hired DNV GL to assure our products comply with this standard The strength of the steel reinforced HDPE tanks is from the combination of a strong and rigid steel reinforcement combined with a flexible HDPE inner-tank. The HDPE material is slightly elastic taking up the weight of the water and forcing it evenly on the steel structure.

The HDPE material "lives" and will shrink / expand as the temperature changes without the risk of cracking with thermal shocks such as when adding cold water to a tank in high ambient temperature. This means the Plastsveis tank is well suited to meet the requirement of any fish farmer in the world. Warm or cold, fresh water or sea water, indoor or outdoor - we have a solution.



We have also experienced that the fish thrives better in some colors. We have had many customers reporting enhanced growth in our tanks and we believe this is related to optimal optical conditions for controlling smoltification and pellet contrast.



QUICK, SAFE AND EASY: The PS-couplings are very popular among customers as they make transportation of fish easier with a seamless connection of pipes and hoses. The PS-coupling consist of a polyethylene lock and a stainless-steel clamp. The lock overlaps the flange of both pipes for quick and secure connection.



# Why electrification of feed barges pays off





**By Tore Obrestad Business Development Manager**, AKVA group

Today, most fish farms are powered by diesel generators. Generators have provided stable operation for several years and the technology is familiar to most of us. Why change a winning team?

The aquaculture industry enjoys talking about the blue revolution, but we also have to relate to the green shift. Most likely our industry, where diesel generators account for significant emissions, will also have to deal with stricter governmental regulations.

According to a study carried out by the Norwegian environmental

foundation Bellona and the global technology company ABB, further electrification in the sea phase of salmon production in Norway may reduce greenhouse gas emissions by 300,000 tonnes annually.

By making a strategic choice to invest in greener operations today, you will be at the forefront and taking a clear environmental standpoint

## Hybrid feed barge solutions

Even with new alternatives on the market, diesel generators will not die away in the near future. For facilities where onshore power is not an option, a hybrid solution will be a good alternative. By combining battery operation with generators on the feed barge, you will reduce the strain on the generators. This means reduced diesel consumption, extended generator lifetime, and reduced need for maintenance. Surplus energy from the generators will charge the batteries, and you'll get a more sustainable solution with less emissions and noise.

AKVA group has experienced increased demands for this kind of hybrid solutions. Customers who made this investment learned that the reduced costs related to maintenance and fuel consumption made the investment pay for itself in just a few years.

For facilities where onshore power is not an option, a hybrid solution will be a good alternative.



By making a strategic choice to invest in greener operations today, you will be at the forefront and taking a clear environmental standpoi

The added benefit of the reduced noise levels when the batteries are running, is harder to estimate particularly when taking the staff's well-being, and the interests of the local community into consideration.

## Underwater lighting

Energy efficiency is becoming an increasingly important topic not only for the actual feed barge but also for adjacent technology. Take underwater lighting as an example: Here, UV lights have made its

impact as a considerably better alternative to metal halogen lights. UV lights provide the same effect from far less energy and generate significantly less heat.

## Save energy with waterborne feeding

Another novelty that will contribute to making facilities more energy efficient is waterborne feeding. AKVA group is now reintroducing water as feed carrier, read more on page 3. Waterborne feeding has the

potential to more than halve the feed barge's energy consumption, which in turn may enable full electric operation.

AKVA group regards energy consumption as a topic that will have a considerable impact on the trends in our business. For that, we owe our customers a great deal of the credit. Each day, you challenge us to be innovative and find new and better solutions to your needs. We are still in the early stages of an exciting development.









Polarcirkel 860 Cabin

The new electric Polarcirkel open workboat.

## **Rigged RBBs for Rough Rides – and the first EL-Polarcirkel going into serial production**

These are exciting times for AKVA group's subsidiary Helgeland Plast as the first grade A and B certified boats hits production. On a parallel, the soon-tobe-ready Polarcirkel EL-boat will be featured at Skansen Docks together with Polarcirkel 790. 860 & 1050.

"Our customers have asked for boats for more exposed locations, and we are proud to deliver. The DNV certification ensures that the boats comply with the high standards set," says John-Atle Figenschau, Sales Manager Boats at AKVA group Helgeland Plast.

The Polarcirkel 1050 cabin workboat is now classified as category A - Ocean, as it is designed for winds over 40 knots and significant wave heights above 6 meters. The Polarcirkel 790 (open workboat) and 860 (cabin workboat) are classified as category B – Offshore, designed for winds to 40 knots and 4 meters

significant wave heights. The boats also have more fuel capacity. The fixed fuel tank has doubled from 210 to 420 litres.

"All Polarcirkel boats are loaded with smart details and unique features for safe operation in tough conditions, with emphasis on safety and the environment. The PE-100 plastic is also LNG-based with great recycling properties," Figenschou says.

## Polarcirkel EL-boats

Polarcirkel is also a central actor in Evoy's aim to build the world's fastest serial produced EL-boat. Evoy are using a Polarcirkel 860 as a base.

"We haven 't made big changes to the boat, but the engine room is smaller, the engine case is removed, and the floor is flat. It is a really attractive boat. In peak power, the motor can put out 600 hp and we estimate a top speed of around 60 knots. If we make the target this will be the fastest serial produced electric boat in the world," says Leif A. Staøstrand, CEO in Evov

Stavøstrand's vision is to eliminate boat emissions around the world and to change the boat industry the same way as Tesla has changed the car industry.

Figenschou at Helgeland Plast has already registered interest in the EL-boat

"It is an exciting new segment and an important development step from the industry. We have registered that there is a lot of interest in the project, especially from the tourism industry. We had 10 inquiries the week it was announced, and I'm

sure the aquaculture industry will follow once the boat is presented," says Figenschou.

