

# Extruded Products.

Technology without limits.



# Without limits. Our view of extrusion.

«Extrusion stands for food and feed products according to the latest understanding of nutritional science. What makes it really unique is its boundless versatility. Let your imagination run wild – we turn dreams into reality!»

Beat Müller, Manager Pasta & Extruded Products segment

Crispy, golden yellow and crunchy or airy, fiery-spiced and bright colored. You know what is tasty! Snacks, cereals and other foodstuffs originate in the minds of our customers. We, at Bühler make products out of visions – and offer a one-stop solution for all the required services. The plants and processes developed by us mirror the ideas of resourceful companies and the different lifestyles and customs of our cultural milieus.

## **More than just goods**

Extrusion has a very decisive advantage: Its only limits are the one you set. Shape, colour, aroma – here it is the market and its imagination that sets the pace. We convert trends and bring your ideas to life. In a world that demands more than simple goods, your cereals and snacks, cut a “good figure”, have “style” or are fun. In foodstuffs, other properties besides the form such as taste and consistency are in the spotlight. That is why extrusion has a future in the consumer markets. Bühler’s expertise lies in the following areas:

- **Cereals**
- **Snacks**
- **Pet food**
- **Aquafeed**
- **Food Ingredients**
- **Automation**
- **Customer Service**

## **Individual – until everything is right**

Our systems are tailored because our technologists and developers occupy themselves constantly with innovations for new products. Our customers and the consumers of cereals and snacks push us daily for this. Our motivations are solutions. We research, we strive, and we experiment – until we can produce what you can sell well and with pleasure.

## **Served from A to Z**

The depth of production of the Bühler Company ensures a concentrated amount of know-how. That is why competence for us is far beyond what is normally meant by this term. From the raw material in the silos up to the sales-ready packing – our specialists make good use of synergies. We work with an overall view – throughout the world. We provide an all-round service from the first idea, through product development up to the layout of your factory. Our consultations greatly ease your corporate decisions. We first test your new products in our own laboratory. There we plan your investment in detail to confirm their feasibility. That is why we set the standard in things quality.

Which products are you dreaming of? Put our research abilities to the test.



# Cereals and Snacks.

## Crispy Zeitgeist – part of the scene.

«Cereals and snacks are lifestyle products that attract attention in the marketplace. With our processes you are in pole position.»

Doris Sieber, Marketing & Communication

### **Cereals**

Around the world they are the highlight of a proper breakfast table: cereals. They start the day right. Cereals are the first consciously created reform foodstuff to conquer the market. Extrusion, batch cooking and flaking are our processes for producing cereals. For this purpose we supply individual machines as well as product lines and processes.

### **Snacks**

Snacks accompany social or simply nice moments. For this reason we give them our full attention, already before production. Continuous cooking and shaping, or simply just kneading and shaping are the most important steps for direct or indirect expanding snacks. Everything is possible here: direct expanded snacks, as well as semi-finished snack pellets with two- or three-dimensional shapes and co-extruded shells with fillings. Cooking and shaping can also be carried out in two steps in separate machines. Our single shaft press with vertical cut produces snack pellets with the highest precision.

### **Extruding, flaking, drying**

These processes together are the three core steps. A pre-conditioner mixes grain flours with various additives and moistens them with direct steam. In order to save energy in the extruder, the mixture is heated to almost 100 °C – pre-conditioned. Renewed mixing, kneading and cooking are carried out by the Bühler extruder. Nozzle and cutter produce stars, flowers, rings and innumerable other shapes, for instance lentil-type pellets for cornflakes. The flakes acquire their typical golden yellow color, fine taste and crispiness during roasting. Then they can be sprayed with sugar, aromas and vitamins.

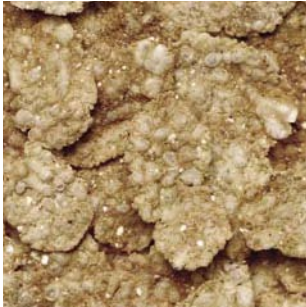
### **Processes for trends**

Our plants provide everything that your marketing promises. Vitality, harmony, adventure and enjoyment – there is almost no feeling that Bühler does not awaken with a process. With Bühler as a partner you are prepared for the consumer trends of tomorrow. Besides processes for the most varied of shapes, colours, consistency and tastes, we also offer revolutionary equipment for producing healthy nourishment.

