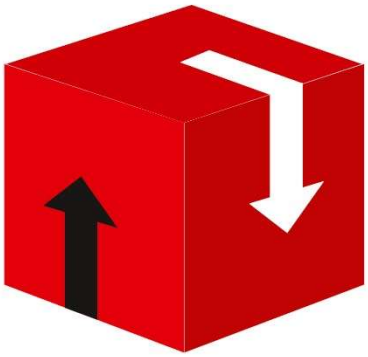
NAVO TECH®

INŻYNIERIA ŚRODOWISKA

OPERATION AND MAINTENANCE DOCUMENTATION

Coalescence separator, type:

MAK



Manufacturer:
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SERVICE AND USE OF DEVICES - NAVOTECH OFFER

1. NAVOTECH SERVICE

Navotech provides a warranty and maintenance service for the offered devices. Service of separators and settling tanks includes activities specified in the relevant paragraphs of the Operation and Maintenance Manual, including:

- control of the completeness of the components of the separation systems,
- control of the amount of collected contaminants,
- checking the efficiency of working teams,
- physical and chemical analyzes, emptying tanks,
- transport and disposal of waste.

The service of the separation system includes all other necessary service activities resulting from the current operation of the separators, which are not included in the following specification.

Navotech prepares a report from the service work carried out with a description of the performed and recommended maintenance and repair activities

The Navotech company offers an extension of the warranty for devices up to 60 months (depending on the service contract). Service of water and sewage devices for: separators, settling tanks, sewage treatment plants, pumping stations, neutralizers, minimizes the occurrence of failures, guarantees proper operation of the devices and optimizes waste management. If you are interested in a service / maintenance contract, please contact the NavoTech Service Department, tel .: +48 32 777 11 44, e-mail: serwis@navotech.com.pl, mobile phone available for applications 24/7: + 48 505 163 080.

SPIS TREŚCI

1. INTRODUCTION

Any work related to transport, assembly, operation and maintenance of devices may be performed by persons familiar with this Operation and Maintenance Manual. In order to ensure the full use of the separator and extend its service life, the operating conditions specified in the documentation must be followed. Comments, complaints and defects during the warranty period should be reported to the manufacturer's address:

NavoTech Inżynieria Środowiska Sp. z o.o.
ul. Pawliczka 22a, 41-800 Zabrze
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2. PURPOSE OF MAK SEPARATORS

MAK type separators are designed to separate sedimenting mineral suspensions and oil and gasoline substances from rainwater, which cannot be discharged to the receiver, sewage system or local sewage treatment plants. Separators are used in the treatment of rainwater from the drainage of streets and car parks, in the treatment of technological sewage from machinery industry plants, gas stations, manual and automatic car washes, repair workshops, etc.

3. PRINCIPLE OF OPERATION

MAK type separators are flow devices. They can work independently, preceded by an OK type preliminary sedimentation tank, they can be integrated with the MAKO sedimentation tank, integrated with the MAKH storm bypass and integrated with the MAKOH sedimentation tank and storm bypass. In a separator equipped with a settling tank, sedimentation of the mineral suspension of sand and mud takes place in the settling part. Gravity and the physical processes of adsorption and coalescence were used in the separation chamber. Oil particles build up on the surface of the cellular structures of the coalescing cartridge (adsorption), where they combine into larger and larger agglomerates (coalescence) and, as a result of gravity, migrate to the surface, creating an oil film. The separators are equipped with closing systems which, after collecting the maximum amount of light liquid, automatically close the separator outlet, thus preventing contamination of the receiver.

The content of substances extracting with petroleum ether in treated wastewater, coming from the technological system of MAK separators by Navotech, complies with the Regulation of the Minister of Maritime Economy and Inland Navigation of July 12, 2019 on substances particularly harmful to the aquatic environment and the conditions to be met when discharging sewage into waters or into the ground, as well as during the discharge of rainwater or snowmelt into waters or into water facilities (Dz. U. 2019, poz. 1311).

4. BASIC CONSTRUCTION

4.1 Tank

The MAK separator tank is made of C35 / 45 concrete or PE-HD polyethylene, it is designed for installation in the ground or for free-standing installation in a frost-free room, well or sewer. The devices are adapted for installation under communication routes.

