DENSITY CONTROL AND PROCESS OPTIMIZATION FOR EXTRUDED AQUATIC FEEDS
The effect of formulation and process variables on finished product density

CLADDING BENEFITS
Catfish feed manufacturer nets production boost with wear-resistant extruder cladding

PRODUCT FOCUS
- New generation feed mill and tank technology
- Software for start-to-finish control of manufacture
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Octaform — The new generation of feed mill and aquaculture tank technology

Manufacture Assist — Software from Aqua Assist for start-to-finish control for manufacturers

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Stay in-touch with our round-up of recent news, resources, event information, employment opportunities and more

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In this issue

Following the article in our January issue that discussed extruder hardware components used to adjust aquafeed density, this issue examines the importance played by formulation and process variables in an article by Galen Rokey and Brian Plattner of Wenger Manufacturing. Still on the topic of extrusion, we hear from the maintenance manager of Land O’ Lakes Purina Feed facility at Macon in Mississippi, USA. Mark Robertson explains how using cladded screws and liners reduced maintenance and downtime, increased production, and improved the quality of finished feed.

We also bring to your attention two products: a new type of building system that offers an interesting and versatile option for both feed mill construction and for aquaculture tanks, and software from an Australian company that was created for aquafeed manufacturers but has now been upgraded to help all manufacturers track and control ingredients from beginning to end.

Be sure to check the Milling Around section for a wealth of news and valuable resources.

Happy reading!

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Density control and process optimization for extruded aquatic feeds

The effect of formulation and process variables on finished product density

By Galen J. Rokey and Brian S. Plattner, Wenger Manufacturing, Inc.

An aquatic feed’s density is a critical component as it impacts many things including plant capacity, floating and sinking properties, product appearance, and absorption of external coatings. However, the pellets’ floating or sinking properties are often the most critical functional characteristics as the feed buoyancy impacts both the aquatic animal’s nutrition as well as the aquaculture environment.

The buoyancy of aquatic feed is easily correlated with bulk density, as shown in Table 1.

Controlling the density during extrusion can often be a challenge due to the many process variables which can be manipulated.

In an earlier article "Adding Flexibility to the Extrusion Process" [FTU - January, 2006] we discussed the various extruder hardware components that can be used to adjust an aquafeed’s density. Here we will examine the importance that formulation and process variables have to the finished product’s density.

A feed’s formulation plays a major role in product density, especially given the challenge of manufacturing high quality protein, high fat rations with acceptable pellet durability and immersion stability.

Functional characteristics of ingredients, such as particle size and flow-ability, also play a key role. These characteristics come together in the extruder and contribute to the product’s bulk density.

The actual extrusion processing parameters play an equally important role as well.

### Table 1:

<table>
<thead>
<tr>
<th>Feed characteristics</th>
<th>Sea water @ 20ºC (3% salinity)</th>
<th>Fresh water @ 20ºC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast-sinking</td>
<td>&gt;640 g/l</td>
<td>&gt;600 g/l</td>
</tr>
<tr>
<td>Slow-sinking</td>
<td>580-600 g/l</td>
<td>540-560 g/l</td>
</tr>
<tr>
<td>Neutral buoyancy</td>
<td>520-540 g/l</td>
<td>480-500 g/l</td>
</tr>
<tr>
<td>Floating</td>
<td>&lt;480 g/l</td>
<td>&lt;440 g/l</td>
</tr>
</tbody>
</table>

**RECIPE CONSIDERATIONS**

Increasing the level of fat during extrusion causes an increase in the bulk density of the feed. The fat lubricates the material inside the extruder and makes it much more difficult to impart mechanical energy into the product.

In one particular study the fat level was adjusted by continuously injecting fish oil into the preconditioning phase of a single screw extrusion system in increasing levels from zero to 14.4 percent.

As the added internal fat level during ex-
trusion increased, the bulk density of the final product increased significantly (Figure 1).

