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Improvement of Resistant Cow Breakers by Mean of Empowering Independent Energy Village Program of PT Pertamina Patra Niaga Fuel Terminal Parepare

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Abstract

Biogas has an important role as a substitute for energy derived from geothermal energy. Biogas has an important role in overcoming energy difficulties because the production and management process is not expensive, besides being friendly to the environment. Biogas is produced from processed animal waste, through a device known as a specially designed fixed dome-type biogas reactor. This study used a literature review through literature related to biogas production and management as well as field trials that took place in the Tangguh Village community, Watang Bacukiki Village, Parepare City, South Sulawesi. The research results prove that the use of biogas can save energy and reduce the impact of environmental damage. These findings suggest that the use of biogas can be practiced further as the CSR program of PT Pertamina Patra Niaga Fuel Terminal Parepare.

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EMPOWERMENT OF RESISTANT COW BREAKERS BACUKIKI PAREPARE INDEPENDENT ENERGY VILLAGE PT PERTAMINA PATRA NIAGA FUEL TERMINAL PAREPARE

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ABSTRACT

Biogas has an important role as a substitute for energy derived from geothermal energy. Biogas has an important role in overcoming energy difficulties because the production and management process is not expensive, besides being friendly to the environment. Biogas is produced from processed animal waste, through a device known as a specially designed fixed dome-type biogas reactor. This study used a literature review through literature related to biogas production and management as well as field trials that took place in the Tangguh Village community, Watang Bacukiki Village, Parepare City, South Sulawesi. This research is a CSR program of PT Pertamina Patra Niaga Fuel Terminal Parepare. The research results prove that the use of biogas can save energy and reduce the impact of environmental damage.

Keywords: Biogas, Livestock Waste, Tangguh Village

INTRODUCTION

The need for energy to support human survival continues to increase day by day. Not only humans, but all living things need energy for their life. However, the amount of energy that can be accessed by humans is very limited, such as fuel oil (BBM), and coal to natural gas, so efforts are needed to encourage energy development through creative or innovative endeavors. One that can be done is through the development of renewable energy, such as through biogas and others.

In recent years, people have started to develop a renewable energy innovation known as Biogas Energy. Biogas is gas produced by the fermentation of organic materials (human, animal, and domestic waste). Biogas is defined as the gas released when organic materials such as livestock manure, human waste, household waste, or other organic wastes are fermented so that they undergo a methanation process in the biodigester (Okky Steviano, Eni Kustanti, 2021). The main ingredients in biogas are methane and carbon dioxide. Biogas has become a popular source of energy among the community because the cost is cheap and economical, the raw material (animal dung) is available free of charge at home, and it saves energy because people do not need to look for firewood; In addition, biogas can only be filled once and can get fuel for cooking a day and is healthier. The use of biogas can prevent people from eye disease and respiratory problems caused by excessive use of firewood. This biogas is also clean and modern, because its management can be done in the kitchen helps the cage to be cleaner, and doesn't make the cookware turn black.

PT Pertamina Patra Niaga is a Subholding of PT Pertamina (Persero) which is engaged in the downstream oil and gas industry, specifically running a business for the distribution and marketing of energy products, including fuel oil (BBM), Liquefied Petroleum Gas (LPG), lubricants, aviation fuel, as well as asphalt and petrochemical products to meet the needs of retail and corporate consumers. Parepare Fuel Terminal is one of the fuel terminals located in Parepare City, South Sulawesi Province which distributes fuel to several areas in South Sulawesi Province and West Sulawesi Province.

As part of the Company's Social and Environmental Responsibility (TJSL) around operational sites, PT Pertamina Patra Niaga Fuel Terminal Parepare has a CSR program to develop Quality Energy together with local communities with the concept of sustainable empowerment.

This program is motivated by the potential in the Watang Bacukiki Village, Parepare City which is in the vicinity of the Parepare Fuel Terminal operational area.

As we know, animal husbandry is closely related to livestock waste which should be managed properly so that pollution does not occur Generally livestock waste is managed by only being used as compost many farmers do not pay attention to their livestock manure even though animal manure can be used as new, friendly energy. environment, namely biogas.

