



Practical Guide

Investing in sewage pump-out stations at leisure craft guest harbours

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1. About BATSECO-BOAT

The issue of sewage collection plays a crucial role in the experiences of the visitors of small boat ports of the Central Baltic region, which forms a joint recreational area for boaters from Finland, Sweden and Estonia.

The BATSECO-BOAT project improves the sewage collecting capacity from small boats at guest harbours in the Baltic Sea region. The goals of the BATSECO-BOAT project are:

- raising awareness of the need to collect sewage that is generated on boats;
- popularisation of potential technical solutions and best practice in this area;
- making specific investments in small ports to install new pump-out stations at the ports, or to improve existing stations.

The improvements and investments of the project will make the status of the marine environment better, promote maritime culture and increase the visits of leisure boaters to small Central Baltic ports.

The purpose of this document is to provide the harbour owners and the organisation responsible for the administration of the harbour, with practical advice and tips in order to facilitate the investment project of a new pump-out station. The guidelines describe the practical aspects, i.e., why collecting sewage from small boats at harbours is necessary, the different phases of the investment project, the main potential technical solutions of pump-out stations, the pros and cons of different solutions and the requirements or preconditions for various solutions when decisions are made.

Thus, the guidelines provide an overview of what needs to be addressed and which aspects and sections of work should be considered in order to create the capacity for collection of sewage from small boats at harbours.

2. Why do we need sewage disposal and collection facilities at small harbours?

The sewage generated on boats is rich in nutrients, such as nitrogen and phosphorous compounds. There are three terms which are commonly used to distinguish the different types of waste water created on boats: black water, grey water and bilge water.

- Black water is toilet waste i.e., waste which will often contain harmful bacteria and viruses
- Grey water is waste water from sinks, showers and washing machines
- Bilge water is self-explanatory but is often contaminated with oil.

The focus of this practical guide is black water (boat toilet sewage, boat latrine).

If the sewage generated on boats is not disposed of at the harbour, but rather pumped from the boat into the sea, it contributes to the eutrophication of the marine environment. Eutrophication is a process where the excessive nutrients found in water lead to excessive growth of plants and the related decomposition process, which results in oxygen deficiency and deterioration of water quality, which consequently has a negative impact on the living environment of fish and other aquatic animals.

Hygiene requirements are the second reason why the sewage generated on boats must be disposed of at harbours. Coastal waters into which sewage from boats is discharged may not meet the requirements set for bathing water. Such water may contain pathogenic bacteria and may therefore be dangerous to beach visitors and swimmers.

The third consequence of the discharge of sewage into the sea is the 'visual intrusion' or aesthetically disturbing sight, which deters beach visitors and tourists, as well as other boat owners and cruisers.

The fourth reason concerns the implementation of international agreements regarding the environment and national environmental action plans. Baltic Sea countries have joined various international conventions and agreements on the environment (HELCOM, MARPOL) and are working on the improvement of the marine environment through EU cooperation. Requirements for the disposal of sewage generated on boats at harbours may also be stipulated in national or local legislation. Allowing ship-owners to dispose of sewage at harbours contributes to compliance with the aforementioned environmental agreements.

Fifthly, the service standard of guest harbours in several Baltic Sea countries stipulates that it must be possible for small boats to dispose of their sewage at the harbour. For the promotion of both domestic and international cruising and maritime tourism, it is important that the level of services provided by guest harbours is consistent across different regions. This means that guests arriving by small boat can assume that the services provided by the guest harbour also include the possibility to dispose of sewage.

Finally, ethical convictions and an educational and inspiring example. The behaviour of parents influences the values, attitudes and behaviour of future generation. If a good example is set for children and young people and they are instilled with an understanding that the marine environment can and must be protected, incl. via simple daily routines and habits (such as disposal of sewage at harbours), it has a broader impact on the achievement of a better environmental status of our seas.

3. Legislation

Levels of sewage input from recreational craft are thought to be relatively small compared to direct inputs from sewage treatment works, but the effects are serious and can potentially affect water

quality in a number of ways (discussed above). Regulations regarding the discharge of sewage are gradually increasing. It is the responsibility of the harbour owners and recreational boaters to be aware of the rules regulating the disposal of garbage and sewage as well as go beyond this by adopting environmental and health best practice.