Check out the 790, 860, 1050 and EL boat at Skansen

## Mooring reaching new markets

Part of the 170 tonne delivery to Tasmania ready to ship from Austevoll, Norway. Including a brand new rope ring for easy installation.

**Egersund Trading went** from local to global distributor overnight. A recent 170 tonne delivery to Tasmania included a brand new rope ring for easy installation.

"We have experienced a huge demand for mooring systems from all over the world. It is both challenging and fun," says Product Manager Mooring, Roar Østebøvik.

Egersund Trading became a global distributor of mooring systems as the company was acquired by AKVA group in 2018.

The company went from local deliveries in Western Norway to global deliveries, including a recent delivery to Tasmania.

"Our technology, products and expertise were to be given access to a wider geographical area through AKVA group's global presence and distribution channels We have mature technology for a broad audience and thrives on the strengthened geographical presence," says Østebøvik.

A brand new rope ring is a part of the solid and expanding mooring portfolio.

"The 66kg rope ring has steel ring and straps instead of coupling plates and shackles, has longer maintenance intervals, and is easier to inspect, maintain and assemble. The installation is quick and easy with the frame already assembled," Østebøvik says.

## "Technology that will change the way we work"

**AKVA group Software's** new cloud solution based on Microsoft Azure will not only save time. It will also increase the quality of the data and ensure that all data is available once the feeding has ended. "This is only the beginning," says Inge Forseth, Chief **Operations Officer Software** at AKVA group.

AKVA group have set up a new cloud solution which will change the way we work with fishfarm data in the future. The technology is based on Microsoft Azure and comes with all the benefits form a major cloud supplier. The new AKVA platform provides a unit possibility to transport information between systems, both AKVA and third-party systems.

The new platform provides unique opportunities for integrating systems, and get all the benefits from having the data in one place.

"The first integration between the feed systems and Fishtalk are already made and it is no longer necessary to manually enter feed data into Fishtalk. This is not just time saving but it increases the quality of the data and secures that all data is available once the feeding has ended," Forseth says

The data from the feed system is pushed to the cloud where the data is stored and given its global ID so that it can be mapped to the correct site and pen in Fishtalk. Several customers in Norway have been trailing the integration the first half of 2019 and they see significant time saving in the automation.

"This is only the beginning. AKVA see great potential to integrate with more systems like sea lice counters, biomass measurements, oxygen sensor and more. The farmers can use more time on analysing data and optimize their production when manual input is a part of the past," says Forseth.

## New apps

AKVA have developed several apps on top of the cloud solution both for Fishtalk Control and for Fishtalk Equipment. The apps are independent of the legacy AKVA systems, which allows them to display data from several systems in one app. The two main apps are for documentation and maintenance of equipment, and for biological registration respectively.

"The control app takes all the main registrations from Fishtalk Control into one app. There is no need for pen and paper or a Citrix connection to do registration of feeding, sea lice, mortality and readings from environmental sensors. The app is built with a modern and intuitive interface which easily allows the user to navigate between sites, pens and the different registrations.



Fishtalk Feeding Insight is another innovation. This app is an efficient tool for analysing feed performance on one site and to benchmark the feeding between several sites.

All registrations are standardized to eliminate errors in registrations. The standardized registrations give better consistency in the data, which sets a good base for big data analysis and machine learning," Forseth says.

Fishtalk Feeding Insight is another innovation. This app is an efficient tool for analysing feed performance on one site and to benchmark the feeding between several sites.

"Fishtalk Feeding Insight brings you all the information you need to get control of your feeding performance. Data from the feed system combined with Fishtalk data gives a unique possibility for analysis of feeding performance. The new intuitive interface allows you to drill down from multiple farms to a single feed system. You can analyse and validate your feeding strategy through the close to real-time data. The combination with FCR data from Fishtalk and feeding data from the feed system will give new insight and help the farmers make good long- and short-term decisions," says Forseth.



The app is built with a modern and intuitive interface.

Software is important for AKVA group 11



**By Hallvard Muri**. CEO, AKVA group

There are expectations for digitalization and predictive analytics to play an increasingly important role in the aquaculture industry. With our current Fishtalk and AKVAconnect solutions, we are positioned to participate in this development.

During 2018 our team has focused on the development of new cloudbased solutions, which will provide more seamless data transfer and opportunities to process large volumes of data from numerous sources. We are committed to continue making investments that will create value for our customers and enable us to grow this segment of our business.

Main products include all Fishtalk-TM software such as production control, planning, traceability and ERP software for both the aquaculture and the fishing industry Main markets include Norway, Iceland, Canada, Chile and UK. AKVA group is the market leader in software.

We see an increasing demand for documentation and knowledge of both equipment and biology. New technology offer several exciting opportunities such as AI for interpretation of images and site data to provide better decision support.

Software will become even more important in the time to come.



# steadily.

"We have recently signed a contract for the lease of new offices in Puerto Montt, Chile, providing our team with the space to grow and consolidate within an optimally designed work environment. Today we employ a staff of more

## The sturdiest pen to date



More than 45,000 Polarcirkel pens are supplied worldwide.

"We have listened to feedback from the experts - the fish farmers who use the pen every day – and created a sturdy pen with more functionality, seeral health. environmental and safety enhancements, and not least; a pen well suitable for exposed locations," says Dag Kolberg, Product Manager in AKVA group.

The Polarcirkel 500R is the latest concept from the renowned Polarcirkel brand. The 500R overtakes the Polarcirkel 630 as AKVA group's "flagship" pen; with several similari ties but also with major differences.