4.2 Auto close

The separator is equipped with an auto-closure that works when the separator is border-filled with petroleum products. The valve, located on the guide profiles, is closed by a float, weighted to the density of $\varsigma = 0.85$ [kg / dm3], which loses part of its buoyancy when immersed in a medium with a density lower than its tare threshold. As a result, when the light liquid layer on the surface reaches the limit thickness, the auto-closure valve completely cuts off the nominal flow through the separator from the part of the separation compartment, protecting the receiver against contamination.

4.3 Coalescing insert

The phenomenon of coalescence was used in the process of separating light liquids. The polyurethane foam used in the device is resistant to oil and water. The calibrated size of cells and their open structure support the coalescence process. The roll-shaped coalescing insert is mounted on a supporting basket and additionally reinforced with bands that protect the insert from slipping.

5. DELIVERY AND TRANSPORT

5.1 Delivery control

The completely assembled separator is delivered to the construction site. The movable element of the separator, i.e. the automatic closing float and the coalescing insert with a basket, are assembled on site after installation, filling and filling the separator with water. During transport, it is forbidden to roll or pull the separator on the ground, or drop the separator from the means of transport or the edge of the excavation to the place of installation. After unloading, check that the separator has not been damaged during transport and that the tank shell has not been damaged. A memorandum of service should be prepared about any damage or missing deliveries and the manufacturer should be notified prior to the installation of the tank.

6. ASSEMBLY OF THE SEPARATOR

6.1 Location and situation

Separators should be installed in the sewage system, in the places where water contaminated with petroleum substances originates and flows out. The inlet to the separator should be gravity; the necessary pumping station must be installed after the separator. The separator should be located in such a way that the access of the equipment needed to remove the deposited impurities is ensured and that it is possible to perform maintenance and service activities.

Separators should be installed in accordance with the national regulations and standards specifying the conditions of explosion and fire safety, in particular:

- located in places where there will be no direct penetration of liquids that may create fire and explosion hazards, e.g. gasoline, solvents; the minimum distance of the separator from the hazard source is 8 m,
- grounded
- protected against overfilling, fire, heating to oil ignition temperature, mechanical damage, freezing of water.

When selecting the location for the reservoir, the soil and water conditions should be checked. It is necessary to determine: methods of protection against flood and frost, method of ballasting or anchoring the reservoir at high groundwater level, the possibility of using the native soil as ballast and backfill, or the need to transport sand. Before starting the reservoir deposition, control measurements of the reservoir deposition level should be carried out, taking into account the target ground level after the completion of the leveling works.

6.2 Assembly and installation

Manhole covers to the separator should be placed above the ground level or above the point of introduction of industrial sewage to avoid uncontrolled outflow of oil from under the manhole in the event of the separator outlet closure. If an elevation is impossible, the separator must be equipped with a device indicating that the outlet is closed due to overfilling of the separator with oil substances.

6.3 Installation of a free-standing separator (PE-HD)

The separator is prepared to be placed in a free-standing, frost-free room. The separator should be placed on an even, stable and leveled surface. The sewage inlet and outlet pipes should be attached to the separator in accordance with the arrows on the tank in a way that does not cause stresses and deformation of the stub pipes. The ventilation of the separator should be led outside the room. In the case of a free-standing installation, the separator must not be exposed to external mechanical effects that could damage the surface of the tank.

6.4 Underground installation of the separator (concrete or PE-HD)

- When installing the MAK separator underground, the inspection holes are adapted to the ML superstructure.
- Details on the construction excavation should be presented in the design documentation (work organization plan) in accordance with the Regulation of the Minister of Infrastructure of February 6, 2003 (Dz. U. 2003, nr 47 poz. 401) on occupational health and safety during construction works. Earthworks should be carried out in accordance with Chapter 10 of the above-mentioned regulation.
- The bottom and walls of the trench should be free of stones, bricks, debris and other objects that may cause mechanical damage to the tank plating.

- In the case of the presence of groundwater or deep foundation of the separator, the foundation of the reservoir requires a design that takes into account local conditions and detailed guidelines not included in this study.

Underground installation of the separator should be carried out according to the following guidelines:

A) Level the bottom of the trench with a sand-cement mixture (in the proportion of 100 kg of cement per 1 m3 of sand) not less than 20 cm thick and at least 20 cm wider than the base of the tank. The bedding should be well compacted,

B) Place the separator in the trench paying special attention to the proper flow of sewage according to the markings at the stub pipes. Arrows and / or inscriptions on the separator indicate the correct direction of the water flow. Check that the inlet connection is at the correct height. Level the separator. The basis for the proper functioning of the separator is its proper leveling.

