Proceedings World Geothermal Congress 2015
Melbourne, Australia, 19-25 April 2015

Tapping the Leftover Steam from Geothermal Power Plant for Environment and Sugar Palm Farmers in Tomohon and Its Surroundings

Julius PONTOH*), Henriette Jacoba ROEROE**)

*) Department of Chemistry, Sam Ratulangi University, Manado and Masarang Foundation, Tomohon, North Sulawesi

**) Researcher at R & D, North Sulawesi Regional Development Board, Jalan 17 Agustus, Teling, Manado. PO BOX 147.

pontohjulius@yahoo.com, cobamr@yahoo.com

Keywords: geothermal, steam, palm Sugar

ABSTRACT

The present of geothermal power plants in the Lahendong Area in Tomohon, North Sulawesi have generated 40 MW of electricity for people in this province. The potency of this geothermal power plant can be expanded for direct use to solve the problems of the people around it. The environment deterioration due to traditional sugar palm production and the low palm sugar farmer income can be solved by using the left over steam from this geothermal power plant.

1. INTRODUCTION

Indonesia is rich in natural resources including biotic and abiotic resources. The biotic resources are including flora and fauna such as forest, agricultural plants, animals, fish and husbandries. The abiotic resources includes minerals, oils, natural gas, coal and geothermal. Many of these resources are not exploited yet, but some have been exploited for the benefit of the people.

As the development of the Indonesian's standard of living increases, the people needs keep increasing including the energy consumption. The increase of energy consumption has force to need to find alternative sources including geothermal. The Indonesian government endorses the development of geothermal to produce electricity anywhere in the country.

One of the geothermal power plants is in the city of Tomohon named Geothermal Power Plant Area Lahendong. The electricity produced by this power plant has been beneficial for the people in North Sulawesi. These power plants have a capacity of 40 MW. The left over steam and brine have been released to the air and the recycled the water injected back into the earth through a 10 inch pipe.

This paper discusses the use of this left over steam for direct use by the local communities for production of palm sugar.

2. WHY PALM SUGAR?

Palm sugar is one of the products produced from the sugar palm tree (*Arenga pinnata*) or *Aren* tree. The stalk of a female flower of the tree was treated by beating it several times in a period of a month and cut near the inflorescence. The cut stalk will produce sugary juice of about 10 to 50 liters a day with an average of 20 liters a day.

The juice, containing about 12 to 16 percent with an average of 14 percent sucrose (Pontoh, 2007), is boiled till become thick juice then molded into a pike of bamboo or a coconut shell to produce a block of brown sugar or the thick juice is continually stirred to produce granulated brown sugar. Traditionally, the brown sugar is produced by the farmers by boiling the juice in a pan of about 25 liters in the field using firewood. The boiling time for one pan is about 4 to 5 hours. It is estimated that one farmer needs about 30 kg of wood per day. The wood is gathered around his farm or taken from the forest. This practice concerned the Masarang Foundation as a Non Government Organization working in the environmental issues such as protection of the lands through reforestation.

Figure 1. Traditional palm sugar production

Pontoh and Roeroe.

If there are about 3,500 sugar palm farmers then they need 200 m^3 of wood per day while their farm can only produce about 50 m^3 per day from 3,000 ha of their lands. Its mean they have to take about 50,000 m^3 per year from the forest (Smits, 2006). This can cause significant impact to the environment. Therefore, the foundation is looking for alternative energy to the farmers.

The solution comes from the collaboration with the PT Pertamina Geothermal Energy, Lahendong Area. The company kindly gave some of the left over brine/steam from a 10 inch release pipe to the Masarang Palm Sugar Factory. The factory only needs 2 inch pipe to supply its need. But for some reason the energy from the release pipe dropped down significantly from 6 bars to just over 2 bar recently and the factory has problem with its capacity.

Figure 2. Releasing Brine/Steam Site at Pertamina Geothermal Energy Lahendong Area Unit I.

3. SUGAR PALM AND ENVIRONMENT

Sugar palm tree not only produces a sugary juice but other products such as aren fiber and wood for the people. But the trees have other significant impacts to the environment. The nature of the trees which has very intensive roots near the soil surface and deep into the soil protects the soil itself which gives some advantages for soil conservation. During the tree growth they do not need soil cultivation and the harvesting can be done by only tapping the juice or taking the fiber without destroy the living trees causing the soil to never be disturbed. The sugar palm trees actually grow very well with other trees so their suitable for production forest.

The sugar palm trees can grow well in various types of soils including the critical soil with stony soil or on the very deep slope lands. In Tomohon and its surroundings, the sugar palm grows naturally without cultivation for many generations.

The potency of the sugar palm trees to produce sugar is the highest among the agricultural plants. It is estimated it can produce 25 tons of sugar per ha per year. This is higher than sugar cane at 14 ton of sugar or cassava 20 tons of equivalent per ha per year.

4. MASARANG PALM SUGAR FACTORY

As mentioned above the Masarang Palm Sugar Factory was build based on the concern for the environment deterioration in Tomohon and its surrounding and the present of the geothermal power plant in Lahendong. The factory was designed to produce 4 tons of sugar per day.

Figure 3. Masarang Palm Sugar Factory

This factory gives benefits directly to the sugar palm farmers. There are over 6,000 farmers registered as sugar palm farmers in Tomohon alone. The present of the sugar factory has tripled their income since 2007 when the factory was started. At the present day, the sugar palm farmers have an income of about Rp. 150,000 per day in 30 days a month. Some farmer can have even more than Rp. 200,000 a day.

Figure 4. Palm Sugar Production at Masarang Palm Sugar Factory

If there are about 500 active farmers at the present time then the left over steam can generate about 75 million rupiah a day to the local people. This contribution is very significantly to the local economy.

The presence of Masarang Palm Sugar Factory also has a social impact to the people in North Sulawesi due to sugar production being an alternative for the farmers who produce alcoholic drink called locally *Cap Tikus*. The alcoholic drink creates instability for the security in this area. The Provincial Police recently has a big campaign to stop people for drinking.

5. CONCLUSION

The left over steam from the Geothermal Power Plant Lahendong Area can be beneficial to the local farmers, especially for the sugar palm farmers and to protect the environment deterioration through Masarang Palm Sugar Factory.

6. REFERENCES:

Pontoh, J. 2007. Chemical composition of sugar palm juice. Report to Masarang Foundation. Tomohon.

Smits, W. 2006. Establishment of Palm Sugar Factory. Socializing Presentation from Masarang Foundation.