VOL 5 ISSUE 4 Winter 2013

AQUAFEED

ADVANCES IN PROCESSING & FORMULATION

An Aquafeed.com publication

The Nutritional Impact of Pea Products

Highly Specific Detection of Ruminant DNA in Aquafeed

A Solution for Sustainable Aquaculture Ecosystems

New Odor Sampling Procedure

Square silos

VICTAM/ GRAPAS/ FIAAP Asia 2014

- Aquafeed Horizons Asia
- FIAAP Conference Asia

Photo: Pisum sativum—peas in aquafeed formulations

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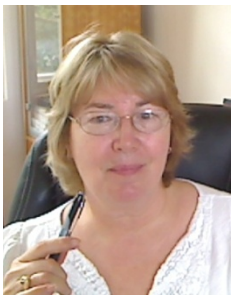
AQUAFEED

Volume 5, Issue 4

ADVANCES IN PROCESSING & FORMULATION

From the publisher



New products for the new year: this issue details a number of innovative solutions for the aquafeed producer. And still on theme, Victam has been renowned for almost half a century as the launch pad for feed industry introductions. It's no coincidence that we choose to hold our conferences during these shows. Read more about VICTAM/FIAAP/GRAPAS Asia 2014 and details of our up-coming conferences.

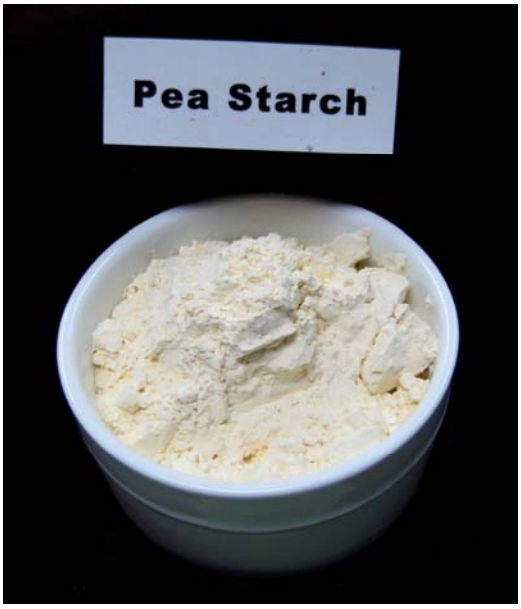
Suzi Dominy,
Publisher

Inside this issue:

** Cover Story*

Advertisers

The Nutritional Impact of Pea Products



By Dr. George Collings, Collings Nutrition Solutions

Twenty years ago, it would be unlikely to find an aquaculture or pet food that did not use of corn, wheat, rice or other grains. These grains provided starch that could be gelatinized in extrusion (cooking) and were well digested by most fish, crustacea and animals. Inventory was always available and of a reasonable price. As we look at many aquaculture foods around the world, many are made where corn and wheat may not be as available or as profitable to use. In pet food manufacturing, corn and wheat have been 'demonized' as being negative ingredients, while no firm data exists to support this conclusion. Additionally, the use of corn in alcohol production has significantly increased pricing leading to increases in all other ingredients. All of these issues have pushed formulation of foods to use alternative sources of starch and protein from beans, peas, tubers and other ingredients. The primary purpose of this article is to look at the usefulness of peas and pea products in aquaculture and pet food products.

Peas (a legume) are grown all over the world and used in human foods and animal feeds. Growing peas can be an advantage in many locations because they are easily harvested and are a valuable rotation crop for soil fertility in areas dominated by grains. Canada is the largest producer of peas (25% of the world's production) and largest exporter (40% of the world's exports). The largest use in Europe and North America is in the feed industry. The largest use in Asia and South America is in human food production, but there is still much used in feed production.

The scientific name for peas is *Pisum sativum* and is identified with many common names around the world: peas, field peas, and dry peas. There are two basic types (smooth & wrinkled) which refer to the surface of the pea. There are also three different colors seen (green, yellow & yellow-green).

While most of the pea production is not processed further into specific components, there is a growing availability of pea protein concentrates with protein levels as high as 80% to a low of 50%. Peas are processed using dry or wet processing methods and then further separated using air classification and pin milling. Some protein adheres to the starch granules even after this processing. The subsequent pea protein ingredients are nutrition-

ally reasonable alternatives to soybean meal, providing similar methionine and tryptophan levels, but higher levels of lysine. Pea proteins have been found to be highly digestible in aquatic species and pets. Pea protein products do not contain trypsin inhibitor (like soybean) and have low levels of anti-nutritional factors compared to other pulse crops. Soybean products can cause immunological reactions in some animals as 35 antigenic proteins have been identified in soybean. Studies of pea protein in some fish have shown superior growth performance and no palatability issues in fish, crustacean or pets.

Additionally, peas are not high in ash (minerals) like meat and fish meals. This is important to help balance mineral ratios and control high ash levels in foods with high meal & fish meals (which is a similar advantage of other vegetable proteins like soybean meal or corn gluten meal). The development of so many pea protein products produces two major byproducts – pea starch and pea fiber. Both of these provide nutritional and functional attributes that can be useful in many diets. It should be stated that pea starch purchased today is generally not just starch as it could have 10% to 15% protein. Pea fiber from the hull and from further processing have been shown to have good effects on digestion in some animals.

Like all starches in the native form, pea starch must be cooked or gelatinized to increase the digestibility of the starch to fish or pet. Gelatinization is accomplished in extrusion with high moisture, steam, pressure and heat. Typically, extrusion that reaches a 'cook' of 85% or more of the starch will lead to good digestion and performance in the animal or fish. Native (uncooked) legume starches like pea have been shown to be more digestible

than native potato or high amylose corn starch. However, it always preferred to cook any starch well. Cooked pea starch is a very useful energy source in many warm water fish and crustacea as well as pets. It has been reported that pea starch is not as rapidly digested as rice starch, but overall digestion of the starch as an energy source is high. Typically, pea starch or pea flour can be incorporated at 3% to 15% of the formula.

With cold-water fish, the amount of protein guaranteed is typically over 40% and up to 50%. The same is also true with many pet foods. As many of the meat and fish protein sources have declined in protein and increased ash (mineral) over the years, formulation becomes tighter and more difficult. Because peas and pea flour are 18% to 23% protein and pea starch is 10% to 15% protein, pea products help add more protein in the formulation space compared to corn and wheat with 7% to 11% protein.

There are two major components in pea starch – amylose and amylopectin. These differ in their branching and size (with amylopectin being the larger component). Many legume starches exhibit a wide variation in swelling during water hydration in extrusion, but pea starch seems to be less variable. There are some viscosity differences between pea varieties, but extrusion characteristics are good such that floating properties desired in many aquaculture diets can be accomplished. Different starches can lead to 'brittle' products and yield fines in the process and delivery. Pea starch extrudes well (similar to corn) and provides some elasticity ultimately reducing fines (pea is preferred over potato and wheat). Pea protein has been shown to be a reasonable alternative in baking with low gluten formulations where elasticity has been reduced.

So, how do these pea products help formulation? They provide good nutritional profiles along with good functionality. They are not sticky like some starches which can slow down production and reduce throughput. If they are well-cooked in processing, the energy provided is high. Losses due to fines in processing can be reduced which improves yield and reduces the delivery of food fines to fish facilities and in packaging. Overall, performance of aquatic species and pets is good. With pea production being worldwide, the use in formulation can only increase and give another option to business profitability.

The 3D Corporate Solutions family of companies is made up of Pet Solutions LLC, which provides EU certified rendered meals and fats, Protein Solutions LLC, which provides gently processed proteins, fats and specialty products, 3D Corporate Solutions, which provides food and feed ingredient acquisitions, logistics and other services.