C) Fill the separator with water through all inspection openings up to the level of approx. 1/3 of its height. Make a backfill around the tank to the water level in the tank, compacting it in layers every 20 cm. The backfill material should be: sand at the concrete tank, sand-cement mix at the PE-HD tank (in the proportion of 100 kg of cement per 1 m3 of sand). If there is a risk of mixing of the backfill and the native clay soil, use a separating material, e.g. geotextile, foil, etc. In winter, make sure that the ballast and backfill do not contain lumps of snow and ice. The backfill width should not be less than 30 cm. The tank should be backfilled while the separator is being filled with water. When backfilling the tank, the water level in the tank should always be at least 10 cm higher than the backfill level.

D) Connect the sewage supply and drainage pipes. Align the sewage pipe axially to the Inlet / Outlet of the device, moisten the gasket of the pipe socket and the outer surface of the spigot with a lubricant, slowly push the socket onto the spigot to the depth specified by the pipe manufacturer, move the connection pipe in different directions to make the gasket align. If it is necessary to connect the separator to a sewage system made of other types of pipes, adapters should be used. In case of shallow embedment of pipes, they should be properly insulated against freezing.

E) Put on inspection chimneys. When installing the separator at a depth of 1.5 m, from the ordinate of the inlet pipe axis to the terrain ordinate, it is recommended to use the ML 600 system superstructures. When installing the separator at a depth of more than 1.5 m, from the ordinate of the inlet pipe axis to the ordinate of the terrain, it is recommended to use ML 1000 system superstructures or concrete rings, in this case individual reinforcement should be made for mounting the superstructure.

F) Applies to separators made on the PE-HD tank. If necessary, cut the inspection chimney to the appropriate height and install manhole covers with sockets, remembering that the manhole socket should not rest directly on the chimney. Cast iron manholes in the case of installation in places with a load of pedestrian or wheeled traffic should be fastened with special concrete relief rings.

Note:

- The foundation and assembly of the separator requires constant supervision by persons with appropriate, due to the nature of the works, construction qualifications for execution. Secure the edges of the trench against loosening, drain the trench and protect its slopes against water, construct platforms and steps for communication during the construction site.
- Secure the trench against falling into it and mark it so that it is visible during the day and at night.
- Questions or doubts regarding the installation of the separation system should be reported to the Technical Department of Navotech Inżynieria Środowiska Sp. z o.o.
- The manufacturer is not responsible for damage and leaks caused by improper assembly. Before commencing installation, check that the tank has not been damaged during improper transport or unloading.

7. SERVICE AND OPERATION

7.1 General rules

All separator works and inspections should be carried out in accordance with applicable health and safety regulations as for works on sewage networks.

Any damage to the separator's structure or working units should be immediately reported to the Manufacturer.

Removal of impurities from the separator, transport as well as neutralization of separation products must be carried out by authorized companies having the appropriate license to perform such services. The user is required to keep waste management documents.

Increasing the efficiency of the separator's operation is possible only with its reliable operation. This means the need for periodic inspection and cleaning of the device. This frequency will depend mainly on the specifics of the separator load. Supplementary recommendations and regulations may result from the building permit and operating permit.

Domestic wastewater, washing liquids and mineral oils in the form of a permanent emulsion may not be introduced into the separators. Waste water introduced into the separation system may contain mineral oils whose specific gravity is lower than the specific gravity of water.

When using separators in car washes, it should be remembered that the used separation system is not used for cleaning, separating stable oil-water emulsions. When using separators on car washes it is recommended to:

- maximum water temperature up to 40 ºC
- using high-pressure aggregates only to flush cleaning agents without mixing detergents with water
- when using washing aggregates, pressure washers on the lance do not exceed 20-30 bar
- use of environmentally friendly cleaning, care and maintenance agents in the washing cycle (eg ASF)

By following these guidelines, you can effectively reduce the amount of oil-water emulsions that you create.