It is important to remember several key fundamentals when adding fat to the extrusion process. First, the fat should be added to the last third of the preconditioner. When fat is added in the batch mixer or early in the preconditioning process, it coats the starch and does not allow the moisture to hydrate and cook the starch. It is extremely important that the starchy portion of the recipe be hydrated before the oil is added in the process. It is also important to consider the application of the oil to the process. Use properly sized flow nozzles to ensure uniform distribution of the fat. Lipids can also be added externally as a way to adjust the final density.

The level of fat that can be added is affected by the type of coater used and the density of the product. The additional coating of oil fills the available pores of the pellet resulting in an increase in density of the final product. The two classifications of coating systems used are vacuum infusion and atmospheric. An atmospheric coater relies on the fat simply soaking into the matrix of the pellet. It is typically limited to 12—15 percent added fat. A vacuum coating system pulls the oil into the center of the pellet and therefore allows for much higher oil levels in the final product. Figure 2 shows the difference in oil absorption for the two coating systems and shows the impact of product density on overall absorption. As the product density increases, the oil absorption decreases.

![Figure 1: Effect of added fat during extrusion on bulk density](image1)

![Figure 2: Effect of Bulk Density on Fat Absorption](image2)
RETENTION TIME CONSIDERATIONS
Another method of altering product density is to alter the process retention time. This can be done in either the extruder or preconditioner. Figure 3 illustrates the impact of preconditioner retention time on final bulk density. As the retention time increases it creates addition cook and thus a much lighter final product density.

The retention time of the entire system can be altered by changing the feed rate or capacity. This assumes that the up and downstream production equipment can handle the added loads due to the increased capacity. As the extrusion feed rate increases (at constant die open area), there is a reduction of retention time and thus an increase in product density (see Figure 4).

The density shown is actually piece density not bulk density as often used in many of the other figures and tables. Piece density

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Figure 3: Effect of Preconditioner Retention Time on Bulk Density

![Figure 3: Effect of Preconditioner Retention Time on Bulk Density](image-url)

Figure 4: Feed Rate vs. Piece Density

![Figure 4: Feed Rate vs. Piece Density](image-url)
is also referred to as a product’s true density.

**EXTRUSION PROCESS CONSIDERATIONS**

Energy management can be essential to controlling bulk density of extruded feeds. As energy inputs increase during the extrusion, the bulk density gradually decreases. Energy inputs are often classified according to their source: mechanical or thermal. The most common form of thermal energy addition is injection of steam to either the extruder or preconditioner. The combination of moisture and energy allows the product to expand more easily.

**STEAM INJECTION**

Moisture added in the form of steam, injected both into a preconditioner and into the extruder barrel, brings with it additional energy for cooking. This increases capacity and reduces the requirement for large drive motors. **Table 4** shows the dramatic drop in specific mechanical energy (SME) as increased levels of steam are injected into the extruder barrel. Adding steam to the preconditioner also lowers the required SME as shown in **Figure 5**. However, since the preconditioner has much longer retention times than the extruder barrel, there is often a much greater impact of the added energy. A closer examination of **Figure 5** illustrates this.

<table>
<thead>
<tr>
<th>Steam Injection</th>
<th>SME (kWh/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% dry rate</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>27</td>
</tr>
</tbody>
</table>

In examining the four percent steam injection curve one can see that as the retention time in the preconditioner is increased the extruder SME declines. Direct steam injection is one of the two primary heating methods for most extrusion cooking processes. There are several ways to adjust the SME input. These include hardware changes including the screw configuration and die configuration. For example, additional cut-flight screws or a more restrictive die can increase the energy added.

