Experimental Study on Sustainable Seawater Purification System from the Depth to the Shallows Built in Quays and Piles Using Purifying Functions of Microorganisms and Tidal Energy

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1.Intoroduction
In closed sea areas in the world the eutrophication is being progressed day by day. Nowadays in closed sea areas in japan it is hard to control the seawater quality in deep areas because of the poor oxygen seawater or the anoxic seawater.
Aerobic microorganisms can contribute to decompose organic compounds as lomg as they live to consume oxygen. As a result the oxygen decreases in deep areas.
It is necessary to maintain that the seawater is clean and rich in nature for the sustainable development. One of methods is this sustainable seawater purification system built in quays and piles using purifying functions of microorganisms and the tidal energy (Dan et al. 2017).
2.Methodology
It is shown that this system can decrease Chemical Oxygen Demand (COD) in the seawater experimentally and can be utilized to in order to purify the seawater from the depth to the shallows using this system built in quays and partially using this system built in piles.
This system has following advantages.
(1)Using the tidal energy -->"ecosystem"
(2)Using the purifying functions of microorganisms, decomposing organic compounds-->"ecological and natiral without chemicals"
(3)Capable of purifying the seawater in the shallow area, especially also in the deep ares -->"useful" in closed sea area
(4)This system built in quays or piles is simple. Not to construct new quays but to construct the purifying room additionally. It costs less.-->"economical"
3.Experimental approach
Microorganisms can decompose organic compounds in the seawater depending on the seawater temperature, DO, the velocity of seawater through the gravels and so on. The experiment was performed changing these conditions. The soze of the used tank is 50cm tall, 45cm wide and 120cm long. This system has two gates. There are the upward and downward purifications in piles or in the vessel of quay. While the seawater moves in the pile through gravels it can be purified by the contact oxidation method with the help of microorganisms. Next the purified seawater moves out of the upper gate to the outer sea areas in case of the uoward purification. Then the tidal cirrent can carry the ourified seawater to another places.
4.Results and discussion
The initial COD is almost 8 by putting sugar adequately in seawater and mixing. The changing process of COD is checked by measuring COD according to JIS K 0102.
COD is becoming smaller and it shows that this system can reduce COD using the tidal energy and purifying functions of microorganisms.
Th results are shown,
(1)COD can be reduced greater in casu of using gravels with microorganisms than in case of without gravels

(2)COD can be reduced greter in summer than in winter
(3)In both cases of upward and downward purifications COD can be reduced
(4)MIcroorganisms require sufficient oxygen concentration in seawater to resolve the organisms
5.Conclusions
The initial COD is almost 8 by putting sugar adequately in seawater and mixing.The changing process of COD is checked by measuring COD.
In the case of seawater purification system COD is becoming smaller and it is found that this system can reduce COD in seawater.
This quay or pile can be utilized in order to decrease COD using tidal energy and purifying functions of microorganisms.

Keywords: Seawater purification, Contact Oxidation method

参考文献
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2. K. Dan et al. :"Experimental Study on a Sustainable Seawater Purification System Built in Quays Using Purifying Functions of Microorganisms and the Tidal Energy in Closed Sea Areas", 37th IAHR World Congress, 2017.
3. K. Dan :"Sustainable Seawater Purification System Built in Piles Using Purifying Functions of Microorganisms and Tidal Energy", 2018 Ocean Sciences Meeting, 2018.

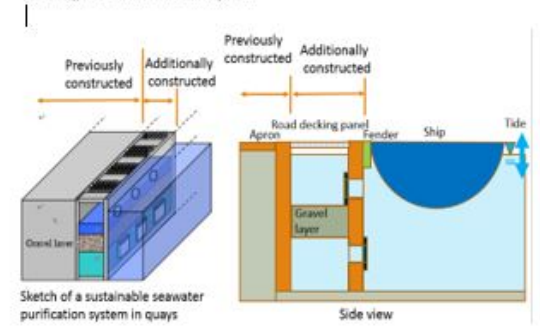

図-1 海水浄化岸壁

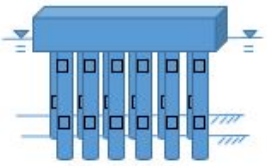

図-2 透過型防波堤

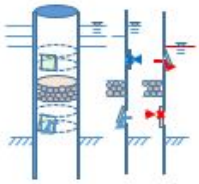

図-3 海水浄化杭

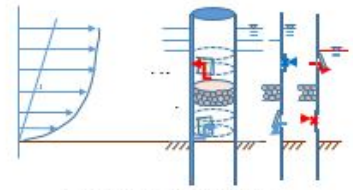

図-4 DO の濃度分布と海水浄化杭

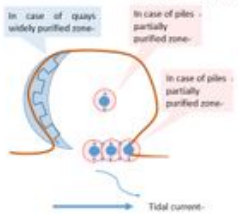

図-5 浄化された海水の潮流による移動

図-6 冬場の海水浄化岸壁模型実験結果（COD、DO、海水温）