The BEB (Bacukiki Quality Energy) Village Program utilizes livestock waste from cattle breeding groups to become biogas for household gas needs with the aim that the people in the Watang Bacukiki Village can become energy independent through environmentally friendly energy that is self-produced through the potential of the area. Electricity and potential water sources used for renewable energy.

Table 1. Composition of sewage gas

Gas Type	%
Metana (CH4)	65,7
Karbondioksida (CO2)	27,0
Nitrogen (N2)	2,3
Karbon Monoksida (CO)	0
Oxygen (O2)	0,1
Propena (C3H8)	0,7
Hydrogen Sulfida (H2S)	0

METHODOLOGY

Research Area

The research was conducted in Tangguh Village, Watang Bacukiki Village, Parepare City, South Sulawesi. Respondents in this study were cattle breeders. Research has been carried out since 2021 with a target of the 4th year, 2024. This research product can realize people's expectations in using biogas processed from natural ingredients independently.

Types And Source Data

The data source was obtained from natural data and primary data at the study site, the cowshed. The data were observed for several years to ensure the accuracy and impact of the object of research on the people of Tangguh Village, Watang Bacukiki Village, Parepare City, South Sulawesi.

Cow dung is one source of raw material for biogas production. The content of methane gas (CH4) in cow dung is 65.7% (Wulandari & Labiba, 2017).

Collecting Data Method

The data collection method was carried out by studying the literature and interviews as well as field observations of the people of Tangguh Village, Watang Bacukiki Village, Parepare City, South Sulawesi. In other words, library data is tested and/or proven against research objects and respondents in the field. The number of respondents is not limited and is taken randomly, because it involves community members in 1 area.

Data analysis

Data were analyzed using the Flow model which included several stages, namely: data reduction, data display, and data verification, then the data were analyzed.

This study used an experimental method with descriptive analysis, for 4 biogas source reactor locations that were built and integrated with cow kennels as can be seen in Figure 1.

Absolute Yield of Household Kitchen Energy Substitution Biogas Program
= Number of Cows x Number of Cow Dung per Cow x Potential Biogas of Cow Dung x Value of Biogas to Kcal x Number of Days
= 10 cows x 5 kg x 0,1 m^3 x 4000 kkal x 360 days
= 7.200.000 Kkal
= 7.200.000 Kkal x (4,1868 $x10^{-6}$)
= 30,14 GJ
= 30,14 GJ x 277, 778 = 8372,23 kWh
Energy Savings
= Absolute Yield x Price per Kwh
= 8372,23 kWh x Rp. 1.114,74
= Rp. 9.332.858

RESULT AND DISCUSSION

The Biogas Village program has been running since 2021 and has entered the 3rd year of implementing the TJSL program, in year 1, the research focused on forming the Tangguh Farmers group in Bacukiki Village, building the first reactor and involving relevant stakeholders such as the Parepare City Environmental Service to research center to support the Climate Village program as well as testing and introducing the use of biogas as clean, environmentally friendly energy for household needs (cooking).

In the second year, the reactors and supporting infrastructure for the production of biogas which were successfully developed began to be duplicated at several locations for cattle breeders in the Watang Bacukiki Village so that the benefits of biogas began to be widely felt by the people there. A biogas reactor is a series of devices that function to convert animal waste, human waste, and other organic matter into biogas. Consumption of biogas on the household scale includes use as cooking fuel and lamps for lighting (Bambang Singgih, Yusmiati, 2018).

This year (the 3rd year) the implementation of the Kampung Biogas program is targeted to add reactors that have begun to develop a plan for storing Biogas through a non-pipeline medium in residents' locations in Watang Bacukiki Village so that all residents can use Biogas for their cooking needs.

In addition, from this year to the 4th year, in the TJSL program strategy roadmap for the Biogas Village Program, MSMEs will be formed for community groups thereby utilizing Biogas, so it is hoped that within 5 years the assistance will be carried out by Pertamina Patra Niaga Fuel Terminal Parepare, Kampung Biogas can become an energy-independent Village and be able to improve and encourage the economic wheels of the people there.


