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IT ALL STARTS WITH THE EGG

An Introduction to AquaFeed Designed for RAS

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Early days of making fish feed



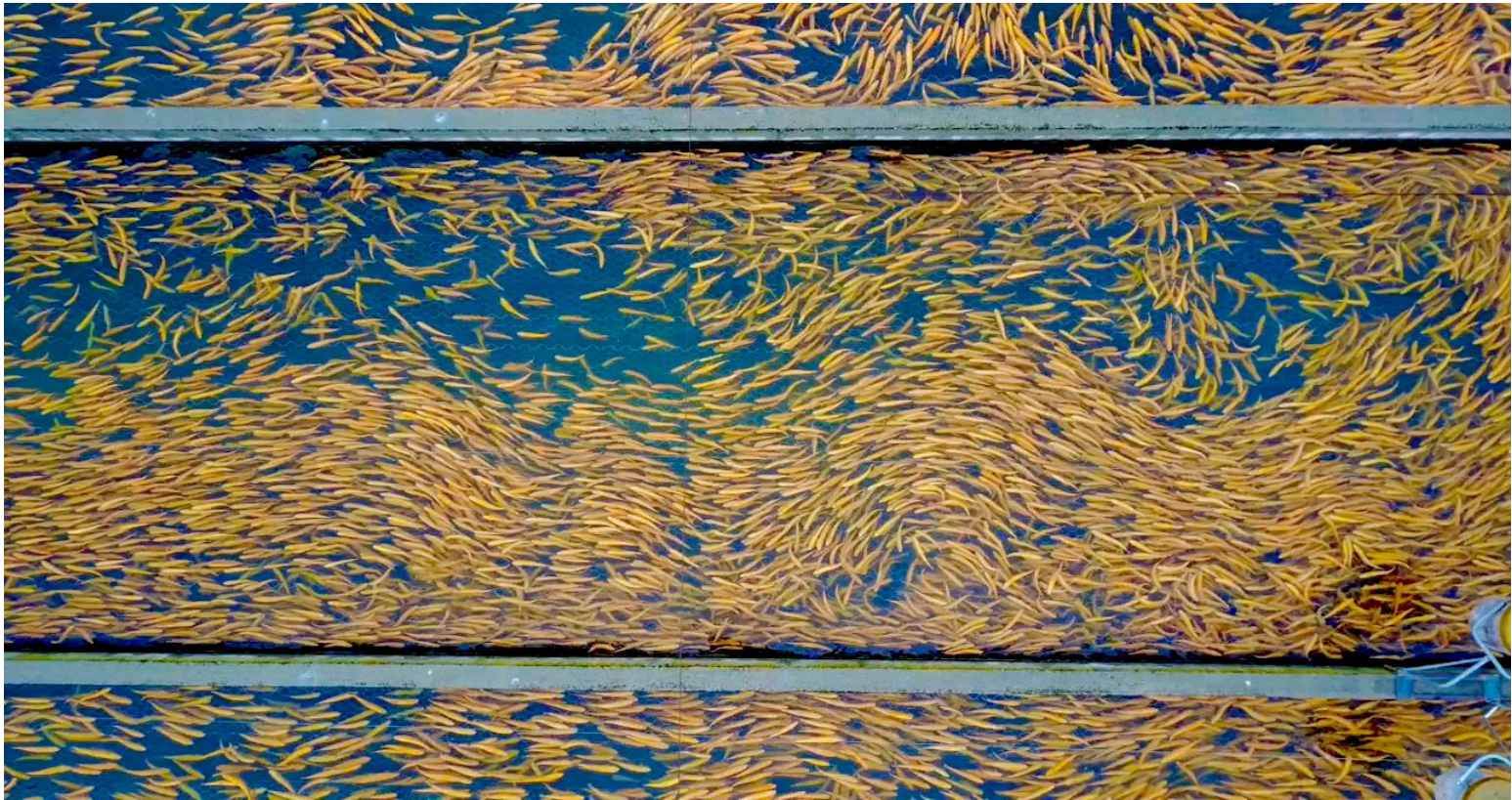
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Diversifying, from raceways & cages...



...To RAS Aquaculture requiring...