For information on pea starch and pea flour please contact Jessica Kutz at 3D Corporate Solutions. For information on pea protein please contact Nathan Green at 3D Corporate Solutions.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Highly Specific Detection of Ruminant DNA in Aquafeed

By Gert van Duijn, PhD, Project Manager, TNO Triskelion B.V., Netherlands

As an ultimate result of TSE Road map 2, a new European Commission Regulation (Regulation EC 56/2013) came into force on 5 February 2013, which reforms the stringent rules on the use of processed animal proteins (PAPS) from non-ruminants (e.g. pigs and poultry) in feed. This Regulation amends the EU Regulation 999/2001 on transmissible spongiform encephalopathy (TSE Regulation) and is the product of the agreement reached between the Commission and technical experts from the EU Member States in July 2012.

The TSE Regulation was adopted in reaction to the poor control of meat and bone meal in the animal feed chain in the past. However, with the decreasing risk of TSEs throughout Europe it is recognized that there is now less need for these measures. The TSE Road map 2 was presented to the European Commission in July 2010. This road map reflects the

final goal to at least partially lift the feed ban while assuring an extreme high level of food safety. The result being that, from 1 June 2013 onwards, PAPs from non-ruminants will be deemed suitable for use specifically in farmed aqua feed only.

So far, the TSE Regulation imposed a general ban on the use of PAPs in the feeding of both ruminants and in non-ruminant animals, including fish and other aquaculture animals.

Now, PAPs derived from non-ruminant animals can be used in aqua feed. The production of PAPs themselves is subject to the requirements as presented in the EU animal by-products legislation.

In particular PAPs must only be derived from so-called 'Category 3' animal by-products (e.g. un-diseased carcasses and parts of slaughtered animals, including hides, skins, horns and feet), undergo pressure sterilization and be subject to controlled storage.

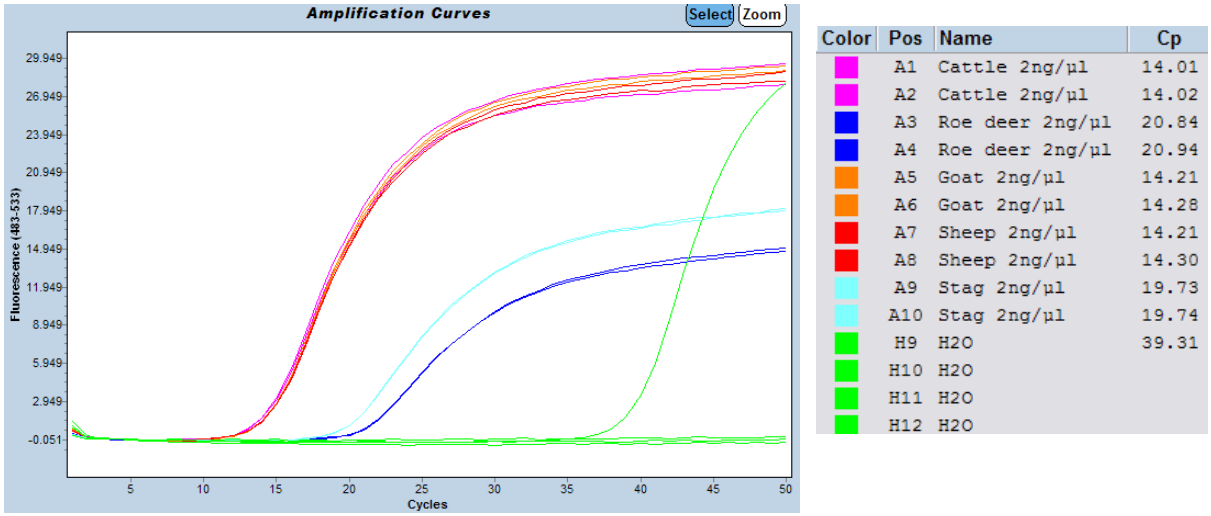
The relaxation of rules on PAPs in the feed chain was mainly based upon scientific opinions which found no TSE risk occurring from the provision of non-ruminant feed to non-ruminant animals, where 'intra-species recycling' (i.e. cannibalism) is avoided. Nevertheless, the European Parliament insisted that any move to revise the feed ban should be accompanied by specific methods in order to identify the species origin of proteins in animal feed containing PAPs so that intra-species recycling and the presence of ruminant PAPs can be excluded. These methods should also contribute to guarantee the minimization of the risk of cross-contamination during the production process performed under a regime

of strict spatial segregation.

Several techniques based on microscopy and spectroscopy have been considered for this purpose. Also, in order to allow a fast screening procedure on the PAP production- plants, rapid protein- specific tests based upon ELISA technology have been developed. By now, analytical procedures enabling the detection of DNA promise to be the most powerful. Within TNO Triskelion BV various Real-Time PCR (Polymerase Chain Reaction) methods have been developed for the specific detection and discrimination of DNA derived from several species such as ruminants (inclusive cattle, goat and sheep), porcine and poultry. These methods even have been proven to be robust for analysis on PAP's which, as a rule, experienced a treatment for 20 min. at 133o C and 3 bar. Further, in order to exclude the possibility of negative matrix effects, these methods were validated with a wide variety of samples including various types of meat- and bone meal from various sources. Also the applicability of the RT-PCR methods was shown for the traceability of different PAP's in feed samples.

As an example, a RT-PCR method was developed for the amplification of a DNA sequence which is specific for the bovine alpha subunit precursor of the acetylcholine receptor. As this DNA target is highly abundant in ruminants (at least 200.000 copies per cell), the method is very sensitive. Further, as the DNA amplicon size is only 85 base pairs in length, extremely treated DNA material as present in PAPs will not lead to loss of respond in the RT-PCR experiments. In Figure 1 a typical amplification profile is presented. As can be seen in this figure "early" amplifications occur for DNA from cattle, goat and sheep. Further it can be seen that also DNA from roe deer and stag give rise to substantial DNA amplification using this method.

Figure 1: Amplification signals obtained on DNAs extracted from ruminant samples and on no template control (H2O) with the LC480 thermocycler (Roche Diagnostics Ltd.)



In a next phase, the ruminant-DNA specific RT-PCR method as developed within TNO Triskelion BV was further assessed in cooperation with the European Union Reference Laboratory for Animal Protein in feeding stuffs (EURL-AP). Besides a deep evaluation of the method with respect to specificity and

sensitivity towards DNA from a wide variety of animals, the method was tested for its robustness, also including the use of various types of laboratory-equipment and reagents.

Table 1: Specificity tests performed on non-ruminant samples using ruminant specific RT-PCR

Species	Cp	Mean Cp	Result	Species	Cp	Mean Cp	Result
Other terrestrial mammalians				**Domestic birds**			
Human	50 50	50	-	**Chicken**	50 50	50	-
Pig	41.21 50	45.61	-	**Guinea-fowl**	42.59 50	46.30	-
Donkey	45 50	48	-	**Turkey**	41.63 50	45.82	-
Horse	43.70 50	46.85	-	**Duck**	45 43.46	44.23	-
Rabbit	39.34 40.30	39.82	-	**Pheasant**	50 40.89	45.45	-
Rat	42.15 40.91	41.53	-	**Pigeon**	50 42.16	46.08	-

In table 1, results from the specificity study are presented. For the terrestrial mammalians, besides pig, donkey and horse, also human and rodents were tested. Further, for the domestic birds, several poultry species were tested. As all mean Cp values obtained from these RT-PCR experiments are > 40, it was concluded that these species showed up as negative in this ruminant specific detection method. Moreover, various fish species potentially present in fishmeals, all showed up as negative in these experiments (data not shown).

