

POWER²

A NEW CONCEPT FOR FEED FORMULATION

LET'S GROW
TOGETHER



FEED FORMULATION BY

NUTRIENT DIGESTIBILITY

A NEW GENERATION OF FEED

WITH POWER² WE INTRODUCE A NEW GENERATION OF FEED. THE COMPOSITION OF THE FEEDS IS ADJUSTED TO NEUTRALISE THE NATURAL VARIATION OF THE RAW MATERIALS.

Traditionally, feeds have been composed and sold in order to obtain a set declaration - a gross composition.

With natural variations in the raw material's characteristics this can lead to variances in the performance of the products. With Power² this relation has been turned around. The goal is now a net composition - stable performance.

This gives feed with the following benefits:

- declaration and raw material composition may vary, but the content, which makes the fish grow, is set
- stable performance and thus predictable production on the fish farm
- efficient utilisation of the applied resources
- minimal loss of nutrients and thus a better environment on the fish farm

Raw materials lined up for testing



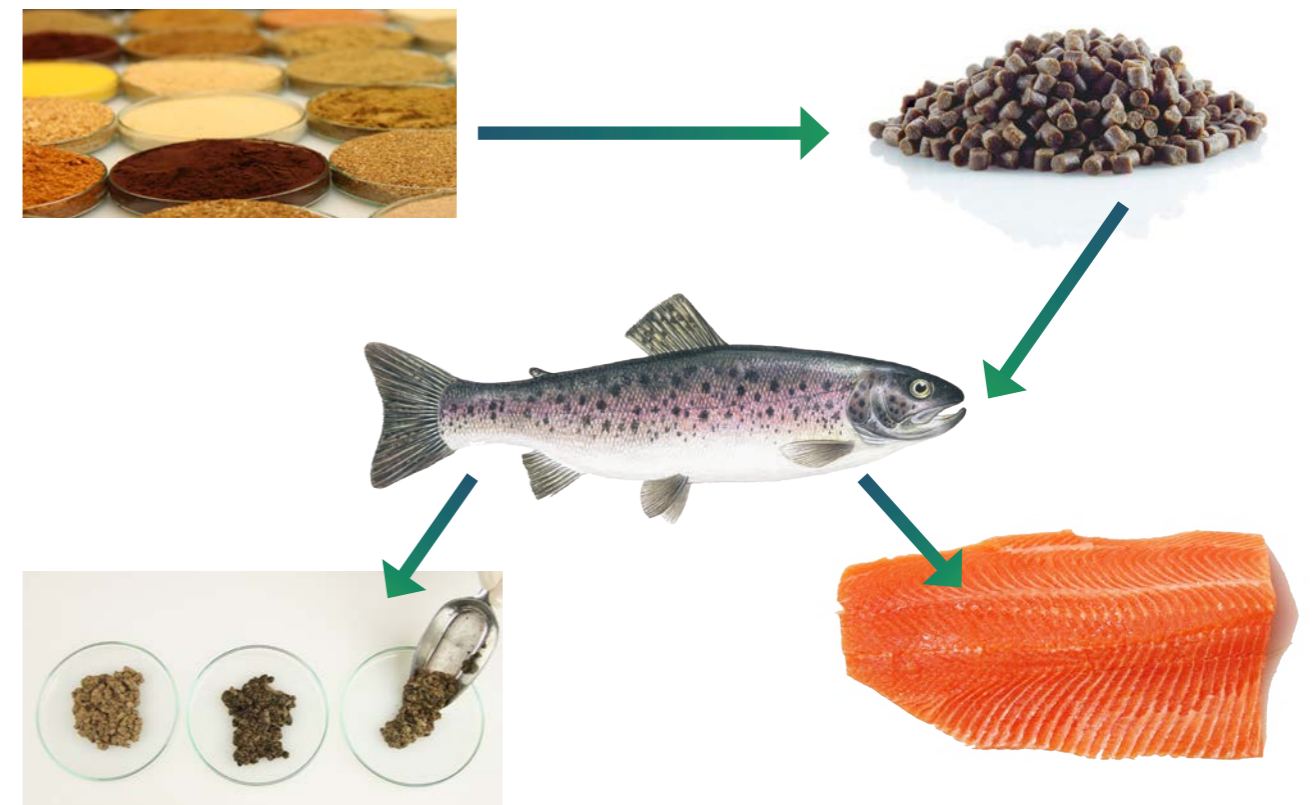
FISH FEED AND GROWTH

NO SPECIFIC RAW MATERIAL WILL MAKE A FISH GROW. FISH GROW BASED ON THE CONTENTS OF THE RAW MATERIALS - SPECIFICALLY PROTEIN AND ENERGY, AS WELL AS MICRONUTRIENTS.

