

CLEAN FEED CLEAN WATER

Wenger AquaFlex Extrusion solution for RAS Feed Production

Wenger innovative extrusion solutions deliver clean durable, nutritional feeds specially designed for the most efficient RAS operations.

Feeds produced on Wenger systems maintain their integrity better and longer.

For clean and clear water. So, you **feed the fish and not the filter.**



AQUATIC FEED DIVISION

Learn more about the Wenger RAS advantage. Email us at aquafeed@wenger.com



AQUATIC FEED DIVISION

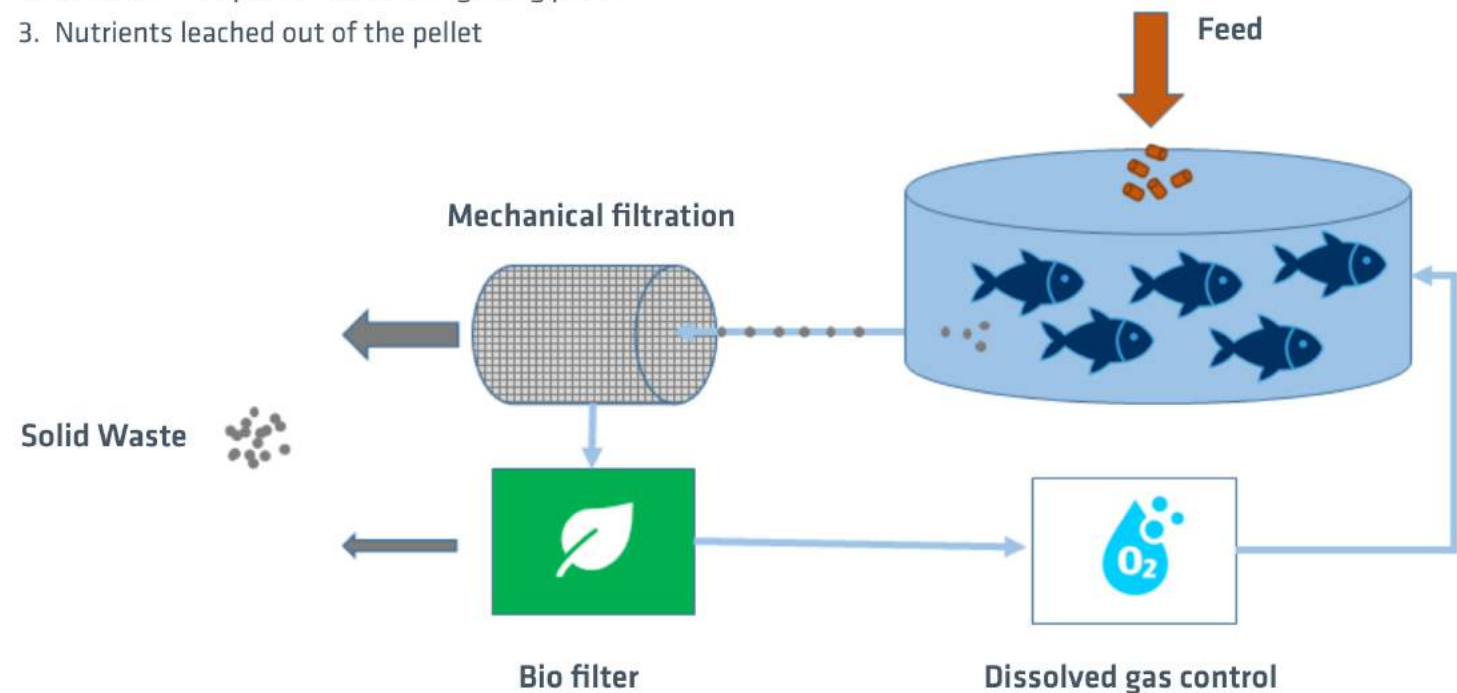
Extrusion processing equipment critical for
high performance RAS feed production

Physical characteristics of aqua feed pellets have always been important in the business of aquaculture, and with the rapid growth of Recirculation Aquaculture Systems (RAS), the requirements of high-quality fish feed haven't become less important.