International conventions such as MARPOL (Marine pollution), the Helsinki Convention (HELCOM Convention on the protection of the marine environment of the Baltic Sea Area) and the EU amended Port Reception Facilities Directive must be implemented in each of the participating countries through their national legislation. Therefore, although HELCOM extends regulations on the discharge of sewage to all ships, including pleasure craft, this is not yet law in all the HELCOM contracting parties: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

The information regarding national legislation in the countries participating in the BATSECO-BOAT project is as follows:

Estonia

There is no national legislation prohibiting the discharge of untreated sewage from pleasure craft into the territorial waters of Estonia. The rules of the international MARPOL convention chapter IV prohibit the discharge of ship-generated sewage into the sea, but it only applies to vessels which exceed 400GT or carry more than 15 passengers. HELCOM extends regulations on the discharge of sewage to all ships, including pleasure craft. As with MARPOL, the recommendations of HELCOM must be implemented in the participating countries through their national legislation. That said, the ban on the discharge of untreated sewage from pleasure craft is not yet a national law in Estonia.

Finland

The discharge of untreated sewage is prohibited at a distance of less than 12 nautical miles from the nearest land, i.e., within their territorial waters. This national regulation came into force in 2005. In addition, there is an environmental protection law for seafaring, 29.12.2009/1672, that bans discharge of sewage/toilet wastewater from any Finnish or international vessel. Outer territorial waters are measured as 12 Nm from the outmost points of land, located outside of the Finnish coastline, i.e., right outside of so-called internal territorial waters (archipelago areas and islands).

Sweden

In Sweden, all pleasure boats, including foreign flagged boats, are prohibited from discharging sewage into the lakes, internal waters and territorial waters (12 nautical miles) of Sweden. Sewage is any discharge of waste water and other waste from any type of toilet, including portable toilets. Sewage contains phosphorus and nitrogen and the primary aim of the ban is to reduce their discharge into Swedish waters. Harbours are responsible for ensuring that there are adequate facilities for boat owners to dispose of this waste on land. Anyone caught not complying with the ban may face an on-the-spot fine.

4. Action model

The owner/operator of a harbour must ask themselves what the action model for ensuring the collection of sewage at the guest harbour is like:

- should they cooperate with neighbouring harbours and establish a joint pump-out station in the area that meets the needs of several harbours regarding the disposal and collection of sewage;
- install an independent pump-out station at their harbour;
- the station is meant for use (free of charge) only for the vessels of the home harbour and for guest vessels that pay for the service;
- can the station be used by other vessels that do not moor in the harbour overnight?

5. Matrix

In order to better plan their work and set the goals that need to be achieved, the leaders of the project/harbour owners should consider and, if necessary, consult with the representatives of their target groups (boaters, small boat owners or the organisations that represent them), service providers (waste management, water supply and sewerage companies), municipality and state supervision authorities. Such consultations help to better understand which requirements, needs and expectations must be met when the sewerage generated on vessels is collected at harbours. For example, here are some questions that should be considered in advance and discussed with others:

- What problems will be solved, what are the expected outcomes and impact of the project?
- Have municipalities and/or state authorities set any specific requirements for the establishment of sewage infrastructure and collection of sewage from vessels at small harbours and what are these requirements?
- What is the target group like and how big is it? How many local ship-owners and tourists who visit the harbour by sea use the sewage disposal service now and will use it in the future?
- The budget, schedule and financial sources of the investment project.
- Future management of the pump-out station (who will manage it, who will cover the costs?).
- Cooperation with other harbours, dissemination of information among boaters and small craft owners about the availability of pump-out services at harbours.

6. Waste management plan

The objective of the preparation of a waste management plan is to ensure that the harbour is adequately prepared to receive boat-generated waste in a satisfactory and environmentally friendly manner. The main question before the preparation of the waste management plan is: what type of waste needs to be disposed of and in what quantities.

A waste management plan describes, among other things, the following:

- how boat-generated waste is disposed of and received in the harbour
- the estimated number of visiting vessels and the number of people on board
- an assessment of the types and quantities of waste that must be received in the harbour
- how the owners of small craft are informed of the possibilities of waste disposal in the harbour
- which measures are taken to make disposal of waste easier.

Appendix I of this guide describes in eight easy steps, how to develop a port waste management plan for marinas and guest harbours.

7. SWOT analysis/CBA, i.e., cost-benefit analysis

SWOT analysis is a strategic planning tool used to assess the strengths, weaknesses and opportunities of and threats to a project.