However, the fish do not utilize all the contents. Part of the nutrients are indigestible, and thus not absorbed in the fish digestive system. These end up as faeces. This accounts for approximately 10% of the feed.

The fact that the fish digest the remaining 90% is however not an expression that all 90% is being utilized. Protein for example consists of various amino acids, and not all amino acids have the same digestibility. The fish needs amino acids in a specific relation, and thus it is important to know the digestibility of the individual amino acid - and in every raw material. One can find tables with such information, but unfortunately these are indicative and not necessarily valid for the actual product.

Aller Aqua's trial-station has established a system for continuous testing of raw materials, by means of producing pilot-scale batches of feed suitable for this purpose. Paired with digestibility results this screening enables measurement of the effect of raw materials on faeces consistency and fish appetite. These results can be utilized and implemented in a new generation of feed.



TESTING FEEDS FOR NUTRIENT DIGESTIBILITY

FORMULATING FEEDS ACCORDING TO FIXED LEVELS OF DIGESTIBLE NUTRIENTS OUTBALANCES THE NATURAL AND UNAVOIDABLE VARIATIONS IN RAW MATERIALS AND IS A SIGNIFICANT PARAMETER IN ASSURING STABLE FEED PERFORMANCE ON A FISH FARM.

Determining the digestibility of nutrients in fish feed can be done in three ways:

1. In vitro (Latin: "in glass") in laboratories mimicking the chemical environment in the digestive tract of the fish
2. In vivo (Latin: "living") with land living carnivorous animals, typically mink
3. In vivo with the actual fish species for which the feed is intended

In vitro tests are the easiest and cheapest. In vivo testing with fish is the most complicated, but provides the most reliable result.

Digestibility tests with fish must take place in water, which makes it complicated to control mass balances by weight. This problem can be overcome using an inert marker. An inert marker is a material added to the feed, which passes through the fish digestive system unaffected. By determining the amount of markers in the feed and in the faeces, one can calculate the amount of feed represented by nutrients in the faeces, and thus its digestibility.

To perform a digestibility test with fish one needs:

- a laboratory-scale feed factory able to produce small batches of test feeds with an added inert marker
- test facilities where faeces can be collected

TESTING INDIVIDUAL RAW MATERIALS

To determine the digestibility of a specific raw material one needs to compare a reference feed to an identical feed with the raw material in question added to it. When the test has ended and the analyses and processing of data is finished, the differences in the measured digestibility can be attributed to the tested raw material.

Once a catalogue of the digestibility of all relevant raw materials is established, it is a valuable tool in the formulation of efficient fish feeds with stable performance.

THE TESTING PROCESS

1. Test feeds are produced under pilot scale conditions. All feeds are identical, except from one being the reference feed and the remaining feeds each containing one specific raw material. All feeds contain an inert marker.
2. The test feeds are fed to fish at Aller Aqua Research for 4-6 weeks. During the test period faeces are collected and stored at -20°C
3. At the end of the test, both feed and faeces are analysed for content of nutrients and inert markers.
4. The data are processed and the result obtained for each raw material can be added to our comprehensive database

APPETITE AND FAECES QUALITY

For fish farmers the growth rate of fish is of the utmost importance to their economy. Growth rate is dependent on the fish feed intake. A valuable piece of information which is also obtained from the digestibility test is the effect of the various raw materials on feed palatability – the tastiness of the feed. During the trial period the fish are fed manually twice a day and the amount of consumed feed is registered. This information provides a clear picture of the effect the individual raw material might have on the appetite of the fish.

The selection of raw materials also influences faeces structure and how fast the faeces sink. Due to an increasing amount of fish farms turning to RAS, the quality of faeces is of growing importance. It is therefore crucial to have coherent faeces which can be effectively removed from the water before entering the biological filter and being recirculated to the fish. The continuous process of testing nutrient digestibility therefore includes testing faeces quality.



