**SMALL-SCALE BIOGAS DIGESTERS AS DEVELOPMENT AID: TALES OF HUBRIS AND FAILURE**

**Site ID: 07**

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**Interviewer:** Okay, where did the digester originate?

**Interviewee:** It came from Ecogen, a Malawian company which sell biogas digesters.

**Interviewer:** Who designed it?

**Interviewee:** The digester was imported from Kenya so I presume the digester was designed in Kenya. As far as installation and everything, it was Ecogen who did all that.

**Interviewer:** Did you pay for it or it was a donation?

**Interviewee:** We paid for it.

**Interviewer:** How much did you pay for it?

**Interviewee:** We paid K600 000 plus, but not more than K700 000. K 600 000 was for the digester, while the other was for labour, water cost and all that.

**Interviewer:** So, who built it?

**Interviewee:** It was built by Ecogen with the support from our labourers, under Ecogen supervision.

**Interviewer:** Did you know about biogas before?

**Interviewee:** Yes. I knew about biogas before I met Ecogen guys.

**Interviewer:** How did you know it?

**Interviewee:** I learnt about biogas from Kenya and also on YouTube.

**Interviewer:** You have been Kenya?

**Interviewee:** I saw on internet how people in Kenya were using manure to produce energy.

**Interviewer:** Okay, what were your expectations?

**Interviewee:** After I saw the videos from Kenya or after I met Ecogen?

**Interviewer:** Both……

**Interviewee:** My thoughts after I saw Kenya biogas videos I was like I need this. So, before I met Ecogen, I did my own experiment with manure to see if what I saw on the internet from Kenya was practical. Luckily enough, it was a successful experiment – it worked. After that, I was introduced to Ecogen by a friend. When I met Ecogen, I wanted a biogas digester which uses manure, but at the time they had food waste biogas digesters from China. They promised that they would get back to me once they got it, and after sometime they reached back to me that they had the biogas digester in store, and that’s when I bought this one. ..

**Interviewer:** Okay great. Could you please take me through the experiment you had?

**Interviewee:** I was lucky that my neighbour had cow dung on his compound. I took some of the cow dung, add water and put it in a 5 litre plastic bottle. Then, I bought an intravenous drip, made a hole on a 5 litre bottle and connected the drip to the bottle and closed the drip. After that I was checking the pressure, and the bottle was expanding each day because of the pressure, and each day I was trying to light up the flame. I tried it for a couple times, it didn’t work, but after 40 or 50 days it produced a flame at the opening end of the drip after I ignited a match stick, then that’s when I knew that these things really work.

**Interviewer:** Wow, amazing. What were you expecting to use biogas for?

**Interviewee:** My desire and wish was to produce biogas that I could sell in order to improve the livelihood of people within the community. That was my first desire. Of course, I knew if I could have such a system, I was also going to be able to use it for cooking as well. I also expected to be able to store gas. Just last week, I was at a children’s party, I saw a jumping castle so I thought to myself that I can turn a jumping castle into a gas storage chamber, you see. So, at the moment I’m at a stage where I’m just trying things out and to see if it’s viable and sustainable. Yesterday, I was at Game Store to see yoga balls and see if I could turn them into harvesting bags – but I wasn’t impressed with their size. They are a little small for storage purposes. That said I want a biogas digester because I’m a farmer and I want to use manure from my cattle for energy and farming. I also feel I have an obligation to help the community in terms of energy by supplying them with biogas.

**Interviewer:** From what you have seen so far, do you think you will be able to reach the level you will be able to supply others with biogas?

**Interviewee:** Of course, at the moment, I’m reaching out to people who have cattle to consider about owning a biogas digester. If they can’t afford the biogas digester, then they can buy biogas from me. As it stands though, we are having challenges in a sense that people are failing to understand what biogas is and what it does. So, at the moment, I’m mostly involved in selling biogas effluent which is manure as well as a pesticide and a supplement to livestock.

**Interviewer:** Okay, what were you told to expect by the installer?

**Interviewee:** They told me that biogas can be used for cooking as well as on a generator. Actually, I saw this on the internet, so I was lucky to meet Ecogen to explain the same thing to me. I’m very thankful to Ecogen that I have learnt a lot from them. And my passion for gas technology, both LPG and biogas has elevated because of them.

