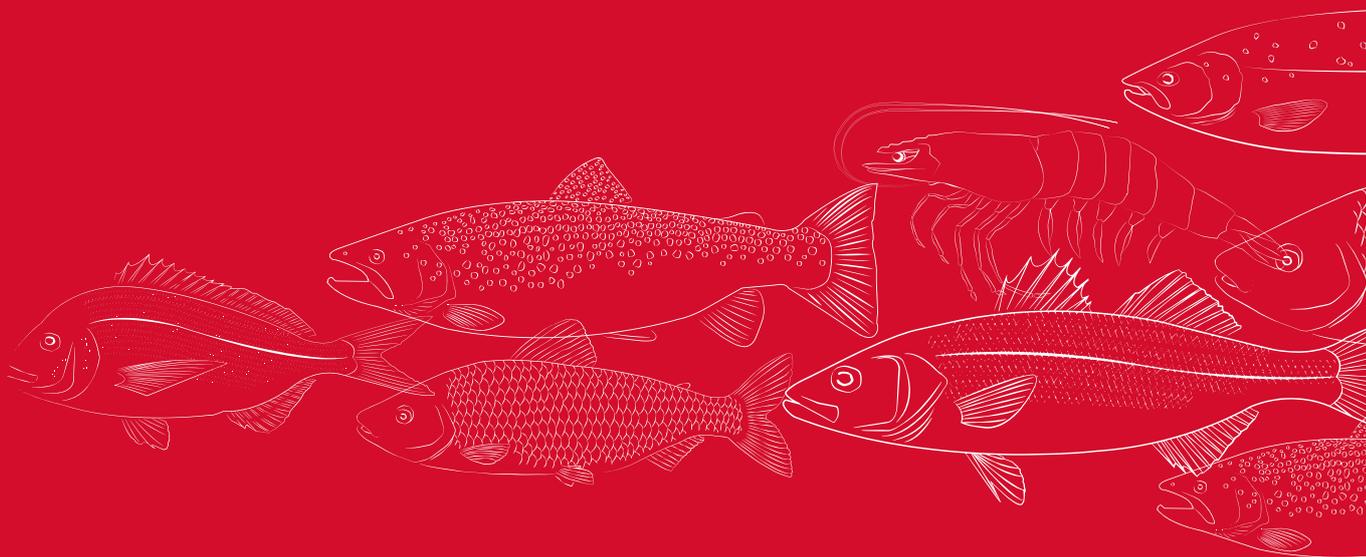


# RAS

## technical guidance

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# RAS at Skretting

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Skretting is a global leader in the production and supply of aquaculture feeds for more than 60 different species of farmed fish and shrimp to over 100 countries. Thanks to the world-class R&D at the Skretting Aquaculture Research Centre (ARC), and our large international team of scientists that lead the way in fish and shrimp nutrition, health and feed production, we are able to develop the right feed solutions to support fish growth, welfare and production of economically viable and sustainable seafood.

Skretting leads the way in the development and supply of feeds designed specifically for recirculating aquaculture systems (RAS). This journey dates to before 2009, when we became the first company to launch commercial RAS feeds. We have continued to pioneer advancements in this space ever since.

RAS farms are increasingly being introduced all over the world for the farming of a variety of aquatic species in more controlled settings. These intensive, usually indoor, tank-based systems deploy precise environmental controls to grow fish and shrimp within their normal climatic range, thereby allowing operators to prioritise production goals linked to market, regulatory parameters and resource availability.

The technology incorporated into RAS allows for close supervision of waste and effluents, while tighter control over water quality and the isolation from external biological and environmental challenges can help produce healthier aquatic species. At the same time, RAS provides the opportunity to greatly enhance feed management and the scope to promote consistent growth rates throughout production cycles to market size.

As part of Skretting's longstanding commitment to support this rapidly growing land-based aquaculture sector, our ambitious research and innovation teams are continuously working on new solutions and products aimed at meeting the growing needs of our RAS customers worldwide.

One of our most recent innovations for the RAS segment is our RCX concept. RCX builds upon our previous market-leading range, RC, but goes further by ensuring consistent structural integrity through a certified quality assessment.

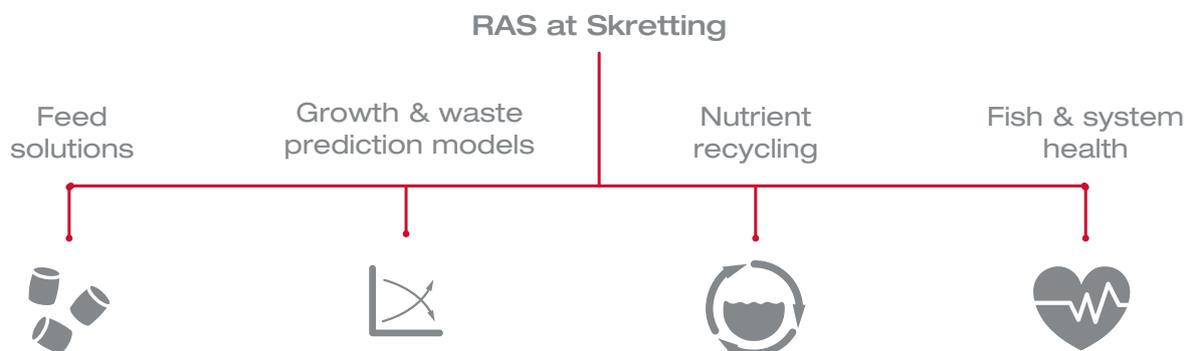
In addition to our focus on developing high-quality feeds and services, we actively seek to assist our customers with their RAS production. To ensure that all of our RAS-specific feeds continue to advance farm productivity and cost-efficiency, we have integrated powerful model-based testing, which provide valuable parameters and predictive tools for comparing feeds and production practices across batches. Furthermore, through our tailored suite of AquaSim management tools, RAS producers can receive recommendations on the most cost-effective stocking patterns, feed selection and feeding strategy to help them to realise their production targets.

Our extended RAS capabilities are also supported by a global network of Skretting RAS research units, each with an explicit area of focus, which is expected to prove invaluable in servicing RAS customers. This network includes a state-of-the-art Recirculation hall all at Skretting ARC's Lerang Research Station in Norway, which comprises 12 independent systems, allowing us to conduct trials not only on the feed, but also on the systems themselves.

Our RAS technical guidance aims to help our new and existing customers navigate potential issues with RAS and to also provide an easy, up-to-date way to access public information from a variety of sources can be accessed.

**We will focus on the four main pillars of our RecircReady concept:**

1. Feed Solutions
2. Growth and Waste modelling
3. Fish and System Health
4. Nutrient Recycling



# Feed Solutions

## 1. Why is it important to use a feed specific to RAS?

Fundamental nutritional requirements for fish in RAS do not change when compared to fish in sea pens or in flow-through systems, but due focus must be given to the specific needs of each production system.

RAS technology enables the water in the farming system to be reused. This is achieved by efficiently removing solid waste and dissolved waste that is naturally produced in the production system. Due to the limited water renewal in RAS systems, the high nutrient input of feed must be converted into fish biomass and easily removable waste.

If nutrients are not efficiently utilised or faeces are difficult to remove, the bio-stability and water quality in the system can be disrupted, thereby creating unfavourable conditions for fish – potentially limiting their growth performance and adversely affecting their health. This could also impact the ability to reach the estimated production yield and also the overall profitability.