POWER²

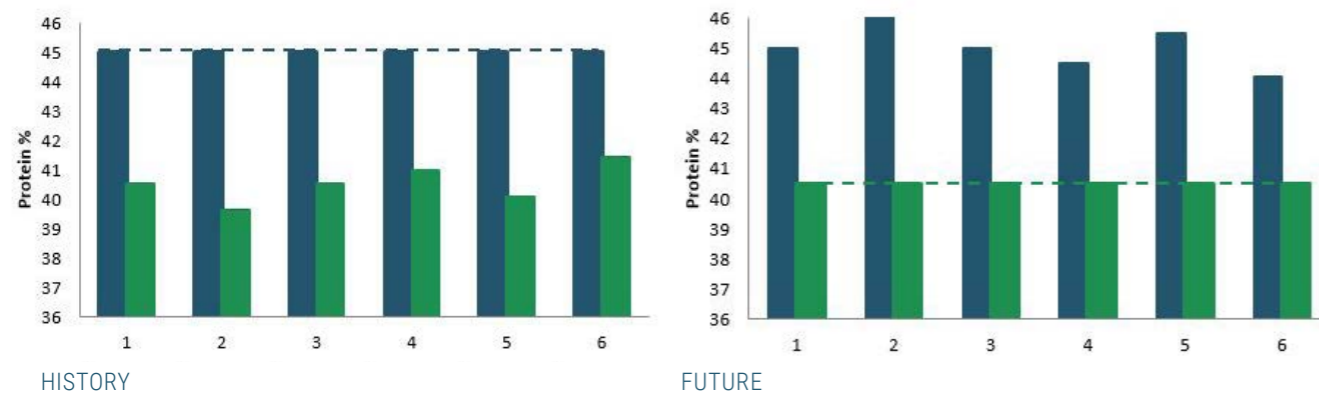
FIXED DECLARATION ON DATA SHEETS AND LABELS IS HISTORY

- FIXED PERFORMANCE IS THE FUTURE

Traditionally the quality and potential in a feed has been evaluated from the declaration. For many farmers declarations and price lists have been the only tools for choosing feed. The performance of a feed can however not be determined from a declaration and consequently these tools have never been anything but indicative. These indications will not get any clearer in the future.

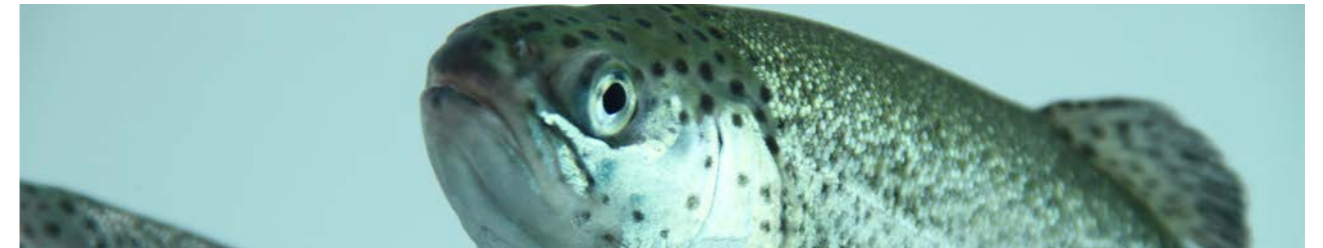
Historically feed has been formulated to a specific declaration and the natural variance in the used raw materials have influenced the digestibility of the nutrients. This situation is now rectified, which can be illustrated as such:

OPTIMIZING TO DIGESTIBILITY VS. DECLARATION



Comparison of the declaration based on respectively set gross- and set net-values. This is illustrated in the above example of a possible development for six batches

It is clear that comparing the declared gross-values, which by law should be used in labelling of the feeds, can still only be considered indicative for determining a feeds potential performance. The only way to definitively determine performance of a feed is by continuous testing – ideally on your own farm with your own fish. Here you will find that the new products have a high and stable performance.



DATASHEETS AND LABELLING

As a consequence future datasheets will note that declarations for:

- crude protein
- crude fat
- NFE (carbohydrate)
- ash
- fibre and
- gross energy

in actual delivered products may vary due to the natural variations in the used raw materials. The actual declaration for the specific batch is shown on the packaging or the product documentation.

