

The role of new raw materials in fish feed production

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- Tema & Partners coordinates a group of all independent experts active in the different fields of the animal feed business.
- We develop products and production processes, design the factories and guide the total realisation of a new product or facility

This presentation will contain information about:

- The main raw material properties
- The influences on the production process
- The influences on the finished products
- The influences on stocking policy
- The influences on production costs
- The behaviour during eating by the fish
- And finally some questions for the future

Main Raw Material properties

- New raw materials need investigation of its nutritional and physical properties and the resulting influences on the final product that is made from it.
- In this presentation we will have a look at the physical properties and how we have to study these properties.
- This needs close cooperation between nutritionists and process technologists as well as factory management!!

Typical remarks about new raw materials

- We have no experiences with it !
- We do not know how to handle it!
- Why a new one? We have so much already!
- Our extruder does not like it!
- In our country we do not like this kind of raw materials
- And so on! But.....!

The right mentality!

- Come on with your raw materials!
- New things make fun!
- If there are problems we solve them!

How?

By systematic analysing the properties and its behaviour in the unit-operations which take place in our factory.

How important can be the introduction of a new raw material?

			Examples of diets			
		Fish meal	Wheat	Tapioca	Soya concentrate	Poultry and feather meal
Dry meal mix						
Wheat	%	9	18.2			
Tapioca	%	9		13.8	12.4	12.8
Wheat gluten	%	5.2	39.7	43.3	14.7	10.1
Soya concentrate	%		19.4	19.7	53.3	
Fish meal	%	75.6	16.7	16.9	15.3	15.8
Poultry meal	%					45.8
Feather meal	%					12.8
Additives	%	1.2				
Min/vit	%		1.0	1.0	0.9	0.9
Amino acids	%		1.9	2.1	1.1	1.5
MCP	%		3.1	3.2	2.3	0.4
Sum	%	100.0	100.0	100.0	100.0	100.0

Test of the pellet binding properties by the introduction of different binders

No of diet	3.0	3.1	3.2	3.3			
Binder added	no extra binder	Plasma	Aquatex	Gelatin			
Addition level to 100 kg meal mix diet 3		3	3	3			

Visual judgement of the binding quality 1= bad and 10 is very good

No of diet	3.0	3.1	3.2	3.3
Binder added	no extra binder	Plasma	aquatex	gelatin
Binding quality	3	7	6	8

Plasma and gelatine can partly replace wheat starch!

Influences on the production process

- **Process parameters**

- Hygroscopic properties.
- Dust explosion properties (high Atex class).
- Caking/flowing/dosing/mixing properties.
- How homogeneous is the product with regard to content of essential ingredient parts (protein, ash, fat and water)
- Aggressive to mild steel.
- Grinding difficulties due to interaction with other raw materials.
- Extrusion parameters influences (power, capacity, smell, expansion, pressure built up, wear, etc.).
- Sticking problems with pellets before dryer?
- Agglomeration and extra water uptake of fine particles in Pre-conditioner resulting in different expansion degrees.



Influences on the finished product

- **The physical properties of the pellets**
 - Pellet hardness.
 - Pellet durability.
 - Pellet wettability.
 - Water stability.
 - Influence on expansion degree.
 - Fat/oil absorption properties.
 - Pellet binding properties

Influences on the finished product

- Leaking of attractants.
- Leaking loss of essential ingredients.
- Influence on Aw-value.
- Influence on visual aspect of the pellet shape.
- Water and oil binding properties.
- Influence on oxidation/rancidity of fat and oil in the formula and need for extra anti-oxidant addition.



Stocking properties

- Bulk density during filling into a silo (air uptake).
- Bulk density increase during stocking.
- Flow ability and flood ability when leaving storage position.
- Tendency for funnel flow or mass flow
- Influence of shelf life on keeping quality

Influences on product costs

- **Cost of formulations**

- Which raw materials will be replaced and what is the price benefit?
- If replacing low protein raw material how to fill up gap and what is price consequence?
- Effect on water need in extruder and drying cost.
- General handling/storage cost.
- Influences on all unit processes with regard to capacity, power consumption and wear.
- What investments are necessary for proper handling of the raw material?
- What will be the most economic ordering quantity and can we store and handle that quantity?