As a consequence of their positive experiences the EURL-AP decided to continue and organize an inter-laboratory validation study. Participants in this study which took place in the first quarter of 2012 were 12 independent European institutes. Most of these laboratories had very good results with an overall rate of false positive results below 5 %. In addition, in this validation study a feed sample with a content of only 0.1 % of ruminant PAP was scored as positive for ruminant DNA with a confidence above 99%. From these studies it was concluded that the TNO Triskelion BV method is fit for the purpose of the detection of 0.1 % of ruminant PAP's in feed. This conclusion will be of crucial interest for maintenance of the prerequisites as described in EU regulation documents with regard to partial lifting of the feed ban.

For more information, please contact Gert van Duijn, PhD., Project Manager, TNO Triskelion B.V., the Netherlands.

Dr. van Duijn will make a presentation on this topic at the feed ingredients and additives conference, FIAAP Asia in Bangkok, April 9, 2014. Details can be found on the conference website at: www.feedconferences.com.

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A Solution for Sustainable Aquaculture Ecosystems:

OriginOil's Electro Water Separation (EWS) Technology

By Dave Anderson, Aquaculture Product Manager, OriginOil, Inc.

Is the aquaculture feeds industry poised for a revolution? What will it take to usher in a new era in aquaculture? For the past several decades, advancements in aquaculture have been arguably slow and cautious. The aquaculture industry has pushed for regular improvements in feed conversion ratios and for a variety of alternative protein sources. Globally, aquaculture production has risen steadily and cultured fish have predictably marched up the list of top 10 species consumed in the U.S.

In spite of these advances, U.S. domestic aquaculture production lags far behind. Seafood remains the third largest contributor to the U.S. trade deficit after oil and automobiles, amounting to a gap of 9.3 billion dollars in 2006. The reasons for this gap are many, with the cost of running a fish farm in the U.S. being chief among them. Feed costs can represent 40-60 percent of operating expenses on a fish farm.

A clue to the next big thing in aquaculture may lay in the past, with one of the most notorious figures in the history of chemistry, Fritz Haber. In 1918, Haber was awarded the Nobel Prize in Chemistry for his work on a process that converts inert diatomic nitrogen into reactive nitrogen compounds – primarily ammonia. Haber's work had an immediate impact on Germany's ability to manufacture munitions, which had previously relied on access to natural saltpeter deposits. More importantly, the so-called Haber Process had lasting implications for agriculture, making synthetic fertilizer widely available and cheap to make.

Industrial agriculture skyrocketed in the 20th century with the production of synthetic ammonia. However, the by-product of animal farming no longer had any value as fertilizer. It became merely waste.

After nearly a century of producing synthetic fertilizer, nitrogenous waste has come to represent two problems. First, nitrogen taken directly from the atmosphere cannot be put back easily. Instead, we allow waste and excess fertilizer to make their way into our water supplies and to the ocean. This has resulted in nitrates in groundwater, toxic algal blooms, dead zones, and fish kills. The second problem is that we're wasting a resource (that same nitrogen) that could be used to create more plant and animal protein.

Bony fish excrete ammonia directly into the water from their gills. On many fish farms, aerobic bacteria convert that ammonia to nitrite and subsequently to nitrate – a process that is limited by pH, temperature, and enzyme kinetics. A small percentage of culture water must be flushed and replaced regularly to prevent the buildup of nitrates. This approach, long the accepted norm in partially recirculating culture systems, has the same two problems described above: incomplete control over nitrogenous waste and the discharge of nitrogen could otherwise be used to build fish protein.

Enter OriginOil's breakthrough in water cleanup technology, Electro Water Separation™ (EWS). EWS technology is based on the electrochemical oxidation treatment of contaminants in water. It is employed in two primary applications that address the problems of nitrogenous waste.

First, EWS can be used to remove dissolved ammonia and nitrates and convert them directly to nitrogen gas. In this process, nitrogen containing compounds are first oxidized and then reduced by highly reactive chemical intermediates formed at the anode through

the donation of electrons. As an added bonus, the high Oxidation Reduction Potential (ORP) that results from the formation of chemical intermediates is extremely effective in disinfecting the treated water. OriginOil's EWS is one of the first commercial, flow-through applications of electrochemical oxidation.

OriginOil's model Q60 is designed to completely remove up to 6 ppm of total ammonia (TAN) while operating at 60 lpm (multiple units may be used in parallel to increase flow rates). Water is pumped from the culture system to a bank of specially designed electrode tubes. As water flows directly though the electrodes, batch treatment is unnecessary. After being treated with a series of low voltage electrical pulses, the water is filtered to remove any residual chemical intermediates and discharged directly into the culture tank.

Algae culture

In the second application of EWS technology, electrochemical oxidation is used to condense and collect algae and other organic material through electrolytic flocculation and subsequent electrolytic flotation. In this application, the EWS electrodes are modified to affect the surface charge of certain molecules and produce micro-bubbles of hydrogen gas.

The EWS Aqua Q60 and EWS Algae A60 models at the inauguration of OriginOil's Permanent Technology Showcase at Aqua Farming Tech, a sustainable fish farm in Thermal, Calif., located in California's Coachella Valley. Read more.

OriginOil's model A60 makes use of this technology to process fish ponds or algae cultures at a flow rate of 60 lpm. The A60 can take any water source with moderate algae density and produce a thick algae paste that has the consistency of cake frosting. The collected algae is viable, disinfected and with a long shelf life can be used directly in algae based feeds. Treated water discharged from the A60 is also disinfected and completely free of suspended solids.

In tandem, these two machines give fish farmers powerful options that have been missing for nearly 100 years. With the Q60, ammonia and nitrate levels in a culture system can be controlled directly, without requiring regular water replacement due to nitrate buildup. We believe this advantage alone will lead to higher culture densities and reduced exposure of fish to harmful, low quality water. With the A60, ammonia and nitrates in fish waste can be used to culture algae – algae that can in turn be used to produce fish feeds rich with amino acids and oils.

OriginOil's A60 and Q60 machines are now being tested by New Global Energy at a tilapia farm in the Coachella Valley of Southern California. The use of OriginOil's technology is expected to sustainably revitalize the aquaculture industry and dramatically improve the nutritional value and taste of farmed products.

For more information, please contact Dave Anderson, Aquaculture Product Manager, OriginOil, Inc.

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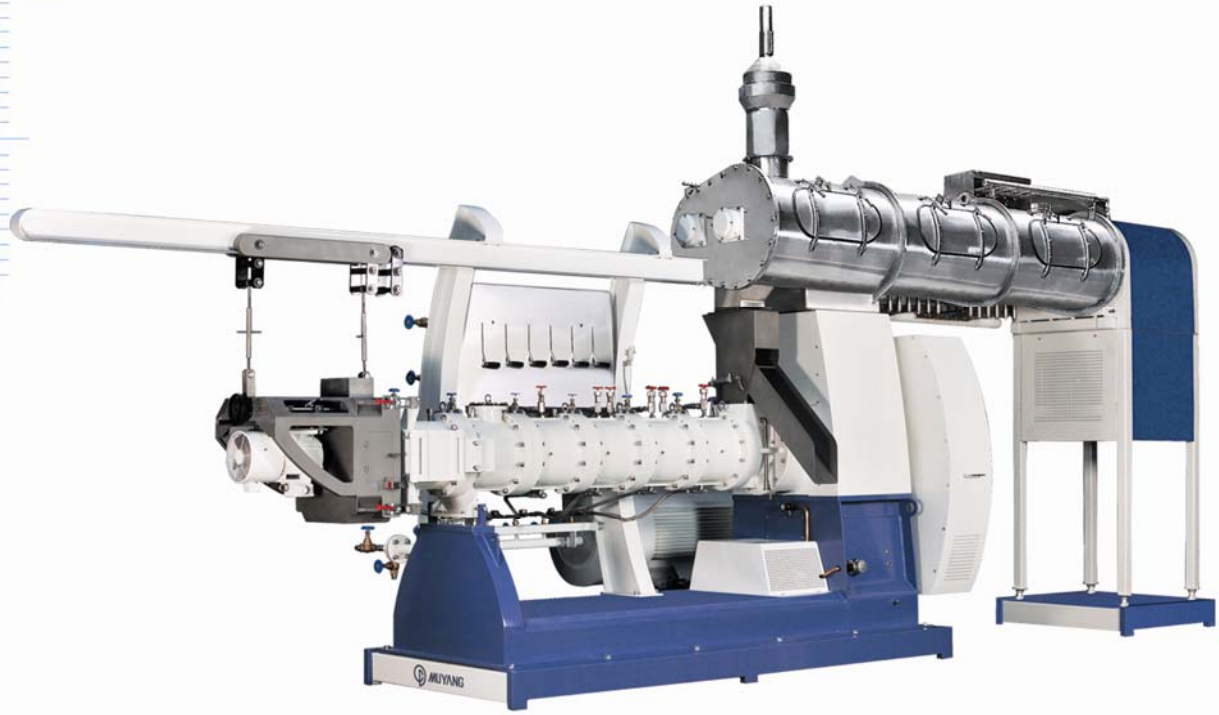

