

# USER MANUAL

TUBENET

REVISION 6



**AKVA**GROUP<sup>TM</sup>  
EGERSUND NET

# THANK YOU FOR CHOOSING EGERSUND NET

Our mission is to deliver solutions and services that optimize production and contribute to sustainable, cost-efficient and safe fish farms. We place great emphasis on fish welfare, operational performance and profitability for the customer in everything that we do.

That means we want to be sure you have the best possible understanding of how to use our Tubenet™ system.

Our goal with the Tubenet system is to help prevent the attachment of sea lice on fish, and thereby help you control the challenges presented by sea lice. Tubenet™ is a product under development, and it is important that you conduct risk assessments related to the use of this product.

This user manual for Tubenet™ is a supplement to our existing user manual for nets.

Tubes can have different depths and comprise of various materials. This user manual applies to all Tubenet™ designs.

If you have any suggestions or ideas that may help improve user-friendliness, we would appreciate hearing from you.

If you have any questions about the product, please feel free to contact us:

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User manual for Tubenet™ is available on our website [www.egersundnet.no](http://www.egersundnet.no), and on our online equipment log Net-Reg, [www.net-reg.no](http://www.net-reg.no).

Best regards,  
Egersund Net

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# 1 INTRODUCTION

## 1.1 About the product

Tubenet™ is a standard net equipped with a roof of netting at the desired depth. This net roof has an opening in the centre that connects to a vertical cylinder – or tube – with the net on the inside and an external lining of tarpaulin. The tube lining is attached to a separate pen, where it is fastened to the railing.

The inner pen is moored to the outer pen with ropes. The tube lining is held down against the net roof by a separate sinkertube.

The net roof keeps the fish away from the top layer of the water, where the concentration of lice tends to be highest. The tube lining protects the fish from lice as they swim up to the surface to fill their swim bladder. The net roof runs up along the inside of the tube lining. To ensure good water quality in the tube, you should evaluate whether to employ water circulation systems or stirring.

## 1.2 Symbol definitions



### REQUIREMENT

Placed beside text describing requirements



### NOTE

Placed beside text describing events or anything else that the fish farmer should be aware of



### TIP

Describes tips and advice in connection with the installation and handling of Tubenet™.



### ESCAPE RISK

Placed beside text describing events and/or operations that may increase the risk of fish escaping

## 1.3 Revision changes

REV.NO	DATE	SCOPE	REFERENCE
6	01.11.2021	Product name changed to Tubenet™.	
6	01.11.2021	Updated information about net roof.	Section 2
6	01.11.2021	Updated information about installation	Section 4.2
6	01.11.2021	Updated information about installation.	Section 4.3

## 1.4 Identification of Tubenet™

The tube should be marked with:

- Egersund Net
- Circumference
- Depth
- Weight
- Number of attachment points between the tube and floater

The net is marked in line with section 2.3 in User manual Nets.

