

FEED FORMULATION

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TYPES OF FEED

1. Live feed: Living organisms

Microalgae, Rotifers, Artemia, Cladocerans, Copepods, Annelids (worms), Small fish, Clams, mussels, cockles, oysters and frozen fish.

2. Formulated feed: Referred to as artificial diets, inert diets or prepared diets

TYPES OF FEED

Pressed feeds

- Pressed feeds are obtained by press-agglutinating the different ingredients that make up the formula.
- The pre-mixing of the fish feed mash prepared according to the instructions provided by the formulator is subjected to steam for 5 to 20 seconds, where the moisture level reaches 16% and temperature rises to approximately 85°C.
- The pasty mixture is then pressed by cylinders against a drawplate. When emerging from the drawplate, a scraper-blade then cuts the pellets to the desired length; the diameter of the drawplate holes determining pellet size. The pellets are generally very dense and their compactness is influenced by moisture and lipid content.

TYPES OF FEED

- The formulae used must be appropriate for the manufacture of pressed pellets, in that the formula should contain binding agents so that the pellets do not crumble too quickly. These binding agents can be extruded (pre-gelatinized starch) before their inclusion into the feed mash and then later pressed so as to improve its compactness.
- However, this technique that scarcely textures raw materials is limited by lipid inclusion, the content of which should not exceed 14 or 15% because pellets could crumble very easily causing excessive dust and pellet breaks. The quantity of lipid energy which can be added or included in the pellets is therefore technologically limited.



TYPES OF FEED

Extruded feeds

- Developed and tested during the early eighties for the manufacture of fish feeds, the extrusion process consists of subjecting the raw feed mash to very high pressures and heat (steam injection), followed by a quick lowering of pressure.
- This process leads, as we have seen, to starch texturing with nets capturing other elements. When emerging from the drawplate, a brutal depression occurs in the pellets, resulting in a kind of expansion producing their specific rounded shape within extruded feeds.

TYPES OF FEED

- Within the extruder, the pre-mixture is introduced into a steel sheath with one or two endless screws with a particular profile twisting tightly inside it.
- The thread of these screws can vary, and can even shift its direction many times on the same section of the screw.
- The pre-mixture, pushed by the rotation of the screw in the sheath, is subjected to very high pressures and temperatures (80 to 120 bars, 110 to 150°C), and is sometimes also subjected to steam injection along the course.
- This process ends up in the cooking and extrusion of the product. When emerging from the sheath, a drawplate behind which a blade rotates, allows one to obtain pellets of the desired size.

TYPES OF FEED

- From the extruder the pellets are dried, sieved and cooled down, and then conveyed towards a coating machine that coats the pellets with additional lipids according to the demands of the formulator.
- The physical structure of the extruded pellets, which contains around 7 to 8% *lipids after coming out of the drier and numerous vacuoles filled up with water or air steam (similar to the bread crumb)*, allows an additional incorporation of lipids much higher than the pressed formulae.
- Therefore the extruder provides an important advantage for nutritionists in terms of energy input and with respect to the manipulation of Proteins/lipid/energy levels.

TYPES OF FEED

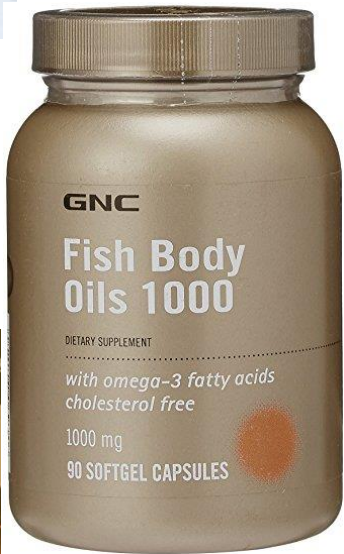
- On the other hand, the expanded texture of the starch and of the feed mixture improves feed for digestibility, by delaying gut transit time and thereby improving nutrient digestion, the net result being better growth, a lower feed conversion efficiency, reduced oxygen demand, and reduced polluting faecal wastes.
- It follows from the higher temperatures and pressures used during extrusion processing that investment and energy costs will be higher than those of conventional pressed feeds. Despite this however, the use of extruded feeds may be more profitable.



