Bühler
Aqua Feed
Solutions.

Innovations for a better world.
Proven extrusion processes.  
Integral element of the production process.

In the production of Aqua Feed, it is important to ensure the ideal formulation for a complete diet for food fish or ornamental fish. More importantly, gentle processing into a product that can be preserved is crucial. The focus is on the extrusion process. As a cooking and shaping process, this has a lasting impact on the end product characteristics. The pretreatment and past treatment processing steps also contribute to overall performance.

**Extrusion of Aqua Feed.**

The single most important goal during production of fish feed is the creation of a complete diet that enables optimal ingestion. At the same time, feed should maintain the animal’s health. This will maximize the conversion rate and the meat quality while minimizing the costs.

**Blending, mixing and grinding.**

Raw materials account for over 80% of total production cost, formulated and continuously optimized on the basis of commercial and nutritional criteria. A fine grinding system can reduce the raw component blend to an average particle size of about 100 to 250 microns. The blend is then conveyed pneumatically to the control sifter.

**Control sifting.**

A sifter, especially suitable for processing finely ground for fatty fish feed formulations is required to eliminate insoluble substances like bones, scales, sand, and fibers, which can clog die holes smaller than 1.5 mm. For this reason, Bühler recommends a mesh aperture smaller than 70% of the die hole diameter.

**Extrusion process.**

The extrusion process is essentially a cooking process during which starch-containing components are decomposed and proteins are denatured. Combined with other ingredients, a hydrophil yet waterstable matrix is created.

The required heat is added mainly in the form of direct steam in the preconditioner. In the extruder, the mass, preheated to about 95 °C, is further heated by mechanical processing so that temperatures ranging from 120 to 140 °C are achieved. The patented “Density Control System” allows the steam pressure of the hot dough mass to be controlled while the mass is still inside the extruder. This enables the sinking or floating characteristics to be controlled across a wide range of bulk densities without compromising the cooking degree. The energy released from the extruder can be recovered almost without any emissions to the conditioning stage.

**Shaping and Cutting.**

Die hole geometry is crucial in the process, as the hot product melt has to be depressurized, shaped, and cut, especially small die holes up to 0.8 mm require an optimized number of holes and a wear-resistant die plate. A movable cutting device enabled precise control with even knife exchange during the process. Since a considerable volume of moisture is evaporated at this point, the addition of hot air and a good aspiration is recommended in order to prevent condensation and agglomeration of the products.
Drying.

The hot and steaming product very rapidly releases the free surface moisture to the hot air stream. Once the surface has been dried, the drying action is limited by the diffusion rate inside the product, and the air stream can be reduced. Due to this physical conditions, the drying process is diverted into different segments with different temperature profiles. This optimized process allows very fast, gentle, and nondeforming drying to the necessary final moisture content of 8 to 10% even of soft and sticky products.

Coating and Cooling.

After drying, the dried extrudates are coated while warm. During this stage, it is possible to add fats, flavorings, attractants, colors, and even powdered ingredients. Depending on the temperature and the specific surface area of the extrudates, up to 10% liquids can be absorbed in the coating drum and the subsequent cooler. For higher oil quantities up to 40%, it is common practice to apply vacuum coaters.
Core elements in Aqua Feed production. 
The crucial processes for highest quality.

PolyTherm - preconditioner.
The preconditioning concept is based on the separation of the overall process into two stages: component mixing and retention to allow cooking. The BCTC preconditioner is available in six sizes ranging from 100 to 1,600 liters capacity, with processing throughputs of 100 to 20,000 kg/h.

Single-screw extruder.
The single-screw extruder is a cost-effective tool for cooking and shaping products, and the standard solution for floating Aqua Feed. The machine is characterized by its adjustable process section, various drive options, accessories such as water-cooled or electrically heatable barrels, and its ease of operation and automated control system.

PolyTwin - twin shaft extruder.
The modular twin-screw extrusion system covers the entire capacity range, from laboratory scale to high-capacity production machines. The process configuration of the machine is carefully matched to the specific application. With this twin shaft technology, new ingredients such as plant based proteins, can be used and can be formulated with minimal fish meal inclusions without compromising product quality.

SmartFeed - Aeroglide belt dryer.
The SmartFeed II conveyor dryer features uniform, efficient, and durable drying solutions for Aqua Feed. The new dual plenum concept provides a superior airflow that results in uniform moisture content and greater saleable yield. Setting the standard for multi-pass dual plenum conveyor dryers, the new SmartFeed II stands out with engineered airflow control throughout the recirculation loop. This unique design provides uniform airflow temperature and velocity distribution across the entire product bed, resulting in extremely consistent product quality.
Bühler Aqua Feed solutions.
Production plants from a single source.
Focus on final product characteristics.  
A variety of shapes, color and density.

In Aqua Feed production, it is important to ensure the formulation of a complete diet for aquaculture or ornamental fish. At the same time, gentle product process that preserves the formula is crucial.

**Micropellets.**
Very small, accurately cut, floating or sinking pellets starting at 0.8 mm, for feeding ornamental fishes and larvae.

**Floating feeds.**
Pellets with moderate protein and fat contents for feeding warm-water species such as tilapia, catfish, eels, etc.

**Sinking feeds.**
Pellets with high protein and fat contents, with high water absorption rate and high water stability, sink slowly in saline water. These pellets are appropriate for feeding salmonides, sturgeons, and sea water fish such as yellow tail, sea bream, sea bass, etc.

**Shrimp pellets.**
Fast-sinking pellets retain their elastic structure even after hours in the water.
Extensive range of services. From engineering to training.

Lab Services
The laboratories offer a broad range of analyses and testing of food and technical materials in order to innovate processes and improve equipment for our customers.

Spare and wear parts
Highest standards of reliability apply to original Bühler spare and wear parts. They are perfectly adjusted and ensure performance and production safety.

Training
At Bühler training centers – or at any site worldwide – specially trained experts pass on their hands-on expertise and knowledge to customers’ employees.

Revision
Bühler evaluates, over-hauls, adjusts or renews customer installations, including Bühler and non-Bühler machines.

Consulting
Strategic, plant performance, or energy consulting are just some of the consulting services to improve product quality, production processes and energy efficiency.

Repairs
Dedicated to minimizing downtime in the event of an incident: Fast and reliable technical repair service via the Bühler eTicket or the Bühler Helpline – worldwide, 24/7.

Maintenance
Packages are adjusted to fit production cycles to prevent downtime, loss in production efficiency or product quality, ranging from individual services to complete outsourcing of maintenance.

Retrofits
With individual upgrades and conversion kits time-worn Bühler machines will perform to current standards of technology and efficiency.