To maintain the proper balance of oxygen, ammonia, and other water quality attributes, the requirement of constant conditioning and filtering of the water is very important.

Filters capture particles from three main sources:

1. Feces
2. Pellet fines or pieces of a disintegrating pellet
3. Nutrients leached out of the pellet



Simplified illustration of water filtration in RAS system.

This key capture is handled best in the diet formulation and proper processing steps to improve digestibility. Feed or feed particles and nutrients that are not consumed must also be removed from the recirculated water and can be reduced by proper diet formulation and processing. How can these factors be controlled to minimize a negative role in RAS operations?

Recent laboratory analysis and lab scale demonstrations have highlighted the pellet integrity and leaching sources that are best controlled via the extrusion processing step as well as attention to diet formulation.

A wide variety of commercially available and laboratory produced floating, sinking and shrimp feeds were tested in a lab scale RAS system.

Feeds were manufactured and compared from three major extrusion platforms:

1. Single screw
2. Traditional twin screw
3. Twin-screw model (AquaFlex) which utilizes deep flighted screws and thermal energy for cooking.



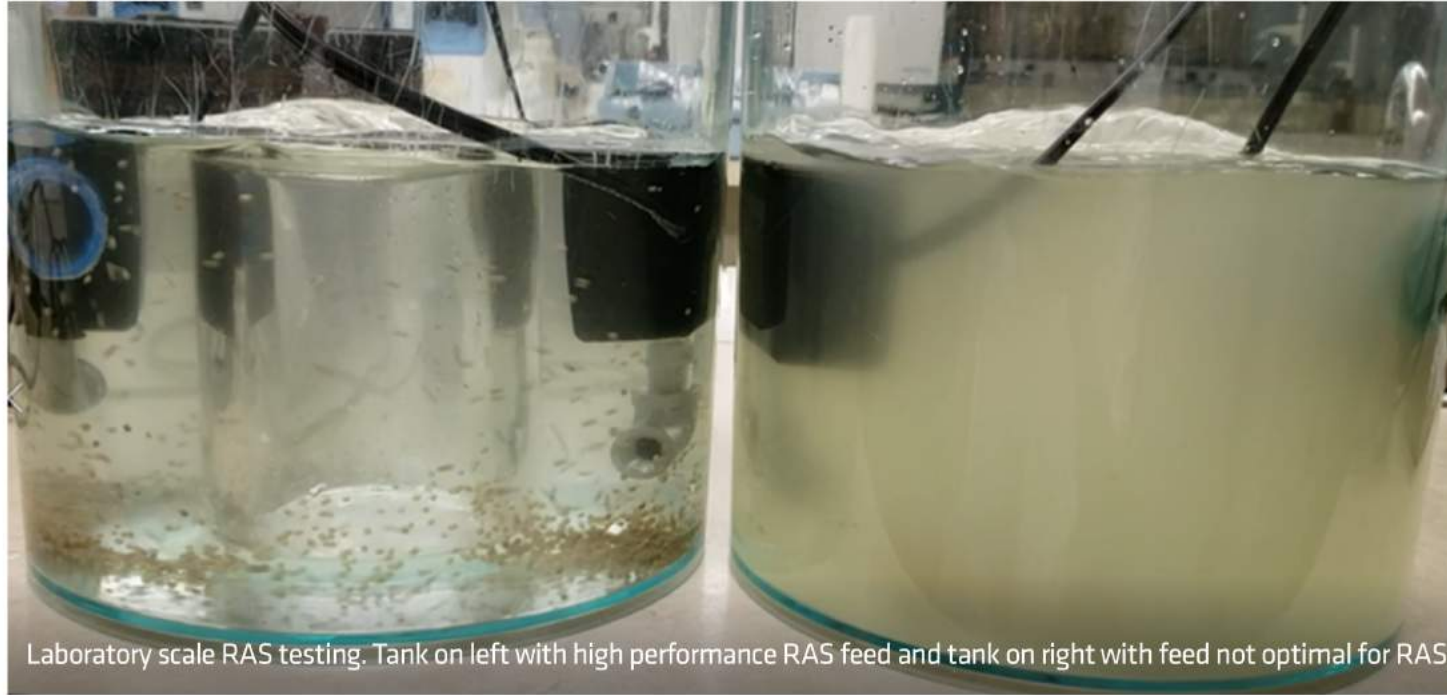
Wenger Technical research center in Sabetha, Kansas US