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When
April 8 - 9, 2014:
10am - 6pm

April 10, 2014:
10am - 4pm

Registration
Registration is free. Register online and avoid the crowds
Register online free now

Established almost 50 years ago, the VICTAM events held in Cologne, Germany and Bangkok, Thailand, are the worlds' largest and leading international exhibitions and conferences for the animal feed, petfood, aquafeed and grain industries. The 2014 exhibitions in Bangkok will be the largest ever. And the organizers say it will get even bigger before the doors open to the thousands of industry executives who will have travelled from all over Asia Pacific and the world to attend what is the showpiece industry event and meeting place. Aquafeed.com holds its conferences, Aquafeed Horizons and FIAAP Conference during the course of this event to provide delegates with an unparalleled opportunity to see the very latest in feed ingredients, technology and services as well as attend the conferences—and of course to network with fellow professionals.

General Information—exhibitions

More than 200 exhibitors will display the latest products—from extruders to NIR systems and bulk handling solutions to probiotics.

PROVISIONAL EXHIBITOR LIST

Floorplan

Travel and accommodation

Victam has arranged preferred rate accommodation with a selection of hotels for the period covering the trade shows and conferences. However you MUST use the links provided below in order to take advantage of these special rates. This page also provides travel information.

HOTELS

General Information— conferences

A number of free and fee-based conferences and seminars take place during the event. Details from the organizers at the links below:

April 8

Aquafeed Horizons Asia 2014
Aquafeed.com

The GRAPAS Asia Conference 2014
Perendale Publishers

April 9

Petfood Forum Asia 2014
Petfood Industry Magazine, Watt Publishing

The FIAAP Conference 2014
Aquafeed.com

April 10

The Thai Feed Conference 2014 (in Thai)
Thai Feed Mill Association

Bioenergy International – Pellets Update Asia
Bioenergy International

Aquafeed Horizons & FIAAP Conferences

Early registration is strongly advised for Aquafeed.com's premier conferences. Previous conferences have attracted 100-200 delegates from throughout the region and beyond and included the major feed companies. Places are limited. Early rates end January 31.

Details of these conferences can be found on the following pages.

REGISTRATION FEES	Aquafeed Horzons or FIAAP Conference Asia 2014	Both Conferences
By January 31, 2014	US$ 275	US$ 405
February 1 — April 8, 2014	US$ 325	US$ 585
April 2, 2014 — On SITE ONLY *If space is available*	US$ 350 or Thai Baht 11,000	US$ 600 or Thai Baht 20,000
Students	US$ 50	US$ 100
Groups of 3 or more on the same booking	- 10%	- 10%

Price includes a sumptuous buffet lunch and two refreshment breaks per conference

Proceedings will be available to delegates as downloads at the end of the meeting

Aquafeed Horizons Asia 2014

Aquafeed.com's 7th conference in the series addresses advances in formulation and processing solutions

The continuing growth of aquaculture is driving demand for quality aquafeed. The industry is at a crossroads: it must find ways to sustain growth. One way is to improve the quality of existing ingredients, another to increase the available nutrients in feed, another is to find alternative protein and carbohydrate sources. The 7th Aquafeed Horizons Asia Conference will look at these approaches and at feeding for health. In recognition of the importance of processing solutions to the overall mix, production technology will also be an important part of the meeting.

Upgrading nutrition

There is an increasing use of exogenous enzymes to ensure better utilization of nutrients in aquaculture feed. However, volatility of global supply and price of common protein in-

gredients has been discomforting for aquaculture feed manufacturers worldwide. One solution is to reduce the inherent variations in protein quality and to increase digestible protein content by adding protease enzyme in feed.

Game changing alternatives

Alternative ingredients are starting to reach the market. Many fish farmers are now looking to algae to serve as an economical and healthy alternative to traditional aquafeed. Algae is rich in Omega-3s and can be pelleted for extended shelf life, which can mean a significant reduction in the cost of fish feed as well as improved nutritional value. Opportunities to capitalize on algae as a tool to not only clean fish farms but also sustainably feed fish populations will be discussed.

A novel feed ingredient that is creating a buzz in the industry has been the subject of research and development by Australia's national research body, CSIRO, for more than a

Registration

Aquafeed Horizons Asia 2014 "Advances in Processing & Formulation" will take place 9am - 5 pm, April 8, 2014 in Rooms 224/225, BITEC, Bangkok. The conference language is English with simultaneous interpretation into Thai and special rates for Thai delegates. Discounts are also available for students, groups and when you also book for the FIAAP Conference Asia (taking place April 9, 2014 at the same venue and at the same time). Register now for best rates at www.feedconferences.com.
'Early Bird' registration is closing soon!

decade. This novel bioactive feed ingredient is soon to be commercialized for inclusion into shrimp diets. It not only has been demonstrated to increase growth rate in shrimp from between 20 to 40%, and provide protection to some known pathogens but can also reduce dependence on expensive and potentially unsustainable marine resources. Delegates will hear the results of feeding trials with Novaq as well as the game changing implications this could have on the sustainability of the industry into the future.

Least cost diets are for suckers!

Dr. Richard Smullen, Technical Manager at Australian feed company, Ridley AgriProducts, says that for too long the focus of diet manufacture has been "least cost formulation" and while this is a function of saving money at the point of the biggest single cost to the farmer, there is a clear danger of least cost formulating off the edge of "the risk cliff". With the volatility of the fishmeal and oil markets, currency fluctuations and the issue of sustainability, there has never been a time where feed company formulators have been under so much pressure to hit the sweet spot of lowest cost feed and highest production of fish or shrimp. It is too easy to be tempted into using lower specification raw materials and adjusting formulations to meet commercial expectations. In his provocative talk, Dr. Smullen will provide but case studies that show that current diets can meet all the above considerations and actually improve growth, FCR and above all health of farmed fish and shrimp, while bad decisions can cost you dearly.

An answer to EMS?

Thai shrimp farmers are reeling from the latest disease epidemic to ravage their industry. "Early Mortality Syndrome" (EMS), more technically known as *acute hepatopancreatic necrosis syndrome* (AHPNS). This new shrimp disease is presently disrupting production in the three major shrimp producing countries: China, Thailand and Vietnam - and has now shut down production in India. Shrimp producers are no strangers to viral epidemics, but EMS is caused by a bacteria that is difficult to eradicate from the production environment. Delegates will learn about the role functional feed can play in a strategy to combat disease.

Processing technology

Extrusion is once again an important focus of the conference. Technical talks by three of the major extrusion technology companies as well as drying solutions will be presented. The extrusion dies for forming are without doubt exposed to the highest loads due to temperature, friction, compression and wear. Die design is often a critical variable as the die pattern influence the pellet physical quality. A new revolving die will be described as well as density and SME control.

