

Innovation In Improving The Quality Of Salt Production at Coastal Areas : A Literature Study

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Abstract – Indonesia has vast coastal areas, but the fact still have to import salt from abroad. For that it is necessary improvements in yield and improve quality salt. Studies on salt production improvement efforts have been conducted by previous researchers. This paper aims to examine new technologies in the production process of salt includes Electrolysis, Evaporation and Geomembran etechnology. The results of this literature review can be used as a reference to the use of new technologies in the salt-producing areas in Indonesia.

Keywords: Salt production, geomembrane, electrolysis, evaporation.

1. Introduction

Indonesia is still importing salt with a more than one trillion Rupiahs per year. More effort is needed to improve the quality and quantity of produced salt. One of the efforts that have been made is the introduction of new technologies in the production process of salt. This paper resumes the new technologies from previous researchers like Heru Susanto et. al (2015) and Veby & Leo Aldianto (2014). With a hope that these technologies can be applied in all Indonesian salt farmer so that improving the quality of salt production.

2. The Use of Geomembrane in process production of salt

Some study in improving the quality of salt production is researched by Heru Susanto et.al. (2015) and Veby Lin Zonia & Leo Aldianto (2014). Heru Susanto et.al (2015) demonstrated the new technology to increase both quantity and quality of salt product from traditional salt production process in Kedung sub-district, Jepara district, Central Java, Indonesia. They modified the traditional salt production process by blocking the permeation of sea water into the soil in crystallization pond with placing a black HDPE tarpaulin. The modification that they demonstrated was also performed by adjusting the concentration of sea water in evaporation pond to the level of 21-23°Be followed by fractional crystallization. In addition, filtration of suspended solid using multi-media filter was installed before the crystallization pond. The modification increased the quantity of salt product from 70,000 kg/year/ha to 117,500 kg/year/ha. The alternatives also made by modified the purity of salt product (as NaCl) that increased from 90% to 98.4%.

Stages of geo membrane technology (Badan Pengkajian dan Penerapan Teknologi Tegal, 2015):

1. The land that will be used should change its layout is traditional lands into a semi-intensive. Layout changes are intended to increase production, which in semi-intensive land consists of several plots
 - a. Water storage ponds from the sea
 - b. 2 pieces swath *peminihan*
 - c. Plot thread
 - d. Old water storage ponds
 - e. Crystallization table

Changes in the land will be able to increase production very real, reaching 40% to 60%. This is because of the comparison area is used, in which 35% of the land area used for an old water reservoir, pond *peminihan*, thread pool and an old water reservoir, while 65% is used for the crystal table. In addition, to other benefits that increased production of semi-intensive system is faster production times. In just 14 days old will be quickly obtained water while on traditional land to get water up to 30 days old.

2. Coat the crystallization table with plastic sheeting

To improve the quality of people's salt that is currently the market demands, the farmers must be willing to add salt existing facilities. Due to the current production of salt people considered less qualified SNI, the value of the low NaCl, color brown and brittle. Therefore, to overcome the problems that exist today were developed geo membrane technology. In the geo membrane technology throughout the crystallization table covered with plastic sheeting. This is to ensure the cleanliness of the salt production.

Geo-membrane technology with the people during the salt farmers can harvest salt thereof continuously. Farmers do not have to worry anymore on the quality of salt produced as a crystal - the salt crystals are not in contact with the ground, so it will obtain the white salt crystals, clean and weighted. In addition to the crystallization table covered with plastic sheeting also the old water intake channel of an old water reservoir to the table needs to be covered with plastic sheeting crystallization. It is intended to prevent existing ground sludge on inclusion should not be brought into the table crystallization, when dividing the old water ingress to the table crystallization.

3. Plastic Sheeting in use.

Plastic sheeting used to geo membrane can use a number 12 or HDPE plastic with a thickness of 500 microns, because plastic has a high economic value, which in use is able to last up to four seasons of salt with good care. Inside this plastic treatment, if not the season should be separated from the salt crystallization table then washed and rolled back continuously stored in a water bath, should not be stored in a dry place, because it is likely to be damaged by rodents.

4. Installation geo membrane

- Measure the extent of plastic geo membrane that will be used.
- Create *galengan* on the table according to the crystallization of plastic geo membrane area.
- Condense crystallization table so flat table surface crystallization.
- Expand plastic geo-membrane on the table to cover the entire surface crystallization bunds.
- Reinforce the edges of the plastic geo-membrane by giving wooden pegs at the edges of the plastic geo-membrane.

The instructions performed by BPPT Tegal accordance with what has been done by heru(2015).

Heru Susanto's research (2015) performed by a demonstration plot (demplot) using 1.2 ha area for salt production. Figure 1 shows the schematic representation of the demplot of salt production system and some modification conducted in their research. First of all, sea water was naturally flowed to stabilization pond and evaporation pond, respectively. The concentration of sea water in the last stage of evaporation pond was within the range 15-17 °Be. Thereafter, the seawater was transported to the concentration pond using a pump powered by wind energy. In concentration pond, the sea water was further evaporated. The concentrated sea water was then flowed to the crystallization pond.

