Schaaf Technologie GmbH

PROJECT PROFILE

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PROJECT FOR EXTRUDED FOOD PRODUCTS

Preliminary profile of a project for manufacturing one or more ranges of extruded food products from among a wide variety of choices like ready-to-eat savoury snacks, breakfast cereals, flat bread, co-extruded soft-centre-filled products and baby cereals. The project is based on an integrated plant with the number of extruders corresponding to the range of products desired to be manufactured and the overall capacity.

ABOUT THE PRODUCTS

EXTRUDED FOODS PROJECT FOR MANUFACTURING ONE OR MORE FROM:

Item	Capacity of finished product per line with 1 extruder 9250 (kgs/hour)
expanded Snacks	300 to 500
co-extruded Snacks	300 to 750
breakfast cereals	300 to 500
baby-cereals	250 to 350
flat bread	200 to 280

PRODUCT CONCEPTS

EXPANDED SNACKS

Ready-to-eat crispy, puffed, savoury snacks in various shapes, colours and flavours made from cereals like corn, wheat and rice as major raw materials. The products are not fried. The products are cooked and expanded into the final texture at the extruder itself. They are flavoured using a slurry made of flavours suspended in fat or by a plain fat spray on the product followed by a sprinkling of dry flavour. A wide variety of flavours are possible.

These products provide a wide possibility also in term of nutritional aspects like low-fat content and variety of raw materials usable. These snacks are appreciated by all age groups and are also easy to digest.

CO-EXTRUDED SNACKS

These ready-to-eat products have a crispy outer shell of normal expanded extrudate in the form of a tube or a pillow (tube with pinched ends) and a center space which is filled with a creamy mass. The creamy mass could be of a wide variety like chocolate cream or other sweet flavoured creams, savoury creams fillings such as cheese etc. They are also a special category of products which are meant for all age groups. They are high calorie products and offer the major advantage of a dual texture. They represent one of the latest technological developments in the field of extruded foods.

BREAKFAST CEREALS

Ready-to-eat crisp, suitably textured cereal based products for consumption with milk, yoghurt or other similar bases. They can be used during breakfast or for any other small meal. These products are mainly designed from the nutritional angle. The products may be sweetened as per the market demands and can also incorporate typical breakfast components like cocoa, honey, malt etc., liked by children as a sweet snack as well.
A further modification involves marketing in the form of so called granola/muesli mixes which are basically consisting of extruded products together with pieces of nuts, raisins etc.

BABY CEREALS

Instant cereal based foods for infants prepared from corn, grits, rice etc. These products can be either in the traditional form of plain instant powder or can be in the form of special mixes incorporating milk powder or even fruit and vegetable components. The use of extrusion process for this product provides many advantages over the conventional baby cereals manufacturing process using roller driers, not only in the technological aspects but also in the capital investment and operational cost aspects.

The product is designed primarily from the aspect of the nutritional requirements of the children. The product is manufactured under strict hygienic conditions and can be further fortified by adding vitamins and minerals as per requirements.

FLAT BREAD

As the name suggests, this product is a flat piece of extruded bread which is crisp and made from wheat, corn, rye etc. It is crisp in texture and has much lower moisture content when compared to ordinary fresh bread. Due to the low moisture content, the product has a long shelf life and hence is suitable as a long keeping product which can be consumed with a wide variety of toppings.

ABOUT THE PRODUCTION PLANT

BASIC CHARACTERISTICS OF THE PRODUCTION PLANT:

The production plant is characterised by the following features:

- The whole production plant is divisible in the categories of:
  - Pre-extrusion processing
  - Extrusion
  - Post-extrusion processing

- The pre-extrusion processing can be done in various extends of automation. Further the pre-extrusion process combines various degrees of batch and continuous processing. The major activities in this section are the mixing of the various dry raw material components in a predetermined ratio followed by addition and thorough mixing of again a fixed amount of water.
  The selection of a particular pre-extrusion process configuration shall be determined by the products planned for manufacture.

- The extrusion step is common to all the products and remains principally the same. Some relatively minor modifications are required in the processing hardware and these are combined with different operation conditions to achieve a particular product using the same basic machine - the extruder.

- The post-extrusion processing diverges into altogether different plants for different categories of products. Thus, the extent of the post-extrusion equipments/plants is determined by the range of the products selected for manufacture. This can however be seen only together with the economic aspects, e.g. the additional costs of plant & equipments for certain additional products.

The above described characteristics of the production plant enable a wide configuration of plant possibilities, e.g.:

- The simplest case of one line for manufacturing only one category of products, consisting of one pre-extrusion section followed by one extruder and post-extrusion plant. Numerous products within the same category can however be produced on this plant.

- One main line as decribed above and some additional equipments which can be then incorporated into the basic post-extrusion line to manufacture additional category of products.

- One pre-extrusion section and one extruder. Followed by two alternative post-extrusion plants. Naturally at any point of time only one post-extrusion plant can be connected to the extruder and can be in use to produce that particular category of product.

- Numerous post-extrusion sections, e.g. extruders and post-extrusion plants. Numerous independent production lines operating the same/different category of products, e.g. 2 extruders can be connected to one high-capacity post-extrusion line for the same product or 2 extruders may be connected separately to 2 independent post-extrusion plants to manufacture different products in same or different categories.

ABOUT THE MANUFACTURING PROCESS & TECHNOLOGY

TECHNOLOGY:

All the products are proposed to be manufactured with the help of primary technology developed by SCHAAF TECHNOLOGIE GMBH, GERMANY, which is a leading European company in this field.

