A record-breaking time

At the end of 2007, Clextral successfully commissioned a BC 160 twin-screw extruder designed to produce salmon feed at the rate of 25 tons per hour. It’s the highest capacity ever reached by a twin screw extruder for this type of product!

From now on, the BC 160 positions itself as THE reference in this industry. More than its reliability and sturdiness, this extruder enables unmatched process performance.

The BC 160 is valued by its faithful users, and we are proud to work with new companies attracted to its production benefits.

With a record capacity of 3200 kg/hour, a recently commissioned couscous production line in Algeria defines the new standard of this industry. Couscous quality and production yield are the main assets of this reference. A fully automated control system is part of the turnkey supply which includes a batch traceability system and energy consumption monitor.

2007 also set a new record for Clextral’s commercial activity with the best historical results of order intakes, sales and financial results. This performance demonstrates our customers’ trust and rewards the quality of our work. We thank you all!

We also want to thank all our visitors at the INTERPACK show. The 2008 exhibition was an excellent show with many attendees who showed a deep interest in our extrusion and drying technologies.

With an agenda to continue our development and strengthen our international network, Clextral recently acquired the Danish Company KAL Proces Teknik A/S. KAL specializes in refurbishing extruder screws, repairing barrels and providing spare parts. Its expertise will give Clextral’s Scandinavian customers faster access to the company’s products and services.

For you and thanks to you, Clextral advances and innovates.

In this new issue of Clextrusion, you will discover all of Clextral’s breaking news.

Pleasant reading!

Georges Hallary
Vice President
Sales & Marketing
TRIA is accomplished in cereals, this year celebrating 30 years of excellence. We were pleased to learn that Mr. Jamaleddine, its President, received the « Diversification’s Prize » by his Majesty, King Mohammed VI.

This prize rewards the clear-sightedness of this Moroccan leader who very early made the strategic choice of vertical integration of the cereal sector creating the holding OJIPAR, which intersects on every level of the channel : Supply, Transformation and Distribution.

Indeed, the group’s structure spans upstream and approval channels : from the supply and wheattrade with Gomic, to the wheat’s transformation at the flour-mill Tria (500 T/d) and the semolina-mill Epidor (300 T/d), then the second transformation with Arzak which manufactures alimentary pastas (35 T/d) and couscous (100 T/j) on Afrem Clextral’s equipment, and finally, distribution with Ladis, the logistic platform which supplies national and international markets. The last symbol of the « integrated channel’s » outcome is the restaurant Cannelle, the Mecca of tasting where the consumer can discover the virtues of the products conceived, distributed and marketed by the group.

The Arzak unit, a new plant that encompasses the pasta and couscous activities, was recently completed in Casablanca. With a new building, the turnkey installation of two new couscous production units of 1200kg/h each, as well as the transfer of the three Afrem production lines which existed on the former site, TRIA is equipped with a successful new production tool. The first production lines for couscous and pasta were commissioned by Afrem in 1992 and since this time, the reliable and friendly relationships with this trade leader have continued. Congratulations to the whole TRIA team for this well deserved prize !

NEW FACES

Luc Charreyyron : Area sales manager
Hervé Dris : Area sales manager
Svetlana Bouvet : Export sales assistant
Julien Giraud : Customer Services Technician (CLEXTRAL France)
José Fabian Hernandez : Customer Services Support & project Management (CLEXTRAL Latin America)
Valérie Rostagnie : Assistant (CLEXTRAL France)
KAL : A NEW TRUMP FOR CLEXTRAL SERVICES

Key aspects of Clextral Services’ success are expertise, responsiveness and customer synergy, both geographical and cultural. The company has developed its worldwide service network building upon those strengths, and has continuously reinforced it through the expansion of its international locations, and specific R&D efforts in wear solutions.

With the acquisition of KAL in Denmark in April 2008, Clextral complemented its expertise in metallurgy, especially in refurbishing of extrusion screws. This technique consists in rebuilding a worn screw by welding alloy on top of the flights; the refurbished screw is then used in production. This process can be repeated several times on the same part, leading to reduced production costs for the end-user as a rebuilt screw costs less than a new one for a similar usage.

