



FEED AND BIOFUEL

AQUA FEED TECHNOLOGIES

HOW CAN WE HELP FEED YOUR BUSINESS?

ANDRITZ

ENGINEERED SUCCESS

Feeding and fueling the planet

Dedicated to feeding and fueling the planet

ANDRITZ is vital to ensuring a reliable global supply of aqua feed, animal feed, pet food, and biofuel. With full process lines accounting for half the world's production of aqua feed and biomass alone, we continuously support leading producers in achieving the highest levels in safety, quality, and control from feedstock to final product.

**HOW
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LET'S FEED AND FUEL YOUR BUSINESS

The future of food and energy is full of ambitious ideas such as novel nutrient blends, unique feed properties that boost conversion rates, and high capacity process lines that virtually eliminate waste. To seize upon these opportunities, feed and biofuel producers demand a partner they can trust to deliver the right production capacity with the right service and expertise today – and for decades to come.

As a partner with more than 180 years of industry experience, no one knows more about these opportunities than ANDRITZ. From initial feedstock analysis to grinding, conditioning, and drying. From extrusion and pelleting all the way through to the largest parts and service supply chain on the planet. Together with leading producers in all major markets worldwide, our knowledge, services, and solutions continue to drive the evolution of tomorrow's feed and biofuel production.

The future of aqua feed starts here

Today's demand for cost-effective yet high quality, high-performance feeds make it clear that producing the best feed requires specialized processing technology. ANDRITZ is one of the world's leading suppliers of technologies, systems, and services relating to advanced industrial equipment for the aqua feed industry.

ADVANCED TECHNOLOGIES

We are strongly committed to excellent performance and the quality of our products, making us a strong partner for our customers. Our focus is on innovation and keeping up with technological developments in the industry. We strive to provide our customers with the newest technologies to ensure:

- Better and more efficient production
- Minimizing operation cost
- Maximizing energy efficiency
- Environmental protection considerations

We provide our customers with the technology that will give them a competitive advantage.

FEED PROCESSING TECHNOLOGIES

ANDRITZ is unique in their ability to manufacture and supply every machine for aqua feed production. With in-depth knowledge of each key process, we provide a compatible and advantageous solution, from raw material intake to finished feed bulk loading.

AQUA FEED

The fish farming industry is experiencing considerable growth in all regions of the world, creating an ever-increasing demand for high-quality fish feed.

The key to successful fish farming lies in correctly formulating a homogenous blend of ingredients with the right physical properties to match the unique feeding characteristics of the species being fed.

Our extruder program ensures the feed achieves these properties; giving it the appropriate sinking attributes necessary to deliver the food to the right location in the water where each of the different species of marine life eats.

COMPLETE PLANT SOLUTIONS

Our solutions are simple and effective. We strive to be a "one-stop-shop" supplying all your needs.

Our packages are tailor-made to suit the specific requirements of our customers, whether it is our extensive knowledge or expert engineering along with individual process machines, complete processing lines, or spare parts and service availability.

PROJECT MANAGEMENT

Our easy-to-operate plants, adaptable systems, short implementation times and proven performance make us the stand out partner for the aqua food processes. Our core competencies, leading technologies, and international business units work together in perfect unison. The ANDRITZ staff commitment and dynamics truly distinguish us from other suppliers. Experienced project managers teamed with specialized, subject area experts ensures that we exceed your expectations every time. Through outstanding performance, mastery of key process technologies, and engineering capabilities, ANDRITZ has become a leading global supplier of extrusion equipment and systems.

Being the largest supplier worldwide of equipment for the feed industry with more than 180 years of experience, five manufacturing facilities, and a global network of sales and service companies, plus a supplementary worldwide distribution network, we are confident in our claim that ANDRITZ is able to supply the optimum technology solution for any possible need in aqua feed plants.

WE OFFER

- Process line solutions
- Unit machines
- Technical consultancy
- Engineering services
- Aftermarket service and support



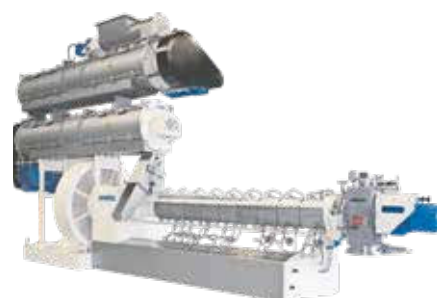
Whether it's sink or swim, ANDRITZ extruders will keep your aqua feed pelleting production afloat. The Expansion Control and Flextex Systems combine to perfect product density and sinking speed so your aqua feed is always a big splash.