"The difference is in the details. We wanted to create a best possible product and have made great progress with the Polarcirkel 500R. We believe this product will meet the high expectations of modern fish farming," says Kolberg.

The details may be hard to catch from a casual point of view, but

experienced users might appreci-ate the changes made. It's in the details: Improved HSE, built-in strong birdnet pole socket and other improvements for a stiffer pen, strong bollards for tying up boats to the pen, attachments for bottom ring and nets, an improved walkway, new bracket design, poles, pipes and railings on the outer side of the walkway for a safer passage and more.

"It's also designed for exposed locations. Requests for fish farming equipment suitable for rough sea and harsh weather is more and more common, and we are always looking at trends and listening to customers' needs in our product development. Several of the enhancements with the Polarcirkel 500R will also become standard to our pen portfolio," says Kolberg.

Strength calculations, analyses and physical tests have played a major role in the development of steel clamps.

"The result is a well-worked and very solid brackets that can withstand extreme stress. Perfect for rough locations," says Kolberg.

Another addition to the pen equipment is the Polarcirkel Crossover Bracket; a robust and user-friendly accessory that makes everyday life on the pen a little easier with the ability to attach all necessary accessories such as pipes for cables, feedpipes, lice skirt and more.

"The Crossover Bracket has become a valuable asset and heavily requested among fish farmers. It is easy to install and applicable to several user-cases," says Kolberg.

AKVA group and Polarcirkel invented the plastic pen in 1974 and has since then supplied more than 45,000 Polarcirkel pens worldwide The pens are made from PE raw materials especially suited for the dynamic loads of the sea, and are available in a wide range of models, shapes and sizes to suit individual needs.



The nets are easily connected to rugged PE plastic brackets. No metal parts that will create corrosion problemes.



us at Skansen

Well-worked and very solid brackets that can withstand extreme stress.

## **Exciting Times Ahead for Land Based in Chile & Canada**

In 2017, Land Based Americas became an integrated business unit, combining years of experience in design and installation of RAS facilities across the region of the Americas. Since then, the unit has been growing

than 60 people, including a design team, technical staff, site managers, installation crew, support engineers and sales experts, all working in collaboration with the Danish organization. This allows us to work closely with our customers and provide locally adapted solutions that fulfill their needs," says Mary Ann Rademacher, General Manager in AKVA group Land Based Chile.

"When we look back over the past two years, we can see how our efforts have been rewarded. We have delivered 6 new land based systems in Chile and Canada and are currently in the process of delivering another 9, thereby extending our customer base and giving us a firm foundation to continue expanding our operation and our team," she says.

The next couple of years look promising for Chile and Canada. More than 10 systems are in the final stages of contractual negotiation, and some promising prospects are in the pipeline.

"We are also exploring projects outside of our traditional salmon market and are looking to grow into other species as the aquaculture world expands. The future for Land Based Americas is exciting," Rademacher says.

GROWTH: General Manager in AKVA group Land Based Chile, Mary Ann Rademacher in front of the existing premises in Puerto Montt, Chile. Her team are now moving to new premises for space to grow and consolidate within an optimally designed work environment.





## Fish in Atlantis : "A potential game changer for aquaculture"



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

In May 2019, the first fish were deployed in Atlantis Subsea Farming's submersible pen and an exciting test period kicked off. "If the technology also allows us to use more exposed locations, this is a solution for the future." says project initiator Finn Sinkaberg.

Atlantis is a part of AKVA group's strategy to investigate different concepts to keep the biomass low in the water column. In Atlantis, fish is kept down in a submersible pen with access to air via an underwater air dome. The companies behind Atlantis Subsea Farming are AKVA group, SinkabergHansen and Egersund Net, and the collaboration started in 2014.

"I am happy to say that we have reached a very important milestone in the project by the operation in May when fish was transferred from an ordinary pen to Atlantis," says Trude Olafsen, the project manager of Atlantis.

"I have great faith that this may be a solution in certain locations with rough conditions at the surface. We have developed a lot of experience in keeping the fish deep in ordinary pens by using deep feeding and appropriate lighting, and we see benefits from that in the form of less sea lice infestation, among other things. If the technology from Atlantis Subsea Farming also allows us to use more exposed locations, this is a solution for the future,"

says Finn Sinkaberg, who took the initiative for the project.

Atlantis Subsea Farming was granted a development licence in March 2018 giving the opportunity to test the concept on fish in largescale trials. Design, construction and technological testing has been focus in 2018 and 2019, and now the fish behaviour and growth will tell us whether the concept gives a productive and healthy production environment or not. If the project succeeds with salmon, the concept is easily transferable to other spe-

## Large-scale testing

"We have had our challenges along the road, and what we are trying to achieve is not easy. One of them is to try to make the underwater air dome stable within what I would call an "unstable" system.

The development license gives us the opportunity to test the technology on actual biomass for three generations – and this is essential for the project," Olafsen says.

## Normal fish behaviour

Transferring fish from an ordinary pen to Atlantis in May was a very well-planned operation, and the main focus of the operation was to stress the fish as little as possible. The fish was deloused with a mechanical method three weeks before transfer. Cameras and ROV, as well as the sensors associated with the infrastructure, provided valuable information while submerging Atlantis down to 25-30 meters below surface. Submerging the pen takes about 30 minutes and the fish became a little uneasy in the middle of the process, but it calmed down after a few minutes when the pen had stabilized itself and started to establish an ordinary swimming pattern. The fish started to show interest in the feed the next day.

