Perfect Separation of Hatched Artemia from Empty Shells and Unhatched Cysts
SEP-Art: introduction

Natural distribution of Artemia
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Harvest Volume per year

<table>
<thead>
<tr>
<th>Year</th>
<th>Harvest Volume (dry kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>800,000</td>
</tr>
<tr>
<td>1997</td>
<td>400,000</td>
</tr>
<tr>
<td>1998</td>
<td>200,000</td>
</tr>
<tr>
<td>1999</td>
<td>100,000</td>
</tr>
<tr>
<td>2000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>2001</td>
<td>1,100,000</td>
</tr>
<tr>
<td>2002</td>
<td>1,500,000</td>
</tr>
<tr>
<td>2003</td>
<td>700,000</td>
</tr>
<tr>
<td>2004</td>
<td>700,000</td>
</tr>
<tr>
<td>2005</td>
<td>900,000</td>
</tr>
<tr>
<td>2006</td>
<td>1,100,000</td>
</tr>
<tr>
<td>2007</td>
<td>800,000</td>
</tr>
<tr>
<td>2008</td>
<td>1,000,000</td>
</tr>
<tr>
<td>2009</td>
<td>1,400,000</td>
</tr>
</tbody>
</table>
SEP-Art: introduction

Harvest recovery per year

- 2004: 25.00%
- 2005: 18.00%
- 2006: 15.00%
- 2007: 12.00%
- 2008: 10.00%
- 2009: 10.00%

recovery
Artemia nauplii are an excellent and still essential food for fish and shrimp larvae. As Artemia nauplii are a natural product, its quality depends mostly on the environment of the harvest site and less on processing techniques afterwards. Next to H%, the most important quality aspects of Artemia are the separation of empty shells and nauplii after hatching. On the hatchery, it is very difficult and labor-intensive to use Artemia with a poor separation; while especially for fish larvae, it is very important that no unhatched cysts or empty shells are mixed with the nauplii. INVE has developed a new technology that allows a perfect separation for all kinds of cysts, producing pure and undamaged nauplii in an easy, safe, and fast process.
SEP-Art: how does it work?

The SEP-Art technology consists of two parts: the SEP-Art artemia and the separator. Both the SEP-Art artemia and the separator are necessary to make the technology work.
SEP-Art: how does it work?

- SEP-Art artemia is **coated** with a ferro-magnetic material.
- This coating is **safe** for the technician, the larvae and the environment and does not affect in any way, the quality of the cysts.
- The SEP-art technology can be applied on **any kind of artemia** regardless of source or harvest year.
- The property of the coating may give the SEP-Art cysts a brown appearance.
SEP-Art: how does it work?

- Flow through system
- The magnets inside the separator attract the magnetic empty cysts shells and unhatched cysts but not the artemia nauplii

Continuous flow of Hatching medium

no power supply required

Nauplii

Empty shells and unhatched cysts
SEP-Art: how does it work?
SEP-Art: easy to use

1. Hatch SEP-Art artemia following the standard operating procedure
2. Place the inlet of the separator under the outlet of the hatching tank
3. Place a collector with a net under the outlet of the separator
4. Fill the separator with clean water
5. Remove the aeration from the hatching tank and slowly open the valve of the outlet of the hatching tank
6. Run the complete hatching medium through the separator. This gives you a maximum collection of biomass.
7. When the harvesting is completed, let clean water flow through the separator until no more nauplii come out of the separator
SEP-Art: easy to clean

- empty the device by lifting up the short side of the separator and collecting the waste in a net.
- To remove the remaining cysts inside the separator, rinse it with a clean and strong water flow against the regular flow until no more cysts come out of the separator.
- A disinfection procedure may be applied
- Keep the separator in a safe and dry place
SEP-Art: benefits

- No need for decapsulation
- Maximum biomass
- Clean biomass
- Undamaged nauplii
No Need for Decapsulation

- It is very easy to separate nauplii from cysts.
- Therefore, it is not necessary to decapsulate cysts.
- The costs involved during this process can be saved.
- No discharge of toxic water.

Decapsulation

- 71 kg cysten/m³
- 0.35 kg OCl⁻ / kg cysten
- 0.15 kg NaOH / kg cysten
- 0.014 kg Na₂S₂O₃/kg cysten

Chemicals (0.35 gOCl/kg cysts)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>kg/50 kg Dry Cysts</th>
<th>$/kg - USA</th>
<th>cost/kg Dry cysts</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaOH 25% solution</td>
<td>7.5</td>
<td>0.333</td>
<td>0.04995</td>
</tr>
<tr>
<td>NaOCl (10%-1.21 kg/L</td>
<td>145</td>
<td>1.574</td>
<td>4.565702479</td>
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<tr>
<td>Antifoam</td>
<td>0.2</td>
<td>0.14</td>
<td>0.00056</td>
</tr>
<tr>
<td>Na₂S₂O₃</td>
<td>0.7</td>
<td>1.1</td>
<td>0.0154</td>
</tr>
<tr>
<td>Water</td>
<td>6000</td>
<td>0.0025</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$4.93</strong></td>
<td></td>
</tr>
</tbody>
</table>

- Chemicals: $5
- Labor: 1-2H @ $30/h
- Risk: High
- Ecology: toxic waste

Total - per 1-2kg: $35-20/kg
- per 10 kg: $11/kg
SEP-Art: benefits

Maximum Biomass

- The complete hatching tank can be harvested and as good as all nauplii present in the hatching tank can be recovered

![Graph showing the hatching percentage and wet npl/kg cysts for different separation methods. The graph includes data points for Double Sieve, High5, Sepmag, GSL, and Sepmag, showing hatching percentages of 12% and 20% for comparison.]
Clean Biomass

- Artemia nauplii can be harvested with lower than 1% cysts or cysts shell
- As a consequence the difference between low hatchers (low H%) and high quality hatchers (high H%) can only be found in the output, i.e. the amount of nauplii harvested per kg cysts.
- No extra labour will be needed to separate the cysts from the nauplii
Undamaged Nauplii

No physical force which can damage the Artemia. The more cysts are present, the faster the filtering screen clogs. Clogging will not only reduce the flow rate but will also increase the risk of damaging nauplii.
SEP-Art: benefits

Undamaged Nauplii

Only cysts are attracted by the magnets. All the Artemia can pass the system.

Data
- Average of Wet Dead
- Average of Wet Alive
- Average of H+

20%
SEP-Art: in short

- The SEP-Art technology is a simple but truly revolutionary concept that will greatly facilitate the daily challenge of every aquaculture hatchery of getting clean, strong and economical nauplii for their larvae.