Aquafeed.

Leading technology, local solutions.
Proven extrusion processes ...
Integral element of the production process.

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

The single most important goal during production of fish feed is the creation of a complete diet which the animal can ingest and digest optimally. At the same time, such feeds should maintain the animal’s health. This will maximize the conversion rate and the meat quality while minimizing the costs.

Blending and mixing, grinding
The raw materials, which account for over 80 % of the total production cost, are formulated and continuously optimized on the basis of commercial and nutritional criteria. A fine grinding system reduces 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, fatty fish feed formulations is required to eliminate insoluble substances such as bones, scales, sand, and fibers, which might clog die holes smaller than 1.5 to 2 mm. Bühler recommends a mesh aperture smaller than about 70 % of the die hole diameter.

Extrusion process
The extrusion process is essentially a cooking process during which the starch-containing components are gelatinized and the proteins are denatured. Together with the 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 of about 120 to 140 °C are achieved. The patented “Density Control System” for the Twin-screw extruder 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 without compromising on the cooking degree. The energy released can be returned almost without any emissions to the conditioning stage.

Shaping / cutting
The die hole geometry is crucial in the process, as the hot product melt has to be depressurized, shaped, and cut. Especially small die holes require an optimized number of holes and a wear-resistant die plate. A movable cutting device allows the die holes to be controlled and the knives to be exchanged even during the process. Since a considerable volume of moisture is evaporated at this point, hot air addition and a good aspiration are needed 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. Such a drying process consists of a hot air conveying system followed by a belt dryer. This 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 / cooling
Usually, the dried extrudates are coated while still warm directly after the dryer. 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 12 % 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 / mixers.
... for high-value aquafeed.
Varied characteristics in shape and color.

**Micropellets**
Very small, accurately cut, floating or sinking pellets starting at 0.5 mm, for feeding all species.

**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 a good water absorption rate and high water stability. Sink slowly in saline water. For feeding salmonids, sturgeons, and sea water fish such as yellow tail, sea bream, sea bass, etc.

**Shrimp pellets**
Fast-sinking pellets which retain their elastic structure even after hours in the water.
Integral customer solutions.
From intake to shipping.

Extensive range of services.
From engineering to training.

**Extrusion pilot plant**
The functional extrusion pilot plant supports practical development of new products, processes, and equipment, complementing scientific approaches to problem solutions. Various process stages can be simulated here either in isolation or in a wide variety of combinations.

**Engineering**
Our project engineers will ensure smooth handling of your order, making sure our systems are seamlessly integrated in your production environment.

**Installation and start-up**
The installation and start-up specialists of Bühler guarantee competent installation and construction site management and a smooth commissioning to start-up.

**Training of customer personnel**
On your request Bühler offers you a personnel training on site, also the opportunity to perform the training in our pilot plant. You take profit of the highly diversified program, executed by our specialists.

**Customer service**
Our engineers and service specialists are available for onsite consulting, ensuring trouble-free operation of our equipment throughout its service life. This concept is supported by a worldwide, efficient spare parts service.
Core elements from Bühler.
The crucial process operations.

**AHZC – 06120 grinding system**
The Hammermill can be applied for normal and fine grinding showing closed up performance of pulverizer but with very high capacity (low investment and running costs). Good sanitation, cleaning and maintenance are achieved by easy removal of doors and screen frames. The special designed feeder/gravity separator DFZC-400 can economically handle difficult raw materials.

**AHSH single-screw extruder (SSE)**
The AHSH SSE is a cost-effective tool for cooking and shaping direct expanded products. The machine has an adjustable process section and segmented split barrels which are enabling easy access to screw and barrel for cleaning, maintenance and changes. The new cutter swings aside on a hinge and allows quick die change. The distance between the die and the knives may be adjusted during production.

**Twin-screw extruder COMPACTwin™**
The COMPACTwin™ extruder with preconditioner ensures highest product quality. The SME (specific mechanical energy input) and density control modules guarantee excellent and reproducible product quality. Thanks to the modules and the automatic control system, cooking degree and product density can be exactly controlled.

**Conveyor dryer**
The Bühler Aeroglide conveyor dryer is applied for drying Aquafeed. Thanks to its modular design, it is possible to match it to different requirements. A sophisticated airflow guarantees an evenly dried product. The dryer can be heated by gas, oil or steam.

**AHWT pellet coating drum**
After drying, in the coating drum up to approx. 12% fat and oil is uniformly sprayed onto the pellets, enabling adjustment of formulation energy levels and sealing of pellets with fat, reducing abrasion and dust. Basically, from a buffer hopper and after proportioning, the measured pellet mass flow value is transmitted to a control system where the preselected liquid percentage is converted into an l/min target value.
AHZC – 06120 grinding system
The Hammermill can be applied for normal and fine grinding showing closed
up performance of pulverizer but with very high capacity (low investment and
running costs). Good sanitation, cleaning and maintenance are achieved by
easy removal of doors and screen frames. The special designed feeder/gravity
separator DFZC-400 can economically handle difficult raw materials.

AHSH single-screw extruder (SSE)
The AHSH SSE is a cost-effective tool for cooking and shaping direct
expanded products. The machine has an adjustable process section and
segmented split barrels which are enabling easy access to screw and barrel
for cleaning, maintenance and changes. The new cutter swings aside on a
hinge and allows quick die change. The distance between the die and the
knives may be adjusted during production.

Twin-screw extruder COMPACtwin™
The COMPACtwin™ extruder with preconditioner ensures highest product
quality. The SME (specific mechanical energy input) and density control
modules guarantee excellent and reproducible product quality. Thanks to
the modules and the automatic control system, cooking degree and product
density can be exactly controlled.

Conveyor dryer
The Bühler Aeroglide conveyor dryer is applied for drying Aquafeed. Thanks
to its modular design, it is possible to match it to different requirements.
A sophisticated airflow guarantees an evenly dried product. The dryer can be
heated by gas, oil or steam.

AHWT pellet coating drum
After drying, in the coating drum up to approx. 12% fat and oil is uniformly
sprayed onto the pellets, enabling adjustment of formulation energy levels and
sealing of pellets with fat, reducing abrasion and dust. Basically, from a buffer
hopper and after proportioning, the measured pellet mass flow value is
transmitted to a control system where the preselected liquid percentage is
converted into an l/min target value.