After six weeks in a submerged cage the results are promising. Swimming speed is monitored every day and so far, it is normal which indicate that the fish is able to fill their swim bladder in the air-dome as planned. Feeding rate and feeding behaviour are normal, and there is hardly any mortality during those weeks.

Very experienced people from SinkabergHansen's operational staff is following the fish every day through six cameras covering all the depth in the cage, and so far, they can only observe normal activity and behaviour. "The fish is steady down at 25-35 meters below surface and it is a nice and calm environment for the fish down there. The feeding response is good and the swimming patterns normal, we are so far very satisfied," says Tronn-Ove Øren, the dedicated Atlantis person at the site.



The sensors associated with the infrastructure provided valuable information while submerging Atlantis down to 25-30 meters below surface.



## The technological solution

The first version of the submersible pen is now product-certified for that specific site. The submersible pens can in principle be moored with regular frame moorings and the circumference of the pen is 160 meters. The plastic pen is filled with water before being submerged and then filled with air when the cage is raised. The entire process is remotely controlled by the AKVAconnect system from a barge or from land, with dedicated software programmed for this system.

In the middle of the net-roof the air dome is giving the fish access to air, and also the waterborne feeding system, lights (AKVA Aurora SubLED) and cameras are connected to the dome.

What we have learned about waterborne feeding in Atlantis, AKVA group is now taking a step further in developing a waterborne feeding system in combination with the flexible feeding system. In Atlantis the waterborne feeding makes it possible to feed at 25-30 meters below surface with a good and steady spreading pattern.

The investments are all in all justifiable in relation to the operational benefits it is expected that Atlantis will provide.

## A scientific approach

Atlantis is cooperating with Frode Oppedal and his research group at the Institute of Marine Research through the DeepDome project, which is funded by the Research Council of Norway. "It is important for us to have a scientific approach in the project and especially when it comes to documentation of fish behaviour and production

efficiency. This is essential and Frode and his group are maybe one of the best research groups in this area worldwide," Olafsen points

## Deep sea operations concepts

- 1. Fish are kept in the deep voluntarily with deep feeding and lights
- 2. Fish are given access to a limited surface in a Tubenet 3. Fish is kept down in a sub-
- mersible cage with access to artificial air

Concept no 1. and 2. are in the market and Atlantis is still an innovation project. AKVA group is working continuously to improve the different concepts.

Crucial in all three deep operation concepts is to really understand the biology and how the fish react on environmental changes and how the technological solutions interact with the biomass. There are also considerable challenges in developing good operational practices and solutions.



1. Fish are kept in the deep voluntary

## Three different concepts for deep operations.



2. Fish is given access to a limited surface



3. Fish is given access to artificial air



Farmers experience an overwhelming pressure to constantly interpret and apply correlations with fish activity, feeding patterns and more. AKVA Observe provides constant analytical and objective evidence of how the fish react to food and different conditions

## Artificial Intelligence is shaping the future of aquaculture



**By Petter Idar Jenssen** SVP Digitalization, AKVA group

By designing a sophisticated and dynamic artificial intelligence system, our aim with AKVA Observe is to convert aquaculture from art into more of a science.

Salmon farming has expanded significantly over the past 30 years, resulting in phenomenal growth and a footprint where most suitable sites are already being utilised and at capacity. Future growth relies on the industry to optimise existing farms and to further industrialise new concepts both off-shore and on-shore. It is well recognised that most farms have the potential to be further optimised with regards to feed optimisation and fish welfare, together accounting for more than 50% of farming costs.

## **Emphasis on Al**

While past innovations have focused on hardware and data collection, we discovered the problem is not a lack of data, but the rigour and overwhelming pressure for farmers to consistently interpret that data and apply correlations with fish activity, feeding patterns, sensory data, food particles and other historical information in real time. In 2018, AKVA group went into partnership with Observe Technologies and formed AKVA Observe in order to bring a new intelligent feeding assistant to the market. By designing a sophisticated and dynamic artificial intelligence system, our bold aim with AKVA Observe is to convert aquaculture practices from art into science. The market response has been incredible and to data over 20 farms around the globe are using the solution.

## Uses existing infrastructure

AKVA Observe is built to be adaptable and empowering for farmers without the hassle of introducing new equipment in the pens. We use existing camera streams found in salmon farms, analyse them in milliseconds and provide a standardised view of fish activity and detection of food particles at different depths. Through the combination of these factors, we



A simple bar underneath each video stream swings from green to red to suggest feeding based on all the data streams flowing through the system

can learn pen-based trends and appetites to identify suggeste optimum volume of food delivery for satiation in real time. Furthermore, companies have the opportunity to plug in sensors, feeding systems and other auxiliary data to make the analysis more comprehensive supporting higher automation of farms.

## Remote site level analysis

For the first time, farms haveconstant analytical and objective evidence of how the fish react to food and different conditions. As aquaculture booms as a sector

and more sites are licensed, our AI systems leverage cloud infrastructures to give remote site level analysis and anomaly detection to degrees never seen before.

## Just the beginning

We have made sure the farmers are the lead and the heart of our development. To understand the problems faced by operators, we have operated on fish sites across multiple continents to develop not only an initial product, but a roadmap of development to ensure that our software is a complete investment for the platform of the future.

As a result, anecdotal feedback has been positive across the world. Going forward, we intend for AKVA Observe to automate entire aspects of the feeding process, bringing significant increases in productivity and lowering costs for consumers. We will be introducing systems to measure the weight of the fish automatically in the water taking out the manual process. When scaled, the impact this will have on the economy and environment is immense. It also allows us to better monitor the health of the pens, using anomaly detection to identify at-risk sites and respond before they become an issue.