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**Figure 5** Effect of Conditioner Steam Injection on SME

**Note**: Same running conditions, except DDC steam flow levels
Figure 6 shows the impact of screw profile on product density. The single flight screws resulted in heavier densities than the double flight screws. The double flight results in additional retention time and therefore can generate additional cook. As shown in Figure 7, there is a strong linear correlation between SME input and the final bulk density of the product. As the energy increases the density decreases. The final process variable that is used to control product density is extrusion moisture content. Extrusion at relatively low moisture contents tends to produce a dense, unexpanded product. As the extrusion moisture content increases, the density declines and the product becomes lighter. The higher moisture level contributes to cooking the available starch and allows the product to expand. However, the extrusion moisture level can increase to a level that actually causes the density to increase. High moisture levels tend to reduce the viscosity of the material in the extruder barrel and make it more difficult to expand the
product. This moisture-density relationship, which holds for most all products, is specific for each formulation (Figure 8).

In addition to these key process parameters, plus formulation and functional ingredient characteristics, still other factors influence density and buoyancy. For aquafeeds these can include surface tension at the interface between the pellet and the water; pellet displacement; and water temperature and salinity.

Also, adjustment of the bulk density process parameters may unfavorably impact other process parameters such as system capacity.

Some companion animals prefer thermally cooked kibbles to those produced with high levels of SME. Therefore, it can often be difficult to reach the appropriate density and desired level of “cook” by only adjusting the process variables.

A range of “hardware tools” or add-on technology is also available to extrude feeds to the desired bulk density while optimizing process parameters such as extrusion moisture and mechanical energy.

**CONCLUSION**

Altogether, there are many ways to influence product bulk density and ultimately to control aquafeed buoyancy. Process flexibility through extruder operating parameters is essential in today’s feed industry to be able to meet the market requirements and to adjust the process to compensate for ingredient and other processing variability.

*For more information: info@wenger.com*
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Or visit our website www.victam.com for your local sales consultant
At the Macon, Mississippi, production facility of Land O’ Lakes Purina Feed, LLC, the primary product is catfish feed.

“We are a full-service manufacturing facility and produce catfish feed along with general purpose feeds, such as cattle, hog, and dairy feed, but our primary business is catfish feed,” explained Mark Robertson, Maintenance Manager.

The biggest area for catfish farming is the southeastern portion of Arkansas, west and east central Mississippi, and west central Alabama.

“These markets are very localized,” Robertson pointed out. “Usually catfish farms won’t be more than 50 to 75 miles from a feed mill because it gets expensive to transport the feed. We also bag a lot of catfish feed that goes into feed stores throughout the South and Southeast for the guy with a small pond that wants to raise some catfish, but for commercial farms, it’s typically bulk shipped in a 10-bin feed trailer.”

The plant primarily manufacture two types of catfish feed: one 28 percent protein, the other 32 percent protein and also a fingerling feed that is sold to producers that raise young catfish until they are typically six to eight inches long, when they ship them to the ponds.

“Often, when they first put these fingerlings into a pond, they continue to use the fingerling feed until the fish get a little size on them”, Robertson said. All three types of feed are extruded.

Most of the protein in catfish feed manufactured by Land O’Lakes Purina Feed comes from soybean meal. Other major ingredients used in the feed are wheat midds and corn.

“Catfish feed is very abrasive to our processing equipment, especially the extruders and conveying equipment,” Robertson said.

SEEKING TO MAXIMIZE PRODUCTION

In the United States, the market for catfish feed is seasonal and runs from about April to October. It all depends on when the weather gets warm and when it stops rain-

Cladding benefits

Catfish feed manufacturer nets production boost with wear-resistant extruder cladding
“Rain and cold weather slow down catfish feeding,” Robertson said.

“If we start out in April without a lot of rain, and it warms up fast, we can get real busy in a hurry. Other years we’re into June before we get busy. But once that water gets warm, the fish start feeding and the race is on. We can run as much as 12 or 13 thousand tons of feed in a month.”

The Land O’Lakes Purina Feed mill at Macon has two extruder lines in the catfish feed production operation. “We’ve been progressively trying to increase production,” Robertson reported.

“We started by increasing extruder speed. Originally, the extruders had 300-rpm output that were increased to 400-rpm. We’ve continually tried to do things that would increase throughput.”