**Interviewer:** You seem very passionate and well versed in gas technology, where did you get all this passion?

**Interviewee:** I’m not well knowledgeable about gas technology; I believe I’m still learning. However, my interest in gas technology didn’t come because of gas; it came because of my interest in environmental protection which started when I was part of organisation called Green Initiative at Chancellor College. During that time we were advocating the use of briquettes to prevent deforestation and environmental impacts. So from there on I have had a great interesting in environmental management.

**Interviewer:** Okay what kind of training were you given by the Ecogen?

**Interviewee:** Yes, we had training. The training was mostly about how and what to feed the digester with, use of effluent and how to replace a filter.

**Interviewer:** How many were trained?

**Interviewee:** They trained my family as well as the team that helps us with the work.

**Interviewer:** How prepared to run operate the reactor did you feel you were?

**Interviewee:** I felt prepared but not only because of the train but also for the knowledge from the internet. There are so many things I have learnt from the internet that even Ecogen did not explain to me. For example, about using a jumping castle as a harvesting bag, that thing Ecogen did not mention. But, because of my interest in biogas I have been able to learn more about biogas, and I’m always looking for way to improve my biogas system.

**Interviewer:** You have said you chose have a reactor here because of you interest in biogas, your desire to help the community, and of course to be able to use it for energy as well as agriculture. Apart from what I have said, is there anything else why you chose to build a digester here?

**Interviewee:** Aaaah, that’s all.

**Interviewer:** Okay, how did you meet your energy needs before the intervention? (I.e. cook)

**Interviewee:** We were using Liquid Petroleum Gas as well as firewood and charcoal.

**Interviewer:** How did you manage your manure waste before the intervention?

**Interviewee:** We were doing nothing with the manure because we didn’t have the capacity to transfer it to our farms to be used as manure. But, we had the desire to use it as manure.

**Interviewer:** Ok,how did the system work after commissioning?

**Interviewee:** At first, it wasn’t as it now; it was just manure and water in the digester bag. The bag wasn’t inflated as it now. We were told that it would inflate after some time and gas will be produced. They also said, we will see gas bubbles in one of bucket after sometime, that’s how we will know that they system has started working.

**Interviewer:** How long did they say it will take for the system to start working?

**Interviewee:** It stayed about 3 weeks.

**Interviewer:** So after 3 weeks it worked?

**Interviewee:** Yes, after 3 weeks it worked, however it got deflated after a little time.

**Interviewer:** How?

**Interviewee:** I believe it wasn’t really ready. I mean what they meant was that after 3 weeks the system was going to able to produce gas and flame to cook with.

**Interviewer:** How much gas does it produce?

**Interviewee:** We haven’t done the calculations to know how much gas it produces. And for me to be able to know how much gas it produces I may need to have a storage bag. But I believe after some time I will be able to know how much gas it produces because for now I have not stayed with it for long enough, only four months.

**Interviewer:** How do you use the gas?

**Interviewee:** We are only using it for cooking.

**Interviewer:** Okay, what are the operation requirements?

**Interviewee:** We use manure and water.

**Interviewer:** Where do you get manure?

**Interviewee:** We have a barn behind.

**Interviewer:** How many cattle do you have?

**Interviewee:** We have 6 cows – three big ones and 3 small ones.

**Interviewer:** Do they generate enough manure for the digester?

**Interviewee:** Yes.

**Interviewer:** How much manure do you feed the digester?

**Interviewee:** We put a 40 litre bucket of manure every day

**Interviewer:** How much water do you add?

**Interviewee:** We add 80 litres of water. One bucket of manure, we add two buckets of water. Two buckets of manure against four buckets of water.

**Interviewer:** How did you prepare that feedstock?

**Interviewee:** We mix manure and water then stir the mixture. After that, we remove trash from the mix like stone, plastic paper and all that. Let me show you how we do it. When we have manure like this, we can’t remove trash directly from the manure, it`s difficult to do. So we add water them stir, Afterward, we removes all the trash that come on top on the mixture.

**Interviewer:** Who was responsible for feeding the digester?

**Interviewee:** It is me, and the workers.

**Interviewer:** Okay, what were the maintenance requirements?

**Interviewee:** When it blocks or fails Ecogen will come to fix the problem because we have an agreement in place on maintenance issues.

**Interviewer:** What’s agreement?

**Interviewee:** We have a ten year warranty with them. So, if the digester malfunctions it is the Ecogen`s duty to come and fix without charge.

**Interviewer:** Ten years? Do you genuinely believe that they will honour that agreement?

**Interviewee:** Yes.

**Interviewer:** Why?

**Interviewee:** They are professionals and a legit company so I have to take them by their word. They said they will fix anything within 10 years if it ever has a problem. So, I don’t have to doubt them.

