ECOPOWER LIBERIA

Cheap, Reliable, Renewable Electricity from Biomass

Monrovia, Liberia
Philadelphia, PA , USA

Tel: +231 (0) 88 643 0813
Tel: +231 (0) 76 482 894

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Installation of a Power Pallet Biomass Generator at Booker Washington Institute, Liberia

The GEK Power Pallet is a Plug and Play biomass to electricity generation device.
This claim was thoroughly vetted on Wednesday, March 13, in Kakata, Liberia. The entire commissioning, from unloading from the truck to generating 10kW of electricity took 2.5 hours.

Background

On March 13, 2013, EcoPower Africa began the implementation of the ECOWAS-sponsored biomass-to-electricity pilot project at Booker Washington Institute (BWI), in Kakata, Liberia.

Two GEK 10kW Power Pallet generators, a DR Chipper, tools, hardware and equipment arrived at BWI at noontime. A dozen faculty members from the mechanical, auto, and electrical departments were present, as well as students.

Building

The building where the generators are located had been selected during an earlier scouting trip, for the following reasons:

- Very high ceiling. This allows flaring heat to disperse easily.
- Large sections of walls are perforated, allowing excellent all-around ventilation
- Large doors for easy access for machines and materials
- Large, well lit interior space of hall-like room allows a classroom with easy access to the generators for demonstration
- Building also contains a machine shop in case we need to fabricate parts
- Space to store biomass indoors

Unloading and installation

All the machinery was unloaded using manpower. No forklift or other power equipment is available at BWI. This is a significant point because outside Monrovia, power lifting equipment is virtually non-existent. Eight strong men, albeit with some exertion, unloaded and set generators in place, thereby dramatically reducing transport cost. Bringing a forklift from Monrovia would have doubled the shipping costs. The only tools needed were metal pipes that were inserted into purpose-made loops at the bottom of the GEK's subframe.

Installation was equally simple and easy. The men pushed the generators onto designated spots on the floor. That was all. The GEK needs no other construction or preparation.

Biomass: fuel preparation

EcoPower brought to the BWI four 50kg bags of coconut shells. Coconut shells will be used as the primary fuel during the training sessions. This fuel was selected for the following reasons:

- Energy-dense
- Easy to prepare manually – no need for any machinery
- Gives students a very visceral feel for the correct chip size, shape, texture and dryness

These factors combine to make coconut shells a choice biomass fuel for training. During gasification and usage training there's an enormous amount of information for students to process and retain. Coconut shells in the GEK provide a stable training platform, thereby ensuring that the students master basic operational sequences before they have to learn how to deal with fuel volatility.

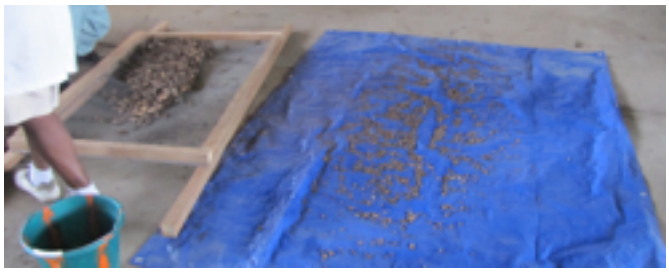
Biomass: training through hands-on preparation

Students were introduced to the concept of coconut shells as source of electricity through a detailed exposition. We discussed the importance of size and dryness for assuring satisfactory performance.

Included were explanations about breaking the coconut stringy fibers, so they do not interfere with the operation of the auger. Students were shown, one by one, how the auger moves the biomass inside the machine, to visualize how chip inconsistency can interfere with operation.

Subsequently, students were given hammers and safety goggles, and proceeded to crack shells to correct size chips.

A smaller group of students was instructed in preparation of charcoal for the initial commissioning firing.



Yet another group of students was instructed in building a sifter, which they built from planks they found in the wood shop, plus a chicken wire mesh EcoPower Liberia brought from the US.

Assembling the GEK Power Pallet






Plug & Play:
The entire assembly took 45 minutes.

The trainees were mostly faculty members, and very facile with tools and hardware. This really speeded up the assembly of the unit. Here three faculty members, Cooper, Clement and Jones, assembled the various parts and appendages quickly, efficiently and with minimal supervision.

Before beginning the assembly, we took the opportunity of having the innards of the generator exposed to help the students visualize the workings. This will help when we get into the discussion of the gasification process.

Very first firing of GEK in Liberia

Final safety check

(L) Cooper loading fuel into the hopper.

We loaded only 10kg of fuel because we wanted to consume most of the fuel during the first demo, so there would be a minimal buildup of condensate before the next firing.

The generator began making Syngas in 5 minutes. A head of smoke billowed from the stack for about 30 seconds, and then the gas ignited. Yoav maintains the flame here to visualize the large amount of gas being produced. In short order Yoav introduced air into the flair, made the mixture lean, and brought the flame down into the stack.

The temperatures rose text-book style, because both the charcoal bed and the coconut shells were dry. 750C/685C was reached within 10 minutes. Temps continued to climbed rapidly to 950/750C. Producing a very clean gas.

Generator On

The gas reached the temperatures that indicate that the Syngas is tar-free within 10 minutes. We redirected the gas to the engine, and began cranking the engine. The engine caught on by the 4th crank as the suction from the engine forced the gas to make its way to the engine. Once gas flow was established, the engine operated well and very quietly. Once the filter vessel was filled with Syngas, the engine consistently started within a single crank.

The system works best when there's a minimum of 3kW load on the generator. Since the generator was not yet connected to any load, the engine ran smoothly, but with somewhat fluctuating RPM.

We kept the generator on for the duration of a presentation to the US Ambassador to Liberia. The Ambassador was accompanied by senior personnel from Winrock international, USAID personnel, and members of the press.

Once we finished the demonstration to the Ambassador, we switched the generator off, and flared excess gas for additional 3-4 minutes before shutting the system down.

Before the next firing we will install a portable power distribution box, so we can connect the generators to loads.

(IL + R) Vickson Korlewala, CEO, and Yoav Palatnik, COO, explain the operations of the generator to the US Ambassador.

(L) Vickson and Michael McGovern, Chief of Party, Winrock International.