“When manufacturing catfish feed, we always know how fast we’re running because we monitor the speed of our feeder screws feeding the extruders,” Robertson said.

“Actually we now have a panel view that tells us how many tons per hour is going through the machines. Over the years, we’ve learned that all of the work that’s done in the extruder is done at the end of the extruder (when the screws and liners are not worn). The final screw is the one that does the majority of the work (pushing)”

“Over a period of time—two, three months, however long it is—that final screw begins to wear and the feed starts slipping back,” Robertson continued.

“When this happens, the screws toward the back start having to do the pushing. The further that push moves back in the extruder, the more energy is required to the same amount of work. So, we have to slow the feed rate down to avoid overloading the motor.”

So, what happens when they have to reduce the feed rate?

“As the push moves farther back, we begin to have fluctuation in the amps. When our amps get up high, the extruder is pushing feed out at a higher pressure. When it gets low, the pressure drops. It tends to fluctuate back and forth between high and low”.

“First we’ve got feed expanding more than it’s supposed to. Then we get feed that’s smaller than it is supposed to be, so we end up with inconsistent sized feed that is both floating and sinking, with increased fines.”

“Over the course of a typical year,” Robertson said, “We would replace liners and screws annually, before the beginning of catfish feeding season, usually in January. After the extruder has run about 1,600 hours and produced about 20,000 tons of feed, production rates would drop significantly. At that time we replaced just the final screws. Usually we’d get another 1,200 hours of service and produce about 15,000 tons of feed before production began to drop again.”

“At this point,” Robertson explained, “production levels were down about 20 percent. Depending on tonnage requirements at that time (being toward the end of catfish season), we would decide whether to replace any more screws and liners or wait until rebuild.”

CLADDING THE SOLUTION

“When Lorrie Muzzone from Conforma Clad, a Kennametal Company based in New Albany, Indiana, started talking to us about the wear resistance of cladded screws, it seemed like a natural thing to try,” Robertson said.

“Of course, we were skeptical because everybody says ‘We’ve got the best and the greatest thing in the world.’ However, even though we had never done business with Conforma Clad before then, it seemed worth taking a chance, and it’s worked out very well.”

“The main thing the cladded screws have
done for us,” Robertson explained, “is to keep our production and feed consistent. We don’t have that slip toward the back, because we’re not wearing out the screws and liners over the course of the year. We maintain the same production level throughout the year so we have a consistent high quality feed throughout the entire year.”

“We have saved some money by using the clad screws,” Robertson reports, “but the savings is secondary. We can lose several thousand dollars a day just in lost production costs. In addition, operating costs are basically the same if an extruder is running 250 tons per day or 200 tons per day. So when we start losing production, we’re not only losing feed that we could be selling, but it’s also costing us more per ton to run the feed that we are producing.”

When parts wear and have to be replaced, Land O’Lakes Purina Feed, Macon is buying new screws and liners for the extruders directly from Conforma Clad, who buys new castings and applies the cladding to meet OEM specifications.

**FEED PRICES ARE LOCKED IN**

“Typically we book 60 percent of our feed orders early in the year, before catfish season,” Robertson pointed out.

“This means that the customer already has locked in the price of their feed. Our production capability and the possible need to bring in feed from other plants will not affect the customer’s cost. But it does affect our margins. We used to bring in quite a bit of additional feed prior to installing the clad screws and liners. Since we’ve switched to the cladded components, we rarely bring in more than an additional truckload here and there.”

“We used to run about 11 tons per hour before we increased the speed of the extruder,” Robertson said.

“Now we’re up to 12.5, maybe 13 tons per hour. Sometimes we even get up around 14 tons per hour. Speeding the extruders up was just the first step. The main benefit in the cladded screws is that during production everything stays the same. Since we’ve gone to the cladded screws and liners, the extruders run the same everyday. The extruders run the same feed day in and day out throughout the catfish season. Most days, once we are up and running, we make very few adjustments to the equipment during the day.”