FEED FORMULATION

RAW MATERIALS

- ☐ Fish Meal
- ☐ Soy Bean
- ☐ Fish Oil
- ☐ Wheat flour



Feed Additives

Binders

High Gluten Wheat flour

Wheat gluten

Alpha starch

Gelatin

Collagen

Alginic acid

Carrageenan

Agar

Gelatinised starch

Antioxidants

Vitamin C and E

Carotenoids

Xanthophylls

Citric acid

Lecithin

Alpha-Tocopherol

To reduce the auto-oxidation and oxidation of nutrients
esp. Vitamin A and D and unsaturated fatty acids

Humectants

- Propylene glycol
- Sodium chloride
- Sorbitol

Use to retain moisture at low level and prevent bacterial growth

Fungistats & Mould inhibitors

- Sorbic acid, Calcium, Pottasium & sodium salts of sorbic acid, propionic acid and menadione
- Sodium benzoate, propyl-para-hydroxybenzoate & methyl-para-hydroxybenzoate at less than 0.1% level.

To reduce the mould growth in moist and semimoist diets

Carotenoids

- Carotenes, xanthophylls, β -carotene, cryptoxanthin and zeaxanthin, quinones, flavonoids, lavins, tetrapyrrols, pterins and indole pigments.

To aid in enhancing the colour of the cultured organisms and beauty of ornaments.

Feed attractants

- Taurine, Glycine, Proline, Alanine, Glutamic acid, Isoleucine, Serine, Methionine, Tyrosine etc.,

Olaquinox

- Bay-o-nox- to stimulate the growth
- Thyroprotein: to increase the metabolic rate
- Bile acids: for absorption of lipids, lipid soluble cholestrols.
- Enzymes: Proteolytic enzymes: to improve the growth
- Phytosterols: to improve the hormones and bile acids in fish.

FEED FORMULATION

Storage

- The raw materials coming into the feed manufacturing plant are generally stored in silos with an ideal height calculated so as to allow the raw material flow to be conveyed downwards, during the manufacturing process, until the final product is produced.
- This is in order to avoid having to pull the products up by vertical conveyors that usually cause breaks and dust the final product.



FEED FORMULATION

Grinding

- Grinding raw materials reduces particle size and increases ingredient surface area, thus facilitating mixing, pelleting and digestibility. The most commonly used grinders are hammer-mills, for fish feed manufacture, as plate-grinders do not generally produce fine enough ground materials.
- In hammer-mills, the grinding chamber consists of a series of mobile hammers on a rotor. The hammers, by centrifugal force, position themselves forming a star on the rotor and split the incoming feedstuff apart, which is then forced by depression through a metal grid composed of fitted appropriately sized meshes.





FEED FORMULATION

Mixing

- The ground ingredients must be mixed according to the desired proportions to obtain a homogeneous mixture. If the grinding process is correctly developed, the particles are homogeneous in size and the mixture produces pellets which statistically have the same formulation.
- Generally, the dry ingredients (flours) are first mixed, followed by the liquid components. Continuous mixers are designed so that the feedstuff moves along the mixer as it mixes. There are many different types of mixers, including horizontal band-mixers, vertical mixers, conical screw-mixers, and turbine mixers, etc.
- During this mixing process, the vitamin “premix”, the binding agents and other additives are added; they must in turn contribute to one or other particular desired quality of the pellets during the pelleting process.

horizontal band-mixers



vertical mixers



conical screw-mixers



turbine mixers



FEED FORMULATION

Pelleting

- Two different types of pellets are generally prepared for aqua feeds, namely pressed and extruded pellets. A third type, designed as 'expanded feed', is also marketed by some manufacturers.
- The main difference between a pressed and an extruded feed is the cooking of the feedstuff in the case of extrusion, with the added mechanical and biological advantages previously described, especially with regard to starch gelatinization



