Technologies to deliver feed and medication

- effective delivery of pellets over large distances and a large surface area to improve consumption levels and reduce losses

By Ulrik Ulriksen
Todays challenge for feeding systems

• Deliver high volumes of feed
  —in a controlled fashion
  —without damage to the pellet.
The modern fish farm
Various system principles

- **Centralized feeder systems**
  - Central storage with pneumatic feed transport to cages
- **Feed hopper systems**
  - Smaller feed storage next to every cage & local distribution
- **Water transport feeder**
  - Using water & pipes to feed below surface
Delivering feed to farms & storage barges

- Bulk deliveries present new challenges with quantity control and pellet breakage
- Up to 3% feed damage in delivery processes
- Deliveries at night require staff to go out to farms at odd hours
Feed storage conditions

Temperature °C

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Feeding start

Feeding start
Controlling the feeding process

- Farmers often use camera systems, environmental sensors, control systems and stock management software to assist in the decision process.
- Feeding fish in modern farms is a complex job!
Is the fish feeding procedure controlled like this?
Staying close to the animal

- Understanding the fish behavior is critical to determine the optimum feeding pattern
- The choice of feeding method depends more on control routines and available technology than the fish biological precondition
Keeping the feed pipes organized

- Increased system capacity (+ 10 – 20%)
- Reduced pellet breakage (+ 0.2 – 1.0%)
- Prolonged pipe lifetime
Keeping the systems operational

- Increased volumes, variable feed quality and later trends of low transport speed present major challenges of blockage
Pellet breakage

- A major source of losses, variations from 0.3% to 13%

<table>
<thead>
<tr>
<th></th>
<th>40m/s</th>
<th>30m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 90°</td>
<td>1.21</td>
<td>0.92</td>
</tr>
<tr>
<td>2 x 45°</td>
<td>0.92</td>
<td>0.85</td>
</tr>
<tr>
<td>2 x 30°</td>
<td>0.8</td>
<td>0.61</td>
</tr>
<tr>
<td>Ingen bend</td>
<td>0.75</td>
<td>0.52</td>
</tr>
</tbody>
</table>
Distributing the pellet in cages

• A good distribution is important important for smaller fish, effects on larger fish are unclear
• Spreaders might reduce capacity and increase the risk for breakage & blockage