“The cost of a cladded screw or liner is about twice the cost of an uncladded OEM part,” Robertson admitted, “but the increase in service life and higher production rates over a longer period of time more than offset the additional cost—several times over. The payback is really yet to be determined but basically if that final screw is doing what it’s supposed to do and it’s not worn, the screws behind it aren’t wearing. It’s the same thing with the liners.”

“Every time production drops off, we’re losing money,” Robertson stresses.

“To me, the main benefit of cladded screws and liners is that we don’t have a loss in
production. The machine does the same thing every day. The feed looks the same every day. The quality remains the same and everything is consistent.”

“During a typical week, we’ll start up on Monday morning,” Robertson said. “After we’ve loaded three or four trucks, we’ll run non-stop until sometime late Saturday night or Sunday morning when we fill up again. Then, we’ll start it all over again the next week.”

“In years past,” he continued, “we never would be full and we’d start out in the hole. Usually by Wednesday or Thursday we’d have to have trucks come in and bring us feed, sometimes eight or ten trucks a day to meet the demand because we couldn’t manufacture enough. Now, we’ve increased production enough to where we don’t have to bring in extra feed. I think we may have brought in about four loads last year.”

“Overall,” Robertson said, “considering our lower maintenance, reduced downtime, increased production, and better quality feed, I would say that changing to the Conforma Clad screws and liners has resulted in an economic gain somewhere in the range of $75 to $100 thousand per year — and that would be a conservative figure.”

**CLADDING SPECIFICATIONS**

Based upon more than 20 years of research, Conforma Clad has developed three standard tungsten carbide cladding formulas: WC200; WC210; and WC219. Each formula provides superior wear protection within a wide range of operating and wear conditions, which may include abrasion, erosion, corrosion, and impact—individually or in combination. Custom formulations also can be developed to fit specific customer requirements.

Standard cladding thickness can range from 0.010 to 0.065 inches (0.100 inches for simple shapes). Most cladding is applied by hand. In cases where there is not sufficient hand access, mechanical aids may be employed. Inside diameters as small as 0.250 inches and 6 inches long have been clad with the aid of an application rod. Chamfers and radii as small as 0.125 inches can be clad.

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**Raw Materials**
The module accepts data input for raw materials:
- purchases
- sales
- used in production
- in stock
- specification for acceptance testing
- price list
- received

**Master Product**
The module accepts data input for:
- creation of products to be made and sold
- uploading and interfacing with manufacture formulation software
- product control to allow for different manufacture sizes and packaging types
- master product specification for acceptance testing of finished products
- expense list for production of the master product

**Production**
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- extruder performance interfacing
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- production raw material expenses
- production Quality Control

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Conversion and Set Up is Easy
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- customer complaints

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- user ID control
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- user rights Wizard
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• customer pricing
• both raw material and finished product sales
• stock allocation to orders

The software provides detailed reports and Wizards for ease of use. There is no charge for any upgrades of software or additional client access licences. The software comes with an unlimited client access licence to be installed on as many computers as you own.

For information contact Rob Bronstein:
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www.aquaassist.com

Ordering
The module accepts data input for:
• placement of raw material orders to suppliers
• supplier / order locations
• Deliveries

Maintenance
The module accepts data input for:
• maintenance schedules and requests
• plant recording
FeedLink is the new, effective way for leading manufacturers to display equipment to buyers and specifiers in the feed industry worldwide. It's a fully searchable buyers’ guide and directory, an interactive brochure and the one catalog that never gets lost, dog-eared or out-of-date. Priced to respect your budget, it’s cost-effective too.

- **Change the photos and data as often as you like to keep your listings current and present a professional image:** update your own entries with our simple management process or let us do it for you.
- **Link your entries to your email or website for even more information.**

Our e-magazine Feed Technology Update is packed with feed technology information and tells the feed industry about your new products and developments; it keeps customers returning to the site time and time again. Discover the advantages of FeedLink membership now:

Contact Chris Reynolds at: Sales@feedlink.com.