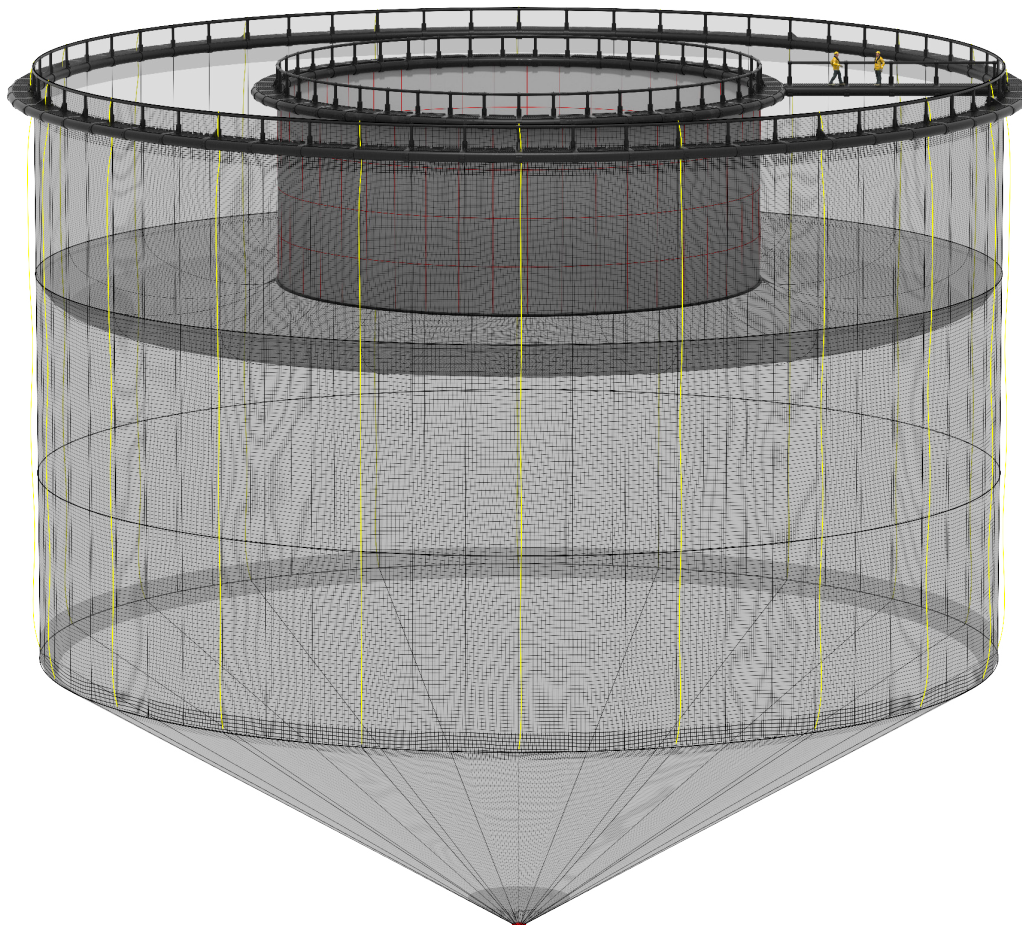
## 2 DEFINITIONS

Walkway	Construction that allows personnel to move between the inner and outer pen.
Inner sinkertube	Holds the tube lining and net in place.
Inner pen	Holds the tube lining and net in place.
Net collar	The part of the net roof that runs up through the tubelining.
Net	The complete bag of netting used to contain the fish.
Net roof	Netting shaped like a roof, designed to keep the fish below the tube lining. The net roof is attached to a flap of netting sewn onto the net, and it is attached to the flap using seam or zipper. The net roof continues up through the tube lining, forming a cylindrical shape.
Tube	Vertical tunnel with the net on the inside and the lining on the outside.
Tube fabric and tube lining	Lining or fabric surrounding the cylindrical section of the net roof.
Bridles, inner pen	Mooring between the inner pen and the outer pen.
Tubenet™	Describes the overall concept.
Outer pen	Standard pen for fastening the net.

# 3 CONSTRUCTION

The structure illustrated below shows an example of a Tubenet™ installed in an ENC 160 3045 60:

- Circular net with a 160 m circumference.
- Side depth is 30 m and depth to the centre is 45 m.
- The number of side ropes is 60.
- The circumference of the inner pen is 60 m.
- The net roof is fitted at a depth of 10 m.
- A walkway is installed between the inner pen and the outer pen.