Products must keep to their promises. For this reason cereals and snacks from our systems are top sellers in shops – throughout the world.



# Diversity in colour, shape and taste. Cereals that inspire.



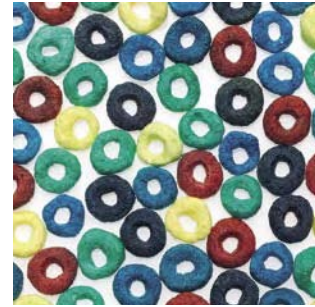
## **Flakes**

Our processes for your flakes. Whether cornflakes or multi-grain, rice or wheat, traditionally cooked or extruded, we are certain to have the right thing for you.



## **Co-extruded products**

Fill your cereals with water or fat-based masses. Whether sweet or salty, always a pleasure.



## **Directly expanded products**

Are you rather traditional or innovative adventurous? You can get your product from us. Popular, current shapes or products developed to your wishes. You decide on colour, shape and taste – we on the process.

# Inviting Snacks.



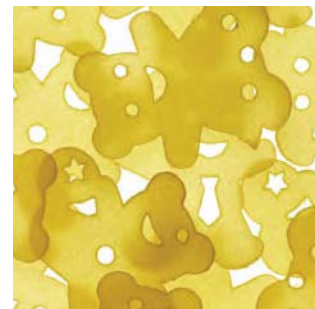
## **Directly expanded snacks**

Equipment and processes for your directly expanded snacks From flour to sprayed and seasoned finished products With our products you are on the right path.



## **Indirectly expanded Snacks**

If you produce semi-finished snacks, pellets out of native or pre-cooked raw materials for further processing in a deep fryer or roaster.



## **Shape diversity**

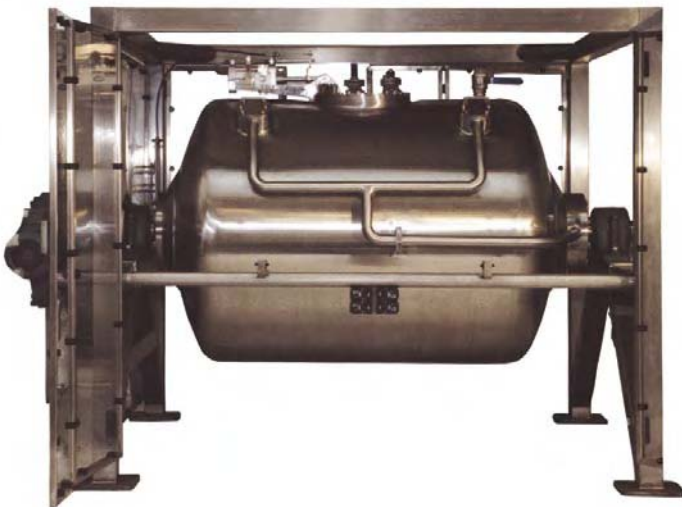
Create new products. You decide on the shape – we will develop the process. Whether shape-cut or cut at the nozzle – we are happy to support you.

## Extrusion. Twin-shaft extruder.



The modular twin-screw extrusion system covers the whole working range from laboratory scale to the highest production performance. The extruder can be adjusted to the desired application process.

## Batch cooking. Rotary pressure cooker.



The rotag pressure cooker cooks batches (discontinuously) of whole grains and large grain fractions. The whole drum is of stainless steel. The pressure vessel has a volume of 1700 l and cooks batches of 800 kg. The cooking cycle is monitored by a separate control set.

# Food Ingredients.

## Innovative processes for modern demands.

«Consumers are discriminating, Consumers want healthy nutrition, Consumers want fair prices. Rightly so! Buhler systems meet the current, constantly changing requirements – flexibly, efficiently and economically.»

Christopher Rubin, Manager Product Marketing

The extruder is excellently suited for the production of flour derivatives; bread crumbs as modified flours and starches and all types of other food ingredients. Our process makes possible very specific properties of the products. The extruder has also proven itself in producing textured proteins.

### **Bread crumbs**

With suitable grinding, bread crumbs, fillers and stuffing are created when using the correct composition of the raw materials and the optimal settings during extrusion. Texture, porosity, colouring and granulation as desired.