7.2 Putting into operation

Before putting into service, the separation system should be filled with water to the bottom of the discharge pipe. The separator, after filling with water, should be equipped with an automatic closing float and a coalescing insert with a basket. Check that the float (self-closing) has not cut off the drain from the separator. Correctly, the float should protrude approx. 20 mm above the water surface. Before putting into operation, the separator and its parts should be cleaned of soil, sand, mortar or other contaminants. The entire separation system, after tight connection of the inlet / outlet pipes, priming the separator and mounting a float with a coalescing cartridge, is ready to work without the need for commissioning. The above condition should be recorded in the separator service and operation card and in the device acceptance protocol. Before putting the device into operation, remove the black clamps from the basket and the float.

7.3 Starting the device

During the first start-up and after each emptying of the separator, perform the following steps:

A) check the completeness of the equipment and the correct assembly of the separator units
B) clean the device from solid contaminants such as debris, stones, sludge, leaves, etc.
C) clean the coalescing insert outside the separator, above the inspection opening of the sedimentation tank
D) clean the seat of the self-closing valve with running water under pressure
E) fill the separator with clean water up to the overflow at the outlet F
F) clean the auto-closing float and after pouring the separator with water, put it in the valve seat
G) close the hatches and secure against opening.

A special check of the flow should be performed in the initial period of the separator's commissioning, after connecting a new, not flushed sewage system, in the case of construction works being carried out in the catchment area (from where the sewage is discharged).

7.4 Inspections in operation

It is recommended to carry out maintenance activities according to the table below. For the optimal setting of service activities, each user is obliged to keep a book of operation and service of the separator, in which all maintenance and service works will be recorded.

The following maintenance and service schedule for the MAK separation system is recommended:

FREQUENCY	ACTIVITY	OBSERVATION	SERVICE ACTIVITY	DETAILED INSTRUCTION
every two weeks	verifying float position	float slightly under water	- controlling the oil level in the chamber - checking the float cleanness	section 8.1
	checking the coalescing filter cartridge cleanness	the difference in the free surface of water in front of and behind the filter is 5 cm	- cleaning the filter	section 8.4
monthly	controlling the level of sludge in the settling tank and floating parts	the thickness of the sediment layer at the bottom does not exceed 50% of the admissible	- removing the sediment by a licensed company	section 8.2
	oil level control	the thickness of the oil layer is greater than 80% of the maximum thickness	- removing the oil by a licensed company	section 8.3
quarterly	coalescing filter cartridge control	- the filter soiled - mechanical damage to the filter	- cleaning the filter - replacing the filter with a new one	section 8.4
every six months	technical check-up of the device component parts	defects permanent sediment	- renovation or replacement with new parts	section 8.5
every five years	general cleaning of the system		made by the manufacturer of the device / licensed plant	section 8.6

The above activities may be provided as part of the manufacturer's maintenance services. The frequency of servicing may be increased or reduced depending on the local conditions of loading the separator with mineral suspension and petroleum derivatives.

8. LIST OF SERVICE ACTIVITIES

8.1 Automatic closing at the outlet (float)

The float is in the lead from the rods mounted on the box connected to the drain. To control the float:

- open a cast iron hatch or cover,
- check the draft of the float. Correctly, the float should protrude approx. 20 mm above the water surface. Complete immersion of the float may indicate excessive contamination of the float, resulting leakage or accumulation of petroleum substances on the surface. Too high position of the float's ball above the water surface indicates its poor tariffication

If checking the amount of light liquid excludes the possibility of flooding the float, for this reason, the following service activities should be performed (in the absence of sewage inflow):

- remove the float
- wash the entire element with a stream of water
- check for possible damage
- install the float in the guide (only with the separator filled). Mechanical damage qualifies the float for replacement.

All works related to removing, cleaning and checking the technical condition of the auto-closing should be carried out outside the separator.

8.2 Control of the amount of impurities in the settling tank

After opening the manhole from the inlet side, please:

- check the amount of solid impurities
- remove large solid impurities in the form of leaves, sacks, polystyrene, etc.
- Use the NavoTech NT-OSI-3 device to measure the amount of sedimentation contaminants. To do this, gently lower the measuring cup to the bottom of the chamber until you feel the increased resistance. Record the top level of the sludge. Then press the measuring cup to the bottom of the tank. Record the level. The difference in levels determines the height of the sludge in the chamber. If it is found that the sludge is filled with sludge above 50% of the permissible thickness according to the technical data sheet, the sediment must be removed by a licensed plant.

Excessive amount of suspended solids accumulating in the MAK separator (in the separation compartment) proves that the settling tank upstream of the separator works poorly.