**Interviewer:** What was the form of agreement, verbal or written?

**Interviewee:** Verbal.

**Interviewer:** Without Ecogen, are you in a position where you can be able to fix it on your own?

**Interviewee:** Mmmh, no.

**Interviewer:** Okay, Does it meet your needs?

**Interviewee:** At the moment, no.

**Interviewer:** How?

**Interviewee:** The biogas digester has only been installed so it hasn’t reached its peak but with time it will pick up. Also, the weather at the moment is no ideal; we are hoping that in the summer everything will be okay. Because, I believe bacterial activity and metabolism is best during hot season.

**Interviewer:** So, when you want cook, how long do you use it?

**Interviewee:** I use it the whole day where the whole day shall mean breakfast and supper time. We don’t normally eat lunch so we don’t use it around lunch time.

**Interviewer:** Okay, what challenges did you encounter apart from what you have already discussed?

**Interviewee:** We are currently experiencing low pressure. But, I don’t take it as a problem; I see it as an opportunity to learn, so it’s not a problem. I can conclusively say there is no problem - it’s just that I’m a time where I’m getting the much needed experience to learn and improve the biogas.

**Interviewer:** You say low pressure does exist, and clearly that’s a problem, but you say it’s not a problem but an opportunity, what do you mean?

**Interviewee:** When we start the biogas, it doesn’t produce enough heat or flame on the stove to cook food, so to address this we put a bag on top of the digester bag to increase pressure and flame or heat at the stove, so you can see at the end of the day, we are still able to use it as much as we want it – so to me it`s not a challenge.

**Interviewer:** In the 4 months you have had it has it ever stopped working?

**Interviewee: No.**

**Interviewer:** Why do you think in the four month you been able to keep it working, because that’s not an easy feat use it for 4 months, some do not last even last a month?

**Interviewee:** I believe we are able to handle it with care. Also, I think our design is durable. But, I think it’s all about durability of the system because you can use some with carefully but if the system is not durable it breaks down.

**Interviewer:** You have said you are currently facing low pressure challenges. So have you tried to reach out to Ecogen to fix the problem? What have you done?

**Interviewee:** I have never talked to them about the problem because I sincerely believe it not their fault in term of its installation but it’s that the system has yet hit the ground running yet. But, it will hit the ground running and work perfectly with time. And when I get fed up with trying my own ways of fixing it that’s when I will reach out to them.

**Interviewer:** Okay, it has taken almost 4 months and that’s a considerable time for any person especially for someone who has bought new equipment and it’s having issues, and luckily enough has a warranty. So how long will it take you to say it’s a problem, let me consult the installers? What will it take?

**Interviewee:** From the experience I have had with the biogas digester, I think I will not reach out to them because it’s improving. I see a massive improvement from how it was performing during the first months and now. The issue of gas pressure is slowly declining. For example, one time the bag got fully inflated and gas pressure was perfect, but I don’t know if I was right or wrong, I stopped feeding it. Because, when the digester bag is full it produces what we call bio slurry so I was waiting for it to release more and more bio slurry so that it would create enough space for me to be able to collect more gas at the top and eventually increase gas pressure. Thus, I can see it`s improving, and I don’t see myself calling them because it`s going to work.

**Interviewer:** But when it keeps on producing low pressure, when are you going to say enough is enough?

**Interviewee:** The change is not significant enough – but I’m able to see the difference, and I’m sure it will pick up.

**Interviewer:** Have you seen something like this (show table of interventions)? What do you think about this kind of information and do you think it would have helped you?

**Interviewee:** I think the information is good and it would help.

**Interviewer:** How?

**Interviewee:** I think the information would eliminate assumptions and speculations. The information would help to get to facts and help users to troubleshoot problem easily. This would help solve problems promptly. And I think this information is better than going to the internet because it’s clearly and specific hence easy to follow.

**Interviewer:** (Laughs)what’s the problem of assuming and speculating?

**Interviewee:** (Laughs) they lead to wrong decisions and conclusions most of the times. For example, we might be saying our digester is producing low pressure because it is relative new. But, the opposite might be true. It might be that new biogas system produce high pressure(Laughs)

**Interviewer:** How would you describe the current state of the digester?

**Interviewee:** I will rate it on a scale of 10. So, it’s 6 or 7 out of 10.

**Interviewer:** Why do you say its 6 or 7? Why not give it a 10?

**Interviewee:** The problem is what I have already talked about, low pressure. Of course, it could be because we had or we have high expectation about it. It could be that we read wrong literature. As you are aware, biogas system come in different shapes and sizes, so it could be that what I read doesn’t necessarily fit this one. As a result, what I get is not what I’m supposed to get. All in all, it’s 6 or 7 out of 10 for me.