For some special projects, e.g. for manufacturing baby cereals, additional assistance in technology has to be obtained from specialists. If the buyer wants, SCHAAF can recommend suitable experienced specialists who can then be independently engaged by the buyer for this purpose.

To enable adherence to local food regulations and specification in various countries, including declaration on packaging etc., suitable experts from this field have to be separately engaged by the buyer.

RAW MATERIALS:

Raw materials used for the various products depend mainly on the characteristics desired from the product. They are mainly cereals, such as maize, wheat, corn, rice, barley, oats etc. and protein rich materials like defatted soya flour, lentils, pulses etc. The extruder is capable of accepting normal quality variations in such raw materials as listed above and hence is an ideal processing instrument.
For coating savoury products, flavours and spices in fat based slurries are used while for sweet products sugar, milk powder etc. in water based slurries are used.
For the manufacture of baby cereals, one - in addition - has to take care of the desired nutritional qualities while selecting the raw materials.

POLLUTION AND EFFLUENTS:

The manufacturing process does not generate any pollution or other effluents that have to be specially treated or as such specifically declared to the authorities.

ABOUT OTHER MAJOR REQUIREMENTS OF THE PROJECT

PACKAGING PLANT:

A suitable packaging system can be decided only after clearly defining the products to be manufactured and the capacities planned. Further, in the case of packaging systems, it is important to decide whether the products are planned to be packed on-line, continuously or in an independent operation system with a suitable buffer between the production and the packaging stages.

For new projects with not clearly established demand rates and product distribution patterns it may be recommendable to start with a buffer system with possibility of upgrading the system to function on-line after the exact demand patterns are known. In any case, it is recommended to use a vertical form, fill & seal machine with a multihead computer controlled scale for packaging snacks and breakfast cereals in flexible pouches. The higher cost of this system is easily justifiable by the operational ease allowed by it to pack a wide variety of products in different pack sizes.

For baby cereals one can propose packaging either in vertical form, fill & seal machines with suitable screw feeding systems or in cans. The flat bread and the co-extruded snacks are best packed in stacks using a horizontal flow-wrap machine.

If desired, the packages for the products can be flushed with nitrogen gas for extending the shelf life (if oxidation is the main shelf life limiting factor).

The packaging materials for flexible packaging have to be various plastic films made of one or more layers from among polyprophylen, polyester, polyethene etc. The films could be further metallised or strengthened by an aluminium foil. The single/multi layered completely printed film for use on the packaging system has to be bought in the form of rolls of specified widths. The packaging machine can basically only form the film into pouches, fill the desired quantity of the material in the pouch and seal the pouch.

The final pouch may be stored further in cartons to enable their easy storage, transportation and distribution.

SPECIFIC RAW MATERIALS PREPARATION EQUIPMENT:

The production plant uses various raw materials in different forms which are generally available in the desirable form locally. However, sometimes in special cases one may have to specially process certain raw materials to get them in a form suitable for the SCHAAF production plant. These equipments can be supplied by SCHAAF in specific cases and also procured from other sources in case they are of a general nature, e.g. Hammer mills, cleaning systems, micro-pulverisers etc.

Some of the raw materials and the form in which they are desired are e.g. cereals, etc. in fine grit form, dry flavours in dry and very fine powder form, salt in a very fine and dry form etc.

AREA AND BUILDING REQUIREMENTS:

For a new project we would recommend a building with a total covered area of approx. 1500 square metres, for installing 1 line (with another approx. 300 to 400 square metres it is possible to install a second line!). This area specification includes the areas required for production, packaging, storage of raw materials as well as finished products, ancillary services, administration, etc. for the first and eventually a second planned production line. If a building is already available, it is possible to try to install the plant there using a correspondingly suitable configuration.

Depending upon various factors, including local environmental factors, it would be recommendable to have a building with a free height of approx. 6 metres. The roof should be preferable reinforced concrete. The flooring should be smooth and should allow easy cleaning regularly.

UTILITIES:

a) **Electric power:**
   A basic plant, e.g. a plant to manufacture snacks, has a connected load of approx. 250 kVA. Depending upon the plant configuration the connected load may go up to 350 kVA per line.

   The actual energy consumption for most of the products, however, is between 0.14 and 0.36 kWh/kg.

b) Water:
Again, very strongly dependent on the products being manufactured and other relevant factors. One should calculate about 1000 - 2000 litres per shift per line (excluding major cleaning operations).

c) Compressed air:
This is required to be oil-free at 6 bars pressure. Quantity depends on the actual requirements of the equipments used at a particular point of time. Major users are packaging machines and spraying systems for slurry application.

d) No steam is required. Hence for the SCHAAF production system no steam boiler and no steam lines are required.

e) All the heating and drying systems in the SCHAAF production plant are electrically operated. Hence, there is no requirement of special heating fuels like gas, kerosene, diesel etc.

PERSONNEL:

For each operating shift, for each partially automated complete line, one needs approx.:

- 1 supervisor (who can also act as an extruder operator)
- 2 operators (1 each for pre- and post-extrusion)
- 4 - 6 casual workers

This is the requirement for the production plant only. Personnel requirements for packaging, ancillary services, maintenance etc. have to be estimated separately (e.g. 2 persons for laboratory and quality control, 1 person each for electrical and mechanical maintenance, etc.).