The study's aim was to determine which extrusion platform consistently produced the feed most suited to the strict RAS environment. The study not only looked at the long held important factors of pellet buoyancy and water integrity but went further and measured turbidity of the water at measured time intervals as a method to measure how each product's technical qualities would react inside the RAS, and thus have an impact on the filter and water conditioning system. High water turbidity was indicative of pellets with too many fines and weak durability and became a key indicator for fat and other nutrients leaching from the pellet.

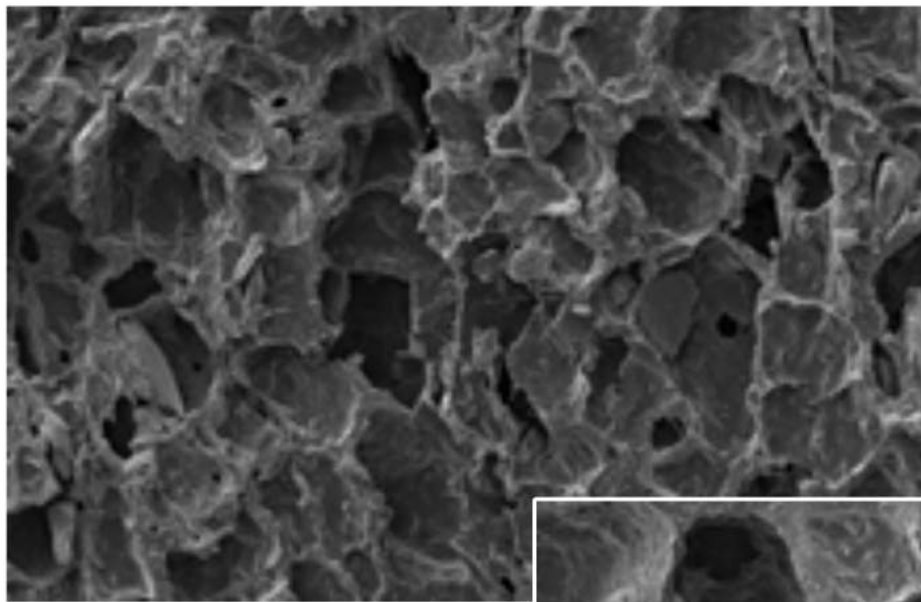


Results from the study show the finer and smaller internal cell structure within a pellet as one key influencer of pellet integrity and thus, water clarity. The finer and more numerous cells allow for nutrients to be more tightly secured inside the pellet which significantly limited leaching nutrients. Securing the nutrients inside each pellet has multiple benefits.

The fish consumes more nutrition with each pellet resulting in a higher feed conversion rate and provides the farmer with more production profit. At the same time, the reduction of particles and nutrients in the water can reduce the load on conditioning and filtering systems, resulting in lower filter maintenance costs and less opportunity for filter system failures.