**Interviewer:** Where do you get the information?

**Interviewee:** On the internet.

**Interviewer:** In your opinion, what has caused it to be in this current state?

**Interviewee:** Like I have said when you feed a digester with first feedstock, it doesn’t start working on the spot; it takes time for it to start producing gas. For instance, it takes 3 or 4 weeks for feedstock to decompose and start producing gas. After that you feed it every now and again, so my thinkis that decomposition of the first feed didn’t happen as it supposed to happen. It could also be we are missing something. Yet, I don’t think I’m doing anything wrong, because whatever Ecogen advised be, I do. Whatever information I learn on the internet, I practice. But like I said it will pick out because sometimes the digester produces adequate pressure like for 3 or 5 days or so. That’s why I’m looking for harvesting bags to be able to store and use the gas when pressure is low.

**Interviewer:** What’s stopping you acquiring harvesting bags right now?

**Interviewee:** It’s because of financial problems. I have many projects running at the moment. But, I’m in the process of getting harvesting bag, like I have mentioned I’m searching for cheap things which I can use in place of genuine harvesting bags**.**

**Interviewer:** How much does a harvesting bag cost?

**Interviewee:** I have never had a chance to ask, and I have seen people on the internet using tyre tube. So, I might use a tyre tube, but at the moment I haven’t gone deeper about it, so I don’t know

**Interviewer:** We are going towards the end; we have about 20% remaining. What will you do for energy it fails now? Or

**Interviewee**: I will go to Liquid Petroleum Gas because it doesn’t harm the environment as firewood.

**Interviewer:** Sure, if it fails completely, how will you manage your waste?

**Interviewee:** We will just leave the manure idle.

**Interviewer:** How much labour do you think went into building digging?

**Interviewee:** It was four people

**Interviewer:** Masonry?

**Interviewee:** It was 2 people. Of course, it’s not complete. I would like to build a fence to prevent animals and children from encroaching to protect it as well as prevent human and animal injuries.

**Interviewer:** Was there any other work?

**Interviewee:** No, that was all.

**Interviewer:** What kinds of special items had to be imported from another country?

**Interviewee:** I had prior knowledge about biogas digesters, and from my knowledge I don’t think something like this can be made here in Malawi

**Interviewer:** Why do you say that?

**Interviewee:** I don’t mean if we want to we can’t, but this one certainly wasn’t made here in Malawi, and you can tell by looking at the digester itself, it’s written manufactured in Kenya.

**Interviewer:** Okay, since you started using the digester, has the reactor save you money in terms of energy consumption?

**Interviewee:** I can say the reactor has not only helped me save money it has also helped me make money. Like I said, the reactor produces effluent that is used as manure, and luckily enough I have managed to sell about 120 Litre of effluent to farmers from within the community.

**Interviewer:** How much does a litre cost?

**Interviewee:** I have set a standard price, but I was selling 20 litre of effluent at K3500. And I’m sure I will google the real value of effluent so that I can set a reasonable price. But, before I do that I want to do an experience with the effluent. I’m thinking of having two pieces of land of equal size. I will grow maize on both, but I will apply effluent on one side and apply fertilizer on the other side. Then, at the end, I will be able to know the real cost and value of the effluent by comparing it with fertilizer it terms of yield. After that that’s when I will know if K3500 per 20L is a good bargain for me or them, and then I will make a proper adjustment.

**Interviewee:** Okay, great. Okay, before the reactor, how much LPG gas were you using?

**Interviewee:** Initially, I had a 9 Kg cylinder, and then I bought a 14 kg cylinder after I bought the reactor. At first 9 kgs of LPG gas was taking about a month. Now, 14kgs of LPG gas takes about 2 months and 2 weeks. But, our plan is to stop using LPG gas completely, and I’m sure we will do it.

**Interviewer:** We are going towards the end of our interview. We are remaining with two questions. What is your opinion of biogas?