In the case of large investment projects, the financier may request that a SWOT analysis and/or a cost-benefit analysis be carried out, prepared and submitted to the financier. Such analyses may be carried out in a simplified manner as well as in a more complicated and thorough way. Ask your financier whether a SWOT analysis/CBA must be carried out and how, and read the relevant methodological guidelines.

8. What kind of solution is needed?

Is it:

- a) a pump-out station fixed on a deck; i.e., stand-alone solution – it may be connected to a collection tank or directly to the local sewerage system;
- b) a mobile pump-out cart on wheels with collection tank;
- c) a purging vehicle/vessel that provides the service when ordered;
- d) a free-floating pump-out station with collection tank.

Depending on the possibilities and preconditions (is there power supply in the part of the harbour selected for the provision of the service?), a manual-mechanical pump or a pump with an electrical motor is chosen.

Does bilge water also have to be collected in harbours? Many producers of pumping equipment may offer combination pump-out stations or stations with two functions, which pump and collect boat-generated sewage and bilge water separately. Bilge water, which often contains oil and fuel residue, must be pumped out and collected separately because different technologies are used to treat them and this means that they may not be mixed.

If guests have to pay for using the pump-out station, it's necessary to consider how the fee will be calculated and how users will pay for the service. One option is to install a pump-out station with the option to use tokens, coins, bankcards or mobile solutions for payment.

It may be said that in theory, option number 2 or a mobile pump-out cart sounds like a simple and economically reasonable solution, but in practice, it's very rare that a mobile pump-out cart is actually used at harbours. There are several reasons for this:

- a mobile cart is usually kept in a locked room which is not located at the place where ships moor, i.e., where the service has to be provided, but somewhere further away in the territory of the harbour;
- the use of a cart requires the involvement of a harbour worker, but they are all very busy in the high season when vessels leave harbour in the morning or arrive in the harbour in the afternoon (i.e., at the time when the sewage service is needed the most) and must perform other urgent tasks such as checking the guest vessels in and out, showing them berthing places, doing the settlements, etc.;
- the collection tank of the cart is relatively small, so it has to be emptied at the designated place after every use (to a larger collection tank or the local wastewater treatment device), cleaned and transported back to the place where it is stored.

Past experience shows clearly that the harbour staff and the boaters who need the service don't have the motivation to perform these operations, which means that the acquired sewage cart may end up in the harbour's storage space for years without being used at all. This situation is particularly likely if the local legislation or the agreements made with the financier don't allow the

harbour to charge adequately for the sewage disposal service. However, if the pump-out station is located in the harbour's water area, it's easily accessible by boat and can be used without the assistance of the harbour staff, it's ten times more likely that the sewage station will actually be used.

9. Planning the project

Planning the project involves analysing and planning needs and possibilities in a simplified way. Needs and possibilities are identified in the course of planning (e.g., the location and logistic position of the station, possible connections to utilities such as electricity, water supply and sewerage networks, requirements for the technical systems of the station, amount of investment, etc.).

The outcome of the planning stage should be the terms of reference of the investment project. This is the most important and the most affordable stage of the investment project. In other words – this is the moment when the desired outcome of the investment project, as well as the ratio of cost to quality, is formulated.

Considering the national and local government rules and legislation that regulates the construction, the harbour owner and/or the person who carries out the investment project must plan and fill the following duties with the appropriate specialists:

- connecting the different parts of the construction project and coordinating the solutions (logistics and location plan, structural part, electricity, water supply and sewerage solutions);
- monitoring deadlines and adherence to the budget;
- technical supervision of construction;
- implementation documentation and applying for possible authorisations and approvals from the authorities.

Depending on the specifics and complexity of the project (which means, above all, the desired technical solution), either one or several specialists can manage to perform the functions listed above. This means that employing a whole team of specialists and service providers isn't always necessary. It may happen that the harbour operator themselves has the required skills and competencies in the case of a simpler solution and suitable preconditions, so they can procure and install the pump-out device and manage the entire investment project. However, if the scope of the investment project includes the design and construction of new utility systems, it would be reasonable to consider involving an external consultant who oversees the process.

10. Procurements

Depending on the method and source for financing the investment object i.e., the pump-out station (public or private sector, personal funds or financing with support from public funds), the person who carries out the investment project must consider whether, to what extent and in which form it is necessary to prepare and carry out one or more procurements for equipment and services.

