

## Chapter 18

# WADES (Water Desalination)

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### Abstract

Water is the most needed resource by humans in its various activities. The largest water composition is in the ocean that reaches 97% of the total water on earth but can not be utilized directly for human needs, therefore a new innovation is needed to make sea water worth consuming and used for everyday human needs. Sea water contains 3.5% NaCl which means every 1 liter of seawater contains 35 grams of NaCl. To be water that is proper to be consumed it must be separated between H<sub>2</sub>O with NaCl sehingga obtained fresh water worth consumption and salt. To separate H<sub>2</sub>O and NaCl or desalination can be done by utilizing heat energy which will make H<sub>2</sub>O which has boiling point 100° C will form a separate water vapor with NaCl solution which has boiling point 1.413° C. Simply put, desalination process can be done with WADES (Water desalination) which consists of electric heating pans and pipes to drain water that has been separated from NaCl. The workings of WADES is to enter the water into the electric heating pan then connect to the electricity until water vapor is formed, the water vapor will be piped through the pipe contained above the electric heating pan. The advantage of WADES is to use simple, practical, and inexpensive tools that can be applied by everyone.

**Keyword:** Desalination, Pure Water, Sea Water.

### Introduction

Indonesia is the largest archipelago country in the world, has an area of 5.193.252 km<sup>2</sup> 2/3 of the area is an ocean, which is about 3,288,683 km<sup>2</sup>. The country is very proud of its abundant marine resources. The irony in the middle of the sea water that there are still some places that have lack of water, especially about the availability of clean water. Consequently, in such a place water becomes an exclusive item. People must buy to get clean water (Walangare, 2013: 1). Salt and fresh water is a very important need for the human body. Some areas in Indonesia the need for salt and fresh water still can not be fulfilled by the government. Especially to meet the needs of domestic salt alone still have to import salt. It is very unnatural for a maritime country to have the second-longest seas and beaches in the world. One of the efforts to provide salt and fresh water is to utilize solar energy. The abundance of solar power that is evenly distributed throughout the entire Indonesian archipelago, solar energy is a potential source of energy, cheap and free. Some areas in Indonesia, especially coastal areas in meeting the needs of clean water is still a problem that has not been solved. There have been efforts made for the provision of clean water that is by utilizing the existing sea water. To be utilized, sea water must be processed first (Mulyanef, 2015: 1.)

Desalination is the process of purifying or reducing the dissolved salt in seawater greater than 1000 ppm to 40,000 ppm into freshwater with soluble salt concentration below 1000 ppm. The first desalination system is MSF and Reverse Osmosis (RO) with low stability membranes where the cost of capital is still high. Promising system and low water product pricing is RO with membranes and hybrid systems such as MED combined with vapor compression (Sunaryo, 1999: 96).

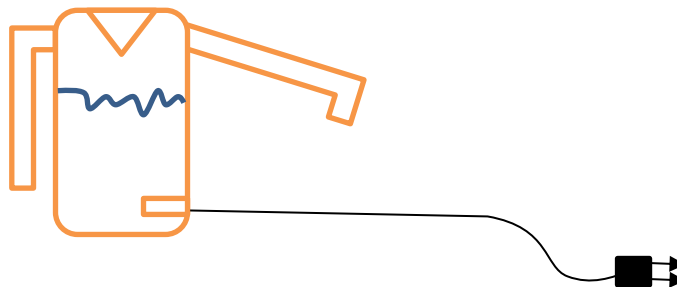
## Content

One method to transform sea water into fresh water is to use heat energy to convert liquids into water vapor. Sea water contains 3.5% dissolved NaCl or every 1 liter of sea water on average containing 35 grams of NaCl. The difference in the boiling point between water and NaCl will convert water to water vapor when heated to a temperature of  $100^{\circ}\text{C}$  so it will separate water with NaCl having a boiling point of  $1.413^{\circ}\text{C}$ . wades is a tool that can separate the content of H<sub>2</sub>O and NaCl by utilizing heat energy by heating sea water with a temperature of  $100^{\circ}\text{C}$ .

### a. Block System Working Tool

Wades use 4 stages in transforming sea water into fresh water ie electrical input, heating iron heating, changes in H<sub>2</sub>O into water vapor and freshwater utilization. At the electrical input stage, low-voltage cables are used for heating iron to convert electrical energy into heat energy. At the heating stage the heating iron is the fraction of electric current into heat energy with heat conductivity medium from iron to heat sea water with temperature  $100^{\circ}\text{C}$  at this stage takes 5 minutes to 1 liter of water. The next stage is heating water by iron heater with a temperature of  $100^{\circ}\text{C}$ . Due to the difference in boiling point between H<sub>2</sub>O with NaCl then H<sub>2</sub>O will evaporate into water droplets leaving NaCl that stays at the bottom of the tool. The last stage is the utilization of fresh water generated from wades by flowing H<sub>2</sub>O vapor that has become water points through the flow pipe of wades. Water desalination results from wades can not be consumed directly but must be cooked first to remove bacteria contained from polluted sea water.

### b. Tool Design



The above image is a schematic design plans of the electronic circuit of the water heater to separate H<sub>2</sub>O and NaCl. in the picture above there are electric cables, heater iron, fresh water pipes and funnel to enter water

### c. How to Use the Tool

Wades have a way of working by converting electric current into heat energy with low-voltage cable media and heating iron. Iron heating will heat up seawater and separate between H<sub>2</sub>O with NaCl. H<sub>2</sub>O will turn into moisture vapor and will condense into a water point and then flowed slowly through fresh water drainage pipes. How to use the wades tool is to enter the seawater through the water chimney then close the chimney, run the electricity and wait until the water is reduced not to cross the heating iron limit, tilt the tool toward the fresh water pipe and wait until water vapor is all, boiled back water bargaining gained to remove bacteria and water ready for consumption.

## Conclusion

1. Sea water can be converted into fresh water using heat energy by separating H<sub>2</sub>O with NaCl which has different boiling points.

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2. Wades using cable devices and heat conductivity in iron as a medium for converting sea water into fresh water.
  3. Wades use 4 stages in transforming sea water into fresh water ie electrical input, heating iron heating, changes in H<sub>2</sub>O into water vapor and freshwater utilization.

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