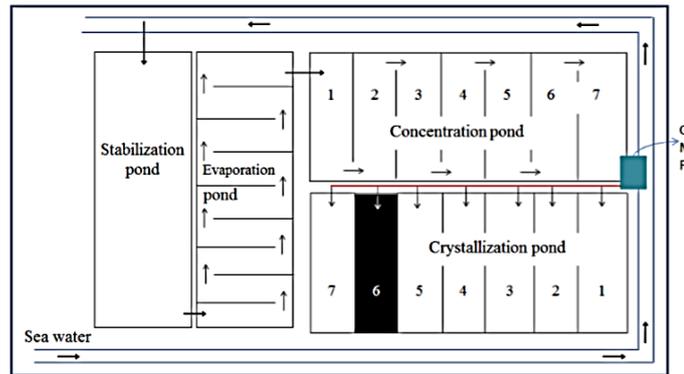


Figure 1. Schematic Illustration of Membrane Distillation Separation Process
 Source: Heru Susanto et.al. (2015).

In term of the color of the salt produced, the use of new technologies led to the results becoming whiter salt. A further analysis showed that the purity of salt (measured as NaCl) produced from modified process is of 98.4%, which is significantly higher than conventional process (90.1%). With respect to the quantity, the modified process could increase almost 70%, i.e. from 70 to 117.5 tons. The increase in quantity and quality were caused by all strategies conducted.

3. Combination of Electrolysis, Evaporation and Geomembrane to increase the quality of salt production.

The combination of electrolysis, evaporation and geomembrane technology used by the “Garam Manis Company” in an effort to improve the quality of salt, especially for salt industry. (Veby & Leo Aldianto, 2014). As it is known that the salt industry required majority Indonesia is derived from imports. Veby & Leo Aldianto (2014) showed that with a combination of three ways, the quality of salt produced the better and meet the standards for the raw material of industrial salt. Electrolysis works to reduce the levels of impurities (magnesium and calcium) present in sea water, so it can produce clean salt like crystals. “Garam Manis Company” with the electrolysis can improve the quality of salt produced. This is evidenced by decreasing levels of impurities (magnesium and calcium) of 300 ppm (parts per million) to 100 ppm (parts per million). The smaller levels of magnesium and calcium the better the quality of salt produced. Levels of magnesium and calcium to meet the industry standard is 100 ppm (parts per million).

Evaporation serves to increase the quantity of salt produced, by seeking contact between water and air as much as possible by spraying (spray) the sea water into "kolam peminihan" (spray pond). If the salt produced in the traditional way produces 60-70 tones / ha / year, then using the spray evaporation, the salt produced by Garam Manis Company can be increased up to 90-100 tones / ha / year.

Geomembrane is used to coat the land stabilization. If the salt is traditionally produced when the harvest of salt produced is mixed with the soil so as to make the resulting salt becomes not clean, while using the geomembrane to prevent direct contact between crystalline salt and ground so that the resulting salt produced by Garam Manis Company was clean.

The salt produced by Garam Manis Company with electrolysis, evaporation and geomembrane technology is increased from 60-70 tones / ha / year, the resulting salt increased 50% from the previous harvest salt using traditional means and traditional windmills. By using technology electrolysis, evaporation and Geomembrane the quality

industrial salt produced by Garam Manis Company meet industry standards in Indonesia, namely salt with NaCl concentration of 99.5% .

Veby & Leo Aldianto (2014) shows that process flow begins with the entry of sea water into salt swath past the electrolysis cell at the bottom of the wheel. Through movement windmill electric energy obtained from the transformation of the energy of motion / wind turbine use. Electrical energy is then supplied to the batteries for the electrolysis process. In this electrolytic process to form chemical compounds required to separate the ions OH-(from water) which is then spray it into the air with the aim of increasing their surface area in contact with air to accelerate evaporation. Geomembrane is a layer of salt on the plot which serves to reduce the permeability of the soil to prevent water infiltration into the low and prevents direct contact between the salt crystals to the soil so that the resulting salt kept clean. Useful addition geomembrane layer increases the rate of evaporation of salt water because it has high solar heat absorption. By previous research analysis technology electrolysis, evaporation and geomembrane has been proven to improve the quality of salt produced by salt farmers, so as to meet the need for salt industry in Indonesia and reduce the percentage of salt in Indonesian imports

The result of Veby and Loe Aldianto' research shows that after using the new technology, Garam Manis Company success to modified these three new technologies so that can produce industrial salt with standards industry by using electrolysis, evaporation and geomembrane. The new technologies using electrolysis, evaporation, and geomembrane that can produce quality crystal salt products meet the quality standards of industrial salt.

4. Conclusion

Efforts to improve the quality and quantity of salt products should continue to be made. it is given until today Indonesia is still importing salts, especially salts for industry. Efforts use of new technologies is very important because until now the production of salt is still using traditional means. The use of geomembrane and a combination of electrolysis, evaporation and geomembrane technology empirically demonstrated significant results affect the improvement of the quality and quantity of salt products.

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