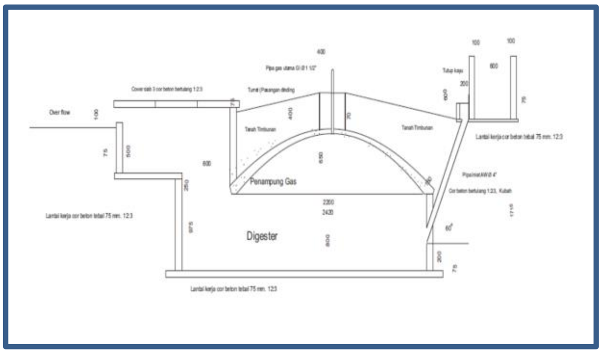

Figure 1. Empowerment Activities for Cattle Farmers Groups, Producing Biogas Energy

The development of the Biogas Village program in the Watang Bacukiki Sub-District is also due to the role of the Local Hero of the Tangguh Cattle Breeders Group, namely Mr. Jamal, who can mobilize the community in implementing the program. In addition to Mr. Jamal's role as a driving force for the community, during the program, of course, the transfer of knowledge of core competencies such as the installation and utilization of biogas as environmentally friendly energy is provided by the Company together with relevant stakeholders to the community.

In its second year, the company and the community have succeeded in innovating a biogas reactor installation that is directly integrated with the cowshed, that is, it no longer requires human participation to transfer cow manure to the reactor. The use of biogas as an environmentally friendly energy for cooking also supports government and company policies to implement an appropriate LPG subsidy policy so that it will have the impact of creating shared value (CSV) for people who are energy independent (clean and free energy), companies (distribution of subsidized 3 kg LPG). can be more targeted) and the government reduces the budget burden on energy subsidies, especially LPG from the state budget.

There are six main elements in the manufacture of biogas reactors, namely: inlet (mixing tank), digester (anaerobic digestion chamber), gas reservoir (storage room), outlet (separation chamber), gas transport system, and bio-slurry pit).

Biogas Installation Technical Planning

1. Installation Design

The biogas installation to be built is a fixed dome type biogas installation, to be precise a fixed dome type biodigester (biogas reactor) with cement walls.

The installation design drawing will refer to the installation design stipulated in the Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia No. 3 of 2014, concerning technical guidelines for the use of special allocation funds, in the Rural energy sector in 2014. The biogas installation design drawings are as follows:

Figure 2. Design Innovation for Direct Biogas Reactor Installation from Cow Stalls

The biogas installation design is in the form of a fixed dome biogas reactor which is mostly made in Nepal (Nepal model). We consider the choice of the type of fixed dome reactor with the design of the Nepal model to be the right choice because, in terms of the type of reactor, the fixed dome reactor is the most robust and long-lived and the most environmentally friendly type of reactor, while in terms of the shape of the reactor, the Nepalese fixed dome reactor type This is a form of fixed dome reactor that is easy to manufacture, the most economical in material use and has satisfactory performance.

This design is also a biogas reactor that has been widely built and used in the domestic biogas program (BIRU). The BIRU program is a collaborative program between HIVOS and SNV funded by the government of the Kingdom of the Netherlands and supported by the Indonesian Ministry of Energy and Mineral Resources.

The fixed dome biogas installation unit to be built consists of:

a. Digester tank (digester), with tub and intake channel (inlet tub) of raw materials as well as organic matter tub and outlet channel (outlet tub)
b. Distribution/distribution of biogas consists of piping, water drain, hard gas, and manometer.
c. The stove consists of a biogas burner and a lighter.
d. Biogas lamp (if needed)

2. Installation Technical Specifications

a. Digester Tank

1) The foundation is made of a) Concrete is made from a mixture of cement, sand, and gravel with a ratio of 1:2:3; b) Plastering is done with a mixture of cement and sand with a ratio of 1:3 or 1:4.