# 4 INSTALLATION

## 4.1 Before installation

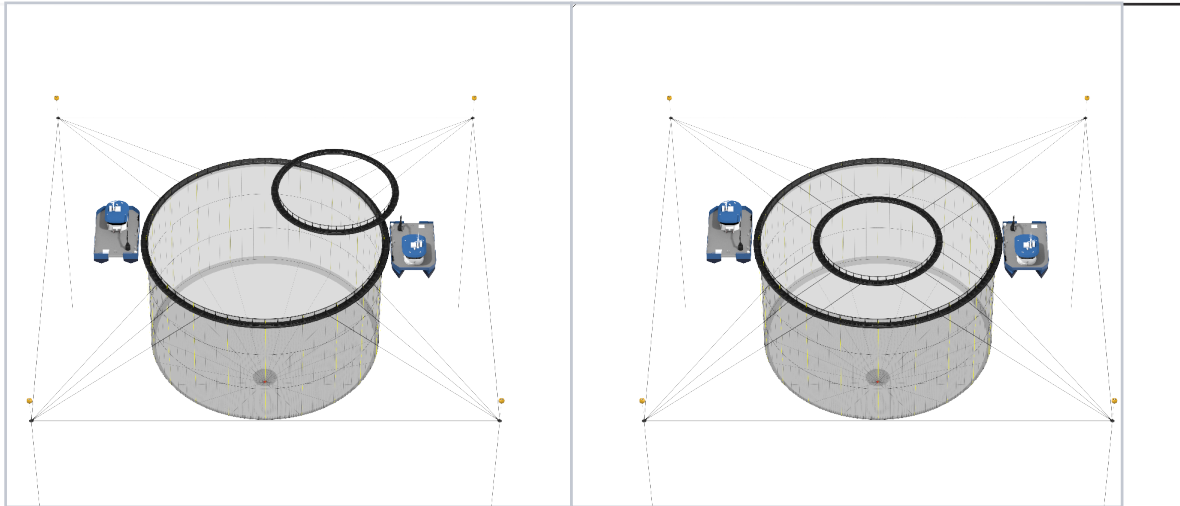
Before installing the Tubenet™, you need to go through the operation with everyone involved.

You must carry out a local risk assessment that takes account of available equipment, personnel, weather conditions and other aspects. It is important that the personnel involved in the operation have the necessary training and understanding of the concept.

## 4.2 Installing the net with the tube pre-installed

- While undertaking the installation, ensure that none of the equipment is damaged or deformed beyond what it is designed to withstand.
- Install the net as normal, as described in the user manual for nets.
- You will find the net roof inside the net, with a rope attached to the attachment loops. During the installation, you must attach a buoy to this rope to allow easy access to the net roof later.
- We recommend using two boats, so that one boat holds on to a specific point on the inner pen while the other boat lifts the inner pen into the outer pen. Bridles must be used to distribute the load on the inner pen.
- We recommend using one or two buoys on the inside of the outer pen to avoid excessive strain on its railing.
- The tube is installed by attaching the lining to the inner pen and inner sinkertube at all the attachment points. The weight of the sinkertube should hang directly from the lining and be secured with ropes for sinkertube running up to the inner pen.
- Guide the buoy with the rope to the net roof into the inner pen. You can now lift the net roof into place and install it in the inner pen.
-  The inner pen will rotate to the correct position and braidles of the inner pen can then be attached. The braidles to the inner pen must be attached in line with the braidles on the outer pen. See illustration on page 9. To minimise the load, ensure the ropes used to moor the inner pen have sufficient elasticity. Use the rope supplied with the Tubenet™.
- Lower the sinkertube for the tube in a controlled manner.



