

Fish Feed Production Systems

Fish Feed Types

- We classified feed types in two groups:
 - 1. Moisture Feeds
 - 2. Dry Feeds (Pellet and Extruder Feeds)

Moisture Feeds

- Made by non economic fish species



Moisture Feeds

- The main principle is grind and mix and then feed the fish



Moisture Feeds

- Most important advantage of the feed is to be cheaper than the other feed types,
- It does not require any mechanization.



Moisture Feeds

- **Disadvantages;**
- 1. It is hard to find in all seasons,
- 2. The nutritional content of the feed varies according to season,
- 3. It is difficult to keep it fresh and ready to use.

Dry Feeds

- **Advantages;**
- 1. Nutritional content of the feed is guaranteed (you can exactly know the nutritional level of the feed),
- 2. there is no change according to the season of the year,
- 3. You can buy it whenever you want from fish feed plants,
- 4. It is easy to store the feed.

Dry Feeds

- Disadvantages;
 - 1. Requires mechanization and automation,
 - 2. It is more expensive than moisture feeds,

Introduction to Dry Feeds

- Pellet Feeds
- Extruder Feeds



Introduction to Dry Feeds – Production Steps

- 1. Intake ingredients,
- 2. Grinding,
- 3. Mixing
- 4. Conditioning,
- 5. Pelleting
- 6. Sieving, drying and cooling
- 7. Packing



Introduction to Production Steps of Aquatic Feeds (Grinding)

Grinding: Variety of raw ingredients requires size reduction..
Particle size is critical to mechanical and chemical activity

A major step in raw material preparation

Benefits of grinding:

- “Large surface area for reaction
- “Efficient & fast pre-conditioning
- “Prevents from die plugging
- “Visual appearance





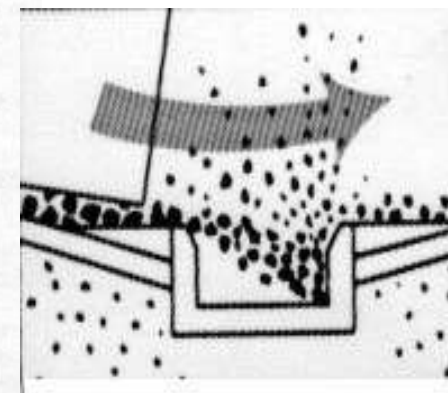
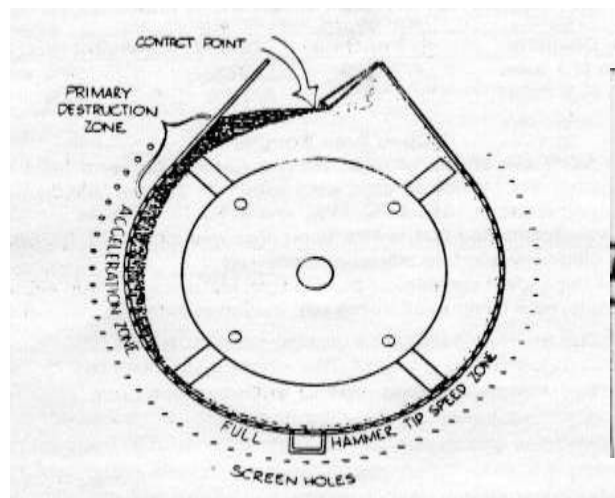
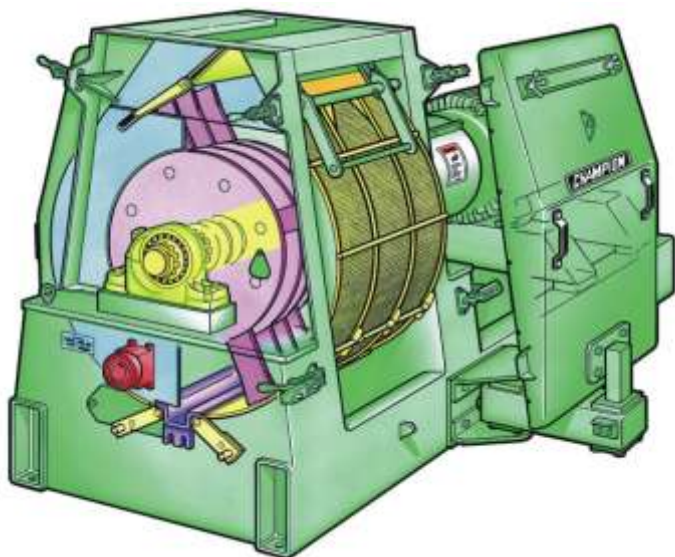


Introduction to Production Steps of Aquatic Feeds (Grinding)

- **Grinding provides;**
- Reduced particle size results in conditioner better water penetration and improved gelatinization
- Improved product appearance
- Reduced incidence of die orifices plugging
- Ease of cooking
- Reduced product breakage and fines
- Increased water stability
- Improved retention of liquid coatings due to small cell structure
- Particle size is critical to mechanical and chemical activity
- Finally: increased digestibility

Introduction to Production Steps of Aquatic Feeds (Grinding)