**GOLD MEMBERSHIP**

- 2 x Company/agency contact pages
- 15 x Product entries - including a product photograph with its technical specifications
- 6 x Product reviews in *Feed Technology Update - you supply material
- 1 x Technical article in *Feed Technology Update - you supply material
- Additional product entries (per entry): $100.00

**SILVER MEMBERSHIP**

- 2 x Company/agency contact pages
- 10 x Product entries - including a product photograph with its technical specifications
- 4 x Product reviews in *Feed Technology Update - you supply material
- 1 x Technical article in *Feed Technology Update - you supply material
- Additional product entries (per entry): $130.00

**BRONZE MEMBERSHIP**

- 1 x Company/agency contact page
- 5 x Product entries - including a product photograph with its technical specifications
- 2 x Product reviews in *Feed Technology Update - you supply material
- Additional product entries (per entry): $115.00

* All prices for 12 months

* Feed Technology Update electronic magazine is distributed to more than 16,000 feed industry professionals
Thermal Meal Treatment
Hygienic in-feed meal production that meets the most stringent standards is now reality, thanks to the Buhler Thermal Meal Treatment system. This process allows production of salmonella-free feed meals which do not contain any pathogenic germs. More details on the FeedLink product page.

OUR TEAM IS GROWING

We are pleased to welcome a new member to our advertising sales team, Christopher John Reynolds. Chris has a long track record in publishing and exhibitions and a thorough understanding of the marketing needs of the feed industry. Chris made the professional move from legal executive to join the world of media sales in 1977 and has worked on a diverse range of titles that includes Food Manufacture, International Aquafeed and Grain & Feed Milling Technology. Chris has also gained extensive experience in trade shows in the U.K., including Convenience Retailing Show, Bake and Food & Bake.

“I am excited to be working with the feed industry again and really look forward to reconnecting with some of my old friends and clients and meeting new ones”, Chris said. “I am particularly excited about being able to bring them the fantastic marketing opportunities that FeedLink and FTU offer”.

Chris looks forward to discussing your advertising needs for Feed Technology Update and helping you with your membership of FeedLink.com. Please feel free to contact our advertising sales team at: info@linxpublishing.com.

More about who’s behind Linx Publishing is available on the FeedLink Website About Us pages.
CPM ACQUIRES WOLVERINE PROCTOR & SCHWARTZ

CPM, leading equipment provider for particle size reduction and pelleting, has acquired the assets of Wolverine Proctor & Schwartz LLC of Merrimac, Massachusetts, USA. The new company, to be called Wolverine Proctor, expands the CPM equipment and technology portfolio in baking, drying, cooling, roasting and toasting. The new products complement many CPM application areas such as extrusion. “With CPM, Wolverine Proctor will re-emerge as the world’s premier thermal processing company sharing the CPM operating legacy for offering unique and innovative solutions for customer needs,” said Ted Waitman, CPM president.

“CPM has realigned people, products, services, and resources necessary to exceed customer expectations for performance and value.” Wolverine Proctor designs and manufactures thermal processing equipment and systems in food, chemical, tobacco, and textile processing industries.

U.K. based Wolverine Proctor & Schwartz Ltd. was not part of the acquisition. It is a separate legal entity, neither a subsidiary nor a parent of the new Wolverine Proctor, and remains under the ownership of the previous owners of the defunct US based company. As it has since 1883, CPM offers equipment and after-market sales and support for particle size reduction, preparation, and agglomeration in feed milling, oilseed processing, ethanol, pet food, biomass, and compounding industries.

