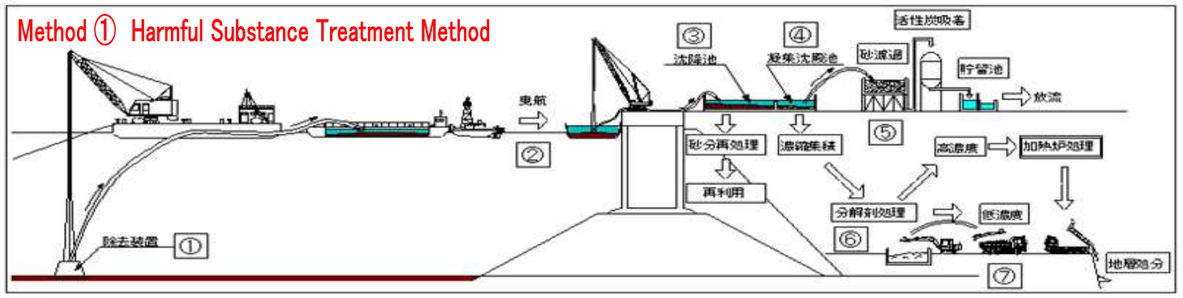
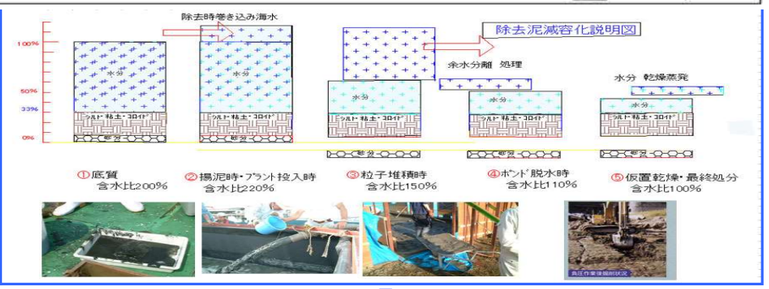
Characteristics of Sea Bottom Sludge Treatment Method





1.【Efficient simultaneous processing method】

*Simultaneous processing of organic matter, harmful dioxins, environmental hormones (TBT), etc.

When harmful substances are contained in the bottom sediment and seawater, a simple plant can quickly separate the seawater and mud, and simultaneously treat sulfides, environmental hormones, etc. (Patented Method ①)

2.【Cost reduction】 *The plant can be located anywhere !

Depending on the size and construction capacity of the onshore construction yard, processing facilities can be installed, leading to cost reductions.

☆If the onshore yard is vacant and large, a pool with built-in filtration equipment will be installed in the yard to separate the mud from the seawater. (Patented Method ②)

☆If the onshore yard is vacant and narrow, a filtration plant will be installed on the yard to separate the mud from the seawater.. (Method ③)

3.【Reducing the volume of dredged soil】 *Less soil to dispose of reduces costs

Volume reduction techniques eliminate the need for large disposal sites, which also reduces overall costs.

【Recycling dredging system】Seawater from which sand and silt have been removed during land-based processing is reused as spray water for the submarine cleaner.

INQUIRY

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SMC工法 ビデオ

Submarine Cleaner (SMC) method

(Patent: Thin layer sealed suction type sediment removal device)

A device that can remove 10cm of organic matter or floating mud accumulated on the seabed without turbidity.

受賞 Received the Excellence Award (Minister of Land, Infrastructure, Transport and Tourism Award) at the 13th National Land Technology Development Awards

受賞 Received the Minister of Agriculture, Forestry and Fisheries Award at the 8th Infrastructure Maintenance Awards

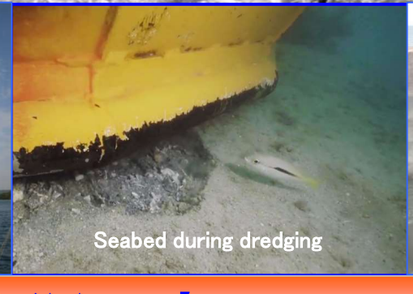
Seabed pollution treatment method

(Patent: Method for treating harmful substances from seabed sludge containing organotin compounds, and seabed sludge removal treatment system)

A series of techniques for rendering harmless and reducing the volume of marine organic deposits and environmental hormones (TBT)

受賞 Received the Excellence Award at the 1st Fisheries Fundamental Technology Development Awards

Equipment set


Seabed during dredging

Mud pumping

Industry-academia-government joint research and development 【Kyushu University, Nagasaki University, etc.

(General Incorporated Association) Recommended by All Japan Fishing Port Construction Association Environmental Maintenance and Conservation Methods Study Group

Features of the Submarine Cleaner (SMC) method

1.【10cm thin layer dredging】 *Dredges can be made as thin as 10cm to 15cm! (Large cleaner)
It is possible to remove the required thickness of 10 cm of sediment from the seabed and organic matter or floating mud accumulated on the seabed.

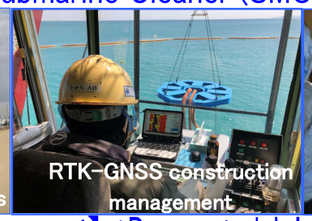
2.【Thin layer dredging without muddying the sea】 *No need to worry about secondary diffusion of harmful substances !
Unlike existing grab methods, dredging can be done near aquaculture sites without muddying the sea, and no pollution prevention membrane is required.