KAL has mastered this operation particularly well as the Danish company has applied it to the plastic industry for many years, and then to large single- and twin-screw extruders for animal feed. Additionally, they are capable of implementing specific metallurgies to achieve extended life for wear parts.

Clextral now has a true « service hub » to upgrade its level of service for its customers and partners throughout Scandinavia. Clextral is indeed successful in this region, particularly with the fish feed producers where the company recently installed several very large machines. With this expansion, Clextral strengthens its leadership in serving this demanding industry.

According to Mogens Klüber, general manager of the Danish firm, KAL already knew Clextral quite well as they were operating in the same market. It appeared that Clextral was the ideal partner to fully support KAL and to pursue its growth not only in Scandinavia. In the coming months, Clextral will leverage the Gadstrup-based team to expand this activity more extensively for companies operating large extruders in Europe and beyond.
From April 24th to April 30th, the most important show at a global level for equipment dedicated to food processing took place in Düsseldorf. A cosmopolitan crowd of attendees visited the Clextral stand with a significant participation from Latin America, the Middle East, Central Europe and the CIS.

INTERPACK 2008: A GOOD YEAR

CLEXTRAL WELCOMES ITS REPRESENTATIVES WORLDWIDE

Just before the beginning of Interpack, Clextral gathered its agents and representatives for a sales seminar. No less than 20 different countries were represented on the 22nd and 23rd of April 2008 at Clextral’s main offices in Firminy.

After an informative demonstration in our test centre on Multi Grain Wavy Chips (MGWC), the participants attended a presentation of Clextral technology with its distinct elements and its strong points... The first day ended with a visit to the manufacturing and assembly workshops where our agents were happy to see a splendid extruder equipped for multigrain cereal production, and an EVOLUM 1200 dryer.

After a study day and a convivial evening, our agents spent their second day visiting Limagrain Céréales Ingredients Company based in Ennezat where they saw a BC82 extruder producing pellets and a drying line equipped with a Rotante. The guided tour in English, Spanish and Russian was very much appreciated.

Many exchanges with our partner LCI enriched this two-day training and the seminar ended with a statement from a pleased and fervent supporter of Clextral.
At the exhibition stand, visitors discovered an EV 32 extruder with easy access to the screws provided by the barrel’s hydraulic opening feature. This laboratory machine will soon be used by Mr. Dan Prefontaine and his staff at the Saskatchewan Food Industry Development Centre in Saskatoon, Canada.

A Rotante scale model enabled visitors to visualize the product flow in the endless screws and to understand the process advantages of this technology:

- Constant residence time due to the continuous screws
- Homogeneous and close contact between the product and the hot air linked to the gentle movement of the products
- Excellent control of the temperature and relative moisture by zone within the Rotante.

In the end, a lot of curiosity and interest in this innovative dryer!

Pasta, couscous, snacks, breakfast cereals, coextruded cereals, petfood, treats, TVP samples… all were made available for visitors desiring to see the products. In this field, the Star of the show was indisputably the Multi Grain Wavy Chip (MGWC). This snack’s tasting generated excellent comments about its flavor, texture, shape and healthy qualities!

Interpack 2008 was another opportunity to showcase Clextral’s extrusion and drying expertise in developing our customers’ projects around the world.
In response to the market and industry demands for wholesome products and private label snacks, Wyandot Inc., a leading contract manufacturer based in Marion, Ohio, decided to invest in twin-screw extrusion technology. Twin-screw technology provides more versatility than the single-screw lines Wyandot has used for over two decades. « The benefits of twin-screw technology are immense, » explains Dan McGrady, Wyandot’s vice president of technical services. “With the twin-screw system we can use whole grain, multi-grains and high fiber formulations which open up a whole new arena in better-for-you snacks. And, the twin-screw technology allows the specific mechanical energy (SME) to create expanded products that incorporate high levels of whole grain and fiber that are not achievable with single screw equipment. The superior processing and cooking provided by the twin screw extruder was key to our decision to purchase the equipment. »