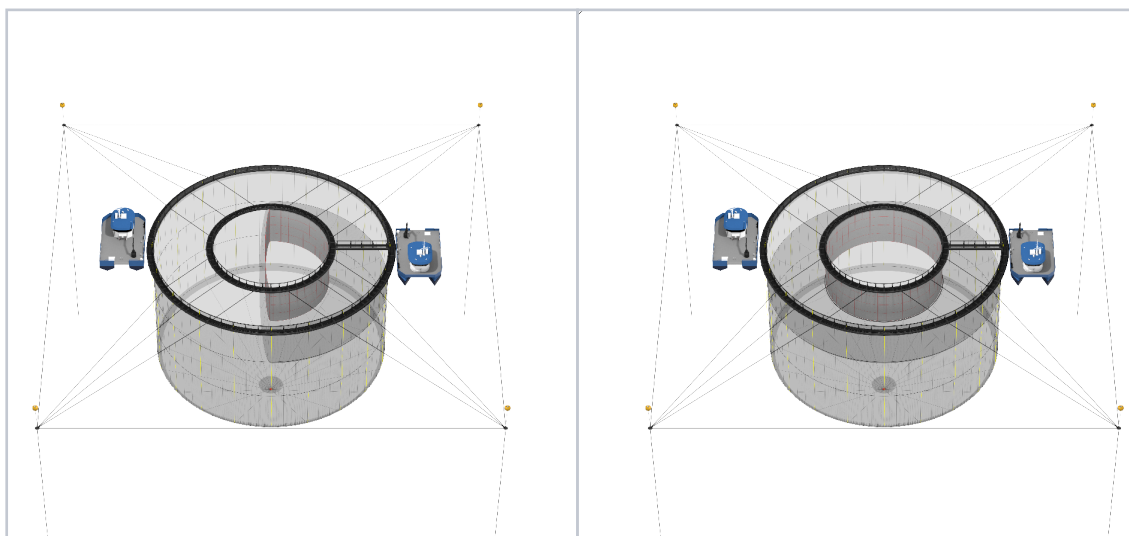


*Illustration; Installing the inner pen*

### 4.3 Installing the tube in the pen

- While installing Tubenet™, ensure that none of the equipment is damaged or deformed beyond what it is designed to withstand.
- Install the net as normal, as described in the user manual for nets.
- You will need to raise the net to allow access to the waist rope where the net roof is to be attached.
- A flap of netting is fitted to the inside of the net where the net roof is to be attached. This flap makes it easier to attach the net roof as you are attaching two sections of netting with the same mesh size.
- Lift the net roof into the net and attach it to the flap. The net roof is equipped with several cross ropes. Loops are fitted along the outer edges of the cross ropes. As you install the net roof, gradually attach each individual loop to a loop over the flap. See image in section 4.4.
- While installing the net, you will need to attach a buoy to the attachment rope in the top loops on the net roof so that you can easily access the net roof later.
- We recommend using two boats when installing the inner pen, so that one boat holds on to a specific point on the inner pen while the other boat lifts the inner pen into the outer pen.
- We recommend using one or two buoys on the inside of the outer pen to avoid excessive strain on its railing.
- The buoy attached to top loops in the net roof, is attached into the inner pen.
- The tube is installed by attaching the lining to the inner pen and inner sinkertube at all the attachment points. The weight should hang directly from the lining and be secured with ropes running up to the inner pen.
- You can now attach the net roof to the inner pen.
- The inner pen will rotate to the correct position and braidles of the inner pen can then be attached. The braidles to the inner pen must be attached in line with the braidles on the outer pen.
- Use the rope supplied with your Tubenet™.
- Lower the net to the correct position and attach the centre weight.
- Lower the sinkertube for the tube in a controlled manner.





*Installing the tube lining and inner sinkertube*

*Fully installed Tubenet™*

## 4.4 General information

The inner pen is stabilized to the outer pen using a rope. At the end of each rope, there is a loop connected to a strap that you feed through the jump net on the net.

You must install a small plastic panel to the jump net, through which you then pass the rope.

This panel is made of PE or PA6 and you need to ensure that the hole in the centre is as small as possible and made to fit the rope that will be passed through it. You attach it to a side rope, ensuring that the netting has sufficient slack to avoid potential strain.

You must inspect where the rope passes through on a regular basis.

- ⚠ You then install a walkway between the outer and inner pen. The walkway must be installed in such a way that there is no risk of it damaging other parts of the structure. Pay particular attention to any areas where the walkway and the braidles of the inner pen are in contact.

When bad weather is forecast, always remove the walkway and secure it to a raft.

Appropriate additional equipment can be installed, but any such components must be designed not to damage other parts of the structure.

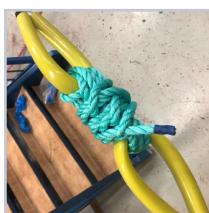
Install any dead fish collection system in the net, and any feeding system in the inner pen.

Remember to centre and secure the equipment so that it does not come into contact with the components of the Tubenet™. Fish samples should be taken inside the tube. The net

- ⚠ The net roof can be fitted with zippers that provide access to the net. A zipper is sometimes fitted between the outside edge of the flap and the net roof and serves to connect the two. You need to secure the zipper with cable ties and have it approved. Alternatively, you can cut an opening in the net roof. This opening must be as small as possible and must be repaired after the operation (see section 5.3)



*Panel for passing through the rope*



*Connecting loops and braidles*



*Zipper*



*Securing the zipper*

# 5 OPERATION AND MAINTENANCE

## 5.1 Risik assessment/special environmental conditions

Using Tubenet™ entails a change of risk with respect to escape of fish and HSE. You will need to have a risk assessment carried out at the site, taking the use of Tubenet™ into account. Items that must be assessed include:

- The movement of personnel between the inner and outer pen, including getting over the railing.
- Work carried out on the inner pen.
- Transporting equipment to the inner pen.
- Special measures in bad weather.