There are a multitude of extruder designs for specific uses and add-on options that allow for a wide range of products to be made on the same equipment. Delegates will learn how to select a machine, manage these options as well as determine which system or option is right for their specific needs.

TIMETABLE

* Program subject to change

9:00	*Registration open*
	Chair: Dr. Warren Dominy, Technical Consultant, Aquafeed.com
9:45 – 10:00	**Opening,** Dr. Juadee Pongmaneerat, Thai Department of Fisheries
	PROCESSING
10:00 – 10:30	**Single use or multiple purpose extruder designs** Joseph P. Kearns, Aquaculture Process Engineering Manager, Wenger Manufacturing, Inc., USA
10:30 – 11:00	**High capacity and cost efficient aquafeed production** Finn Normann Jensen, Director of Global Business Development & Marketing, Andritz Feed & Biofuel A/S, Denmark
11:00 – 11:30	*Questions/Coffee Break*
11:30 – 12:00	**Improving aqua feed buoyancy and pellet uniformity with density controllers and revolver die** Dr. Cristian Atienza, Aqua Feed Technology Manager, Bühler, Switzerland
12:00 – 12:30	**Impact of drying parameters on aquafeed properties** Justin Hamm, Global Applications Engineering Specialist for Aquafeed and Petfood Drying, Bühler Aeroglide, Switzerland
12:30 – 2:00	*Questions/Lunch*
	INGREDIENTS & FORMULATION
2:00 – 2:30	**Functional feed additives to reduce the impact from bacterial diseases on shrimp production** Dr. Peter Coutteau, Business Unit Manager – Aquaculture, Nutriad International NV, Belgium
2:30 –3:00	**Protease in aquaculture feed - better quality, better profit or both?** Dr. M A Kabir Chowdhury, Product Manager Aquaculture, Jefo Nutrition Inc., Canada
3:00 –3:30	*Questions/Coffee Break*
3:30 – 4:00	**Least cost diets are for suckers – economic formulations for 2020** Dr. Richard Smullen, Technical Manager, Ridley AgriProducts Pty. Ltd., Australia
4:00 – 4:30	**Algae as fish feed, a panacea for aquaculture?** Jose Sanchez, Vice President of Quality Assurance and Services, Origin Oil, USA
4:30 – 5:00	**Novacq – commercializing the paradigm shift in shrimp nutrition** Dr. Matthew Briggs, Technical Project Manager – Novacq Commercialization, Ridley AgriProducts Pty. Ltd., Australia

FIAAP Conference Asia 2014

Developments in feed additives and ingredients

The variety of micro -and macro- ingredients and additives available to today's feed formulator is extensive. Staying on top of what's new, and more importantly, what offers commercial advantage, can be bewildering. What is certain is that escalating costs make buying decisions ever more crucial: which is why formulators and ingredient buyers from the major animal and aquafeed companies from throughout Asia Pacific – and the world – come together for the FIAAP Conference – to learn about the latest products and findings and to interact with the international lineup of expert speakers - and of course with their fellow feed industry professionals.

Proteins

Soybeans are an established staple of animal feed production but there's more to these essential oilseeds than just crude protein. The conference will take a look at quality parameters such as Total Amino Acids, Digestible Amino Acids, Digestible Energy, Metabolizable Energy and Net Energy as well as supply and pricing.

From the well established soybean, delegates will learn about a new high protein feed on the horizon, one that can be grown sustainably for fish and crustacean production - the simple, tiny duckweed. Why the sudden fuss about duckweed? Simply put, it's the fastest growing vascular plant in the world, doubling in volume every 16-48 hrs.

Making the most of protein

Enzyme supplementation in poultry nutrition has focused significantly in maximizing the energy and phosphorus digestibility of feeds, so much of the general knowledge on enzyme use concerns their role in targeting the non-starch polysaccharide and phytate components of poultry diets. The dramatic increase in prices of protein feed ingredients has renewed interest in the use of exogenous protease enzymes. Protein and amino acid digestibility studies in poultry indicate that valuable amounts of protein pass through the gastrointestinal tract without being completely digested. This undigested protein represents a good opportunity for the use of exogenous protease enzymes.

Registration

FIAAP Conference Asia 2014 "*Ingredients for Success!*" will take place 9am - 5 pm, April 9, 2014 in Rooms 224/225, BITEC, Bangkok. The conference language is English with simultaneous interpretation into Thai and special rates for Thai delegates. Discounts are also available for students, groups and when you also book for Aquafeed Horizons Asia (taking place April 8, 2014 at the same venue). Register now for best rates at www.feedconferences.com.
'Early Bird' registration is closing soon!

Probiotics

Gastrointestinal disorders in commercial poultry contribute to significant financial losses due to reduced growth, compromised immune system, severe mortality and contamination of animal products for human consumption. Traditionally, antibiotic growth promoters (AGPs) have been used in poultry diets to reduce the impact of these challenges. However, as the use of AGPs is being limited and/or banned throughout the world, there is continuous search to identify alternative strategies: the use of probiotics is one of the most promising. Probiotics can be based on many different microbes but Bacillus-based probiotics seem to be ideal candidates for in-feed applications because they are tolerant to heat, harsh pH environments, pressure, coccidiostats and antibiotics. Bacillus-based probiotics are a viable alternative to AGPs and can improve the production efficiency of poultry.

Delegates will also hear how prebiotics and probiotics are playing a more important role in aquafeeds. They have been shown to be particularly efficacious for sensitive species, for use during critical life stages when fish are more susceptible to enteritis, for preventing infection from pathogens that can colonize the gut, and for reducing inflammation that can result from anti-nutritional factors in plant proteins.

Not just an acid

There is more and more evidence that butyric acid possesses interesting characteristics that make it “not just an acid”. In addition the well documented anti bacterial effect, sodium butyrate is known to stimulate the production of pancreatic secretions, including enzymes. It will also stimulate hormones, such as insulin, which in turn stimulates epithelium development. Sodium butyrate also improves the absorption of electrolytes and reduces the incidence of diarrhoea, providing the ileal and the hindgut mucosa with a preferred energy source. Recent data suggests positive impacts on the immune defence of the animal. However, not all butyrates are equal: different production technologies affect the product.

Winning the war on mycotoxins

Mycotoxins are an ever present concern for feed manufacturers worldwide, and particularly so in tropical and sub tropical regions. Mycotoxin contamination of the feed can reduce animal performance significantly, even at low levels and without visible symptoms, since mycotoxins affect the immune system and have a synergistic damage when several are present in the feed at the same time. One of the most practical approaches at combating the effects is the use of clay-based anti-mycotoxin additives. Delegates will learn about demonstrably beneficial effects of these products on performance and especially on the protection of target organs. Results of a study that indicate that the use of effective mycotoxin control offers an opportunity to significantly modify animal response to vaccination will also be shared.

Combine the FIAAP Conference with Aquafeed Horizons and book now for the very best rates. Early-bird booking rates are ending soon—don’t delay!