Wyandot Choose Clextral
After extensive research, Wyandot purchased a Clextral BC72 extruder. « Clextral pioneered twin screw extrusion and continues to advance the processes and technologies, » says McGrady. « We were impressed with Clextral’s quality engineering of the equipment and user-friendly features – like the automatic barrel opening that facilitates screw reconfiguration for product changes – and wanted to have access to their superior expertise. » Twin-screw systems give Wyandot much greater flexibility and more product opportunities than single screw equipment. Twin-screw systems can handle a greater variety of ingredients, including fine particles sizes that would challenge a single-screw extruder. « We’re able to get much more fiber and whole grain in our products by using a twin-screw extruder, » says McGrady.

Wyandot’s development team experimented on a Clextral BC45 twin screw extruder at the pilot plant at Ohio State University. In less than two days of testing, Wyandot produced a winning multi-grain chip that contains 8 grams of whole grain, 3 grams of fiber, and less than 3 grams of fat per serving. Test panels raved about the taste. « In the past, products with high fiber or whole grain formulations have presented process difficulties in achieving good mouthfeel, » says McGrady. « Clextral helped us overcome these challenges and produce a great tasting, healthy snack. Furthermore, we’re just amazed what we can get from a twin-screw extruder. We’ve been prototyping products ahead of our own equipment installation. We’re impressed with the new capabilities. »

Wyandot will continue to conduct R&D on the BC45 extruder at Ohio State’s facility, yet will be manufacturing the product on their newly purchased BC72 machine. « Another reason we went with Clextral is the fact that their equipment is very scalable, » explains McGrady. « Sometimes scale-up can be quite a challenge because of unexpected
product characteristic changes, but the design of Clextral’s equipment eliminates that concern. »

Wyandot’s twin screw production line offers flexibility to produce direct expanded snacks and cereal-like products for diverse markets. At the outlet of the extruder the line splits: to the left, the product undergoes a cereal process, where it is developed and flavored with sweet, high brix coatings. To the right, the product is transformed into traditional snack foods with savory coatings.

Clextral and Wyandot’s Synergy

Overcoming challenges and working as a team is an important reason Wyandot chose Clextral. « Wyandot is known for their quality in their people, process and technology, » explains McGrady. « We strive to make the Wyandot name synonymous with quality and service. We feel that Clextral equipment, staff, test plants, and reputation in the industry will reinforce Wyandot’s image as a cutting-edge company that is always looking to improve our product offerings. »

In addition to the superb technology Clextral provides, we felt their employees have a similar level of commitment as ours do. The professionalism and knowledge they demonstrated throughout the negotiation and purchase process has helped us make the transition from a single screw to a twin screw mindset. The in-depth technical and processing support they’ve provided has been invaluable. »

Clextral works alongside those who invest in their technologies to help them realize the full potential of the equipment. Their research teams assist clients in carrying out trials and experiments, working in two state-of-the-art test plants fully equipped with extruders and ancillary equipment. The test plants’ on-site engineers and research scientists work with clients on innovative products with exciting shapes, textures, formulas and coloration, and the confidential trials avoid downtime and lost throughput encountered with in-house testing.

After Clextral’s research and development team and their client hit upon a winning product, Clextral’s engineers take over to ensure the line is fully integrated and automated. Their engineers are fully committed to developing unique technologies adapted to the client’s requirements.

Partnerships with companies like Wyandot create a win-win situation for all involved. Twin-screw extruders allow for greater flexibility and put manufacturers on the fast track to enhancing their products with nutritional benefits and flavors not possible with single-screw extruders.