MAIN MACHINES IN THE AQUA FEED PROCESSING TECHNOLOGY

Multimill



Extruder EX1021



Optimix



Extruder EX1250



Conditioner CM



Combi-zone dryer



Extruder EX618-EX621



Batch coater



Supplier of key machinery and complete process plant solutions

BULK INTAKE SYSTEM WITH ASPIRATION FILTER

Bulk intake hopper and conveying system with filter.

INGREDIENT SILOS AND HOPPER SCALES

Hopper scales for weighing individual ingredients in formula mixtures.

LIVE BIN

For pre-mixing feed ingredients prior to grinding ensuring optimum hammer mill performance and homogeneous particle size distribution.

MULTIMILL HAMMER MILL

Fine grinding is often used in the aqua feed industry when producing starter feed or scrimp feed. 3000/3600 rpm hammer mill with small hammer-to-screen clearance. Screen perforations as small as 0.75 mm. Capacity: up to 25 t/h.

ASPIRATION FILTERS

Fully automatic, continuously operating bag filters cleaned by compressed air. A variety of filters support any need for process air filtration throughout the entire extrusion plant.

PREMIX AND MICRO-INGREDIENTS WEIGHING UNIT

For weighing/metering premix and micro-ingredients in formula mixtures.

OPTIMIX PADDLE MIXER

Optimix paddle mixer for dry mixing or for mixing with large amounts of added liquids. Capacity: up to 40 t/h. Batches: up to 6 t.

CONDITIONER

CM series for pre-conditioning with addition of liquids and steam, providing optimum mixing and retention time. Dual conditioning for perfect blending with liquids and extended conditioning time, as well as availability of CRT first-in-first-out solutions. Hot start conditioning also available.

EXTRUDER EX0618-0621, EX1018-1021, AND EX1250

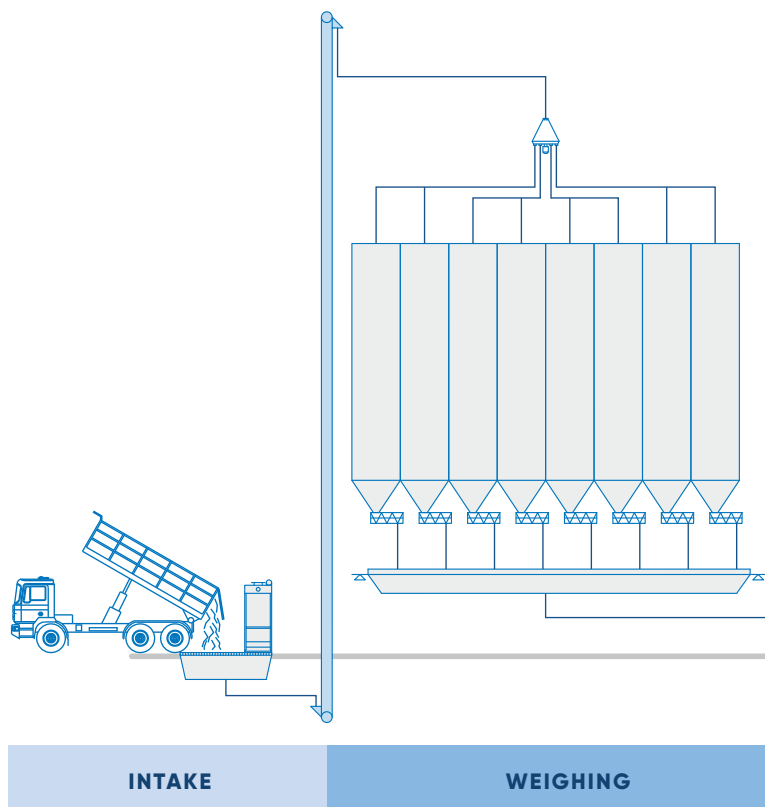
High-performance extruders, providing low operating costs combined with exceptional feed quality and unique process flexibility. Capacity: up to 20 t/h.