There are several good ways of delicing salmon, but what if we were able to prevent the fish from getting lice in the first place? How much could you save per generation if you could avoid delicing?

the concept.

## A net inside the net

12

## **AKVA**GROUP

## **Tubenet reduced lice** infestation by 80%



By Bjarte Sævareid T&D Senior Manager – Marine Infrastructure in AKVA group

Salmon lice are a part of everyday life for fish farmers, and the cost of delicing has to be factored in for each new generation of fish. But if we could prevent lice, we would substantially improve our profit. Over several years, our subsidiary Egersund Net has developed the Tubenet, a method for preventing lice. We have ample proof from thorough testing and improvement and are still gathering experience through a phased introduction to the market. In this article, I will give you a brief explanation of what a Tubenet is, what benefits to expect, and what research findings the Institute of Marine Research in Norway have gathered over a few years of testing

Tubenet is a cylindrical tube made of tarpaulin that is attached to a smaller buoyant pen inside the main pen, and that stretches down to the desired depth by means of a bottom ring. The tube usually has a circumference of 90 meters in a pen with a circumference of 160 meters.

From the bottom ring of the tube, a roof of netting stretches to the net wall in the main pen. This means the fish can remain in the deep under the net roof, but have access to the

surface through the tube, where there is an opening. The net roof keeps the fish away from the upper water layer with the most massive lice presence, while the tube protects the fish from lice when it heads up to the surface to fill its air bladder.

## Prevents lice infestation

Thanks to the Tubenet, the fish stay at depths where lice presence is minimal. When it heads up to the surface to fill its swim bladder with air, it is protected by the tarpaulin which encircles the tube in the middle, all the way up to the water line. When used properly, lice attacks can be reduced without handling the fish.

The added safety of having two net walls in the upper part of the pen hat holes in the outer wal caused by, e.g., drifting objects or boat traffic, do not cause escapes. Also, because most fouling occurs on the upper part of the net wall, cleaning is not needed as often or as powerfully as in a traditional pen, which means less wear and tear on nets and reduced stress for the fish. The shape of the tube also allows the creation of a controlled freshwater layer on the surface, which can be used, for example, in conjunction with AGD treatment.

By combining Tubenet with cleaning fish, light, and underwater feeding, you can achieve an even better

## Not for everyone

preventive solution.

Tubenet cannot be used everywhere. We find that local conditions such as currents and wave heights determine whether this is a suitable solution for any given fish farm.

By combining Tubenet with cleaning fish, light, and underwater feeding, you can achieve an even better preventive solution.

Some operations at the worksite will be more difficult with this solution, e.g., it becomes more challenging to use traditional mort collector nets, and a mort collector system with pumps (lift-up or equivalent) should be used instead. We have also found that so far Tubenet demands more high-qualified personnel than if standard pens are used.

We continue to work on further optimization of the product. The development period has clearly shown that Tubenet will be a vital tool in the fight against lice, and will thus contribute to increased fish welfare, improved growth, reduced environmental impact, and increased profitability.

"In summary, the results clearly show that the presence of lice will be almost 0 if the snorkel is deep enough, or more correctly, if the fish swim deep enough"

- The Institute of Marine Research



Large-scale trials of the tubenet have been performed since May 2014.

## Years of research and development

Tubenet is still a concept under development. The first small-scale tests of the concept started back in 2011. We have now completed several large-scale tests, and as you read this, we are collecting results from four commercial fish farms using Tubenet.

What we have learned so far have already produced significant change in design and materials, and scalable experiments at SINTEF define specifications to withstand wind, current, and wave height.

## Impressive test results

We have tested the concept over seve eral years in close cooperation with the Institute of Marine Research and Bremnes Seashore, and the results so far are indisputable: Tubenet reduces the presence of salmon lice.

Here are some of the findings:

- Lice presence decreases with the depth of the tube. At 16 meters, there are virtually no lice.
- A 10 meter tube reduces lice presence by 76 – 80%
- The need for lice treatment is reduced by 50%
- No difference in fish welfare
- between Tubenet and control pens

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## Stepping up land based operations in Norway



The new office is headed by Ole Jonny Nyhus.

**AKVA group Land Based** recently opened a new RAS office in Trondheim to assume an even stronger position in the Norwegian market.

"We're experiencing an increased demand for our services and have been growing fast during the last couple of years. In 2018, we opened a Sales and Service Office in Bergen, and now we're expanding further more with an additional office in Trondheim. This will become our head office for RAS projects in Norway," says Morten Nielsen, COO Land Based in AKVA group.

## **Closer to customer**

The new office in Trondheim will house RAS technology specialists

and will play an important role in managing and coordinating the company's Norwegian RAS projects. Ole Jonny Nyhus, who has extensive experience with land based projects from AKVA group Land Based's engineering department at Sømna, heads the office.

"By establishing a new office we will not only increase our presence in the Norwegian market, but also get closer to our customers. RAS projects are incredibly complex, with advanced technology and major investments in play. Thus, this is an important strategic move to provide our customers with the best possible support throughout the project life," Nyhus says.

## International team

The Trondheim office is strategically placed in the center of the Norwegian industry. The office will have a close collaboration with the other units within AKVA group Land Based, in particular the Danish department, which comprises a large group of RAS specialists with extensive international experience. The land based division in AKVA group has already had a close cooperation across boarders through several years, and is now counting 160 employees in Norway, Denmark and Chile.

"The experience and expertise we possess as a team is our biggest strength. But it is also important to be able to adjust to local needs and maintain a physical presence to our customers. The development of the Norwegian maket is very exciting and through the establishment of a separate RAS office in Norway we aim to assume an even stronger position in the market," says Morten Nielsen.