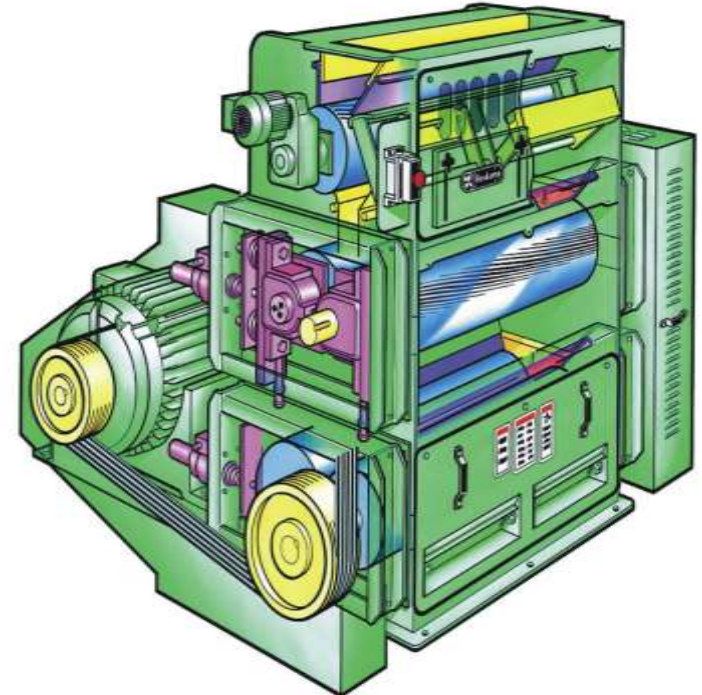
- **Grinding equipments; Hammer Mills:**
- Low investment costs
- 85% grinding success (especially good down to 150-250 microns)
- High capacity (10 mt/hour)
- Low energy costs (1.85-2.25 USD/mt)
- Easy maintenance (0.20-0.25 USD/mt)
- Total grinding cost: 1.20-1.55 USD/mt





Introduction to Production Steps of Aquatic Feeds (Grinding)

- **Grinding equipments; Roller Mills:**
- High investment cost
- 90% grinding success (especially down to 500 microns)
- High capacity (5-7 mt/h)
- Low noise
- Low maintenance costs (0.1-0.15 USD/mt)
- Total grinding cost: 2.05-2.50 USD/mt)



Introduction to Production Steps of Aquatic Feeds (Mixing)



- **Mixing:** The process is as important as grinding. If you grind ingredients but then you should mix them homogeneously. So mixing is;
- To assist in obtaining a more homogeneous grind,
- To increase the efficiency of the grinding process: e.g. high oil content ingredient such as fish meal, full fat soybean meal,
- would, easily clog the hammer mill screens if ground separately. Grinding a complete ration would lower mixture oil content thus improving grinding
- performance.
- Mixing time 3-5 minutes, mixer speed 25-30 rpm (rpm: rotation per minute)
- **Please remember**, every formulation has its mixing time. If you get over the mixing time ingredients start to be decomposed
- **Please remember**, to put very small amount of ingredients like additives at the middle of filling the mixer.



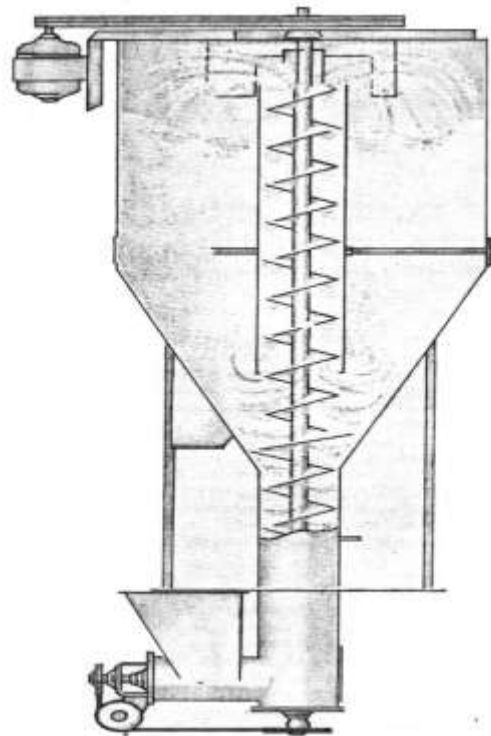
Introduction to Production Steps of Aquatic Feeds (Mixing)

- **Mixing equipments:** are evaluated in two groups;
- **1. Continuous mixing**
- **2. Partial mixing**
 - a. Vertical mixers**
 - b. Horizontal mixers (Welt mixers and pallet mixers)**

Introduction to Production Steps of Aquatic Feeds (Mixing)



- **Vertical mixers:** Grinded ingredients are sent to vertical mixers, the spiral container transport the ingredients above of the mixer. Spiral material helps to mix them while transporting.
- Vertical mixers provide fish feed plants to save place.





Introduction to Production Steps of Aquatic Feeds (Mixing)

- **Horizontal mixers, walt mixers** provide;
 - uniform mix in low speed,
- homogenous distribution of grinded ingredients,
 - great partial capacity.





Introduction to Production Steps of Aquatic Feeds (Mixing)

- **Horizontal mixers, batch mixers** provide;
- mixing of partial ingredients completely,
- mixing ingredients in different densities,
- to add liquid in to the mixing ingredients.





Introduction to Production Steps of Aquatic Feeds (Conditioning)

- **Conditioning**; is the last important process point before extrusion, provides;
- To mix water, steam and oils in the dry material (mixed ingredients),
- To moisturizing the feed particles,
- To transfer the steam's heat in to the particles.
- Water, steam and oils are added respectively.
- Conditioning gets some advantages in the system because;
- Lengthens the life of extruder,
- Increase the speed of production,
- Increase the product quality.

Introduction to Production Steps of Aquatic Feeds (Conditioning)

- Important points effect the conditioning are:
- Time: 2 – 3 min.
- Temperature: minimum 95 C
- Moisture: 20 – 24 %