2) Walls are made of: a) Brick masonry mixed with cement, and sand with a ratio of 1:3 or 1:4; b) Plastering is done using a mixture of cement, and sand with a ratio of 1:3 or 1:4; c) Coating is done with a mixture of cement and water. d) Waterproof coating is carried out using a water-absorbing mixture.

3) Dome; a) Concrete domes are made of: (1) cement mixture; sand; gravel with a ratio of 1:2:3; (2) plastering is done using cement mixture; sand with a ratio of 1:3 or 1:4; (3) the coating is carried out using a mixture of cement and water; (4) water-resistant coating is carried out using a mixture of emulsion paint (acrylic emulsion paint) or a waterproofing agent mixed with cement.

b) Brick masonry domes are made with the following requirements: (1) Brick masonry with a mixture of cement; sand with a ratio of 1:3 or 1:4; (2) Plastering with a mixture of cement; sand with a ratio of 1:3 or 1:4; (3) the coating is carried out using a mixture of cement and water; (4) water-resistant coating is carried out using a

mixture of emulsion paint or a waterproofing agent mixed with cement.
c) Intake of raw materials, made of (1) masonry bricks with a mixture of cement; sand with a ratio of 1:4; (2) Plastering with a mixture of cement; sand with a ratio of 1:4; (3) the coating is done using a mixture of cement and water.
d) Installation of pipelines for the inflow of raw materials; Installation of the inlet pipe is done by connecting the raw material inlet tub with the inlet hole on the wall of the digestive tank (digester) using a PVC pipe. The two ends of the channel are glued together with brick masonry using a cement mixture; and sand with a ratio of 1:4.
e) Manhole, 1) Type 1 (one) manhole, concrete from a mixture of cement; sand; gravel with a ratio of 1:2:3; 2) Plastering is done using a mixture of cement; sand with a ratio of 1:3 or 1:4;
f) Installation of gas discharge pipelines; The gas outlet pipe is ordered with a minimum of 13 (thirteen) turns of white seal tape with slow-drying PVC glue attached to the knee of the digester tank.

3. Construction Material Specifications

a. Cement

The cement used is "fresh" cement, free of lumps, and stored in a dry place. Clumped cement shall not be used for construction. To prevent the purchased cement from clumping, bags of cement will not be stacked directly on the floor or leaned against the wall. Wooden pallets or planks will be placed on the floor as a backing to prevent the cement from getting damp. The cement bags will be stacked about 20 cm away from the wall. The amount of cement needed to build a 4 cubic meter biogas installation is a minimum of 12 sacks (fill 50 kg).

b. Sand

Because the sand used is crucial to the durability of the biogas reactor building, the sand to be used for construction is clean sand and does not mix with the soil or other building materials. To test the silt content in the sand, a simple bottle test will be used.
If the sand is mixed with about 3% of other materials, then the sand will be washed before use.
For concrete work, the sand used is coarse sand or concrete sand, while fine sand will be used for the plastering process. The amount of sand needed to build a 4 cubic meter biogas reactor installation is 1.5 cubic meters.

c. Pebbles (coral)

Coral gravel is used for concrete work. Concrete work was carried out for the reactor foundation, reactor dome and outlet cover. The size of the gravel used should not be too big or too small. The size should not exceed 25% of the thickness of the concrete. The thickness of the concrete layer on the foundation and at the outlet cover must not exceed 7.5 cm (3 inches), so the maximum size of gravel must be 2 cm or ¼ the thickness of the concrete. The gravel should be clean, hard, and angular in shape. If the stone is dirty, it will be washed thoroughly before use. The amount of gravel needed to build a 4 cubic meter biogas reactor is 1.5 cubic meters.

d. Water

Water is needed primarily for making mortar, casting, and plastering. Water is also used to soak the stones before use besides, water is needed for washing

or cleaning dirty building materials. Because dirty water harms the resilience of buildings, in the process of making this biogas reactor, efforts will be made to use water from drains, wells, or other sources that can be sure to supply clean water.

e. Brick

Bricks play an important role in the biogas reactor construction process. Bricks are used as reactor foundations, reactor walls, outlet walls, and inlet walls.