### **Modified flours and starches**

Pre-gelatinized flour and pre-gelatinized starches are characterized by a changed water absorption and solubility. You decide how viscous this flour-water suspension is to be. The flours and starches attain their desired properties by the introduction of suitable mechanical or thermal energy.

### **Derivates**

Starches and flour derivatives with special properties for the paper and textile industries. The extruder starts the necessary chemical reactions. Contrary to traditional batch cooking, these occur in the extruder much faster and with much less moisture.

### **Instant foodstuffs**

Industrially produced foodstuffs for as convenience foods are growing. In emerging markets, on the other hand, they assist in covering basic nutritional requirements. The extruder also produces instant foodstuffs. You determine the suitable nutritional physiologically sensible recipe.

### **Mill by-products**

Extruders make “waste” and by-products valuable. Millers refine bran or rice polishings in that they process them in a targeted thermal or mechanical manner. The process stabilizes the product enzymatically for oil extraction. Bran is enhanced by the extruder in a tasty and nutritional physiological manner.

### **Textrudates® (textured Extrudate)**

Protein-rich raw materials – primarily Soya – form the basis of meat-type products. Buhler has also developed the special process which produces „textured proteins“ as meat substitutes by means of extrusion. These correspond to a trend in modern nutrition. The extruder ensures fibrous meat-like textures. We differentiate between expanded textrudates and wet textrudates. Expanded textrudates are suitable for fillers, for example, in meat balls or Pizza coverings. Larger pieces can be found in some prepared meals as a meat substitute. Wet textrudates, because of their properties have a large market potential. Because they flow out of the nozzle at low temperatures, they do not expand. Usually granulated and then deep-frozen, they possess an improved fibrous structure.

Textrudates® is a protected trademark of the Buhler Company. We will be happy to show you further innovations.





# Diversity in Colour, Shape and Utilization. Basis for healthy nutrition.



## **Rice**

Refine broken rice. With our products you can extrude new rice grains from it if desired also enriched with vitamins.



## **Flours and starches**

High requirements of water absorption and Solubility of flours and starches?  
No problem.  
By means of extrusion you will achieve your desired product properties!



## **Soya**

Follow trends early: Extruded textured Soya proteins as meat Substitute products.  
A treat with a future.



## **Mill by-products**

Add value by means of extrusion. Refine your by-products such as bran or rice polishings.



## **Bread crumbs**

Grainstometry texture and colour your bread crumbs adapted to your requirements.



## **Derivates**

Produce flour and starch derivatives with functional properties by means of extrusion.

## Drying and cooling. Fluidized Bed Dryer/Cooler.



The fluidized bed dryer/cooler is best suited for the continuous thermal treatment of extrudates from a size of 0.25 mm. The fluid bed fluidizes as a cross-current immersion of individual particles, dries and cools them gently and efficiently over the whole length of the bed.

## Drying Roasting and Cooling. Fluid bed dryer and roaster.



By means of the fluid bed, pellets and flowing products are dried and roasted. A modular chamber system enables an exact dwell time and the corresponding throughput.

# Animal Food.

## For animal success stories.

«Extrusion fulfils innumerable wishes of animals and their owners. This calls upon the whole of our know-how.»

Dieter Hofacker, Manager Engineering

Domestic animals are mankind's most loyal companions. That is why they deserve to be spoiled. Their food is attractive and so healthy that they can lead a long, healthy life. Also, keeping fish for optimal breeding requires particular feed properties.

### **Domestic animal nutrition**

Modern domestic animal nutrition requires gentle preparation. Only with balanced feeding will there be no deficiency symptoms in the loved ones. Extrusion guarantees high value feed. It is the ideal technology for exact dosing and to make the feed tasty with attractive colours and shapes.

### **Acquaculture feed**

Whether utility fishes or decorative fishes – both have very different requirements for their feed so that they can take it up and absorb it optimally. Decisive factors are density, rate of sinking, high water absorption and stability.

### **The process**

After fine-milling, fish feed is sieved in order to pull out coarser particles, which can block up the shaping nozzles. Both fish and domestic animal feeds seem to be made for the extruder. It modifies starches, denatures proteins and adds shape and texture before the products expand. Subsequently, the hot melt is portioned by a cutting arrangement. This can be exchanged during the process. Thanks to multi-step drying (hot air movement, fluid bed, belt or counterflow dryer) even wet and sticky extrudates quickly acquire the desired moisture content – gently and deformation-free. Spray fats, colouring, taste and attractants or even powder components onto the dried feed – completely to the requirements of your consumers.