**Interviewee:** I have a lot to say about biogas, and if I can say all of it would takes us the whole day.

**Interviewer:** (Laughs) I have the whole day, talk to me…..

**Interviewee:** Firstly I would say, if a farmer is serious about farming and wants to be productive he should have a biogas digester. He should have a biogas because he will be able to use waste to produce energy for cooking as well as generate manure which he can use as manure for agriculture purpose. Also, he will not only be able to use the by-product as manure, but he can also sell the by-product making it an income generating product. Also, cattle manure releases methane into the atmosphere which cause ozone layer depletion which has serious consequence on health of people including the farmers themselves. It’s hard to envision this, but it has happens and it is happening. So, biogas is very crucial in alleviating environmental impacts, and we shouldn’t be saying gas emissions from vehicles are the major culprits of ozone layer depletion, its manure waste which is the major culprits. So, as farmers, we should do our bit to reduce environmental impacts which affects us in many ways, for instance, it terms of climate change which cause prolonged drought which has serious repercussions on farming activities. Thus, every farmer should have a digester, and it’s a must. In a society, not everyone can manage to have a digester, but most farmers can have one, so we should have one to help those that don’t have the capacity to own a digestor to protect the environment. On the issue of reckless cutting down of trees and smoke emission due to use of firewood, such things are not easily to imagined, it’s just like pouring one litre of oil into a lake, it still pollutes the water. Thus, when a person cuts down a tree or use firewood the impact it has on the environment is beyond measure. But, people don’t know the magnitude of damage they are doing to the environment and to themselves by cutting down a tree – They don’t know that it’s a chain, and it affects everybody.

**Interviewer:** Last one, if you could have designed your own waste or energy intervention, what would you have chosen instead?

**Interviewee:** I don’t know if I will answer your question as it supposed to be answer because it’s a tricky one. If I’m given a chance to choose my own waste or energy intervention, I would choose 2 or 3 interventions. First, I would choose a system that is user friendly, not hazardous. Of course, I’m not say other intervention are hazards and dangerous, but a system that doesn’t seem hazardous and has all the qualities I have said is biogas system – whether it be a fixed domed or bag digester. So, personally, I would still choose biogas as an energy intervention as well as waste intervention. Also, I’m thinking of trying my own energy intervention, as you can see there; I have a bag full of plastic bags and bottles. I have collecting them because I want to build a system to be able to produce gas.

**Interviewer:** Ooh okay, how?

**Interviewee:** Okay, I don’t have all the information, but I can share with you a little information I have so you can understand what I’m try to do. First you should know that all plastic come from oil. So, this technically means that plastic can be reverted back to oil.

**Interviewer:** Okay how?

**Interviewee:** There is a process called polyposis – this is a plastic separation process which uses heat – this means that you can separate plastic into 4 products using heat. It’s a simple process that burns plastic in a reactor. Thus, when you burn plastic in a reactor it produces vapour. The vapour is then condensed and becomes crude oil. When you burn plastic in the reactor with little heat it produces petrol. When you burn it with very high heat it produces diesel. Also, when you are producing crude oil at the end system you can put an outlet to release pressure at the end of the tube; the pressure which comes out at the end of it is Liquid Petroleum Gas (LPG) which can be stored and use for cooking. Thus, the system produces crude oil which is petrol and diesel, and LPG. And also, the reactor produces char, the hard material from the plastic as a by-product which can be used briquettes for cooking.

**Interviewer:** Oh nice. I want to see your perspective of our study, our study like I said is trying to find out why many digesters fail, as a matter of fact, many have a very short life span. I’m thinking of digesters in Mulanje prison and in Chikwawa which completely failed in less than 2 months. What’s your take? Why do you think many digesters fail or would fail?

**Interviewee:** I can’t comment much on failures because I don’t know the reasons for the failures, I don’t know the design or the feedstock and all that. But, what I can say people are optimistic about biogas, yet we are failing because of a number of reasons. I feel money and investment is not a problem here, but people are lacking expertise and the information. Still, it’s difficult to say why many are failing. It could also be that most people don’t have reliable sources of manure so they are dependent on people. It’s a real challenge, I remember I ran out of manure once, and I reached out to friend, but I was so disappointed with the manure. It was full of debris and sand that it wasn’t good for the digester. I think the key to success is, having a good barn made of concrete so that one is able to harvest enough and quality manure for the digester, And also you have to understand that this is a new thing to many Malawians, and biogas is still in its infancy stage so we are still learning about the technology – so with time we will be able to get things right.

**Interviewer:** Thanks for the interview.

**Interviewee:** Wonderful.