The bricks used are high-quality bricks (no. 1) which are available locally. These high-quality bricks are bricks whose manufacturing process goes through perfect firing, are straight, have regular size and shape, and have no cracks or damaged parts. Bricks like this can withstand pressure up to 120 kg cm3. Before use, the bricks will be soaked in clean water for a few minutes. Wet bricks will not absorb water from the mortar. Good adhesion between bricks and cement is required. The number of bricks needed to build a 4 cubic meter biogas reactor is 1,500 pieces. If bricks are not available at the construction site, then the bricks can be replaced with materials that have the same strength as bricks.

f. Acrylic Emulsion Paint

Acrylic emulsion paint is used to guarantee the reactor dome which functions as an airtight gas reservoir. So after plastering the inside walls of the dome, the inside walls of the dome were painted using Acrylic Emulsion paint. The type of Acrylic Emulsion paint to be used is of good quality which is commonly used by the Indonesian Household Biogas program. The amount of Acrylic paint needed to build a 4 cubic meter biogas reactor is 1 liter.

g. Bars (Concrete Steel)

Mild steel rods or rebar are used to construct the outlet tank caps and water drain covers. In the 20 cubic meter biogas reactor, rebar is also used for reinforcement in the concrete of the reactor dome. The concrete iron to be used is round concrete iron that meets SNI with a diameter of 100 mm. (MS rod D-10 mm). The concrete iron used is also concrete iron which is free from rust. The amount of rebar used to build a 4 cubic meter biogas reactor is 10 kg.

h. Inlet Pipe

The inlet pipe is a pipe that functions to drain a mixture of dirt and water from the inlet into the reactor. The inlet pipe will use a 4-inch diameter PVC pipe. The type of PVC pipe used is a good quality PVC AW type.

i. Main Gas Pipe

The main gas pipe serves as the main conduit for methane gas from the dome, at least 60 cm long. This main gas pipe will be made of good quality iron pipe and will be zinc-plated or galvanized. So that it can be firmly embedded when it is installed on the dome, the end of the main gas pipe will be given concrete iron.

J. Main Gas Valve

The main gas valve functions to control the flow of biogas in the pipeline from the gas reservoir. The valve is opened when it is in use and closed when finished. Because of this function, if a medium-quality valve is used, there will always be a risk of leakage. To prevent this from happening, the main gas valve that will be used is an iron faucet with a diameter of ½ inch.

4. Process of working/manufacturing biogas installations

The development stage of fixed dome-type biogas will consist of the following activities:

a. Procurement (collection) of materials and equipment
b. Drawing biogas design in the field
c. Hole digging
d. Reactor construction
e. Construction of gas storage domes
f. Plastering the reactor and gas storage pits
g. Manufacture of turrets, manholes, and outlets
h. Making inlets
i. Manufacturing and installation of pipelines and equipment
j. Making slurry holes
k. Water tightness test
l. Gas tightness test

Figure 3. Results of design drawings for the construction of a biogas reactor

5. Hole Digging

After the biogas design drawings in the field to accommodate standing water from the reactor have been completed, the next activity is digging the reactor pit. Hole digging is done manually by human labor using tools such as crowbars, pickaxes, shovels, pushers, and baskets. The steps for digging a hole are as follows:

a. Excavation is carried out per building size as specified in the design.
b. To be practical, digging the soil must be done vertically. If a pool of water is found that hinders excavation, then make a new, deeper hole next to the reactor hole. This new hole will collect stagnant water from the reactor through underground pipes and then suck it out.
c. If the excavation depth is the same as the drawing, level it and harden the bottom.
d. Always ensure that the excavated earth is placed at least 2 m from the side of the hole to facilitate further construction work.
e. Excavate the manhole foundation (flow outlet) along the reactor foundation according to the dimensions shown in the design drawings.
f. Drive the poles horizontally into the ground and arrange them so that they cross one another and form a 90-degree angle. Make sure the pole is stuck in flat ground. The vertical pillars will guide the subsequent construction of the reactor walls.
g. If hard rock or underground water is found so that the excavation depth is not accurate, then the hole must be made as deep as possible.