ECS AND FLEXTEx

Expansion Control System for in-line control over extruded feed expansion/sinkability. FlexTex for easy adjustment of extrusion SME during operation.

DRYER

Combi-zone dryer for the improvement of fish feed and pet food, covering a variety of production capacities (up to 30 t/h.) and product sizes (0.6-40 mm).



Additional unique features minimize the spread of product moisture and make it energy efficient.

COATER

Vacuum coater VAC - simple design for unique results, e.g. adding large amounts of liquids, no product damage, and production of special products. Capacity: up to 25 t/h and up to 35% added oil/fat.

COOLER

Vertical or horizontal coolers - orientation determined by the customers applications and preferences. Vertical counterflow cooler, model PCF. Capacity: up to 20 t/h.

PROCESS AUTOMATION

Automation systems are available as basic control systems, as fully automatic systems for control of each process machine or complete process lines. The system ensures cost-effective processing and consistent feed quality. The plant design with integrated automation solutions provides traceability of ingredients and process parameters.

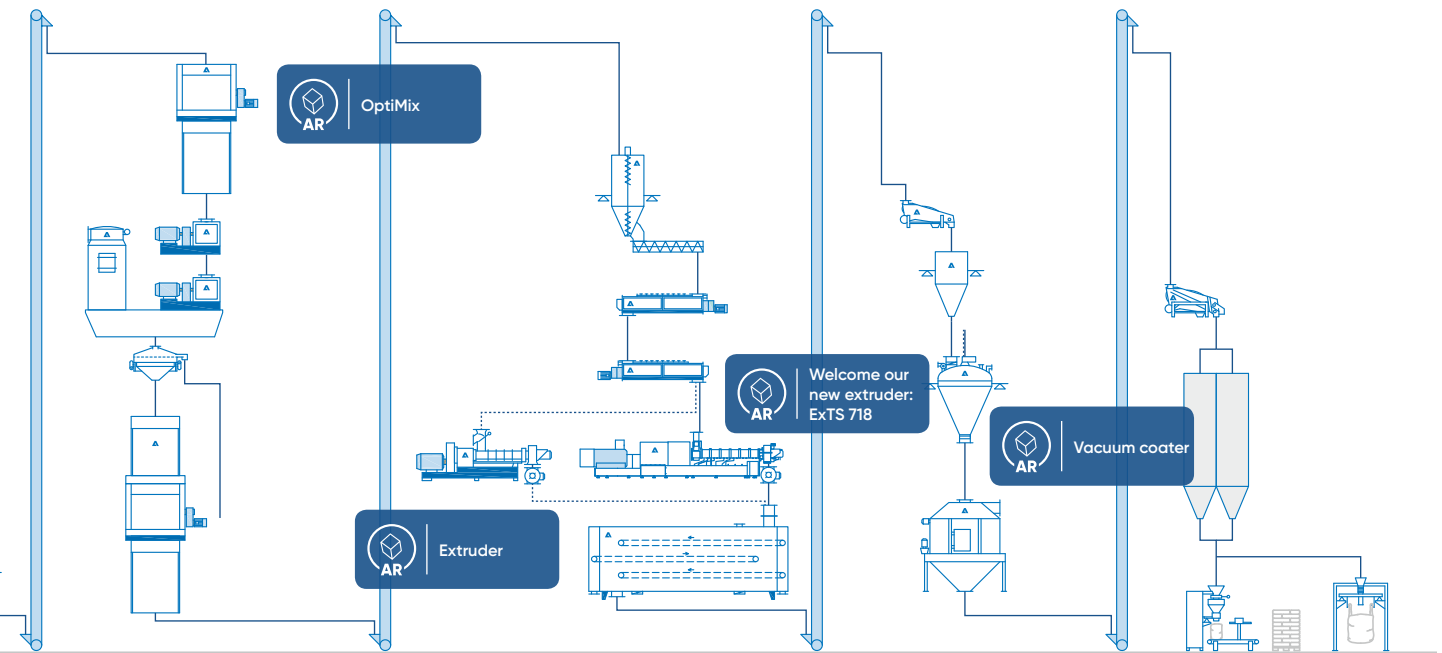
To view our machines in a more direct and lively way, we added augmented reality to our processing flows. Check it out.