The purpose of the procurement is to ensure the transparency of the investment, sustainable use of funds and equal treatment of tenderers, and to find a supplier of the equipment with the best price to quality ratio for the contracting entity.

An invitation to tender, which specifies the following, must be prepared in order to carry out the tenders:

- terms and conditions of the contract (technical specifications of the object of procurement, technical requirements for the devices, composition and volume of the construction and installation work, estimated value of the devices and work, deadlines for completion of the supply or construction work, possible sanctions in the event of breaches of the contract, warranty period, etc.);
- tender forms, which set out which information and in which format the tender must contain so that the submitted tenders are comparable;
- additional information to be submitted by the tenderers for the qualification of tenderers, and for the evaluation and comparison of tenders (e.g., prior references, documents certifying the professional qualification of the tenderer's employees in charge, information about the tenderer's economic indicators, etc.).

Based on the submitted tenders, it is possible to assess which tenderer has offered the best price to quality ratio, i.e., with whom the supply, construction and/or installation contract(s) should be entered into.

11. Location of the pump-out station and selection of suitable equipment

How can the technical conditions of design influence the selection of the equipment and the location where the equipment is installed?

The location of the new pump-out station is one of the factors that certainly needs to be thoroughly weighed. The location must be:

- protected from the wind and waves;
- easy to moor at with the side/board of the vessel;

- such that a moored vessel that is using the service does not obstruct the traffic of other arriving or departing vessels.

Ideally, two vessels could be moored near the pump-out station at the same time, so that when one of them stops using the station, the other is already prepared to use the service and time is saved on manoeuvring.

The mooring place must be deep enough and there must be enough space around it so that yachts with a bigger draught can freely manoeuvre to the pump-out station. It is rather common for the pump-out station to be set up near the exit fairway in guest harbours, which often adds extra manoeuvring space and depth, and reduces the possibility that the traffic of the ships arriving at the harbour is obstructed.

How does the location of the pump-out station and the holding tank affect the technical requirements set for the equipment? For example, the necessary lifting height of the pump may depend on the location of the collection tank. The location of the pump determines the length of the hose the pump must have and whether the hose will be held in place by a stand or reels on rollers as well as whether new cabling and a new switchboard must be installed to supply the pump with power. Geological and environmental protection aspects may also have an impact on the size and structure of the collection tank that can be installed in the harbour.

12. What are the different types of sewage stations and pumps?

There are many different types of pump-out stations and pumps on the market. You can decide which type of pump and station is the most suitable on the basis of the number of users and the workload, the composition of sewage, the climatic conditions, the planned maintenance interval, etc. The next section below is an excerpt from the BATSECO-BOAT study report “Technology assessment for sewage collecting systems for leisure boats”, compiled by D. Acquaviva, J. Alm, A. Morey Strömberg (2018). The study report describes the main types of stations and pumps and gives an overview of the market offer in Sweden, Finland, Estonia and outside the project area. You can download the full report from the project website using the following link: <https://batseco-boat.eu/wp-content/uploads/2018/05/Technology-assessment-.pdf>

Excerpt from the study report, chapters 3.3.1, 3.3.2 and 3.3.3

3.3 Different technical solutions for pump-out stations

3.3.1 Type of stations

- Land based pump-out stations: The most widely used technical solution. Their placement must be carefully considered, in order to be easily accessible by boaters.

- Portable stations: This type of pump-out station is handy in the way that it can be carried to the boat without the boat needing to be moved. They have a small capacity and require extra work to move the station.
- Floating stations: They can be used only in locations protected from wind and waves. They can be placed outside the harbour and be moved whenever this is needed. Floating stations with hand pump and a tank can be used in those islands where there is no possibility to have electricity and wastewater connection to the municipal network.