Figure 4. The process of digging the reactor pit and strengthening the foundation floor

6. Reactor Construction

After the hole is done, the next activity is making the reactor wall. Reactor walls are made in the following steps
following:

1. Installation of marker pipes; at the bottom of the hole, right in the middle of the hole, plug the pipe marking the center of the circle in an upright position. Strengthen the pipe by tying it to another pipe placed crosswise on the flat ground above the reactor shaft and make sure it is in the correct position.
2. Casting the reactor foundation; compact the bottom of the excavation by laying bricks and compacting it with sand. After the rock layer compaction process is complete, do the casting, for the casting of the reactor foundation, a concrete layer is used with a ratio of 1:2:4 PCC properly.
3. Build the reactor wall in the following way:
   • Reactor walls made of masonry bricks,

The ingredients for this brick wall mortar are 1 part cement and 3 parts sand. The installation of stones must be round. Laying bricks for the reactor wall starts from the manhole first.

• When laying bricks, make sure the gaps between the bricks are filled with cement mortar and compacted. The thickness of the mortar for the section is at least 15 mm. Make sure the mixture in the layer does not form cracks.

4. Install the inlet pipe in the following manner; When the wall height reaches 30 cm install the inlet pipe. The slope of the inlet pipe installation to the ground surface is at least 60 degrees. Make sure the length of the inlet pipe is adequate for the floor construction, at least 15 cm higher than the bio-slurry overflow level on the outlet wall.
5. Plastering the walls of the reactor in the following way; When the laying of bricks for the reactor walls has been completed and has reached the correct height, the inside of the reactor walls shall be plastered with a fine layer of cement with a mixture of 1 part cement and 3 parts sand.

Figure 5. Development of reactor construction Casting of reactor foundations and walls.

6. Making a Gas Storage Dome

After the construction of the reactor or reactor wall is completed, the next step is to make a dome that functions as a gas reservoir. The construction of the dome is done by casting concrete. The concrete mix used for pouring the dome is Portland cement: sand: gravel in a ratio of 1:2:3. To speed up the process of casting the dome, a tool in the form of a dome mold made of iron plates will be used.

The steps for casting the dome are as follows:

1) Casting of the dome starts from the top of the manhole, by casting a 25 cm thick beam which functions as the foundation wall. Special care must be taken to maintain the thickness of the dome during casting.
2) When casting, don't forget to install the main gas pipe and make sure the installation of the main gas pipe is done properly, namely positioned right in the middle of the dome.
3) Casting must be done quickly and neatly without stopping. Any lag in processing time will harm the quality of the casting.
4) After casting, the concrete must be protected from direct sunlight, so it must be covered with cement sacks or straw curtains. While waiting for the cast dome to dry, it must also be sprinkled with water 3 to 4 times a day (curing).

Figure 5. Dome molding which is made of cast iron

7. Installation of distribution lines and equipment

Biogas is produced in the reactor and stored in a gas reservoir, then distributed or flowed through pipes. Implementation of the installation of distribution channels and equipment is carried out as follows:

a. Before installing the pipe, the length of the pipe from the biogas reactor to the point of application (kitchen) must be measured, the route is kept as short as possible so that the risk of damage to the pipeline due to external factors can be reduced.
b. After the length of the pipe is determined, digging the trench where the pipe can be started, the slope of the trench is not too steep and precise, so that laying the pipe into it can be done at a certain slope.
c. First of all, the pipe valve must be positioned. Make sure there are no tools other than pipelines between the dome-mounted main gas pipe and the main gas valve. This is to avoid the risk of gas leaks.
d. Before installing the pipeline, the length of the pipe and the number of tools needed must be determined first. Pipes must be cut as needed using a special blade. Joining two PVC pipes must be completely bonded with the help of glue. While other equipment that must be connected to the pipeline must be glued together with zinc putty, and Teflon tape to reduce the

risk of leaks, the use of additional equipment must be kept to a minimum.