8.3 Oil quantity control

The oil separated in the separation and coalescence process in the form of an oil film accumulates on the surface. Measure the amount of oil when the device is idle (no sewage flow). In order to measure the thickness of the oil layer, use the NavoTech NT-OIL-3 measuring rod, the end of which is immersed in the sewage. When the oil layer thickness is greater than 80% of the permissible thickness specified in the technical data sheet of the device or if there is a highly contaminated water-oil mixture in the entire volume of the separator, the entire system should be cleaned.

8.4 Coalescing insert control

To check the condition of the coalescing cartridge it is necessary to:

- open the inspection hatch,
- check the water level inside and outside the cartridge during the inflow of sewage to the separation system. The difference in levels greater than 5 cm during the operation of the separator indicates the need to clean the coalescing insert,
- remove the coalescing insert with the carrying basket,
- clean the insert from contamination under running water above the open manhole of the sedimentation tank,
- check the condition of the insert in terms of mechanical damage, in the event of damage or heavily contaminated insert, replace the coalescing insert with a new one,
- insert the coalescing insert into the separator and place it carefully on the guide.

8.5 Technical condition control

Check the device assemblies for mechanical damage, quality of the coating and fastenings, and completion of elements. Remove any damage.

8.6 General cleaning

In order to ensure the proper functioning of the separator and long-term durability of the components, periodic cleaning of the device should be carried out. Separation products are removed using a suction pump and a slurry tanker. To do this, you need to:

- remove and clean the coalescing insert,
- pump off the surface oil film,
- pump out the water layer,
- clean the tank under pressure,
- pump out the resulting leachate,
- install a coalescing cartridge,
- fill the separator with water up to the outlet overflow.

Removal of impurities from the separator, transport and disposal of the separation products must be carried out by authorized companies with an appropriate license for this type of service.

9. DISPOSAL OF SEPARATED SUBSTANCES

All removed contaminants should be taken to landfills or to catchment points after prior consultation and location by the appropriate territorial sanitary authorities and institutions related to environmental protection.
Waste accumulated in separators and settling tanks in the form of oily sands and oils, were classified as hazardous waste.
Both transport and disposal of separation products must be carried out by authorized companies. The user is required to keep waste management documents.

10. HEALTH AND SAFETY REGULATIONS FOR SEPARATOR OPERATION

Prace konserwacyjne urządzeń separatora winny uwzględniać wymogi:

- Regulation of the Minister of Infrastructure of November 6, 2008 Dz.U. nr 201 on technical conditions to be met by buildings and their location hroughout the scope of the Regulation, in particular: section II chapter 2. Access and commute division II chapter 7. Non-drainage tanks for solid waste division IV chapter 2. Sewage and rainwater sewage system
- Regulation of the Minister of Economy of December 20, 2002 Dz.U. nr 1 together with a list of minimum explosion risk zones for technological equipment of fuel bases, gas stations and LPG,
- Regulation of the Minister of Spatial Planning and Construction of 1/10/1993 regarding occupational health and safety in sewage treatment plants.
- The device's inspection and maintenance work should be carried out in accordance with health and safety principles. In particular, attention should be paid to:
- effective ventilation of the device before starting work,
- work can only be carried out in the presence of a minimum of two people, equipped with appropriate security equipment.

Within the device smoking or holding an open flame is strictly prohibited - danger of explosion.

10.1 Preparation for maintenance and operational work

Before opening a manhole on a sidewalk or road, you must first mark and secure the area from each side. Standard marking – red warning flag in the daytime, possibly additional warning light. When opening the manhole, make sure that the instruments used are not made of sparking materials.
It is strictly prohibited to:

- defrosting the manhole with an open flame
- smoking when opening the separator or inside it.

All maintenenace and operation works on the inspection holes should be carried out after securing the hole against falling in. For safety reasons it is important that the interior of the separators is sufficiently illuminated. A warning triangle or “road works” sign should be placed on the road (if the separator is located in lane).

Note:

The contractor carrying out the construction and the user of the devices are obliged to comply with the health and safety regulations on their own with regard to all details that are not covered in the documentation.

10.2 Completion of work

At the end or in the event of a predicted break in work, the entire work area must be ordered in such a way that there is no danger to human health and life.

11. ATTACHMENTS

1. Explanatory drawing
2. Declaration of performance

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