3.【High mud content】 *It can efficiently raise bottom sediment! (Large Cleaner)
The surface mud (silt) from the seabed is pumped up at the same time as seawater, with a mud content of approximately 60% (wet weight).

4.【Volume reduction of dredged soil】 *Less soil to dispose of !
Since the amount of dredged soil is small, a large disposal site is not necessary, which reduces overall costs.

☆Features of the Submarine Cleaner (SMC) method

Land transportation status


RTK-GNSS construction management

Mud and sand removal

Mud removal rate: 60%

5.【Suitable for soft ground】 *Does not sink !
By adjusting the ballast tank attached to the cleaner body, construction can be carried out even on soft ground without sinking.

6.【Speedy construction】 *Smooth continuous construction!
The frame is suspended from a crane ship, allowing the cleaner body to be moved smoothly for continuous construction.

7.【Cultivation effect】 *It has the effect of cultivating the bottom sediment of the seabed !
The jet is sprayed towards the bottom sediment on the seabed, which has the effect of cultivating the sediment.

8.【Environmentally friendly construction methods】*Don't create a depression in the seabed !
The thickness of the material removed is thin and it is a continuous process, so it does not create depressions on the seabed that can lead to hypoxia.

☆Specifications and construction capabilities

Item	Standard/Size	Standard Construction Area	Water Depth capable to construct
1. Large Cleaner	Diameter: 4,500mm	3, 000㎡／Day	2. 0m～40m
2. Regular Cleaner	Diameter: 3,500mm	2, 000㎡／Day	0. 5m～100m
3. Little Cleaner	Diameter: 2,000mm	1, 000㎡／Day	0. 5m～20m
4. Middle Cleaner	Diameter: 2,200mm	100m3／Day	0. 5m～40m
5. Small Cleaner	Diameter: 1,350mm	20m3／Day	0. 2m～20m

*The amount of construction per day varies depending on site conditions such as soil type and water depth.

☆Application Examples

Removal of sulfide deposits beneath fish farms in fishing ports
Removal of hazardous materials deposited in ports
Removal of organic matter accumulated in fishing ports and cultivation to restore fishing grounds.
Removal of plankton cysts (dormant cells) that cause red tides.

Submarine Cleaner (SMC) Method Types and Achievements

Large Cleaner (L)

Regular Cleaner (R)

Middle Cleaner (M)

Little Cleaner (Li)

☆Main construction results

From 2003 to 2008 Demonstration experiment in Tachibana Bay, Nagasaki Prefecture・Omura Bay・Port of Hakata

2009 Hakata Port floating mud removal work Order from the Ministry of Land, Infrastructure, Transport and Tourism, Kyushu Regional Development Bureau, Hakata Port and Airport Development Office Floating mud removal(L)

2011 Red tide countermeasures bottom sediment improvement demonstration work Kagoshima Prefecture orders Removes 82% of plankton cysts(L)

2012 Cesium-contaminated bottom mud removal system verification experiment Demonstration experiment 88% of cesium removed from the bottom of the water(S)

2018 Central breakwater outer foreign trade container wharf (-16m) channel and basin dredging work Tokyo Metropolitan Government Port Bureau Order Sand Removal(M)

2020 Regulation pond bottom mud survey work Ministry of Agriculture, Forestry and Fisheries Kyushu Agricultural Administration Office Order Floating mud removal(M)

2020 Miyamura River River Improvement Project (Section 1) Nagasaki Prefecture, Kita-Ken Development Bureau, River Division, Order River dredging(M)

2021 Yatsushiro Port Disaster Recovery Works (3rd Phase) Soil removal(L)
Ministry of Land, Infrastructure, Transport and Tourism Kyushu Regional Development Bureau Kumamoto Port and Airport Development Office Order

2024 Nakagusuku Bay Port (Awase area) ground improvement work Okinawa Prefecture Chubu Civil Engineering Office Order
Removal of floating mud from within the anti-pollution membrane(M)

Effect of bottom sediment removal using the Submarine Cleaner (SMC) method

☆It is possible to remove 82% of the cysts (dormant cells) of Chattonella (Planctonia), which causes red tides.(KAGOSHIMA-bay,2011)
☆It is possible to remove 88% of cesium that has accumulated on the surface of the bottom of a reservoir without causing the water to become muddy.(HUKUSHIMA-bay,2011)

Seabed before removal

Before → After

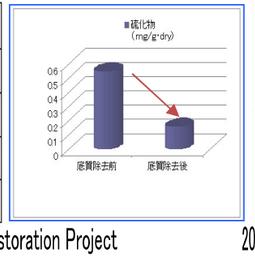
After removal, the seabed is stripped of all the fine silt that was there before removal, leaving behind clean sand and shells.

2009 Hakata Port mud removal project

Seabed after removal

☆The seabed before removal had less sulfide and other substances than the seabed after removal.

Item	Before bottom sediment removal	After bottom sediment removed	Decreasing Rate
Water Content (%)	210	131	38%
Sulfide (mg/g・dry)	0.548	0.155	72%
T-N (mg/kg・dry)	2850	1760	38%
T-P (mg/kg・dry)	730	580	21%



2009 Imari Bay and Surrounding Sea Area Fishing Ground Restoration Project

☆Removal of red tide Chattonella (Plankton) cysts !

Area	Removal Area	Number removed (estimated)	Removal rate
W area	23,000㎡	1,089 millones individual	85%
I area	22,000㎡	1,256 millones individual	80%
whole	45,000㎡	2,345 millones individual	82%

2011 Red tide countermeasure bottom sediment improvement demonstration project