Wyandot plans to process snacks and cereal-like products that range from multigrain chips to better-for-you direct expanded snacks and cereals. Thanks to the addition of Clextral’s advanced twin-screw extruder technology, Wyandot’s creative team is able to experiment with recipes and ideas that weren’t possible before.
CLEXTRAL Installs
Turn Key Pasta Plants

At Clextral, besides our mastery of twin screw extrusion, we offer other technologies to satisfy our customers’ needs for turnkey solutions.

After a long relationship with Afrem, Clextral acquired the company in 2002. Now, Afrem’s team and equipment manufacturing facilities are fully integrated within Clextral at the Firmiry headquarters, giving pasta and couscous customers the benefit of a larger offer and R&D programs as well as synergy between extrusion & pasta/couscous process teams.

Pasta technology proposed by Afrem-Clextral offers many advantages and in particular the use of the Rotante Very High Temperature technology for short pasta processing.

In pasta and couscous as well, Rotante drying is a key asset of the Afrem-Clextral offer. Let us list just 10 advantages of Rotante drying:

- Continuous, gentle movement during drying maintains product integrity (no product damage)
- All fines are screened & may be continuously recycled in previous processes
- True FIFO resulting from the specific design of the Archimedes screw configuration
- Operation by zones; independent climate zones enable compliance with product drying curve constraints
- Computerized product tracking during drying to limit over- or under-drying; product changeover can be reduced to less than 3 min.
- Superior hygiene & reduced maintenance equipment (all operating parts outside of drying chamber to maximize life time, all std shop parts available WW, easy access for cleaning,...)
- Optimum control of parameters via supervision (moisture, temperature, residence time,...)
- Quick setup on site

- More uniform heat & air distribution associated with « semi » dynamic product movement provide uniform product moisture reduction
- Due to optimized drying conditions, process completed at maximum efficiency (minimum cost & minimized outlet moisture fluctuation)
In couscous production, Afrem-Clextral is recognized as the leader, having supplied more than 60 production lines around the world (including the United States, Canada, Italy, France, Israel in addition to traditional markets in North Africa).

The highest capacity ever reached was in Algeria with a 3200 kg/h couscous production line installed in Mostaganem, near Oran. The line is currently running at full capacity.

**INTERVIEW** of Mr. Adil Ghazzali, Chairman of Sania Group

Clextrusion: Your group is established in cereals with a wheat mill and a semolina mill and you have just completed a new plant equipped with a pasta line and a couscous line. So, you are a newcomer to the couscous and pasta markets. Why did you choose AFREM?

Mr. Ghazzali: From the beginning, the choice was obvious. Afrem has equipped the market leaders and has proven its abilities. Its extensive experience and its knowledge of the Moroccan culture are well-known. We wanted to enjoy the latest technology in couscous where Afrem is the leader but also in pasta. Indeed, we are convinced of Afrem’s mastery in this field by the ease of maintenance and the total solution they supply.

Clextrusion: How did the setting up go?

Mr. Ghazzali: Our order to Afrem was a turnkey plant from the boiler to the finished product. The whole team worked very professionally to make the construction site progress according to schedule. From the architectural plan to the product’s conception, every aspect had to respect the strictest hygiene standards of the food processing industry. Afrem experienced team did not disappoint us.

Clextrusion: How would you describe your collaboration with Afrem?

Mr. Ghazzali: Friendship is what connects us with the whole Afrem team. We are impressed by the personal relationships and the team spirit of the company. We feel that we work within a family, with confidence and professionalism.

**TECHNOLOGY**

Pasta plants installed by Afrem-Clextral offer short drying times due to Very High Temperature technology, and reduced maintenance with optimized sanitation. All the parameters are fully controlled by PLC supervision and traceability devices.

In couscous production, Afrem-Clextral is recognized as the leader, having supplied more than 60 production lines around the world (including the United States, Canada, Italy, France, Israel in addition to traditional markets in North Africa).
The new snacking trend could be to eat your « croutons » or « baguettes » for snack. Flavoured slices of « dried bread » are sold in coloured bags as alternatives to chips in Russia and this new habit is spreading in Europe and Latin America. The word crouton is derived from the French croûte, meaning « crust ». It is a small piece of stale leftover bread which is fried and often seasoned. Traditionally is is used to flavour salads or accompany soups and the new fashion is have it for snack.