CPM’s holdings include California Pellet Mill, Roskamp Champion, Beta Raven, and Century Extrusion. CPM has more than 450 employees and production facilities in the Americas, Europe and Asia. More information: www.cpmroskamp.com
MILLING AROUND

Aquafeed.com
Your gateway to Aquafeed information

Hooked on the Hype?
Fish Scam .com

NATURE’S BRILLIANT SOLUTION FOR VIBRANT COLORATION

NatuRose® natural astaxanthin comes from nature’s richest source of astaxanthin – pure cultured microalgae. Unlike synthetic or yeast sources of astaxanthin, NatuRose® microalgae meal delivers astaxanthin in a natural fatty acid complex. In addition to 15000 ppm astaxanthin, a complimentary mix of carotenoids is supplied including lutein and beta carotene, as well as proteins, fatty acids and amino acids not available from other colorants. Natural coloration from NatuRose® is chemically indistinguishable from wild fish pigmentation.

Fish • • •
Provides more even coloration, making for a more marketable fish. Researchers report results such as improved feed conversion ratios and improved immune system functions. More than just a colorant, it has also been shown to dramatically improve the health of your fish.

Shrimp • • •
A highly effective source of a natural carotenoid complex. Easily mixed into larval and maturation diets.

Ornamentals • • •
Achieves vibrant coloration in fresh and saltwater species. Capable of naturally enhancing colors such as yellow, orange, red, purple and blue.

*EU Registration pending

Please contact Valerie Harmon for a complete nutritional profile and more information on how to integrate NatuRose® into your feeds!

Grown in pristine conditions under pure Hawaiian sunshine.

Also, ask about HAWAIIAN SPIRULINA, our carotenoid-rich microalgae for aquaculture applications.

Feeder Technology Update — June/July 2006
NEW FEED SHOW FOR ASIA PACIFIC

Feed Ingredients and Additives Asia Pacific (FIAAP), is a new exhibition to be colocated with Victam Asia 2008 at the Queen Sirikit National Convention Center (QSNCC) Bangkok, March 5-7 2008. This new trade show and supporting conferences will be held separately from the Victam show, however visitors to each show will be able to visit both shows free of charge.

Meanwhile, Victam has announced a series of conferences at Victam Asia 2008 and the following have now been confirmed: Petfood Forum – organized by Watt Publishing and Aquafeed Workshop – organized by Aquafeed.com. Visit. More information

LEADING RESEARCH INSTITUTE AND AQUAFEED.COM LAUNCH MAJOR AQUAFEED CONFERENCE

Aquafeed.com, the aquafeed industry information gateway and Norwegian Institute of Fisheries and Aquaculture Research, Fiskeriforskning, have joined forces to stage an important conference during Victam 2007. Scientists from Fiskeriforskning Department of Aquafeed Development and Marine Processing, Bergen, Norway will join internationally acclaimed experts from industry to examine the latest concepts in feed development for aquatic species, cutting edge aquafeed technologies and developments in aquaculture markets.

We are delighted that “Fiskeriforskning has agreed to partner with us to present this conference”, Aquafeed.com president Suzi Fraser Dominy said. "The institute is a leader in aquatic feed research and development and the industry has benefited greatly from their work on marine protein sources and in developing and commercializing larval feed for marine fish for the European market”.

“Most recently Fiskeriforskning has pioneered the development of feed for sea urchins and king crab, and larval feed for shellfish,” she added.

Aquafeed Horizons will provide feed companies and their suppliers with important insights into the needs of aquaculture and the possibilities offered by advances in aquafeed technology and formulation.

Aquafeed Horizons will take place at the Jaarbeurs, Utrecht, the Netherlands, May 9 -10, 2007. For more information contact: editor@aquafeed.com www.aquafeed.com

EVENTS

September 4-8, 2006
New developments in fish feed and pet food extrusion
Researchers/teachers from The Norwegian University of Life Sciences (UMB) and Bühler will give theoretical lessons on topics related to chemical changes during processing in Aas, Norway. More information

Aquaculture conference for southern and eastern Europe
Eurofish is organizing a two day conference in Duino (near Trieste), Italy, September 14-15, 2006 More information

September 25-27, 2006 - Norway
AquaVision 2006 – Strategies for sustainable aquaculture
AquaVision 2006 will focus on ways to ensure sustainable development of the aquaculture industry while defining different strategies. More information

