



## Pelleting Process

### Evolution of fish feeds:

Moist feeds; beef liver, spleen	1960
Powder mixture	
Semi moist feeds; trash fish and powder	1970
Dry pelleted feeds with lots of fines	1980
Extruded feeds	1990

**Pelleting:** to give a cylinder shape to the mixed ingredients under temperature, pressure and moisture.



### Pelleting Process



- **Why we pellet the ingredients? Because;**
- Pelleting process requires temperature, moisture and pressing; so pelleted feeds have a special smell and odour. It is sensed as attractant by the fish.
- We need to use homogenous nutritional value in feeds,
- Pelleted feeds are less influenced by external factors; such as oxidation, moisture etc...
- It is easy to carry and store pelleted feeds





## Pelleting Process

- What we do to pellet the mix?
- We use pellet mill and extruder



## Pelleting Process (Pellet Mill)

- **Working principles of pellet mill**
- There are two rollers turn separate ways (to left and right)
- Both of them press the mix and provide them to pass in to the die.
- The basic principle is pressing the mix and giving the pellet shape.





### Pelleting Process (Pellet Mill)

**8 Pellet Mills**  
24,000lbs, Mfg. CPM, Model 9042-12, some with dies, some without dies, some with motors and some without, there are (2) 4160 volt motors available.



### Pelleting Process (Pellet Mill)



If you buy new pellet mill, It will be your first and last sight clean like them...☺





### Pelleting Process (Pellet Mill)



### Pelleting Process (Pellet Mill)

- **Characteristics of feeds are produced by pellet mill**
- We can produce sinking feeds,
- Cooking rate is about 50%,
- Moisture content is about 16-17%,
- Additives like pellet binder should be used about 2-3%,
- There are fines in last product (it is acceptable until 5%),
- There is a risk to see a bacterial contamination in last product,
- It is hard to use different fish feed formulations (e.g. to increase the level of plant origin ingredients),
- The level of crude fat is limited with 12-15%,
- First investment of pellet mill seems cheaper or there is second hand chance to find and buy (It is about 200.000 Euros, if talk about complete fish feed plant – pellet mill system).



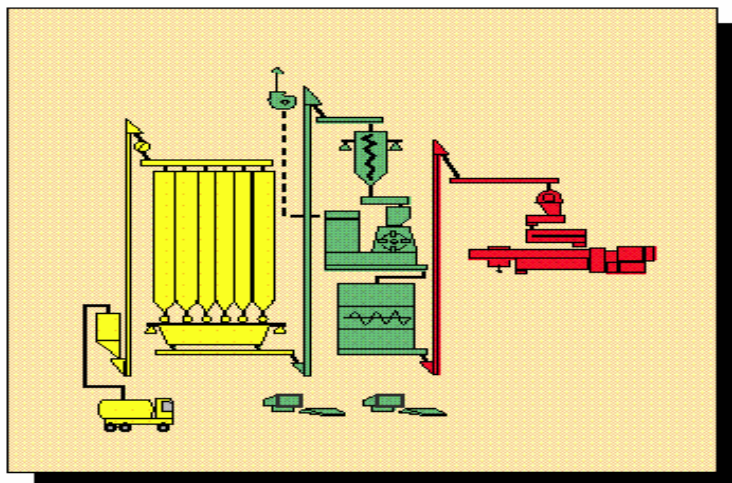
### Pelleting Process (Extrusion)

- **Working principles of extruder**
- Extrusion means to cook the mix of ingredients under temperature, moisture and pressure in extruder.
- Historically, it has been using since 1960's to treat the soybean meal in U.S.A. (remember trypsin inhibitor)



### Pelleting Process (Extrusion)

- The production system is the same until shaping in pellet mill or extruder.

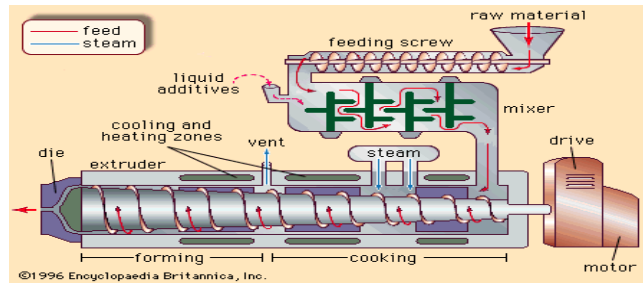




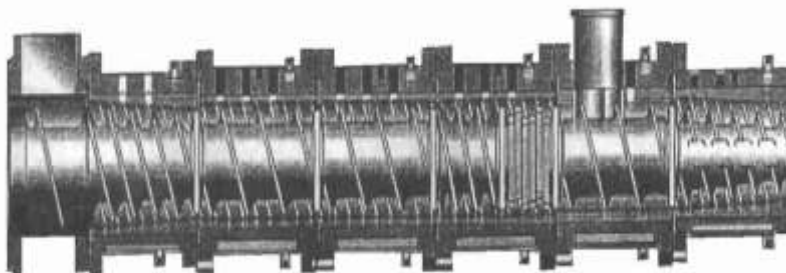
### Pelleting Process (Extrusion)

- **After conditioning what happens in the extruder?**

- The mix spills into the extruder,
- The screw presses the material,
- The steam is injected inside the extruder (moisture is about 35-40%),
- Turning screw in the barrel causes a thermal energy (temperature is 110-130 C)
- Finally; we have cooked and well treated fish feeds



### Pelleting Process (Extrusion)



Feeding part

Molding and cooking part

Last cooking part





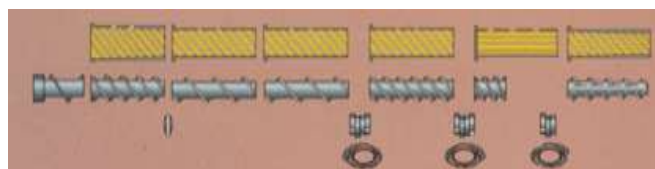
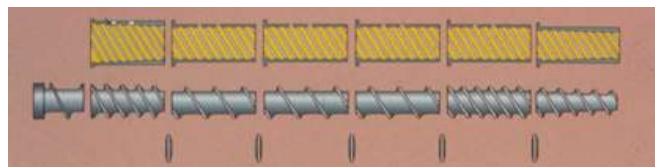
### Pelleting Process (Extrusion)

- **Characteristics of feeds are produced by extruder**
- We can produce floating, sinking slow sinking feeds (remember feeding characteristics and habits of fish); because we can control the density using different types of screws (screws on the left are for floating feeds, screws on the right for sinking feeds) .



### Pelleting Process (Extrusion)

- Whenever we want we can change the length of extruder and screw type; it gives us more flexible feed densities.



## Pelleting Process (Extrusion)



- **What does an extruder do more different than a pellet mill?**
- It can produce fish feed in every densities
- It can also produce unlimited types of feeds (especially pet foods)
- It can process high level moisture mixes and ingredients (until 55%)
- Cooking rate is higher than 90%
- There is no bacterial contamination, because of high temperature application.
- It can process highly plant origin ingredients, high temperature and pressure increase gelatinization. That's why digestibility increase.
- We can add high level fat before extrusion (25-30%)
- First investment is expensive; but the quality is top, second hand is still ??? (400.000 Euro)