Snack-like crouton are of course cereal-based and can be made of soft wheat, rye, bran, whole wheat or other ensuring a good fiber content and healthy diet. Clextral uses its twin screw extruder to produce a crunchy crouton with various shapes and recipes. The cereal flour additionned with water is extruded and cooked to produce « snack crouton » in much larger quantities and much quicker than by the traditional way which consists of drying bread in ovens. With the Clextral process, after being extruded, the dough is cut in slices either at 45° or 90° and then seasoned before being dried. To avoid seasoning and ensure low fat content, in flavor process can also be used.

Many flavours can be applied : spices, garlic, olive oil, … and even chocolate crouton can be extruded ! Various types of textures, from crunchy to crispy textures can be produced on the same line, thanks to the flexibility of the twin screw extrusion technology.

Clextral process offers also the advantages of the twin screw extruder in terms of repeatability of process and greater production capacity with less energy consumption. Complete productions lines range from 180 kg/h to 700 kg/h and allow to produce both snack-croitons & other traditional snacks. An upgrading kit to adapt on existing snack lines can also be supplied by Clextral for snack producers willing to enlarge their offer with this new trendy, healthy and savoury product.
About pet food palatability ...

The very significant evolution of the global pet food market these last years is accompanied by a strong premiumisation trend. Pet foods must meet pets taste and their nutritional needs. But they also have to answer pet owner demand for the best quality for their companion animals.

In this context, palatability enhancers play their entire role. In dry pet food, they are essential to make the kibbles attractive and pleasant to eat for the cat or the dog. After the extrusion of the kibbles and a prior fat coating, palatability enhancers in dry and/or liquid form are coated on the surface of each kibbles.

As cats and dogs have specific feeding behaviour and taste perception, palatability enhancers’ design takes into account all their differences. However, managing palatability performance is not only managing palatability enhancer.

Comprehensive studies carried out by SPF application team have shown, for example, that a relationship exists between the kibble texture and palatability. Moisture content affected more significantly the kibbles texture than the fat coating (Fig.1). Consequently, different rigidity impacted palatability: kibbles with lower moisture level were judged more palatable for cats and less palatable for dogs.

The palatability of a pet food is the result of combination of:
- kibbles formulation and process,
- palatability enhancers nature and its application,
- palatability measurement tools.

The whole system must be taken into account to satisfy pets and pet owners.

To know more on palatability, contact SPF at: contact@spf-diana.com.
www.spf-diana.com
The growing fish production in aquaculture systems demand for plant based alternatives for fish meal to improve both cost effectiveness and sustainability [1,2]. In the course of the EU project « Grain Legumes - New Strategies to Improve Grain Legumes for Food and Feed » the production of protein concentrates from smooth pea, faba bean and lupine angustifolius as well as their applicability in salmon feed were studied [3].

**Substituting fish meal and oil for a more economic and sustainable fish production**

Whereas fish capture seems to have reached with 90-95 Mio.t per year a limitation, production in aquaculture is growing about 8-10% per annum (fig. 1). Due to the natural, carnivorous feeding habit of most intensive farmed fish species, fish meal is the most important fish feed component. With a high protein and a considerable oil content fish meal corresponds well with the nutritive requirement. The increasing demand for fish meal for aquaculture and other animal feed production and the declining fish meal production resulted in shortage and rising prices in the last years (fig. 2). By that, plant based, protein rich ingredients became of increasing interest to substitute, at least partly, fish meal. Today, deoiled or full-fat soya meals, residues from oil seed processing, corn and wheat gluten as well as several other materials are usually used as feed ingredients. Replacing at the same time fish oil partly with plant oils, reduces the overall need of marine resources.