3.3.2 Type of pumps

- Membrane or diaphragm pumps: This kind of pumps can displace a great volume of material and they are quite wear resistant, as the friction points are very limited since the only section in a diaphragm pump in contact with the fluid is the diaphragm. They do not provide high pressure, which is important when delivering material over a very long distance. Some users have complained about the membrane getting worn and needs to be replaced after a couple of years. It is not a complicated procedure, the trouble has rather been to track down the correct replacement membrane.
- Impeller pumps need to be equipped with an additional grinder to be able to pump sewage water with larger particles.
- Vacuum pumps: Different types of vacuum pumps are used for black water systems in household onsite systems, in airplanes and ferries. Some vacuum systems are never in contact with the liquids, they only evacuate air from the holding tank and produce a suction that moves the liquid. Other manufacturers build their vacuum pump in combination with a grinding pump that chops up the particles and pumps it to the holding tank.
- Eccentric pumps: Consist of an eccentric “screw-rod” that rotates in a rubber housing. The cavity between the rod and the housing moves as the rod turns, transporting the liquid in the pump from one side to the other. This kind of pumps are common in pumping stations for household sewages, for example, but must be equipped with a shredder when pumping liquids containing solid objects.
- Peristaltic pumps: A wheel resembling a cogwheel squeezes a hose or a soft tube, moving the liquid in the hose or tube forward. The pump type is common in dosing systems and for chemicals that are corrosive to metals, since the liquid does not have to leave the pipe when being pumped. One drawback of the system is that the pipe or hose get worn and have to be replaced regularly.

3.3.3 Connection to the wastewater treatment plant

The pump-out stations are often directly connected to the municipal wastewater system, but in some cases they collect the sewage in a septic tank. This is the case of most of the floating pump-out stations, where the sewage is collected in a floating sewage tank. The advantage with the floating holding-tank station is that it can be placed far from the municipal infrastructure and does not have to be close to the shore. Some of the disadvantages are that in some cases these

floating solutions are not very stable, as the holding tank varies in density when it fills up, they must be emptied with a tank vessel and they tend to smell as the gases evacuate from the tank. When logistically possible a land-based station directly connected to the municipal sewage system is to be preferred. Land based pump-out stations also have better accessibility, making the service easier and cheaper.

13. The costs of building a pump-out station

The best place for building a pump-out system is a place close to power supply and municipal sewerage networks. The case of each pump-out station is somewhat unique and there are a number of factors that affect the pricing, such as capacity and the type of station, for example.

The author cannot give specific figures regarding the costs yet, but the price ranges based on the investments made in the BATSECO-BOAT project from 2019-2020 can be used as a reference.

The cheapest versions of pump-out stations could perhaps be built for €4,000 to €6,000, if you opt for a manual pump connected to a fixed holding tank on-shore.

A station with an electric pump and a holding tank of 2-3 m³ or a pipeline which is connected to the municipal sewerage network may cost around €12,000 to €20,000, with the cost of the pump being around €8,000.

The prices of floating stations range from €40,000 to €60,000. The floating facilities built in Norrtälje municipality, Sweden, and in the Turku archipelago, Finland, in 2020 cost approximately €42,000 per station. Each tendering process and the agreements made are also unique, as they depend heavily on the location of the new station as well.

14. Fees for use of pump-out station

The no-special-fee policy is applied in the Baltic Sea region, which means that no special fee may be charged for the disposal of boat-generated waste at the harbour, so that those who want to dispose of their waste correctly and in an environmentally friendly manner are not disadvantaged.

The expenses related to the acquisition and installation of a pump-out station and to the further handling of the sewage disposed of at the harbour must be financed from the general port fees. If the service provider is a gas station, grocery store, etc., a fee may be charged for using the pump-out-station.

15. Information and signage

A harbour must inform ship-owners and harbour visitors of the rules for disposal of waste. One of the main activities that helps to achieve this is the installation of clear, understandable and well-placed signage and information boards.

Information on the possibilities for disposal of waste should also be shared via cruising guides, maritime tourism magazines and websites targeting boaters and pleasure craft owners.

The information signs in harbours should include the following information:

- information on the person who is responsible in practice for the collection point and the telephone number of the person in charge;
- reference to the nearest place where the owners of small craft may leave the waste that the specific harbour/collection station does not accept.
- What kind of waste can be disposed of and how?
- The manual/infographics on how to use the pump-out station.

References

Technology assessment for sewage collecting systems for leisure boats, D. Acquaviva, J. Alm, A. Morey Strömberg, 2018.

UKMPA guidelines for the production of port waste management plans

Mottagningsanordningar för toalettavfall från fritidsbåtar, L. Borghagen, 2009

Utsläpp av toalettavfall från fritidsbåtar, Sjöfartsverket, 2006

Latrin från fritidsbåtar i Stockholms skärgård, J. Klingberg, 2017

Appendix I; Port Waste Management Plans for Ship-Generated Waste

The production of waste management plans in ports and harbours presents the most effective means of minimising and avoiding the potential effects of operational and illegal discharge from ships on the marine environment. This includes marinas, yacht harbours, boat building yards and public slipways. This will be achieved through the provision of adequate reception facilities that encourage the disposal of waste in ports and terminals, and remove as far as is practical any incentives for illegal discharge at sea, reducing the amount entering the marine environment. What questions need to be answered in the port waste management plan? The following is a shortened version of the UKMPA guidelines for the production of port waste management plans with the eight-step approach adapted for marinas and guest harbours.