TIMETABLE

SAVE Your Spot Today Register

* Program subject to change

9:00	*Registration open*
	Chair: Dr. Warren Dominy, Technical Consultant, Aquafeed.com
9:45 – 10:00	**Opening**
10:00 – 10:30	**Effects of diets contaminated with deoxynivalenol and supplemented with mycotoxin deactivator product on levels of Newcastle disease antibody titers in poultry** Dr. Olga Averkieva, NutriAd International, Belgium
10:30 – 11:00	**Efficacy of anti-mycotoxin additive must be based on target organ protection** Fernando Tamames III, Vice President, Special Nutrients, USA
11:00 – 11:30	*Questions/Coffee Break*
11:30 – 12:00	**Soybeans in animal feed; more than just crude protein** Dr. Basilisa P. Reas, Technical Manager-SEA, USSEC, Philippines
12:00 – 12:30	**The use of Lemna based products in aquafeeds** Marcus Kenny, VP Products Development, Parabel Ltd, Abu Dhabi
12:30 – 2:00	*Questions/Lunch*
2:00 – 2:30	**Importance of the gut microbiota for health** Dr. Ei Lin Ooi, Aqua R&D Manager, Novus International, Vietnam
2:30 –3:00	**Effect of feeding Bacillus-based probiotic on growth performance and health of broilers** Dr. Girish Channarayapatna, Technical Sales Manager, Health and Nutrition, Evonik Industries, Singapore
3:00 –3:30	*Questions/Coffee Break*
3:30 – 4:00	**The use of protease enzyme in poultry diets – factors to consider for optimum results** Dr. Glenmer Tactacan, Technical Support Manager - South East Asia, Jefo Nutrition, Canada
4:00 – 4:30	**Benefits of adding sodium butyrate, a sodium salt of the short chain fatty acid butyric acid, in the feed of broilers and other farm animals** Mathieu Cortyl, General Manager Asia Pacific, Norel Animal Nutrition, Singapore
4:30 – 5:00	**Highly Specific Detection of Ruminant DNA in aquafeed** Dr. Gert van Duijn, Project manager, TNO Triskelion BV, Netherlands
5:00	Questions/end conference

AQUAFEED HORIZONS ASIA 2014

April 8. 2014, BITEC, Bangkok

Aquafeed.com is proud to present the popular international conference "Aquafeed Horizons Asia" once again during FIAAP & VICTAM 2014. The 7th in the series will focus on advances in formulation and processing that offer practical solutions to commercial aquafeed companies in terms of production efficiency, quality improvement and profitability.

The conference language is English with simultaneous Thai interpretation

Special rates are available for early registration, combined registration with FIAAP conference, students, for Thai delegates and for groups of three or more people registering at the same time.

***PROGRAM**

Ingredients & Formulation

Novacq – Commercializing the paradigm shift in shrimp nutrition
Dr. Matthew Briggs, Ridley AgriProducts Pty. Ltd., Australia

Least cost diets are for suckers – economic formulations for 2020
Dr. Richard Smullen, Ridley AgriProducts Pty. Ltd., Australia

Protease in aquaculture feed - better quality, better profit or both?
Dr. M A Kabir Chowdhury, Jefo Nutrition Inc., Canada

Functional feed additives to reduce the impact from bacterial diseases on shrimp production
Dr. Peter Coutteau, Nutriad International NV, Belgium

Algae as fish feed, a panacea for aquaculture?
Jose Sanchez, Origin Oil, USA

Processing Technology

High capacity and cost efficient aquafeed production
Finn Normann Jensen, Andritz Feed & Biofuel , Denmark

Improving aqua feed buoyancy and pellet uniformity with density controllers and revolver die
Cristian Atienza, Bühler, Switzerland

Single use or multiple purpose extruder designs
Joseph P. Kearns, Wenger Manufacturing, USA

Impact of drying parameters on aquafeed properties
Justin Hamm, , Bühler Aeroglide, Switzerland

**Program subject to change*

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Uniqair, Purdue University odor lab odor sampling procedure

By Hans Schieven, CEO, Uniqair Technologies, Canada

A new odor sampling procedure with nitrogen dilution has been developed by Uniqair and Purdue University's odor lab for odor samples with high humidity from fish feed (and pet food) dryers, extruder air conveyer (wet cyclones) and coolers

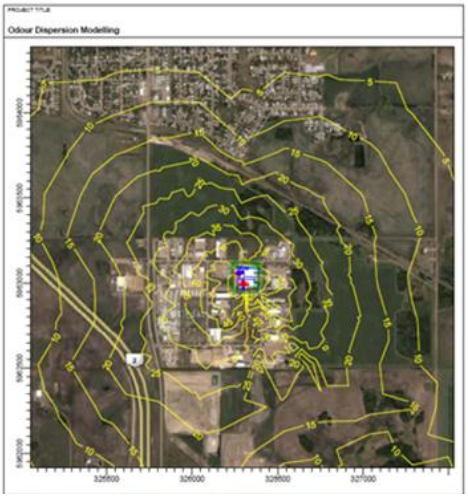
The sample bags are pre-filled with a specific quantity of ultrapure nitrogen prior to sampling to:

- prevent or reduce oxidation of the odors in the sample bag and
- reduce interaction with the sample bag surface which is nitrogen pre-conditioned and
- prevent condensation and preserve the sample for more accurate odor concentration test results.

After adding the odor sample from the stack or pilot test unit, the odor lab can determine the added volume and exact nitrogen dilution in the bag. The bag is made of Tetlar or PTFE.

Odor analysis

Only an odor lab that can comply to the latest olfactometry standards in combination with a correct odor sampling procedure, is able to measure the odors from fish feed processing. The odor test results are used for stack dispersion modelling to calculate the odor concentration at ground level around the plant.



Odor evaluation: odor concentration at ground level before and after treatment

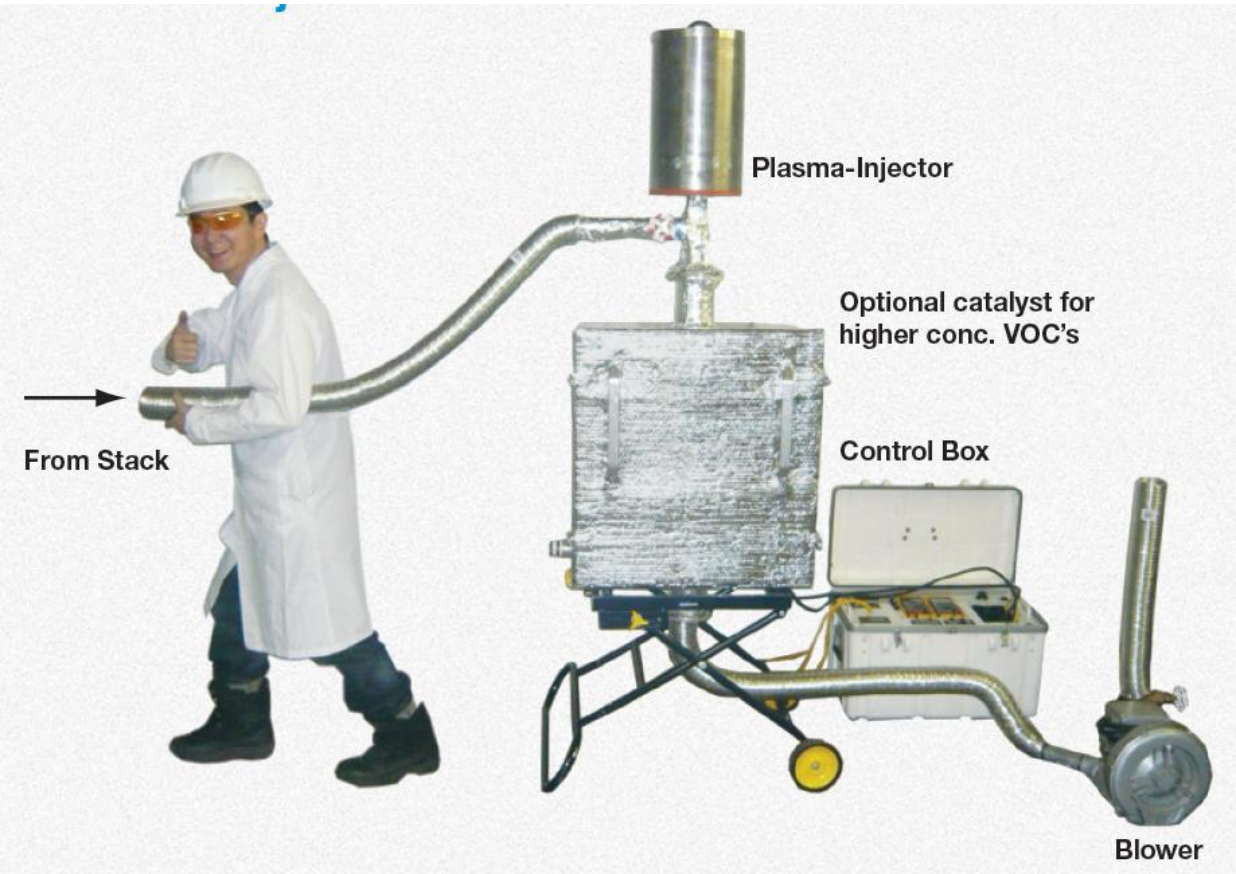
Analytical testing for the chemicals in airflows from the extruders/dryers/coolers will not provide any clear information about the odor concentration, because:

- It is a **cocktail** of hundreds different organic components. A single chemical may have a certain odor but it is not possible to calculate the resulting odor if all chemicals are mixed in a cocktail.
- The weight **concentration of the odor components is mostly very low**, like 10 mg/m3, but the odor-concentration can be very high. Odor concentration = DT (Detection Threshold) or ou/m3 = odor units per cubic meter. 1 DT = 1 ou/m3. The odor concentration is the number of required dilution's with clean air in order to just being able to detect it. For fish feed dryers and extruders app. from 20,000 to 100,000 ou/m3 (or DT) depending on process conditions, recipe, etc.
- The odor components with the lowest concentrations (sub-ppb-range) **may not be detected analytically by GC or GCMS** but the human nose may detect. An example of an odor with a very low threshold is IsoAmylMercaptane = 0.00077 ppb. This is less than 1 part per thousandth of a billionth.
- Each odor component can **mask or amplify** another component within the cocktail.

Other factors that make odor emission evaluation complicated:

- Odor is **dynamic**, since the components and their concentrations will vary in time due to differences in process-conditions, raw material quality and origin, recipe's, etc.
- **Particles** can generate odor once they are released in atmosphere, especially particles below 1 micron have a large total surface area and can interact with the air. A cold plasma odor oxidizer need to be placed after the cyclone or dust filter to prevent new odors from generating again after treatment.
- Odor **can escape** out of windows and doors and during outside loading/unloading, which can cause odor and/or dust complaints even if there is no stack emission. A clean environment and "good housekeeping" are important.
- With a low odor concentration out of the stacks, odor may sometimes still be detected during **certain weather conditions** when the (humid) plume goes down to ground level quickly, reducing the dilution.
- Odor measurements are expensive and do have a **large tolerance** on the results. They have to be executed by certified laboratories according the best available standard: CEN13752.
- Odor emission in the surrounding area occurs within 1 - 10 minutes after emission out of the stacks. Odor measurements need to be done as soon as possible after sampling but are officially allowed to be analyzed within 28 hours after sampling. Odors can oxidize or change in the sample bag and odor concentrations are mostly decreasing in time, so this may cause errors.

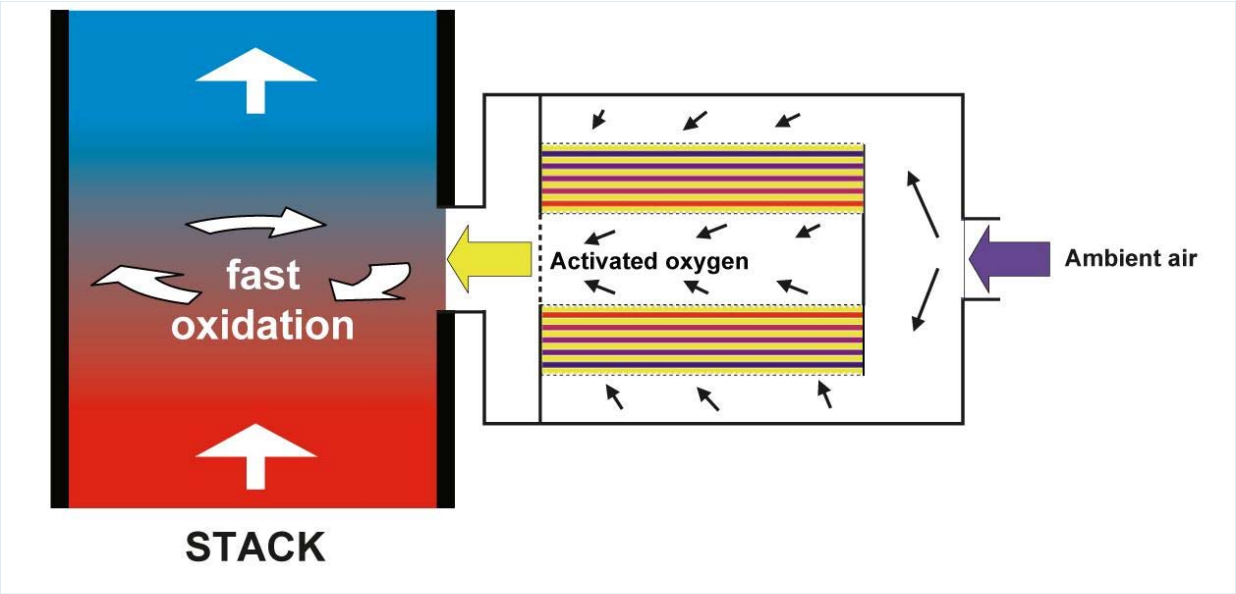
Odor emission on ground level can be calculated from stack emission measurements and stack dispersion modelling. The actual situation can cause differences with respect to the outcome of the standard calculations due to changing area situation (new buildings, etc.), weather conditions (long hot summer, unusual wind direction etc.) and above mentioned



Pilot testing: example of a Plasma-Injector pilot test system for cold plasma

factors. Therefore pilot testing, sampling, odor sample analysis and stack dispersion modeling need to be done accurately according the highest standards.

Plasma-Injector stack odor oxidation process



The Plasma-Injector oxidizes fish feed odors instantly with oxygen radical injection from ambient air; for example 12,000 cfm (20,000 m3/h) with 9kW to max.12kW energy consumption, reducing odor concentration from app. 100,000 ou/m3 to 5,000 m3/h without using water or any chemicals and no waste. With stack dilution of 5,000 the odor concentration is below 1 ou/m3 (detection threshold) on ground level. The odor reduction efficiency can be controlled with the energy level duty cycle 0 -100%. By increasing the frequency from 400Hz to 30,000Hz this is now the only plasma injection system that can generate activated oxygen most efficient.

Odor lab

Unlike VOC testing, the odor lab utilizes human noses in an odor free lab environment: six screened panel members with odor sensing capabilities that reflect the 'average person' according the latest ASTM and CEN odor testing standards. The sensitivity of the assessors noses are measured with a reference gas (n-butanol) and they are only allowed to detect this in a specific range that represents an 'average person'.

To be a panel member, the data collected for that assessor must comply with the following criteria:

- the geometric mean of the individual threshold estimates, expressed in mass concentration units of the reference gas, has to fall between 0,5 times and 2 times the accepted reference value for that reference material (123 µg/m3 for n-butanol: 62 µg/m3 to 246 µg/m3 = 0,020 µmol/mol to 0,080 µmol/mol).

- the antilog of the standard deviation S (individual threshold estimate) calculated from the logarithms (log10) of the individual threshold estimates, expressed in mass concentration units of the reference gas, has to be less than 2.3.

- for at least one of each twelve regular sample odor detection measurements, the reference gas test has to be measured again in order to record and maintain a measuring history. If the panel member does not comply he/she is excluded from all further measurements until compliance is reached again.