**Producing protein concentrates in a dry process**

The use of plant meals in fish feed is often limited due to relatively high contents of non-digestible components like soluble and raw fibres, the lack of essential amino acids or anti-nutritional effects. Wet processes to produce protein concentrates low in anti-nutritional components are established, but their high processing costs, particularly for drying and waste water treatment, makes this products often to expensive for the inclusion in bulk feeds.
An interesting alternative are dry processes based on dehulling followed by micro grinding and air classification to produce protein concentrates. These processes allow to separate granular starch or fibre components from smaller protein particles by their differences in size and density in an air sifter, and by that to increase the protein content in the fine fraction. The, in the course of the project, considered grain legumes smooth pea, faba bean and lupine angustifolius allowed to produce protein concentrates with protein contents of 55-70% at high yields. In addition to the protein content also increased the fat, minerals and α-galactosides contents (tab. 1). These was also true for anti-nutritional components like trypsin inhibitors and phytic acids. But, due to the very low initial contents of these components in the respective seeds, the absolute contents in the protein concentrate fraction kept low. [5, 6]

**Improved nutritive value of protein concentrates**

In a digestibility trial with grower Atlantic salmon dehulled, micro ground meals and respective air classified protein concentrates have been tested on a 30 per cent inclusion level over three weeks. The diets were formulated to be iso-nitrogenous and iso-energetic. All protein concentrates and the meal from L. angustifolius showed a high absolute protein digestibility. A clear increase in protein digestibility compared to the respective meals of dehulled seed turned out for the protein concentrate of smooth pea, whereas this tendency was also recognisable, but not statistically significant, for faba bean.

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<tbody>
<tr>
<td>Protein (%)</td>
<td>25,5</td>
<td>54,6</td>
<td>34,7</td>
<td>64,5</td>
<td>46,0</td>
<td>64,7</td>
</tr>
<tr>
<td>Starch (%)</td>
<td>45,0</td>
<td>3,6</td>
<td>41,3</td>
<td>6,9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>2,7</td>
<td>5,1</td>
<td>2,4</td>
<td>3,9</td>
<td>6,8</td>
<td>8,0</td>
</tr>
<tr>
<td>Minerals (%)</td>
<td>2,9</td>
<td>5,6</td>
<td>3,4</td>
<td>6,0</td>
<td>4,0</td>
<td>5,1</td>
</tr>
<tr>
<td>α-galactosides</td>
<td>4,0</td>
<td>6,4</td>
<td>1,9</td>
<td>2,9</td>
<td>4,9</td>
<td>6,9</td>
</tr>
<tr>
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<td>40,3</td>
<td>100</td>
<td>38,5</td>
<td>100</td>
<td>41,1</td>
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Tab. 1
PROTEIN INGREDIENTS FROM GRAIN LEGUMES FOR FISH FEED – NUTRITIONAL AND TECHNOLOGICAL IMPACTS

Accurate feed processing

To ensure optimal usage of fish feed pellets a high pellet stability during transport and agitation in water as well as defined sizes and sinking behaviour to meet the particular feeding habits of the respective fish species are required. Additionally, proper processing can optimise nutritional properties by inactivating of heat sensible anti-nutritional components and pathogenic germs, but preventing nutrients at the same time. For intensive aquaculture, using feed high in protein (40-50%) and fat (15-40%), cooking extrusion processes are widely used to produce a stable pellet with a defined size, density and porous structure. Following extrusion and drying, the pellets are (vacuum) coated with oil.

The influence of air classified pea protein concentrate on physical pellet properties was tested using two strongly reduced feed formulations. A reference formulation consisting of fish meal and native wheat starch and a modified formulation with a 50 per cent replacement of fish meal with pea protein concentrate were processed (fig 6). Pellets of 4-5 mm were produced at a constant throughput of 90 kg/h using a Clextral BC 45 twin screw cooking extruder. Whereas the cooking extrusion parameters were slightly affected by the formulation, the modified formulation showed significantly less radial expansion effecting a smaller pore volume. This reduces at the same time the maximum quantity of injectable oil during coating. Further on, the modified formulation resulted in pellets with slightly reduced hardness, and turned out to be more sensitive to further decreasing hardness and expansion when starch content is reduced or oil content is augmented in the extruded formulation. (fig 7)

