The Application of Brackish Water Distillation Technology as a Solution to the Problem of Clean Water Needs

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Abstract.
Community service of Banjarmasin State Polytechnic (Poliban) is aimed at supporting the improvement of community welfare and the competitiveness of the institution. Based on this, Poliban formulated community service programs and activities to synergize with regional development programs contained in the South Kalimantan RPJMD 2016-2021. There were two regional strategic issues raised and became the topic of activities, namely the first is the development of local resource-based economic competitiveness and the second is the development of regional infrastructure to support the economy competitiveness and socio-cultural issues with one of the problems is that the infrastructure development is not evenly distributed, therefore one solution is needed and the programproposed as the solution is "increasing the coverage of clean water supply in urban and rural areas" The problems that arise are the limitations of equipment, technology and science, therefore ; Poliban in this case P3M, tries to provide a solution to the problems that exist in the village of Sungai Rasau, Bumi Makmur district, Tanah Laut regency, South Kalimantan province. The problem is the shortage of clean water since the water source of the area is brackish. The solution is to manufacture reverse osmosis system water distillation in Sungai Rasau, Bumi Makmur district, Tanah Laut regency. These community service programs are carried out through partnerships with Sungai Rasau village apparatus. Based on the survey, all community groups need clean water treatment, however; as an initial effort, the implementation of appropriate technology implementation activities will be carried out in two groups of communities in Sungai Rasau village, namely the residents of RT 05 and RT 09 Sungai Rasau Village, Bumi Makmur District, Tanah Laut District. The next program that should be conducted is more intensive assistance to the community hence all members of the community can apply standards in clean water management activities. At the end of the program there will be a monitoring and evaluation by the reviewer. Program sustainability is expected to enable the community to implement clean water management and refining programs and local governments can also implement the same program.

Keywords **: brackish water; application of technology; water distillation; reverse osmosis**

Introduction

The economic development of Indonesian people occurs in many rural areas, in line with the government program to accelerate the village economy which focuses on dealing with rural infrastructure. The form of implementation of Tri Dharma Perguruan Tinggi aims to share knowledge and implement the results of research for the community in the village of Sungai Rasau, Tanah Laut District, which has been lacking in infrastructure development of rural areas, hence this condition has impacts on all aspects, not olny economic, socio-cultural aspects but also hinders the growth of development in the regions, especially the rural areas.

The geographical factor of Sungai Rasau village is also very influential because it is located on the edge of the

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Java Sea and has brackish water. The activities carried out for 6 months were starting from the recruitment of socialization participants including the groups handled, the manufacture of water refinery processing facilities and the manufacture of equipment such as the selection of the location of the water source that will be used, the pipe installation, and the making of a reverse osmosis system water distillation [1][2]. The implementation of this activity began in the form of theory and practice. The theory is in the form of training or socialization on how to implement the water refining, management of clean water management and processing in Sungai Rasau village to improve the welfare of the community and the organization [3].

Problems

The potential of water and water resources in Sungai Rasau village is mostly by using river water with moderate discharge. River water quality in the village of Sungai Rasau is colored, smelly and tastes salty. In addition, residents in the village of Sungai Rasau have received assistance from village funds to make several points of boreholes, but the quality of water from the boreholes is still not good for consumption. Although the water from the well has a fairly good level of water clarity, it still has an unpleasant and odor and salty which is caused by the geographical location of Sungai Rasau village which is adjacent to the Java Sea. As a solution to get clean water, the residents of Sungai purchase water from traveling water dealers.

Fig. 1. Borehole well water source in Sungai rasau Village

Purpose

The purpose of this activity is to provide technology choices that are adapted to the conditions of local water sources, especially sources of raw water from river water or drilled wells [4]. This activity is carried out by conducting joint learning in applying appropriate technology to local scale which then next to be encouraged for greater capacity and scale through community empowerment approaches.

In the future, the results of this activity are expected to be in the form of dissemination of a package of simple water treatment technology to treat river water, drilled well water or rainwater, which can be used in remote areas [5]. If there is electricity in the village, then the technology development can be carried out by the local community independently.

Methods

In order for the implementation of technology to run properly, an appropriate method of implementation is needed. The method in applying brackish water distillation technology to drinking water can be seen in Figure 2 below.

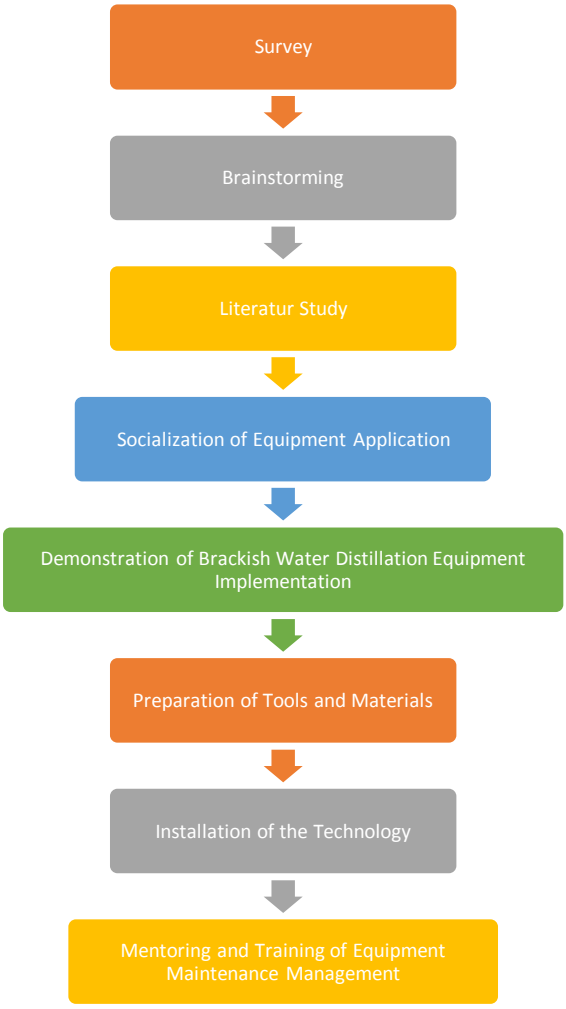

Fig. 2. Technology Application Method

Results and Discussion

1. Technology Design

The technology that will be applied as a solution to the difficulty of drinking water in this activity is a water