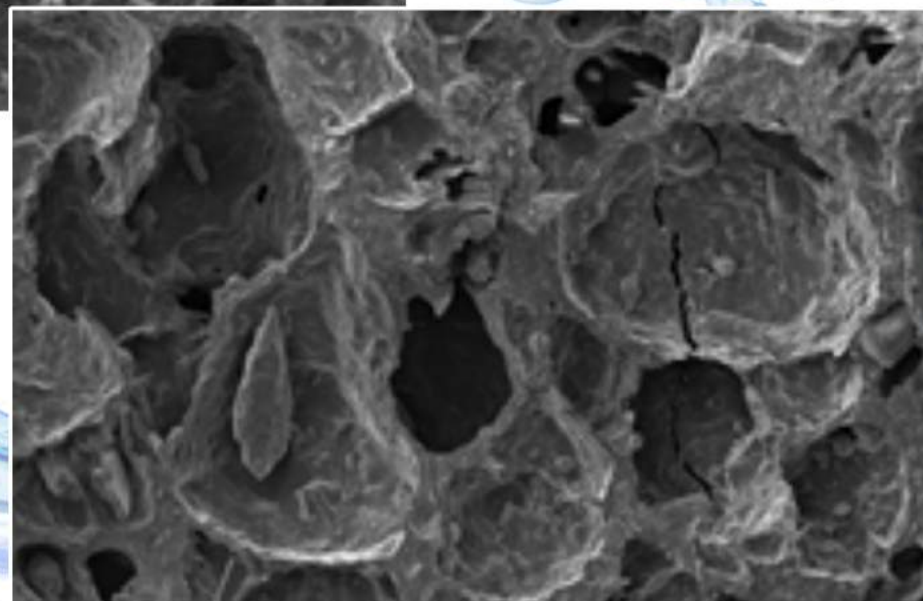
Laboratory scale RAS testing. Tank on left with high performance RAS feed and tank on right with feed not optimal for RAS