1. Consult with interested parties

The consultation process is fundamental to the production of effective waste management plans. In addition to statutory consultees like the Local Government (municipality), Environmental Board, Health Authority, and Maritime Administration, ports and harbours should consult with representatives of port users and representatives from environmental associations to improve their understanding of waste management planning and the measures taken by ports and harbours to minimise the potential impacts of waste on the environment.

2. Analyse the estimated amounts and types of waste generated

How many vessels of different types used the port in the last two years and how many are expected to use the port in the next two years?

What amounts of different types of waste were actually landed by ships using the port in the last two years?

What are the estimated maximum amounts of waste that should have been landed over the past two years and that might be landed in the next two years?

3. Consider if the type and capacity of facilities are adequate

What types of waste reception facilities are provided at the port for the collection of different types of waste and how much waste can they hold?

Is their capacity adequate for the amounts of waste that is actually landed in the port or the maximum amount of waste that should be landed?

4. Consider if the location and ease of use of facilities provide a disincentive to use

What is the location of reception facilities in the port and what conditions or arrangements are imposed for their use?

Based on consultation, does the location of facilities or the arrangements for their use act as a disincentive to landing waste?

5. Consider if the cost of facilities provide a disincentive towards use

What method has been adopted to charge for the use of different reception facilities (free of charge, direct fee or indirect so-called no special fee)?

Based on consultation, do these charging methods act as a disincentive to the use of reception facilities and why were other methods of charging not considered appropriate?

Indirect charges for the use of reception facilities through port dues or contracts covering the use of facilities over a fixed period are considered unlikely to act as a disincentive towards use.

6. Ensure that effective publicity is given to the facilities

To ensure that reception facilities are fully used, ports and harbours must provide information to all mariners on the location, cost and procedures for using the facilities available and consultation arrangements for comments and complaints.

Are users aware of the location of waste reception facilities and how to use them?

What information is provided to ships on the location and operation of waste reception facilities?

How is this information transmitted to users (particularly new and irregular users)?

7. Submit a written plan to the relevant authority (e.g., Environmental Board)

Find out in advance in what form, to whom and by what deadline the port waste management plan must be submitted.

What is the procedure for reviewing and amending and for approving and adopting the plan?

8. Review the planning process regularly

The waste management process must be reviewed in accordance with the deadlines and intervals laid down in national legislation. It may be necessary to review the plan in the meantime if substantial changes in operation or legislation take place.

Appendix II, Photos

The mobile pump-out cart seen in the photo is currently used at Haapsalu Grand Holm Marina, Estonia

According to the author's estimates, the prices of such mobile sewage carts start from €3,500, but bigger and more durable ones can cost as much as €12,000.



Photo 1, 2; Haapsalu Grand Holm – Veskiviigi Marina

Norrtälje Gästhamn (guest harbour)

At the Norrtälje Guest Harbour, all guests can use the modern, clean and fully functional sewage pump-out station free of charge. Visiting small vessels often use the pump. There are easy-to-follow instructions that are displayed in a visible place. The value of the pumping device depicted in the photo is around €7,000.



Photo 3, Norrtälje Gästhamn



Photo 4, Norrtälje Gästhamn

Svinninge Marina

Two sewage pump-out stations are used. The service is provided to the members of the yacht club free of charge. Visiting boaters are expected to pay 300 SEK per usage. Instructions for use are clearly visible. Pump model (in the photo) Vogelsang S160. The procedure to empty the collecting tank takes approx. 5 min.

According to the author's estimates, the value of the device depicted in the photo is between €12,000 to €14,000 (in 2020).



Photo 5; Svinninge Marina

Örö

Floating pump-out station. Fixed to the bottom of the bay with an anchor. A manual pump is used for pumping out.

A floating station located in an archipelago would not be connected to power supply, so installing a manual pump would be the only option. A manual pump is not expensive (around €2,000). However, the manufacturing and installation of a floating station made of marine grade aluminium is relatively expensive. The new station installed near Örö in 2020 cost around €42,000.



Photo 6, 7; Örö

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