refining technology. The stages of the processing process consist of several stages:

- Neutralization with lime / liming
- Aeration by air pumping
- Coagulation by giving alum
- Deposition
- Filtering (Reverse Osmosis)

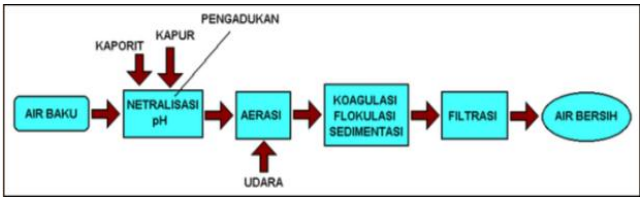

Fig. 3. Process Stages Scheme

The water refining process in this activity cannot use the technology used to distill river water, because the raw water used is brackish water. In the deposition process, not all lumps of dirt can be deposited. The lumps of dirt with large and heavy sizes will settle, while the small and light ones still float in the water. To get water that is absolutely clear, a filtering process must be carried out [6].

To get fresh water from the sea water, reverse osmosis-na process of filtering sea water using pressure flowed through a filter membrane, can be done. This system is called SWRO (Sea Water Reverse Osmosis) and is widely used on ships or clean water installations on the beach with raw water of sea water.

The filtering process uses the reverse osmosis method must through five stages including:

- 5 micron sediment filtering stage
- granular activated carbon (GAC) filtering stage
- Chlorine Taste Odor (CTO) Carbon Block filtering stage
- reverse osmosis membrane filtering stage
- post carbon filtering stage

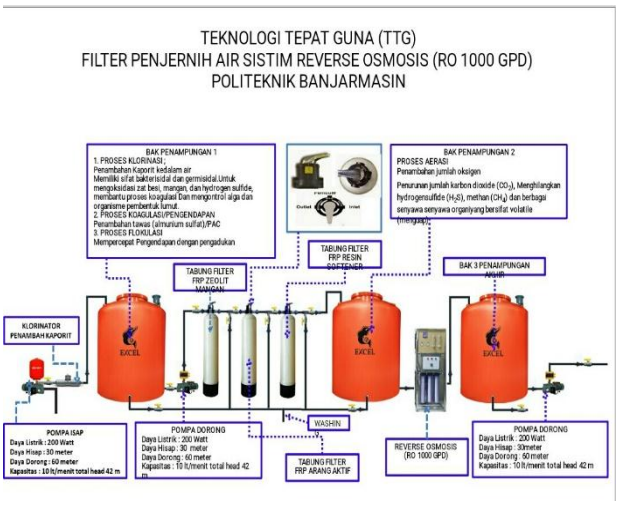

Fig. 4. Appropriate Technology Design of Raw Water Purifier

2. Equipment

In order for the activity of applying water refining technology supported by reverse osmosis system run smoothly according to the plan, it is necessary to have equipment and materials adapted to the needs.

Table 1. Equipment and material

No	Name of Equipment/ Material	Volume
1	Water Pump	2
2	Radar	1
3	Pressure Control	1
4	Chlorinator	2
5	Tank	2
6	Filter Tube	4
7	Aerator	1
8	Reverse Osmosis	1
9	Pipe	As needed
10	Chlorine tablet	5
11	Active Charcoal	100
12	Zeolit	100
13	Resin Softener	100
14	Other material	-

3. Installation

The installation process of drinking water distillation equipment was carried out in two places, namely in RT 5 and RT 9 of Sungai Rasau village. The installation process involved not only the team, but also directly involved the residents. Community involvement greatly determines the sustainability of system maintenance because it is expected that the residents can maintain and manage the existing water refining system independently.

Fig. 5. Installation in RT 5 Sungai Rasau Village

Fig. 6. Installation in RT 9 Sungai Rasau Village

Fig. 7. Socialization of technology application and maintenance

Conclusion

Based on the results of the Appropriate Technology Implementation Program for the Community in Sungai Rasau village, South Kalimantan sub-district, the following conclusions can be drawn:

a. Sungai Rasau Village is a village located close to the edge of the Java Sea and has difficulty in getting clean water. Water found in the village of Sungai Rasau has an odor and has a salty taste. The PDAM's access, untill recently, has not reached the area. Therefore, through the appropriate technology application program, Banjarmasin State Polytechnic team chose this location as the location for the application of clean water refining technology using a reverse osmosis system.

b. Through the application of appropriate technology, water quality in Sungai Rasau village can be improved by doing the purification process by processing the river water that is not suitable for consumption into a source of clean water, using neutralization methods, aeration by air pumping, coagulation, precipitation and filtering and reverse osmosis.

c. The results of this activity can support the government program and the strategic plan of Banjarmasin State Polytechnic to prepare ready-to-consume clean water refining technology that is beneficial to the community

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