## **Crystal clear images in Full HD**

SmartEye Precision HD delivers crystal clear underwater video images in Full HD even in difficult lighting.

"This is the next generation camera. The SmartEye Precision HD comes with Full HD, a high quality lens for better depth and sharpness, a gyroscope stabilizer, built-in depth and temperature sensor, day/night function, a reusable camera home, adaptive noise reduction and auto-adjusted color balance. SmartEye Precision HD

is a solid successor in our product portfolio," says Bjørn Sirnes, Group Marketing Manager & Business Development in AKVA group.

Being highly light sensitive, the camera will deliver excellent video images even when filming down into deep and dark cages.

The advanced double feeding and inspection camera is easily operated and can be moved both horizontally and vertically in the pen. The camera is supplied as an integral part of the new control system AKVAconnect 4.0 and can be controlled via a web browser through wireless video transmision. "User experience and simplification of the fish farmer's tasks is key. The pan/tilt functionality provide 360 degree motion for full overview and the camera comes with built-in depth and temperature sensors.

Combined with one of our winch systems, the SmartEye Precision HD provides excellent insight into the feeding response and the condition of the fish," Sirnes says.



SmartEye Precision HD provides full control below the surface

## Lot of first's in Eastern Canada

It is exciting times on the East Coast of Canada as a lot of first's are happening for the region.

The start of two new feed platforms has started with the collaboration from AKVA group, local builders, fabricators and tradesmen to bring the client the product they required for the growth of their company. The builds will bring two new twin line feed systems to the growing

Eastern Canadian sector, while growing local rural jobs.

As for net cleaning, the first FNC8 2.0 for North America was delivered in July. When the client went looking for the newest and most adaptable net cleaner to expand it's services offered, they stopped looking when they came across the FNC8 2.0. The ability to fly the net cleaner to reduce wear on nets and the ability to track positioning and provide reports with precision accuracy made it a easy choice for them.

The use of cleaner fish in Eastern Canada has been gaining momentum and the results are very positive. To protect their cleaner fish stock and provide fish welfare AKVA group North America and OK Marine worked with producers to provide them with the right product for each specific site, this effort has lead to the first installation of cleaner fish hides and feeders for the eastern region.

Leonel Sarmiento Palma (right), Techical Services Manager for AKVA Group North America Eastern Region with Steve Bent of Risers Construction at the build site of the new feed platforms.



few years?

"We have both a diving department and many ROV systems, but we acknowledge that the trend is moving towards more ROV usage, and we are gradually moving in that direction ourselves. We use a Sperre ROV to drill bolts in deep water, and there is no doubt that the HSE aspect is easier to safeguard with an ROV. It can go several hundred

## **AKVA**GROUP

## Will ROVs replace divers in aquaculture?



TO NEW DEPTHS: Sperre Sub-Fighter 15K with drill. Visit Sperre 's stand at Skansen Dock to get a close look of the ROV.

The question is becoming more and more frequent. Experts predict close to zero dives in 3-5 years. Arild Aasmyr, CEO in FSV Group, acknowledges the

In recent years, remote-controlled underwater vessels such as ROV and FNC (Flying Net Cleaners) have become increasingly prevalent in the aquaculture industry. They replace work that was previously done by divers. Will they replace divers in aquaqulture within a

FSV Group is a leading service provider to the aquaculture industry that offers operation and rental of special vessels for work operations above and below water. They also have a special focus on HSE.

meters without problems, while that is impossible for a diver," says Arild Aasmyr, CEO at FSV Group.

Commercial diving is among the most dangerous occupations in Norway. The number one priority of any diver is safety; running out of air, decompression sickness, nitrogen narcosis, differential pressure and currents are all potential risks. With ROVs you don't need the same HSE precautions. Aasmyr thinks a combination is feasible going forward.

"We have a good dialogue with our divers regarding technological development, and we are constantly working to limit the risks of diving operations. The ROV has its advantages in several areas, but so has the divers such as in net repairs. I think a combination is sensible for FSV Group going forward, but the ROVs will probably take over more of the work over time," Aasmyr says.

The limit for divers is basically depth. An ROV can get to thousands of metres. It can stay in the water. And it can go deeper with no physical limit. Brynjar Karlsen, CEO in Nærøysund Aquaservice, has gone "full ROV".

"We see an increase in the mapping and drilling segment with an increasing use of ROV. Especially

lowering of bolts in deep water," Brynjar Karlsen, CEO in Nærøysund Aquaservice says.

With ROVs he is able to drill and secure bolts that can handle 120 tonnes load on depths of several hundred meters.

"The trend seems to be more ROVs and less divers, but I think there still will be a need for divers in aquaculture. However, the technology development are so fast-paced that it is almost impossible to predict how it will look in

5 years. The ROV will be preferred as long as the quality of the work and the price matches ordinary diving. The operating time for an ROV is of course beneficial," he savs.



The limit for divers is basically depth. An ROV can get to thousands of metres.

## Success with new setup for cleaner fish hides

Lerøy Midt and OK Marine have developed a new robust standard for cleaner fish hides over the last few years.

A cleaner fish that thrives will live a better life and eat more lice," says Head of Lerøy Midt's cleaner fish program, Erik Bårdseng.

Together with OK Marine, he has been involved in developing a new hide solution for cleaner fish. The solution is now standardized at Lerøy Midt.

"We have experienced a great improvement in fish survival after we designed the new hide solution. The result is very good; we have great control, the fish thrives and the handling of the cleaner fish is much easier," says Bårdseng. The new hide standard consists of several important elements.