Odor samples need to be assessed within 28 hours after sampling, otherwise the odor molecules may react with other odor molecules or with oxygen, water vapour, etc. and this will generally reduce the odor concentration. So after pilot testing and sampling, the samples need to be shipped overnight to the odor lab for odor testing the next morning. Since the odors from feed processing contain a very large (hundreds to thousands) number of organic components in very low concentrations (ppm to sub-ppb) in addition to sometimes very large quantities of water vapor, the odors can change rapidly if not diluted and preserved with nitrogen.

Each odor sample is diluted with an "olfactometer". This is a computer controlled mass flow dilution system that is

The Purdue Agricultural Air Quality Laboratory (PAAQL) is part of the Department of Agricultural and Biological Engineering at Purdue University, West Lafayette, Indiana, USA. The PAAQL specializes in odor assessment using field and laboratory olfactometry, chemical analyses using gas chromatography-mass spectrometry with olfactory sensing (GC-MS-O), ion chromatography, closed-cell FTIR spectrometry, and continuous emissions monitoring of ammonia, hydrogen sulfide, carbon dioxide, methane, nitrous oxide, ethanol, methanol and particulate matter.
More information

Uniqair Technologies Ltd are the originators of advanced high frequency cold plasma injection odor control systems for stack emissions. Unlike incinerators, chemical - or water scrubbers or bio-systems, the PLASMA-INJECTOR™ is an oxidizer that does not need any chemicals or water and does not generate any waste.

More information

For more information contact Hans Schieven, founder and CEO of Uniqair Technologies. He invented the cold-plasma technology for feed stack odor control and started Aerox (NL) in 1994 as Partner and Director until 2004. He has been responsible for over 200 projects with odor control in Europe, Asia and N-America.

Or visit Uniqair at Victam Asia Booth CO53

presenting air and diluted odor from a sample bag to the assessors. Air is presented at three ports; two ports present clean odor free air and the third supplies diluted, odorous air. The port with odorous air is presented randomly. The assessors must select which port contains the odor, this is called the "forced-choice" method. First the air from the sample bag will have a very high dilution, like 500,000 dilutions so it cannot be detected. Then the dilution is step by step reduced until a value where half of the assessors identify the correct port and this is the threshold concentration; the value of the required number of dilution is the odor concentration: DT (Detection Threshold) or ou/m3 (Odor Units per cubic meter). This procedure has to be repeated at least 3x in order to increase accuracy.

Some processes or recipes with high fat and protein content can have very high odor concentrations in the (untreated) air from the extruders of more than 100,000 DT or ou/m3. This will require a Plasma-Injector with more energy capacity to oxidize these odors. Most countries/states now recognize the latest European CEN-13725 odor standards and support cold plasma odor oxidation for stack odor control as it is a sustainable technology with low energy that does not need any water or chemicals and has no waste.

Hydrogen sulphide	*Rotten egg*
Methylmercaptan	*Cabbages*
Ethylmercaptan	*Cabbages in decomposition*
Allylmercaptan	*Garlic*
Ammonia	*Very prickly, irritating*
Methylamine	*Fish in decomposition*
Indole, scatole	*Excrement*
Cadaverine	*Meat in decomposition*
Acetic acid	*Vinegar*
Butyric acid	*Butter rance*
Valeric acid	*Sweat, perspiration*
Formaldehyde	*Acre, close*
Acetaldehyde	*Fruit, apple*
Acetone	*Sweet fruit*
Dimethylsulfur	*Vegetables in decomposition*
Thiolane	*Gas (product for odorization of nat. gas)*

Table 1: Chemical substances—some examples with their typical smell (**bold** = detected in fish feed)

Have you thought about square?

Frequently asked questions about square silos

Have you always thought that silos are round? Yes, most of them are, however square silos are with no doubt an attractive alternative.

Why square? > 25% more capacity:

Most obvious advantage of square opposite to round is the storage capacity. On the same ground surface square stores over 25% more than round. When having limited space, this could be enough reason to go for square.

Why square? > Modular construction

Square becomes more interesting when you want to store different products and/or qualities next to each other. The modular way of building the square silos enables a silo block design with different bins. Since the several individual bins share wall elements, it takes less material and becomes economically interesting. Moreover it is possible to vary with different bin sizes within one block, square and rectangular.

Why square? > Customize to your process

The modular way of building also enables you to design the silos around your process. For example to create a bulk outloading street for trucks or to plan machinery directly underneath the bins (e.g. mixers, scales, sieves, hammer mills). The silo block can be a con-

Raw material silo at a German feed mill.
It comprises a smooth wall silo block consisting of 26 bins with a total capacity of 2.750m3. Note the varying bin sizes and bin heights.

structive part of your building and can bear the load of roof constructions or neighboring machinery floors. Cladding can be applied directly onto the silos. Typically square silo are applied in process environments with frequent loading and unloading.

What to store?

Square silos can be used for all kinds of dry bulk solids and are typically used in the feed and food industries. For example to store raw materials like wheat, barley, or seeds or finished products like pellets or flour.

Doesn't the product get stuck?

All bins are customized and obviously most critical question for the design is: what goes into the silo? For free flowing products like dried wheat, a profiled wall silo may be used with relatively gentle hopper angle of 45 degrees and a simple slide to unload. Other products are far more challenging think about aqua feed mix, meals or bran. Then a double smooth wall silo is used. Hopper angles are much steeper up to and over 70 degrees. Discharge equipment for these situations are e.g. multiple screws, scrapers or vibrating bottoms, sometimes in combination with aeration.

All silos have a sanitary design avoiding any obstacles and dead spots for the product. As a matter of fact, the silo is not fully square, but slightly octagonal, so nothing will get stuck in the corners.

Smooth wall or Profiled wall?

For free flowing dry granular products, a profiled wall silo is the more economical solution since a strong single wall profiled steel sheet is used. This also gives you maximum storage capacity. For products with more challenging flow characteristics, a double smooth wall silo is the better option. This type of wall gets its strength from reinforcements inside the wall and has a very hygienic design, there is no place where product can stay behind. The double wall has also natural insulations characteristics. Silos are made from black steel or stainless steel. The black steel is at least primed or – in case of food environments – finishing may also be a high quality food approved 2-components painting. At the silo outside, cladding is often applied.

What about capacities?

Individual bins have capacities of roughly 5 – 500m3 depending on the type of silo. A silo block consists of 2 – 200 bins in practice, but is in fact unlimited. This gives a wide range of possibilities.

If you want to make optimal use of a small footprint, bins can go up to 30 – 35 meters (excluding steel support structure), depending on type of silo and product to store. Needless to say, European Standards are being followed to make sure you will have a strong and safe silo.

For more information contact Auke Markerink, Account Manager, Top Silo Constructions B.V., the Netherlands

ISFNF 2014
Great Barrier Reef
Cairns, AUSTRALIA

International Symposium on Fish Nutrition and Feeding

Cairns Convention Centre, Queensland, Australia
25–30 May 2014

Australia is proud to be hosting the 16th International Symposium on Fish Nutrition and Feeding (ISFNF XVI), the premier international forum for researchers, academics and industry concerned with the nutrition and feeding of aquatic animals.

This biennial event will see several hundred attendees from around the world meet for five days between 25–30 May 2014, in the tropical city of Cairns, adjacent to Australia's magnificent Great Barrier Reef and the fabulous Daintree Rainforest.

An event not to be missed by researchers, academics and industry—ISFNF XVI will be an opportunity to discuss and debate the current and looming issues faced by the fish nutrition sector and to develop innovative and novel ways to overcome them.

Key themes that will be explored at the upcoming symposium will include:

- Nutritional requirements
- Nutritional physiology
- Practical nutrition
- Raw materials

Key dates*
Abstract submission opens: late June 2013
Registration opens: mid August 2013
Abstract submission deadline: early January 2014
Earlybird exhibition closes: 31 January 2014
Earlybird registration closes: 1 March 2014
*dates subject to change

For more information visit the symposium website
www.isfnf2014.org
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