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Drying

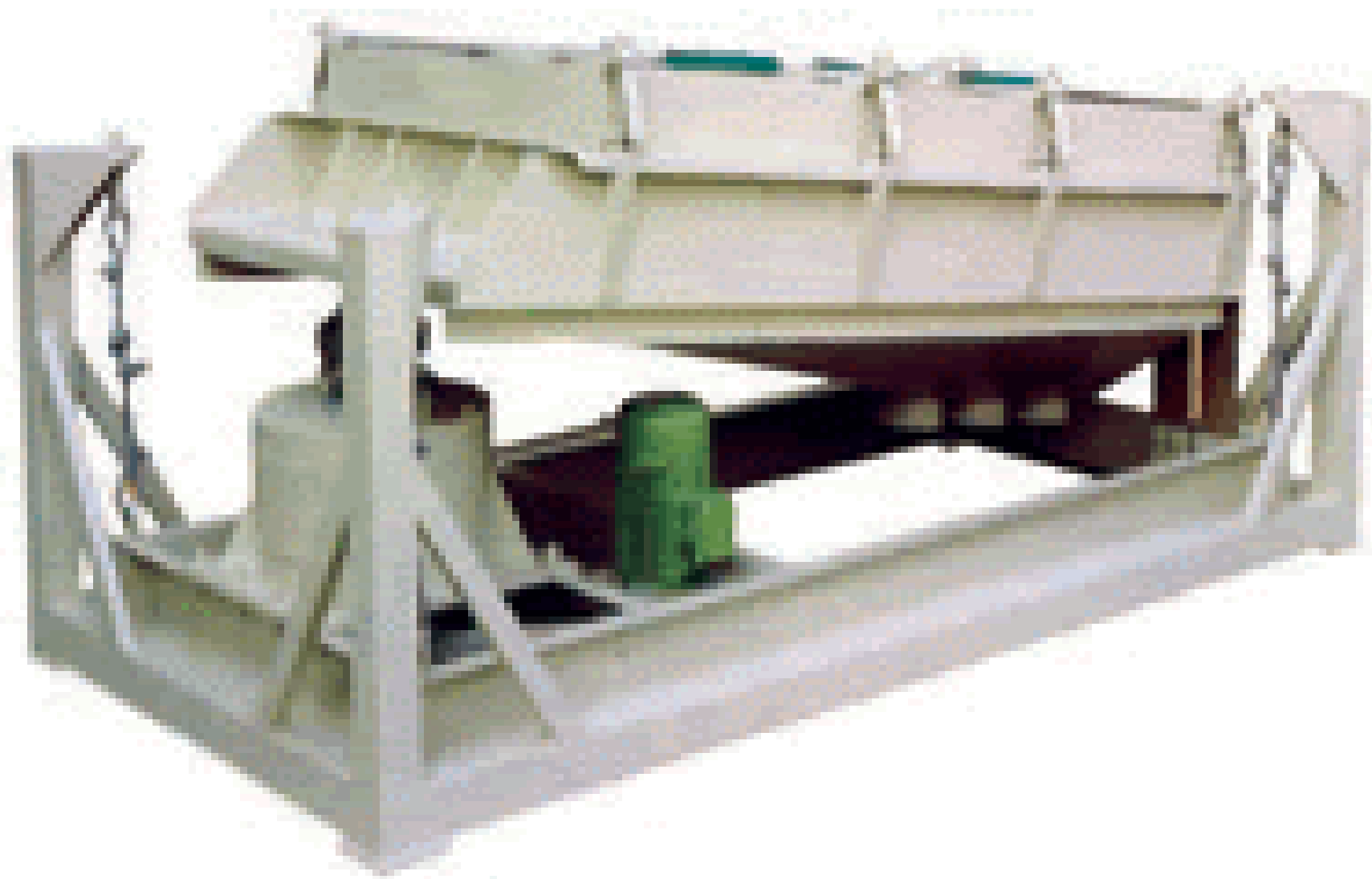
- After the pelleting process, the pellets usually have a high moisture content (15 to 20%) that must be quickly reduced to avoid spoilage. This is usually achieved by using a hot-air drier, which lowers the moisture level to between 8 and 10% depending upon the manufacturing process.