"The cleaner fish is dependent on having an area where it can feel safe, so we have set up several hides and corridors where it can rest and hide from the environments. Thus, there will be less struggle for territory and less struggle to find resting places.



Over time, we have optimized the environment by testing different hide sizes and different setups. We also went from double-folded kelp to triple-folded kelp to add more volume, pockets and hiding place.

The cleaner fish now gets the peace and security they need when moving in the hides," says Bårdseng. The process has been long and thorough, with tank testing in Hirtshals, Denmark, and with several adjustments along the way.

CLEANER FISH SUCCESS: Erik Bårdseng, Head of Lerøy Midt 's cleaner fish program.

"It is important for us to cooperate with companies who focus on quality, and OK Marine has developed the products considerably in a short time. The fact that they also have certified their product shows that

they are actively working to create the best possible product and at the same time meet the requirements in the industry," Bårdseng says.

## **Recycling 99,99% of the water**





Tytlandsvik Aqua is located in Hjelmeland, Norway.

in the RAS systems. Planning started in July 2017, and construction 4 months later.

In December 2018, the first unit was ready to receive 180-gram smolt from Fister Smolt. The second unit was commissioned two months later.

"So far the experience with the system are positive, having the first batch delivered and the next two well underway," states Nils Viga, executive in Tytlandsvik Aqua.

Tytlandsvik Aqua invested \$36 million in two, state of the art facilities, recycling 99,99% of the water in the RAS systems.

Hopes are high that Tytlandsvik Aqua's new facility will raise harvest volumes to 100,000 tons in 2020, with the goal of better fish welfare and survival, lower environmental footprint per kilo and lower costs.

Tytlandsvik Aqua signed an agreement with AKVA group to deliver two large RAS systems for production of salmon smolt up to one kilo in the Hjelmeland municipality of Rogaland. The system has an overall tank volume in excess of 15,000 m<sup>3</sup>.

Aquaculture giants Grieg Seafood, Bremnes Seashore and Vest Havbruk are owners of the new facility that opened its doors in June 2019.

The new RAS facility is capable of producing 3,000 tons of post-smolt each year for delivery to fish farms.

Sales Director in AKVA group Land Based, Jesper Lund, Lead Designer of the facility explains

"Facilities like this is a major step in bringing a larger part of Salmon production on-shore. Even the basic design parameters are known, it required quite a lot on new thinking and innovation to up-scale the RAS design, which we have managed well to make it work," he says.

"We see a huge interest in growing larger smolt in RAS, which makes perfectly sense, as larger smolt lead to shorter time in the sea, minimized environmental risk, and less treatment while in the sea," Lund adds.

Tytlandsvik Aqua invested \$36 million in two, state of the art facilities, recycling 99,99% of the water

## **AKVA**GROUP

## World's largest Arctic Charr producer expands facility



**By Jacob Bregnballe** Sales Director, **AKVA group Land Based** 

Samherii Fishfarming, the world's largest Arctic Charr producer, is now in the process of expanding its fish farm at Núpar, Iceland, that was severely damaged due to a fire.

It was in late June 2018 when Samherji's farm at Núpar was heavily harmed due to a fire in the electrical system. Since then, Samherji has been renovating its facilities at the site. The Núpar station is the centre of juvenile salmon and Arctic Charr production for the Icelandic entity. The farming system is designed as flow-through

mixing cold Icelandic well water with warm geothermal water and thus driven by green renewable energy. The station was originally built in the 1980's and consisted of a start feeding hall with a number of small 2m<sup>3</sup> tanks and a juvenile hall with 11m<sup>3</sup> and 44m<sup>3</sup> tanks, including an outdoor area with larger tanks.

In the first phase of the renovation AKVA group Land Based supplied 12 pcs. Plastsveis tanks at 28m<sup>3</sup> each and an Aquatec feeding system installed in the juvenile hall. In the second phase of the project a number of 10 pcs. 22m<sup>3</sup> Plastsveis start feeding tanks have been delivered.

The renovation will be completed by an extension of the main building where six new tanks will be installed, each around 100m<sup>3</sup>. All tanks are delivered with Plastsveis inlet systems and outlet boxes in addition to Plastsveis fish transporting system.

The farming system is designed as flow-through mixing cold Icelandic well water with warm geothermal water and thus driven by green renewable energy

According to Gunnar Dagur Darrason, Station Manager at Núpar, the expansion will increase the production capacity of juvenles by 50%. He is also optimistic that fish from the new systems will have better SGR and less mortality in the Icelandic land-based grow-out farms.

## During Aqua Nor 2019, everyone can visit and explore this state-of-the-art AC 600 VR feed barge at the Skansen Dock display area.







Better fish welfare and economic benefits goes hand in hand when you regularly sort out fish that are slaughter-ready.



Carsten Wangsmo (66) found a niche in aquaculture and stayed put. Today he is making great success on fish grading systems.



The grading system increases the growth of smaller fish in the cage and hypothetically lower the feed factor.

seconds.

fish

AKVA group have focused on lice prevention technology for a long time, including tubenet, subsea feeder and underwater lights. The AKVA FLS Delouser complements the product portfolio.

"Our customers take fish welfare seriously and it is important for them to treat the fish as gentle as possible. Good fish welfare, combined with the fact that the system is easy and efficient to use is key," Sagen says.

AKVA FLS Delousing has been developed by Flatsetsund Engineering AS. They supply various types of industrial equipment for the aquaculture industry; the first version of the delousing system was introduced in the early 2000s, and in 2018 the 10th generation was launched.