## A la carte.

### Petfood – for the dear one at home.



#### **Kibbles**

For dogs and cats as well as for rodents. Kibbles with a moisture content of less than 8%.



#### **Multi-coloured**

Produce multi-coloured products continuously on an extruder – thanks to a patented Bühler process.



#### **Filled**

Filled products on a dry or semi-moist base. The filled strings are sealed by a downstream cutting system.

## Aquafeed



#### **Floating**

Pellets with moderate protein and fat content for warm-water species such as Tilapia, Catfish, Eel, etc.



#### **Sinking**

Pellets with high protein and fat contents with good water absorption and stability. Slow sinking in saltwater, special for Salmonides and sea water fishes such as Yellow Tail, Sea Bream, Sea Bass, etc.



#### **Fast sinking**

Fast sinking pellets which retain their elastic structure after hours in the water.

## Pre-Conditioning and Extruding. ECOtwin™ twin shaft extruder.



The ECOtwin™ is distinguished by the highest degree of operating safety and user friendliness. Best reproducible qualities are the characteristics of its modules (SME, Density Control). The system reacts to swings in the raw material quality and changes the properties of the extrudate in the shortest time without reconfiguration. Cleaning is very simple as all critical zones are easily accessible.

## Mixing and Dwelling. Two-Step Pre-Conditioner.



The pre-conditioner divides the process into two steps. First it mixes the raw material with steam, water or other fluids, then the raw material is fed into the retention section. In six sizes, the Buhler pre-conditioners cover many applications of throughput and dwell times. Thus, the economical all-rounder is suitable for all possible applications.

# Flaking.

## Noble quality does not fade.

“Technological, technical and economic characteristics make the Buhler flaking mill untouchable and also make the product successful.”

Teddy Sutter, Sales Manager

The Buhler flaking mill has proven itself well in the manufacture of delicious breakfast and grain flakes. But not only that – the mill is also selected for special products which are increasingly being asked for by consumers. The Buhler flaking mill has long been established with the leading breakfast and grain flakes manufacturers as the standard. Its popularity is especially due to its flexibility and performance capability. The flaking mill makes possible the best adaptation to customer-specific requirements. The small footprint, variable arrangement of the drive, the product feed and the outlet allow it to be placed as required. A significant increase in

performance compared to the previous model leads to a high degree of economy. The flaking mill delivers an excellent quality with a product-dependent output of 1300 – 6000 kg/h.





# Buhler Process Automation. Economically fast.

Buhler offers the optimal solution especially for the production of extruded products. The extrusion controls are characterized by a high degree of flexibility, user friendliness and open system structure. Here too, the basic system can be extended by individual modules. The utilization of tailored control technology by Buhler relieves the operating foreman, produces less waste with the same product quality. Time is saved by quick product changes leading to higher plant availability. In short – the controls are also convincing due to their economic properties. Thanks to the Touch-PC, the intelligent process controls correspond to the trend and greatly support the work of the personnel.

Automatic acquisition of the operating data and simultaneous display of stored values ensure exact traceability and regulable production parameters. Up to eight trend curves can be shown at the same time in the process controls. Complete language change, independent of the language of the PC operating system in use, lifts the Buhler controls clearly above the competition.

# Service and Training. Lifelong contact person.

Even before the purchase of a Buhler plant our service begins with the planning of the installation, financing and production development. Buhler provides support with competent specialists.

## **Extrusion technology**

In our extrusion pilot plant we are constantly developing new products, procedures and equipment on a scientific basis. Our specialists continually optimize the processes. We concentrate fully on you so that you can completely work on your success. Your plans are a welcome challenge for us. Your products are tested by us, so that your operation does not suffer production losses.

## **Engineering**

An engineering team is responsible for planning and coordination. It ensures smooth development of your job.

## **Erection and start-up**

Our own erection and start-up specialists ensure proper erection and building site management and a seamless operation up to start-up.

## **Training for your operating personnel**

If desired, Buhler offers the training of your personnel at site or at the pilot plant at our headquarters.

## **Customer service**

Our engineers are at your disposal at your premises or in Uzwil. They ensure problem-free utilization of our machines over the whole period of their utility.

Have you any questions or proposals? We look forward to hearing from you!

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