October 23-26, 2006 - Spain
2006 IFFO Annual Conference - Barcelona, Spain
The 2006 International Fishmeal and Fish Oil Organisation Annual Conference will take place October 23-26, 2006 in Barcelona, Spain. This year's theme is "Sustainable Business Development” More information

MORE DIARY DATES ON THE CALENDARS AT
FeedLink.com
Aquafeed.com
Books

Asian Aquafeeds: Current Developments in the Aquaculture Feed Industry
Editors Wing-Keong Ng and Chee-Kiat Ng

Comprising a valuable reference for aquafeed professionals, suppliers and researchers as well as aquaculture producers, entrepreneurs and policy makers, this book is a compilation of invited papers presented at the inaugural Asian Aquafeeds 2005 regional seminar held in Kuala Lumpur, Malaysia. The aquafeed manufacturing industry is widely recognized as one of the fastest expanding agricultural industries in the world. With Asia accounting for more than 90 percent of aquaculture production, this publication presents a comprehensive analysis of some of the current issues facing the Asian aquafeed industry and its contribution to the rapidly growing global aquaculture industry. The information contained within the pages of this book will add a small but important piece to the huge puzzle of how the global aquafeed industry works and the challenges and opportunities it provides for industry players. Topics include:

• concepts in aquafeed formulation and feeding management;
• alternatives to fishmeal and fish oil in aquafeeds;
• twin screw extrusion technology;
• current issues such as traceability, replacement of trash fish in caged marine fish culture, the establishment of an Asian Aquafeed Network, new FAO initiatives; and
• comprehensive reviews on the status and developments in aquafeed production in some Asian countries.

Price: RM 35.00 for local orders and US $15.00 for orders outside Malaysia; excluding postage and handling charges. Contact: myfisoc@time.net.my and wkng@usm.my Website

Seafood research from fish to dish
Quality, safety and processing of wild and farmed fish
Edited by J.B. Luten, C. Jacobsen, K. Bekaert, A. Sæbø, J. Oehlenschläger
Scientists address the advances in seafood research with respect to quality, safety, consumer’s demands and processing of wild and farmed fish.
More Information Order form

FAO: Traceability Report
Traceability is not new to the fish and food industry. Fresh fish is a highly perishable product and traceability systems have been utilized systematically in the fishery industry. The traceability concept has also been included, explicitly or implicitly, for food safety purposes in several fish and fish product regulations.
More on Globefish

ERS-UDSA Feed Yearbook
The text is now available in PDF format. The report examines world and U.S. production, consumption, trade, stocks, and prices for feed grains (focusing on corn).
View this publication
Scientists at Fiskeriforskning's department in Bergen are working to reveal the secrets of fishmeal. The research will provide answers about which substances in the meal salmon needs to grow and develop normally.
"The answer can mean halving of the amount of fishmeal in the feed", says Senior Scientist, Anders Aksnes.
"When we understand which substances the salmon requires, then we can adapt the production such that we preserve as many of these substances in the meal as possible. We can utilise the fishing resources more effectively and get out more of the valuable components that the salmon needs, said Aksnes.
"This also means that the feed can be tailored to the needs of the salmon. This is knowledge with many positive effects."
It will also enable raw materials to be provided from alternative sources. "This can be fish offal, plants or animals in the sea. Everything from starfish to sea cucumbers and seaweed can be potential sources for raw materials", said Aksnes.
"Feeds and marine raw materials are going to become increasingly important. This is therefore a priority area at Fiskeriforskning's department in Bergen", says Department Director Ola Flesland.
"For the aquaculture industry, more knowledge in this area will be very important. This concerns both increased production and improved products."
For more information contact Senior Scientist Anders Aksnes.
Too much information?

Drowning in work, papers, reports?
Magazines piling up unopened on your desk?
We hear you!
Give yourself a break~ get your aquafeed info all in one place

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