Conclusions

The investigated grain legumes smooth pea, faba bean and lupine angustifolius proved to be a suitable ingredient for salmon feed formulations, that are able to substitute a considerable share of fish meal. Protein concentrates from pea and faba bean produced in an air classifying process showed even improved nutritional properties. Their higher protein and fat content compared to extracted soya meal as well as the considerable lower prices compared to protein concentrates produced in wet processes, makes these products to competitive ingredients. Further reduction of fish meal might be possible when optimal combination of high valuable vegetal protein products are combined. Nevertheless, increasing amounts of plant based materials can have a considerable influence on the processing and pellet quality. To maintain high pellet qualities the accurate adaptation of process conditions is necessary.
Acknowledgment
This work was partly financed by the EU FP6 project “Grain Legumes” (FOOD-CT-2004-506223)

Literature

Fraunhofer IVV
The Fraunhofer Institute for Process Engineering and Packaging (IVV) is a competent and professional organization which carries out contract research and development work for industry. The activities are partly supported by publicly financed exploratory applied research projects. In addition to the research work, the Fraunhofer IVV provides a range of services - also for small and medium-sized companies. One main research area is the recovery of new ingredients from plant raw materials for industrial food production, animal feeds and technical applications. The development of polymer films for food packaging with barrier and ultra-barrier properties again permanent gases and water vapor is also an important topic. Therefore, equipment for the processing of agricultural raw materials and for the production of functional films are available. Additionally, analytical competence and equipment for trace and ultra-trace analysis are on hand in order to assess the suitability of plastics, paper and metals for contact with foods and pharmaceutical products.
We would be pleased to welcome you to our booths at

- **Pet south**: 17-19 September 2008 - São Paulo - Brazil
- **Plovdiv fair**: 29 September - 4 October 2008 - Plovdiv - Bulgaria
- **Agroprodmash**: 13-17 October 2008 - Moscow - Russia
- **Papfor**: 10-13 November 2008 - St Petersburg - Russia
- **IAOM**: 14-17 November 2008 - Anuska - Tanzania
- **IPA**: 17-20 November 2008 - Paris - France
- **Anuga foodtec**: 10-13 March 2009 - Köln - Germany
- **Ipakc Ima**: 24-28 March 2009 - Rho - Milan - Italy
- **Snackex**: 8-9 June 2009 - Berlin - Germany

**CONFERENCES**

We had the pleasure of organizing or presenting short courses and lectures on:

- **Société Française de Génie des Procédés (French Chemical Engineering Society)**
  « Innovation & R&D », 9 October 2007 - Saint-Etienne - France
- **Aquafeed euro-asia, 22-24 October 2007 - Istanbul - Turkey**
- **Feed & premium pet food seminar, 29 November 2007 - Warsaw - Poland**
- **Food & Feed Extrusion Seminar**
  « introduction to twin-screw technology in the food industry », 6 March 2008 - Brno - Czech Republic
- **VICTAM**
  « Twin screw extrusion technology for the production of aquafeed », 6 March 2008 - Asia
- **« science and technology for chilean aquaculture » 25 March 2008 - Almagro - Puerto Montt Chili.**
- **AACC (American Association of Cereal Chemists) Food Extrusion Course**
  « Thermomechanical development of extrudate structure in extrusion-cooking »; « Instrumental methods for the measurement of extrudate properties. », April 02-04, 2008 - St Gallen, Switzerland
- **Petfood Forum 2008**
  « Twin screw versus single screw in feed extrusion processing » - April 15-16, 2008 - Chicago, USA
- **5th Abrasiv Bulk handling Technologies Symposium 7 May 2008 - Kecskemet - Hungary**
- **Pulp and paper conferences**
  « Innovation in paper Industry for higher production, quality and cost savings » - 14 May St-Petersburg

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