HOW TO

Download our ANDRITZ AR APP on our website or in the AppStore/PlayStore



Scan the marked icons and experience the enhanced content.



| | | | |
|------------------------------|-------------------------------|------------------------------|--------------------------|
| GRINDING & MIXING | EXTRUSION & DRYING | COATING & COOLING | SILo / OUTLOADING |
|------------------------------|-------------------------------|------------------------------|--------------------------|

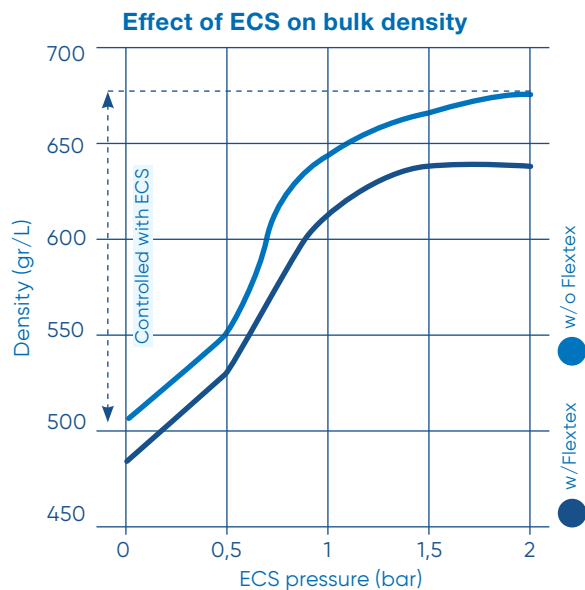
Advanced extrusion technologies for superior fish feed characteristics

Expansion Control System (ECS™) is a unique process technology for full feed controllability.

THE ANDRITZ EXPANSION CONTROL SYSTEM (ECS) – FOR INCREASED BULK DENSITY

The ANDRITZ Expansion Control System (ECS) is unique in its ability to control the bulk density of a wide range of products while also optimizing product quality. The ECS concept is based on controlling the expansion in the extruder knife house without influencing the product quality. Thus all desirable parameters can be used in the extruder without regard to expansion. The main focus here is product quality.

By adding compressed air in the knife house, it is possible to control and adjust the pressure. This is made possible by mounting an airlock under the knife house (see figure). Increased pressure in the knife house results in a reduction of flash-off and thus, increases the bulk density.

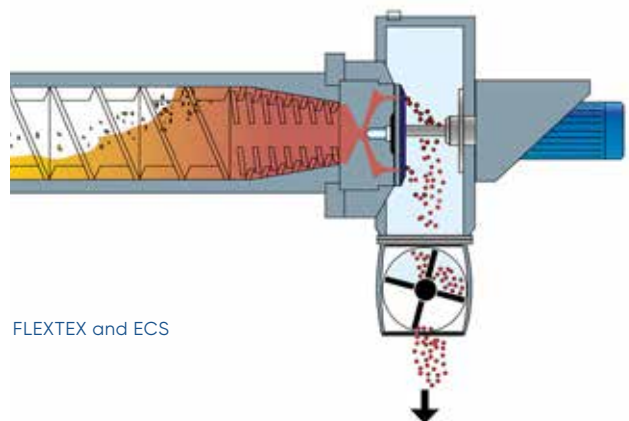


The ECS can increase the bulk density by 25% by adjusting the pressure in the knife house only.

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Extruder with ECS installed



FLEXTEx and ECS



Keep your business growing with our global service network

Our excellent aftermarket service and support is what sets us apart from our competitors. Our cooperation with our customers does not end with the sale – or the machine installation. The good customer relationship is extended through important after-sales service and support.

OUR SERVICES

Our highly skilled and motivated employees stand ready to help you with:

- After-sales services, support, and follow-ups
- Spare and wear parts, maintenance, and repairs
- Process optimization
- Training of plant operators

FIELD SERVICES

We offer our customers excellent field services, where our service technicians come to you and your plant for assistance. The depth and experience of our field service specialists is unmatched – backed by the full knowledge and technical support that only the equipment manufacturer can provide.