e. The biogas flowing from the reservoir has been mixed with water vapor. Water evaporates when it hits the pipe wall. If the evaporation of this water does not flow smoothly, it will certainly clog the pipe. Then the outlet for draining water must be installed on the pipe. The position of the water channel must be vertical below the lowest point of the pipe channel so that water will automatically flow due to the gravitational pull to the outlet. Water must be circulated periodically, and because of this, the water drain must be properly installed. The outlet must be properly protected in a room (30 cm long, 30 cm wide and 50 cm deep). This chamber cover shall be coated at the time of plating the plate for the outlet tank.

f. f. Once the in-ground pipe has been properly installed from the dome to the kitchen, the next step is to install the biogas stove and lights. Adjust the faucet position first, then use the neoprene rubber hose pipe to connect the faucet and gas stove.

g. g. The gas meter to be installed is a type of manometer. Therefore, the method of installing the manometer is done by connecting one end of the manometer to the gas pipeline and the other end is attached to an empty bottle into the air. Gas pressure gauge must be installed with the point of use of gas.

Figure 6. The finished biogas reactor unit

Referring to the results and impacts obtained through the Biogas Village innovation in the Watang Bacukiki Village, the City of Parepare emphasizes that efforts to develop renewable energy can be carried out easily and sustainably. The existence of Energy Sources from Biogas, helps people to creatively seek, discover and develop energy sources.

Table 2 Reactor Biogas in Watang Bacukiki

Reaktor	Kapasitas (m3)	Sapi (ekor)	Rumah	Ban
1 (2021)	12	9	5	-
2 (2021)	12	9	5	-
3 (2022)	14	10	5	-
4 (2022)	14	12	5	-
5 (2023)	12	10	5	10
6 (2023)	12	10	5	10
7 (2023)	12	10	5	10

CONCLUSION

The TJSL program that has been implemented is on track with the program sustainability roadmap, which is targeted for the 3rd and 4th years in the program development phase, the company provides the formation of MSME groups in the community, which is expected apart from being energy independent the community can also be economically independent through group business activities that utilize Biogas.

In addition to program monitoring and evaluation, the company has also carried out a Community Satisfaction Index study, especially for beneficiaries with an IKM score of 73.46 in the Good Category, meaning that the beneficiary communities are very satisfied with the implementation of the community empowerment program.

Figure 7. Monitoring and Evaluation Activities

Impact of the TJSL Program

The Environmental Social Responsibility Program (TJSL) implemented in the Watang Bacukiki Village has a target target for cattle breeders in the Watang Bacukiki Village with a total beneficiary of 570 heads of families. Where in the middle of the 3rd year of the program, this program has succeeded in flowing Biogas to 20 houses or 20 Heads of Families through 4 Biogas source reactor locations. Cow manure, which has always been a problem, is now a blessing for the community, where people can save as much as Rp.148,000/month because they can save on the use of 3 Kg LPG gas. Before there was biogas, green melon gas was used up in just 3 days, but with biogas, LPG gas is no longer used.

Apart from that, the existence of this program indirectly improves the quality of the environment in the community because all components implemented are organic-based. Then socially this program is also able to change the bad habits of the people who previously disposed of the remains or waste of cow dung and then processed and reused in groups.

In 2021, the Ministry of Environment and Forestry of the Republic of Indonesia awarded the Proklim award for the TJSL Pertamina Patra Niaga Fuel Terminal Parepare Program for the Main Category because it has actively carried out integrated climate change adaptation and mitigation actions so that it can contribute to the environment.

Figure 8. Communities can already use Biogas for cooking, which previously used subsidized LPG

This program also contributes to the sustainable development goals or SDGs at point 7, namely clean and affordable energy where people can produce their own clean, environmentally friendly energy, namely Biogas, and point 8, namely decent work and livestock economic growth to be able to improve the breeder's economy which in the future will be developed by the group. MSMEs in the Watang Bacukiki Village area. This program contributes to point 5, namely gender equality because this program is not only carried out by male farmers but also by the wives of cattle farmers who are involved in managing cow manure into compost.

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