## Grade fish for a living

"To grade fish has always been attractive. It's all about grading bigger more dominant fish from smaller vulnerable fish to optimize production for the fish farmer." Carsten Wangsmo says.

Bergen-based Wangsmo has been a part of fish-related industry since the eighties and worked with feed technology in the aquaculture industry from 1987 - before starting on his own in 1990.

In 2003, he found the fish grading systems to be both expensive for the farmer and stressful for the fish. His answer was 'Flexi-Panel' Grading System. A passive-grading device for size-grading live fish in the water - lightweight, flexible and allowing for quick, accurate and stress-free grading.

"The aquaculture industry has come a long way. We started with 12x12 meter pens with 2-meter-wide and

1-meter deep grading systems - and it was all easy to handle. The pens have evolved from 12 meters, to 15, 20 and 30 meter and the steel grading has become much tougher to handle in the process. Our largest system is 1000 square metres - and that is massive compared to our first efforts," he says.

The Flexi-Panel Grading System is used in Norway, Scotland, USA and Chile among other countries.

"Over the past 3-4 years, we have noticed an explosive growth in sales. We came up with a produc tion standard and philosophy in cooperation with Mowi (former Marine Harvest) and the word on the street spread," he explains.

Although the Flexi-Panel today mostly sorts salmon and trout, Wangsmo says there is unused potential for other types of fish.

"Farmers of sea bass, kingfish and vellowtail are also interested in the system. Another use case is cleaner fish and to sort wild fish from farmed fish. The potential is great," he says.

In 2018 Egersund Net (part of AKVA group) acquired 70 per cent of the Flexi-Panel Grading System. Wangsmo and his company Viking Atlantic owns 30 per cent.

## How does it work:

The Flexi-Panel is made of short lengths of rigid uPVC pipes combined in loops. The plastic pipes with a smooth surface are able to rotate - this way the fish will not damage the material or experience shell loss. The grading system is placed in the pen and the smaller fish swims through.

By passively grading the fastgrowing fish from the smaller ones, the large fish can be removed and slaughtered while smaller fish can grow to optimal size. The grading system increases the growth of smaller fish in the cage and hypothetically lower the feed factor.

"The hypothesis is that large fish prevent less fish from eating. By slaughtering it, the remaining smaller fish can grow to the optimal size," Wangsmo says.

## 5 reasons why grading systems are profitable

Better fish welfare and economic benefits goes hand in hand when you regularly sort out fish that are slaughterready. By removing large and dominant fish from the population, you facilitate for the smaller fish to gain weight.

- 1. Larger fish eats proportionately more feed than smaller fish
- 2. Increased average weight means a better prize per kg 3. Better utilization of the feed
- 4. Easier to hit the market prize
- 5. Cleaner fish are sorted before delivery



The plastic pipes with a smooth surface are able to rotate - this way the fish will not damage the material or experience shell loss.

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18

# Removes 95 percent of sexually mature lice

This gentle, heat- and chemical-free, delousing system puts fish welfare first. The gentle treatment enables the fish to feed again on the day of the treatment.

AKVA FLS Delousing System uses no moving parts, no heat treatment and no chemicals to delouse the

"We focus on delivering technology that promote good biology. This is a delousing method that place the fish welfare front and center, where only seawater is used for transport and treatment," says Hans-Øyvind Sagen, SVP Sales and Marketing i AKVA group Nordic.

The fish is transported through a delousing line and treated with lowpressure salt water in a closed system before being returned to the pen. The treatment time is two seconds with a total transport time of 10-15

## **Documented results**

This very gentle treatment method has proven results:

• The system removes 90 per cent of mobile lice, 95 per cent of sexually mature lice and 70 per cent of sessile lice

"The system can be used at all

says Lars Georg Backer, CEO of

Untreated fish are led into the

delousing line - counted and

Flatsetsund Engineering.

How does it work:

• A very low mortality rate of only 0.1 per cent • The gentle treatment enables the

fish to feed again on the day of the treatment

## Mature system



The treatment time is two seconds with a total transport time of 10-15 seconds.



Gentle treatment with AKVA FLS Delousing System.

## **AQUACULTURE CROSSWORD**

GODT COPPDRATT

Solve the crossword and win a cool t-shirt! Take a picture of the completed crossword and send to marketing@akvagroup.com to enter the draw.





Down

- 1. Production of aquatic animals and plants
- 3. Part per thousand
- 5. Indoor tanks where water is constantly filtered and reused
- 6. Colourless gas
- 7. Under water
- 8. Young salmon
- 9. Used for respiration and excretion
- 10. AKVA group net cleaner
- 11. Marine growth
- 14. Fish
- 16. Sperre AS
- 17. Common gas
- 18. What is a way of learning about the natural world?
- 20. Measure of acidity, 1-14
- 23. Floating marker
- 24. Young fish

Across

- 2. Recycling Aquaculture System
- 4. Norwegian AKVA group office
- 12. UAE port
- 13. Aqua Nor organizer
- 15. Micro-organism
- 19. All the members of a species inhabiting a given area
- 21. Ocean inlet
- 22. Parasite
- 25. Ocean stream
- 26. Fenced-in area

## Visit AKVA group's exibithion at Aqua Nor

AKVA group has the largest stand in hall D, number 338, and will be one of the first companies you meet when you enter through the main entrance. We will also be present at Skansen Dock, where you may enter our brand-new exhibition barge packed with innovations. We also advise you to drop our subsidiary Sperre ROV Technology a visit at the outdoor exhibition area by Skansen.





The exibithion area at Aqua Nor 2019.

Visit AKVA group 's stand 338 in hall D.