BUT THE PERFORMANCE POTENTIAL REMAINS STABLE

FEED FORMULATED FOR HIGH, STABLE AND PREDICTABLE PERFORMANCE

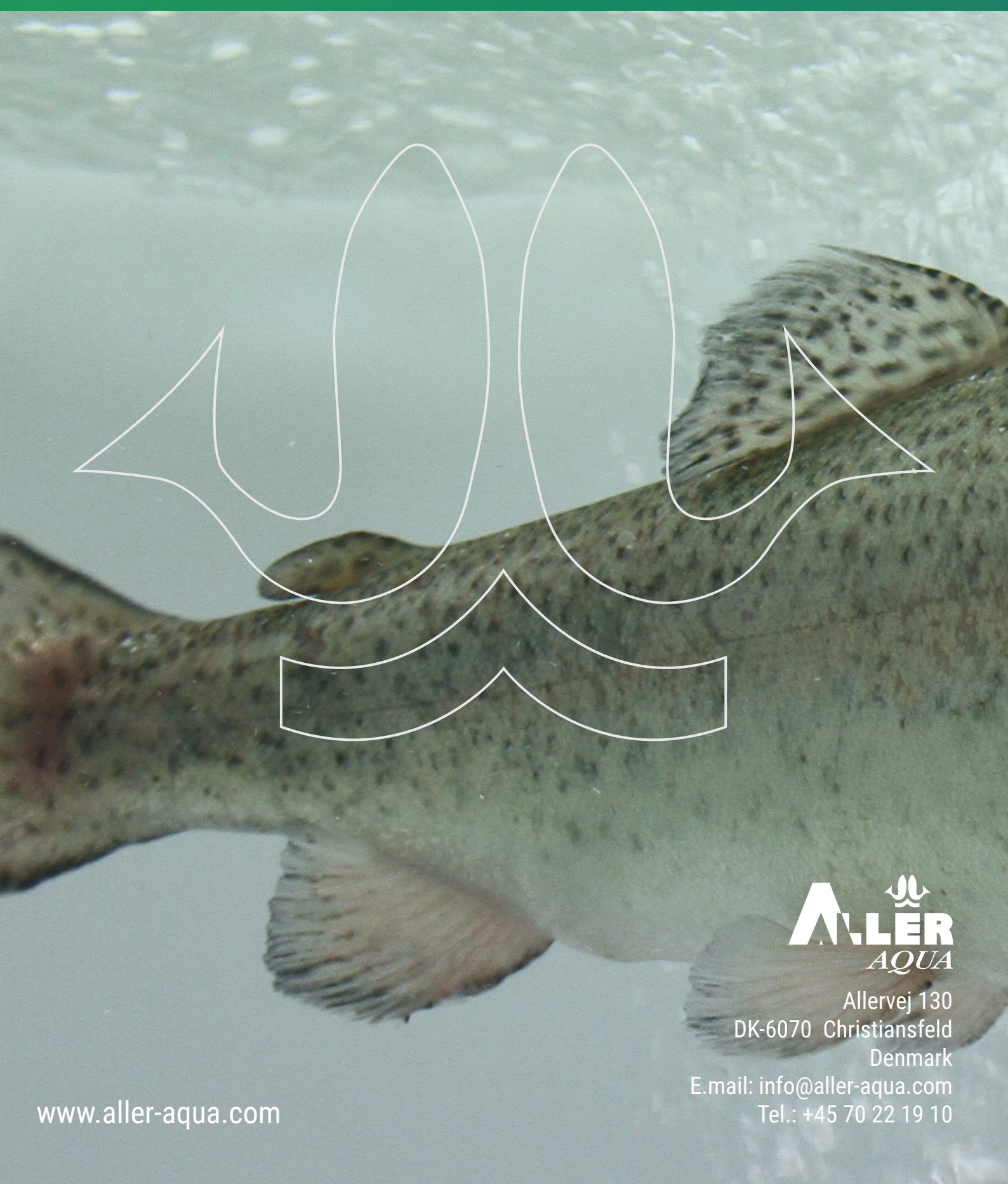
Power² is:

- targeting specific needs of the fish
- optimal utilization of all nutrients
- highly palatable feed
- ensuring stable and predictable performance
- faecal quality adapted to modern farming technology
- best water environment inside and after the farm

- assisting you in achieving the best results!

Feeds included in the Power² concept:

- ALLER GOLD
- ALLER VITAMAX
- ALLER NORDIC
- ALLER ARCTIC



Allervej 130
DK-6070 Christiansfeld
Denmark

E.mail: info@aller-aqua.com

Tel.: +45 70 22 19 10

www.aller-aqua.com