Pellet structure from AquaFlex XT

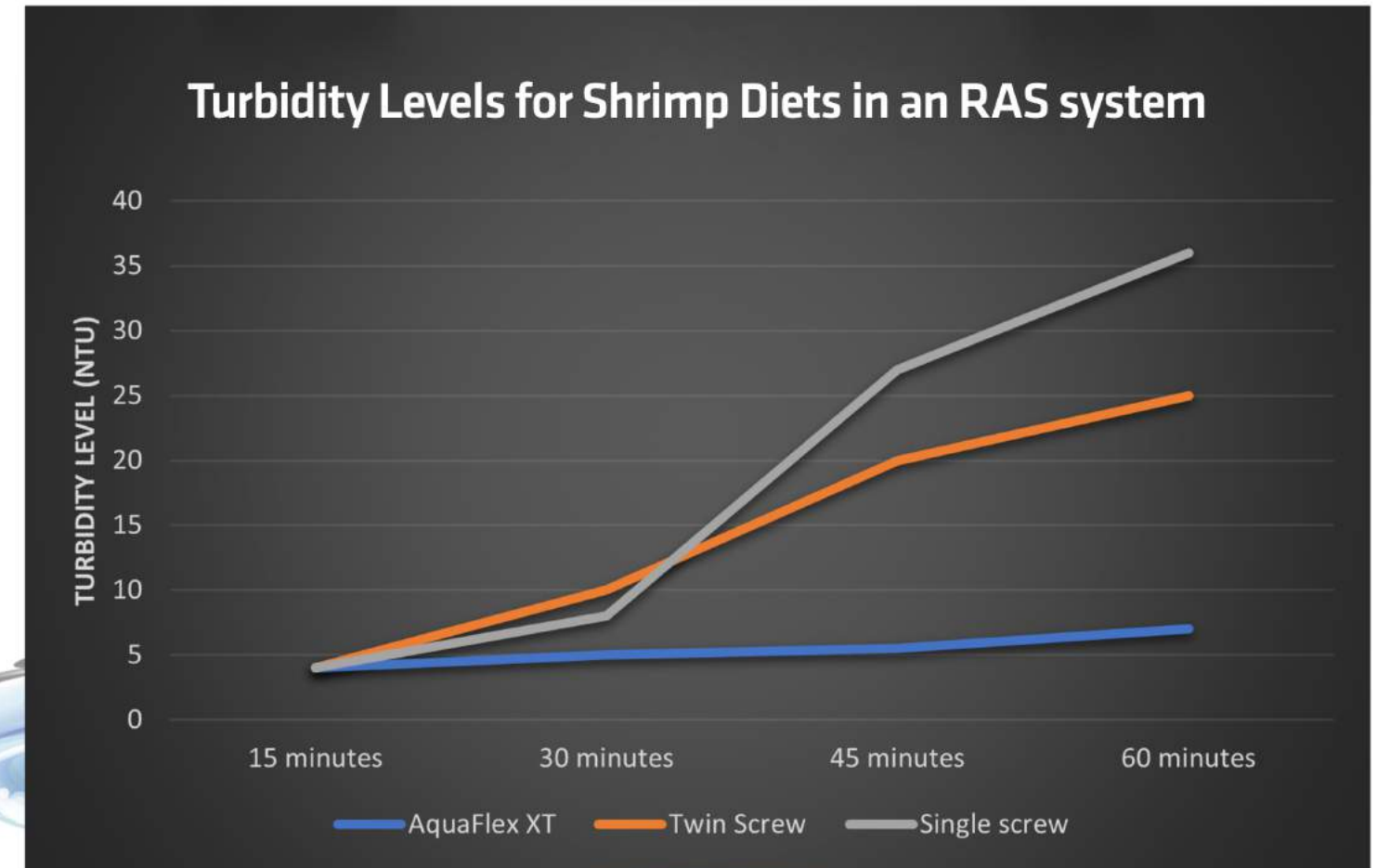


Pellet structure from single screw



The ability of each extrusion platform to produce the finer and smaller cell structure varied significantly. Generally, feed samples made with single screw machines showed the largest and most inconsistent cell structures. These feeds often resulted in the highest level of water contamination once placed into the lab scale RAS systems. This was noticed both by visual appearance and confirmed through turbidity monitors. Feed samples made with traditional parallel shaft twin screw extruders generally ranked better than single screw systems in all aspects of cell structure, integrity in the water and turbidity level. The consistently top-performing feed samples were those produced on twin screw technologies which utilize deep flight geometries and allow for significantly higher levels of thermal energy to replace mechanical energy in cooking the extrudate. These feeds showed unique cell structure development, exceptional integrity inside the water and the lowest turbidity numbers which was easily noticeable by visual inspection of the water. This new twin screw technology coupled with intense pre-conditioning prior to extrusion resulted in RAS feeds with desirable technical qualities.

The conclusion of the lab scale study is that there is significant importance on the type of extrusion platform used to produce feeds destined for RAS usage. While traditional extrusion systems have been able to supply adequate feeds to help RAS farmers develop their markets, true growth in the RAS sector will be facilitated with the highest performing feeds. This will supply consistent nutrients to the fish, reduce the load on conditioning and filtering systems and will in turn reduce the costs of maintaining these systems. Perhaps most importantly, it will mitigate the risks that occurs when conditioning and filtering systems become overloaded and RAS water chemistry becomes toxic for the fish. Advancements in feeds specifically produced for recirculating systems is a critical step in the growth and advancement of the global RAS industry.





The **AquaFlex XT twin screw extrusion** system is tailored to manufacture a wide range of feeds for the aquaculture. Floating, sinking, shrimp, and micro feeds in different product sizes at maximum quality while utilizing a broad ingredient and recipe selection.

As the AquaFlex XT utilize a specialized screw profile design, significantly higher levels of thermal energy can be used cooking the extrudate resulting in a unique cell structure.

- Produce aquatic feeds ranging in pellet size from 0.4 to 50 mm
- Unique cell structure ensures high water stability and reduces nutrient and oil leaching.
- Pellet sinking rate customized to feed fish in land based farming
- Reduced mechanical wear on wear parts due to higher use of thermal energy
- Capacities up to 12000 kg/hour