Working alone on the Tubenet™ carries substantial risks. It is difficult to spot if someone falls into the tube since lining reaches all the way up to the railing on the inner pen. Hence the need to establish procedures for the use of life jackets and working alone.

Note that constant movement in sections of the net that are attached together may cause wear and tear to the attachment ropes and loops.



In order to reduce wear and tear, you should aim to attach components in such a way as to minimise contact between any sharp edges and rope.

We recommended that you avoid using steel equipment as this risks causing wear and tear; consider replacing any metal components with ropes or straps.

It is important that loads do not cause the railing on the inner pen to bend. If this happens, you should attempt to correct the situation by loosening the attachments.

Examples of conditions that can increase the load include freezing, marine fouling and strong currents.

Be aware of any objects that may strike the net or tube and potentially cause tears. Pay special attention to this during installation, handling and operations. The inner pen is moored at the surface and is therefore easy to monitor. Your inspection checklist should include visual checks of the braidles to the inner pen. This also applies to the inspection of the fastening between the tube lining and inner sinkertube.

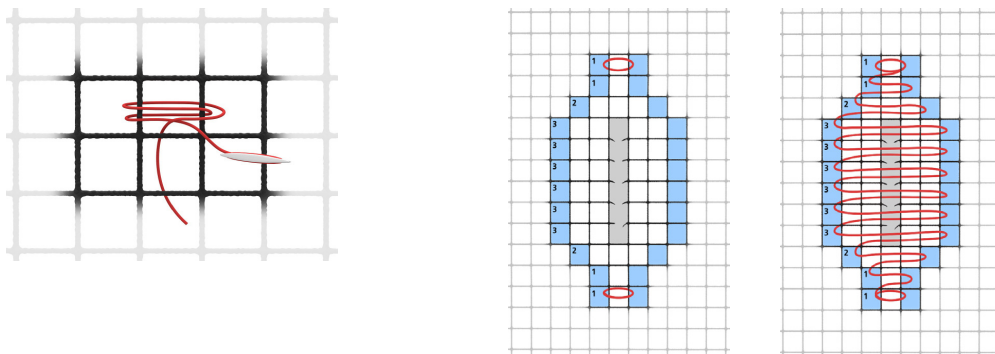
If you install additional equipment – such as a mort pump/dead fish collector, feed spreader etc. – bear in mind that you will be using it in a Tubenet™ and not in an ordinary net.

## 5.2 Maintenance

- Keep the tube lining free of growth/shells
- Establish inspection procedures
- Report any deviations or suggestions for improvement to the supplier so that improvements can be made

## 5.3 Temporary repair

If it is necessary to cut a hole in the net roof, make sure to repair it after completing the operation.



## 5.4 Checklist

You should draw up checklists for the components of your Tubenet™. These must be included in the site operator's routine inspections of the facility, and must also be carried out after severe storms or other unforeseen events that may have damaged the net. Here is a list of suggested checklist items:

Checkpoint	Inspection
Chafing	In general, pay attention to wear and tear that may become visible on components that are in contact with each other, such as ropes, netting, tube lining, pens and sinkertubes.
Slack	Check that ropes and braidles are evenly tightened.
Opening to pen	Check that the braidles to the inner pen has not caused tears in the net where the opening to the pen has been made.
Tube lining	Check that the tube is the correct shape, and that ropes are nice and tight. Check that the tube lining is intact and has no tears.
Braidles	Check the braidles, and tighten them if necessary.
Walkway	Check that the walkway does not come into unwanted contact with - and any potentially damage - other components.
Zipper	Check that any zipper is secured with cable tie.
Braidles, inner pen	Braidles, inner pen is located in the waterline and should be inspected regularly. Look for wear after any contact with the walkway.
Inner sinkertube	Check fastening of inner sinkertube.