FEED FORMULATION

Sifting

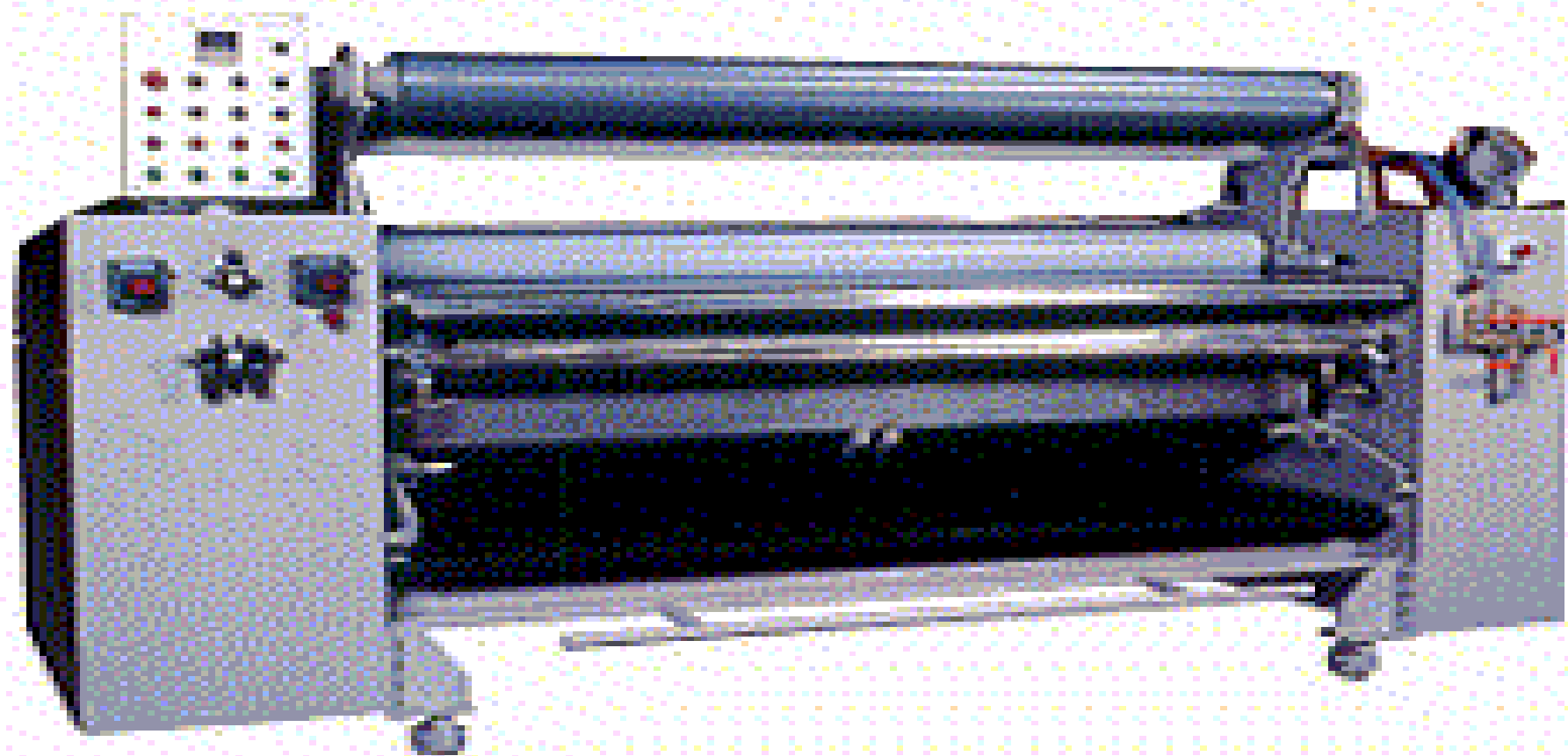
- The mechanical manufacturing processes inevitably results in shocks and scorching that partially crumble the pellets at their surface and cause various breaks and dust that must be eliminated. This is achieved by sifting, a process that is generally applied at least twice before the final conditioning (sifting after drying and after coating/cooling).



FEED FORMULATION

Coating

- The pellets emerging from the pelleting presses or extruders do not generally contain more than 7 to 10% lipid. To achieve higher dietary lipid levels, coating is necessary with the appropriate oils, generally using heat. In the same manner, certain heat sensitive vitamins and/or drugs that would not normally withstand the pelleting processes (thermolabile products) can also be added later during the coating process.



FEED FORMULATION

Cooling

- On completion of the coating process (generally undertaken with heated material) the pellets are then cooled and sieved before the final conditioning; cooling occurring in a cool-air flow generated by a cooling-machine or another cooling source (river or seawater, for instance).



FEED FORMULATION

Bagging

- Bagging usually produces different types of feed presentations within the same factory, namely either small bags (20 or 25 kg) on pallets covered with a plastic film, or big-bags (500 or 1 000 kg) in bulk.



Vallabha

Fish Feed



Premium Pangasius Grower Feed

MFG.DATE: DEC-11
BATCH NO: 4831
MRP: 1000/-

Net.Wt : 50 KG.
(When Packed)
(Incl.of All Taxes)

Manufactured By:
VALLABHA FEEDS PVT.LTD.

Admin. Office : 60 Feet Road, Prakash Nagar, Factory : Bye-Pass Road,
Marasraopet - 532 601, Guntur Dist. A.P. Customer Care No : 9704196777.
www.vallabhafeeds.com

Vallabha

Fish Feed



Premium Carp Grower Feed

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MICROPARTICULATE DIET

- The substitute diet can be used to replace a live diet in larval organisms.
- Commercial fish farmers could use this substitute to address cost and availability issues that are present with the use of a live diet.
- The diet demonstrates all of the characteristics that have been defined as essential to the success of a larval diet. The diet is nutritionally complete and does not need to be supplemented with live food. The diet has successfully found an effective method of packaging and delivering the nutrients to the organisms.



MICROPARTICULATE DIET

Advantages

- Less expensive than a live diet
- Not subject to the same availability problems as a live diet
- Nutrient composition can be controlled and modified as needed
- Size of the diet particles can be easily controlled to allow for feeding to larval organisms of a variety of sizes.