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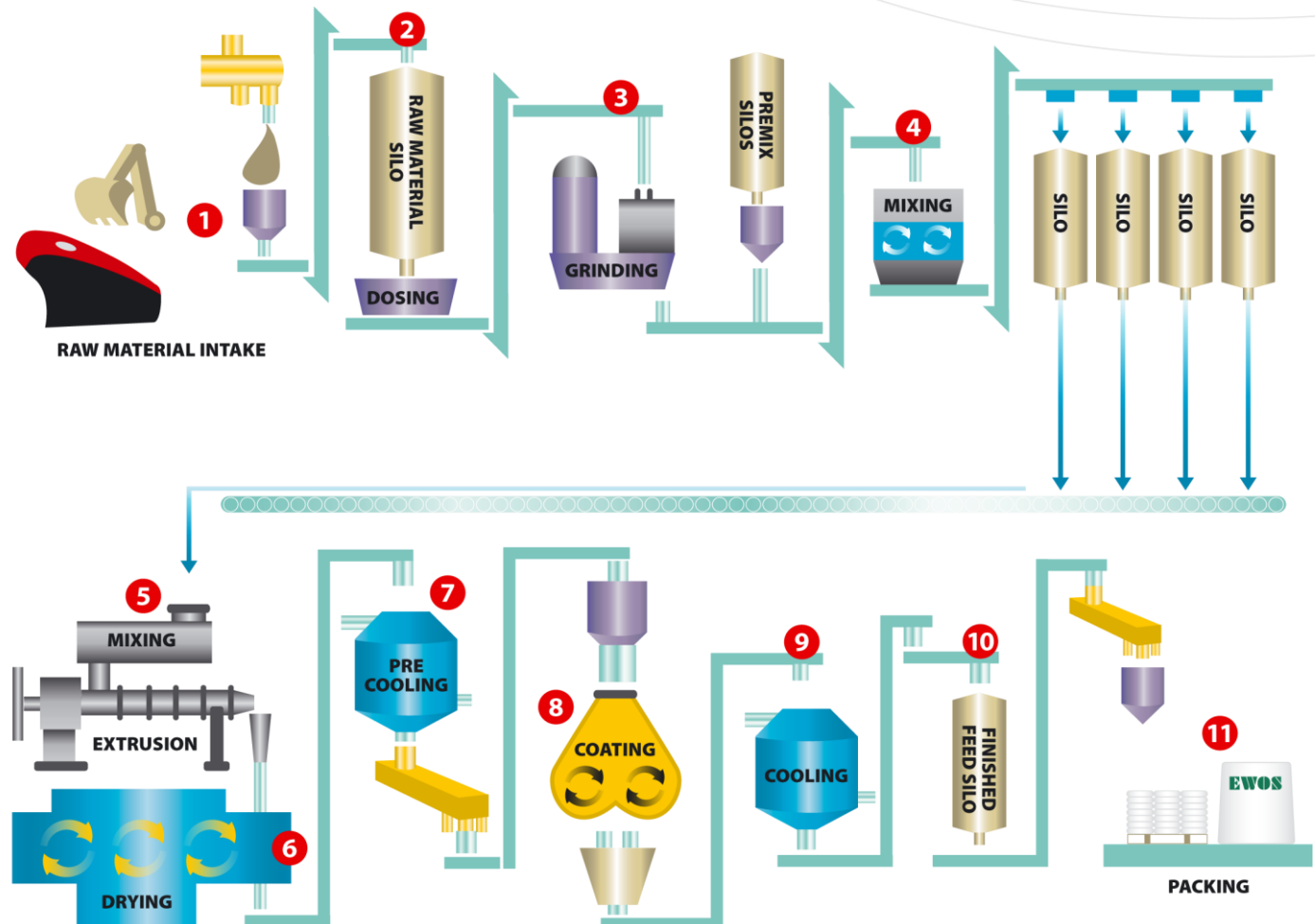


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EWOS

Feed production which is complex

- 1 Intake
- 2 Storage
- 3 Milling
- 4 Mixing
- 5 Extrusion
- 6 Drying
- 7 Pre-cooling
- 8 Coating
- 9 Cooling
- 10 Storage
- 11 Packing