BENEFITS

There are several benefits to be gained from continuous upgrades, optimizations, and services on your equipment:

- Maximum production
- Process knowledge and experience
- Reliability and cost efficiency
- Reduced life cycle costs
- Short and effective shutdowns
- Improved energy efficiency



SPARE AND WEAR PARTS

ANDRITZ spare and wear parts warehouses are located at strategic locations worldwide.

ANDRITZ: Solid relationships help one of Ecuador's largest shrimp feed producers reach jumbo proportions

Empagran, the parent company of ABA Balanceados and pioneers in the development of aquaculture diets, is a fully integrated aquaculture company dedicated to the entire shrimp production chain. They manufacture feed for shrimp and tilapia, which they have been raising for over 45 years.

In order to cover the full production cycle of their shrimp, Empagran bought the feed manufacturing plant ABA Balanceados in 1998, which is located just a few kilometers away from their shrimp pools, the Somar packing plant and their headquarters in Guayaquil. Shortly after the January 1998 purchase, an expansion of the ABA plant was completed, allowing Empagran to produce 162,500 40Kg bags of feed per month.

At the time of this first expansion, ANDRITZ extruders were chosen for their ability to perfect a dense pellet that will not lose its structure underwater. Production manager, Mauricio Vernaza explains, "Since shrimp are bottom feeders, the pellet must hold together long enough to be discovered by crustaceans roaming the bottoms of the grow-out pond and they must also be dense enough that they do not float. Sinking must occur in just a matter of seconds or shrimp food quickly becomes bird food."

Equally as important as sound "sinkability" of the pellet, is the nutritive quality of shrimp feed. Shrimp feed is complex because it must be nutritionally balanced as well as properly sized for healthy growth at each stage of shrimp development from larvae to adult. "We are



continuously improving our nutritional formulas thanks to direct interaction with shrimp and tilapia farms and research groups in the field, with whom we verify the direct results of feed conversion." ANDRITZ extruders allow ABA to produce the right-sized pellet to match the life cycle and nutritional needs of the shrimp.

"The quality and certifications we have been awarded due to our extensive research and development have led to very high demand for our pelletized and extruded shrimp and fish feed. We sell approximately 85% of the feed we produce to farms throughout Ecuador and many other countries, with the remaining 20% used for the feeding of our own stock."

This growth has prompted the addition of another new plant. The new ABA plant will provide growth areas in the extrusion product line to meet the growing demand for Empagran feed.

Having enjoyed a long and prosperous working relationship of approximately 20 years with ANDRITZ, Empagran will once again install the ANDRITZ extruder.

ANDRITZ was chosen because of their product quality and knowledge and because Empagran's familiarity with their products means less operational training will be needed and implementation will be faster. "However, it is not only because they are a leading brand

known for their quality," Vernaza stated unequivocally, "they also have excellent post-sales services. Logistics are never a problem with ANDRITZ – with other companies, located in other countries, there are language and time challenges that Empagran does not encounter with ANDRITZ because they have representatives and product centers nearby to coordinate and manage projects locally."

"With ANDRITZ I am comfortable knowing there is someone covering my back, someone responsive, who will return my calls to work on challenges when they are presented. But the biggest reason we chose ANDRITZ is that they are a good group of people who are always so easy to work with, and together, we are a team."

The new production line is now in the commission period with the full operational launch planned to occur later this month, April 2018. The new production line will add up to 25,000 tons of feed per year over the next three years. Currently, ABA is the biggest and most automated plant in Ecuador, and even though it has the capacity to produce any kind of feed, it has specialized in making feed for shrimp its primary focus.



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MAURICIO VERNAZA

Production manager, ABA Balanceado, Ecuador.



GLOBAL SUPPLIER – LOCAL PRESENCE

With sales, service, engineering, manufacturing and production sites located all around the world, ANDRITZ Feed and Biofuel is truly a global organization with a local presence. ANDRITZ is vital to ensuring a reliable global supply of aqua feed, animal feed, pet food, and biofuel. With full process lines accounting for half the world's production of aqua feed and biomass alone, we continuously support leading producers in achieving the highest levels in safety, quality, and control from feedstock to final product.

How can we help grow your business?

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