Behavior during eating

- **Influence on mouth feeling**
 - Chewing gum effect (sticky in the mouth)
 - Brittle and breaks into meal particles (negative for shrimp)
 - Brittle and breaks into small non brittle pieces (positive effect for shrimp)
 - Difficult to absorb water in the stomach and intestines
 - Too hard to break
 - Hard as a stone and spitted out again

- **So far physical properties and behaviour in the feed and factory of new raw materials**

- **Now some advices when new raw materials are introduced into a factory.**

- Discuss pro and con's with the factory management!
- Ask the supplier about his experiences with handling the product in a factory!
- Make some test feed with limited amounts of the new raw material. Large changes with negative result will give a lot of resistance and the raw material will get a bad image!
- Benchmark competitors usage of the raw material.
- Make a HACCP analyses and adjust safety and quality procedures where necessary.

Product development means

- Never think that you are OK now with your products.
- Always try to be better than the competitors
- Always look for better options
- Do so and you will be a winner!

And for the future!

- Check the carbon footprint of the product
- Discuss with the suppliers the option to get products that are still in a liquid phase. Drying will in general influence the feed properties in a negative way and it will enlarge the carbon footprint!

Example

Drying systems for blood meal/products

Mink digestibility:

>90%

?

84%

70%

50%

Drying cost

Digestibility

Spray dryer

Flash dryer

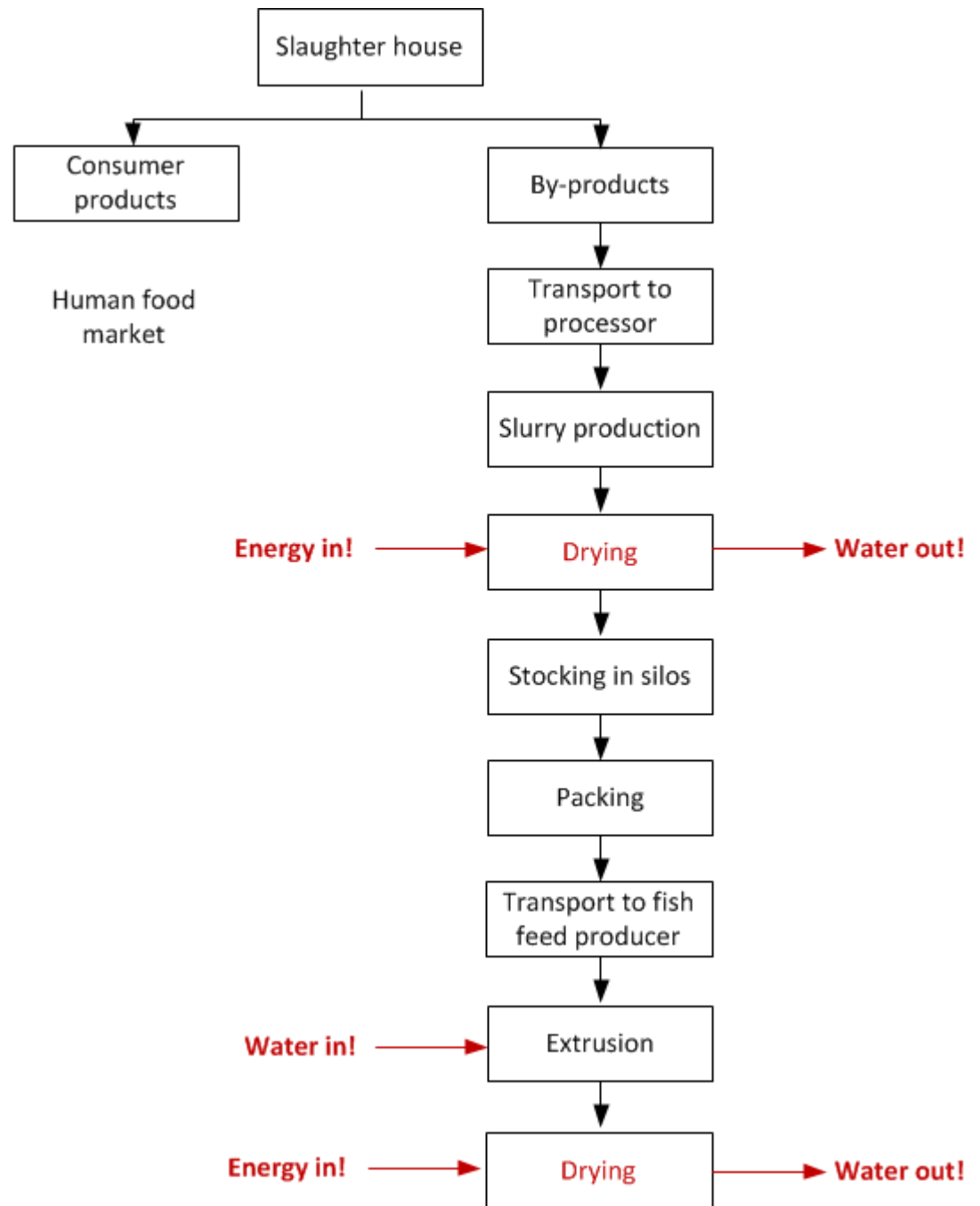
Paddle dryer

Drum dryer

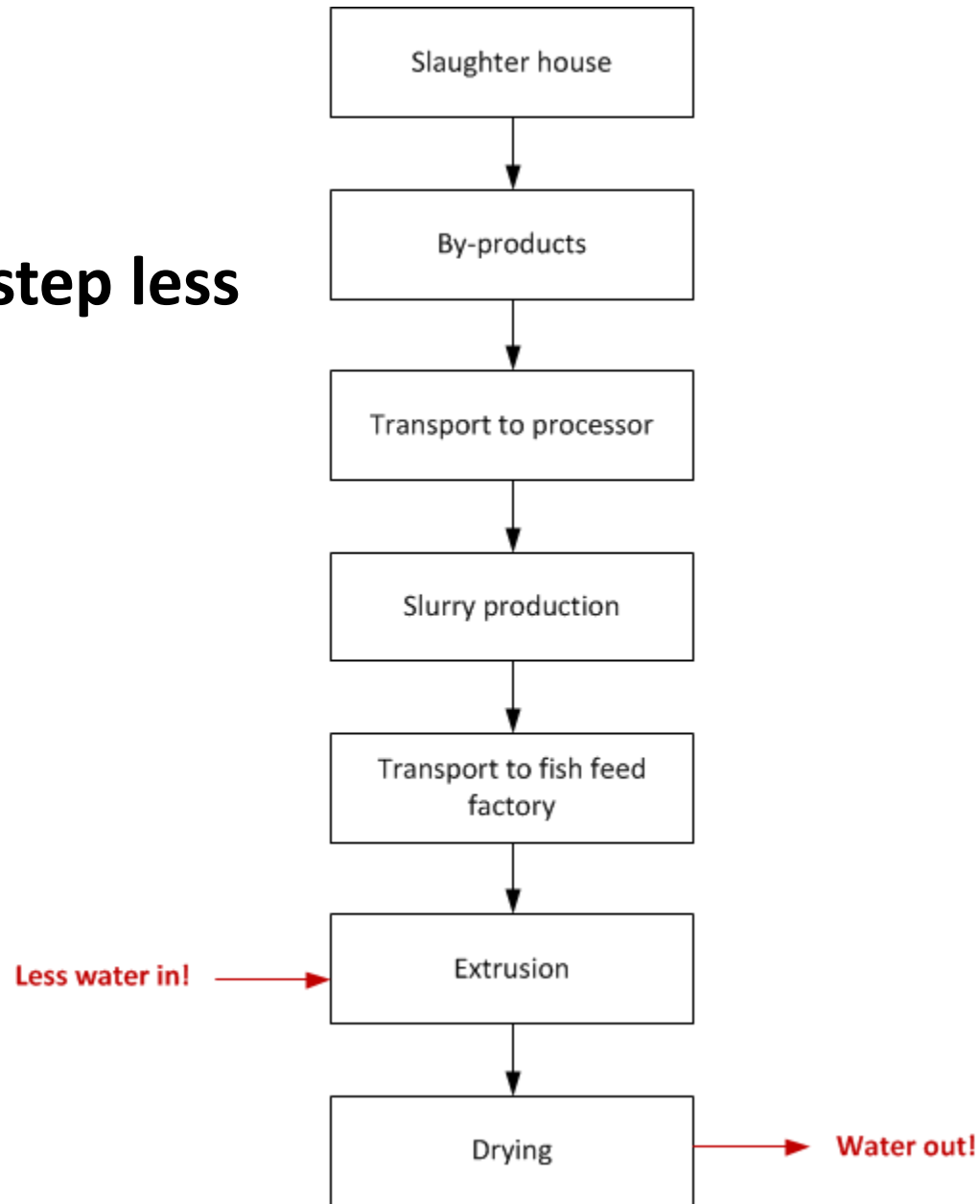
Disk dryer

**Question: Can we keep it liquid and
can that be a contribution to
sustainable aquaculture?**

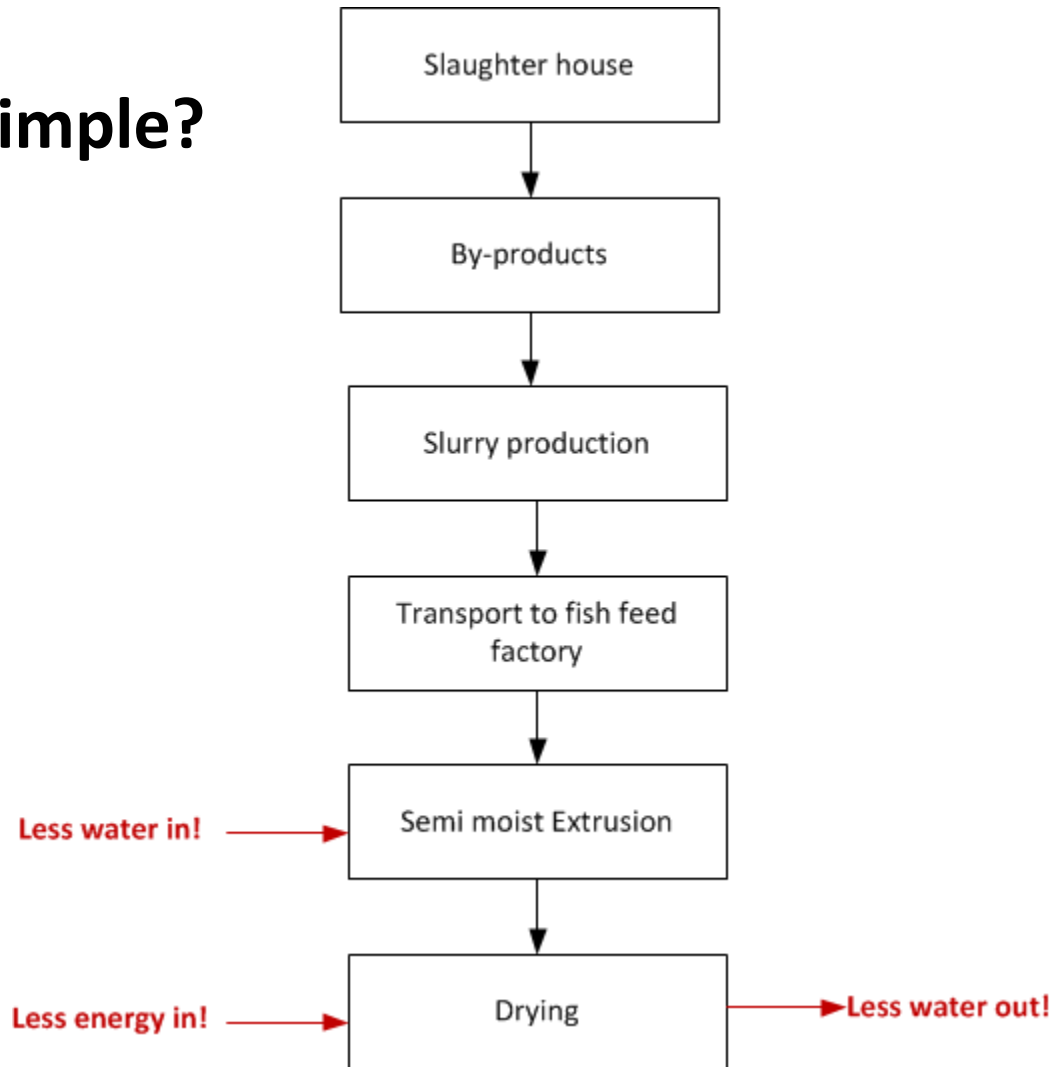
From Slaughter house to fish feed



One drying step less



And more simple?



**Future task for nutritionists and technologists:
Replace raw materials with a limited content of
an active ingredient by more concentrated raw
materials and water and let that be a
contribution to sustainable aquaculture.**

Thank you!