Fishmeal inclusion over 25 years



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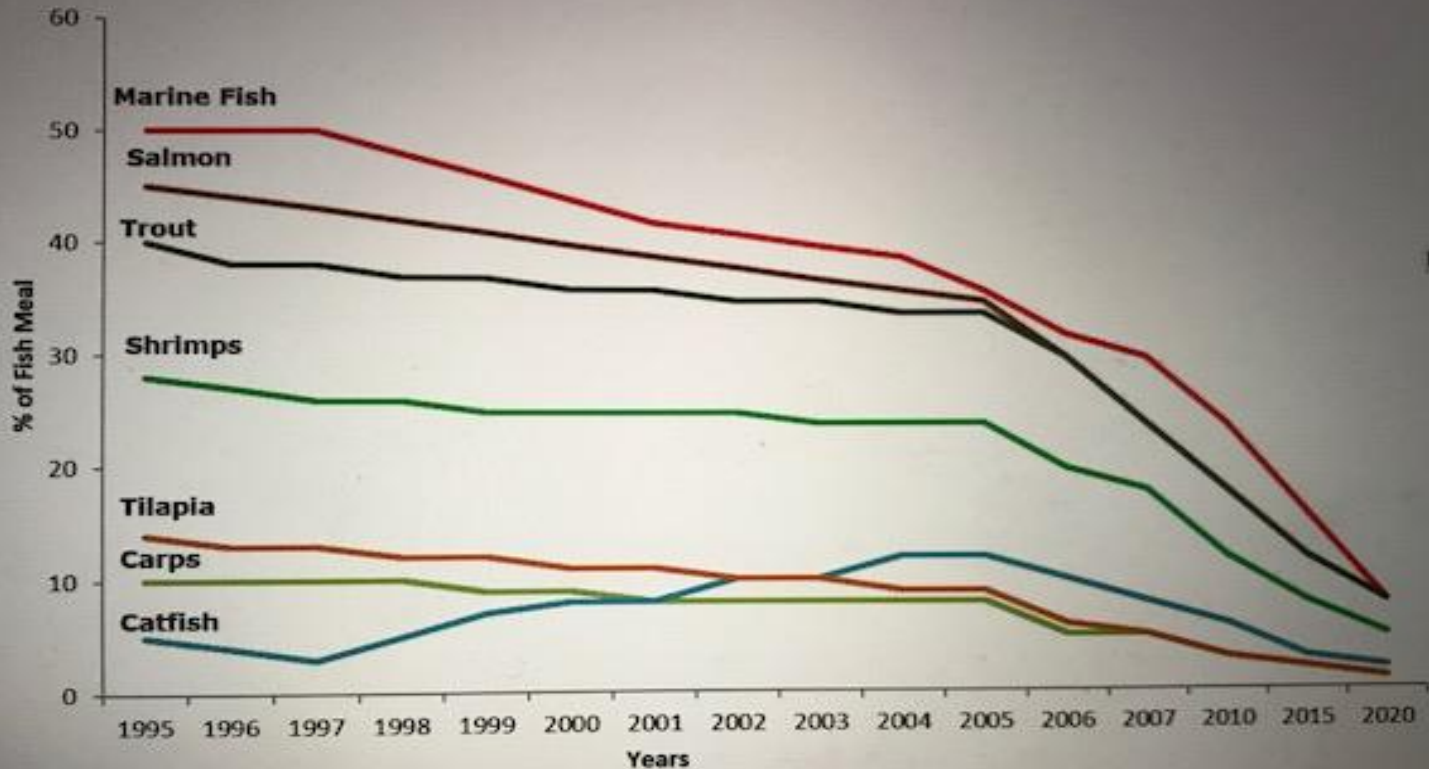


Fig. 1. Percentage of fishmeal inclusion in aquaculture species. Data obtained from Tacon and Metian, 2008.



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RAS Aqua Feed Design

- When designing aquaculture feed for use in RAS, the following attributes need to be considered and incorporated...



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Ideal RAS Feed Characteristics

- Provides excellent feed efficiency and growth
- Highly palatable diet with high uptake by the fish without waste
- Very highly-digestible



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Monitor protein digestibility (Aller Aqua , Internatiional Aquafeed)





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Ideal RAS Feed Characteristics

- Accelerate production cycle, improving RAS output
- Low NPN in raw materials
- Consider maximizing farm revenue instead of feed cost per tonne
- Invest in the recipe



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Very strict testing of RAS feed & ingredients





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Ideal RAS Feed Characteristics

- Minimize fat leakage from feed pellets
- High water-stability of feed
- Low in dust and broken pellets



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Ideal RAS Feed Characteristics

- Feeds fish and system indirectly
- Yields very good fecal stability
- Emphasis on maintaining good water quality



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Ideal RAS Feed Characteristics

- The feed formulation, quality of milled ingredients, and use of appropriate binders to maintain intact fecal pellets is critical.
- Light transmittance in salmon RAS can play a critical role in preventing early maturation. Thus, the feed must not produce brown, high-turbidity water.
- The goal is to maintain turbidity at < 1 NTU



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Ideal RAS Feed Characteristics

- With the large amount of solid/organic waste, one promising approach is anaerobic digestion and converting the sludge to biogas.
- To enable efficient digestion and minimal amounts of leftover, undigested waste, the level of ash and fiber in feed should be reduced
- Balanced feeds that take good care of the microbes in the bio-filters.



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Ideal RAS Feed Characteristics

- Feed and ingredients meet all regulations
- Controlled shipping conditions (temp) of RAS feed
- Support RAS farming growth with feed plants near
- Develop new, innovative and feasible ingredients



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Ideal RAS Feed Characteristics

- Traceable ingredients from origin (producer)
- Certified sustainable and food-safe
- Utilize functional additives giving better fish health
- And, finally, an ideal RAS feed yields an end-product that...

...consistently tastes great !



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