

Power Generating Play

Never has generating alternative sources of energy been so fun. All that excess energy children have bottled up now helps power lighting for remote African villages.

On an 18-month missionary trip to Ghana, retired engineer Ben Markham visited rural schools and noticed the children were subjected to poor lighting and a lack of playground equipment. With the sun as the only source of light, Ghanaian schoolchildren are very limited in the time they have to study. After school, daily chores often consume their days due to limited technological resources, like transportation. "The problem with Ghana is it's right on the equator, so they get about 12 hours of sunlight a day," Markham says. "There's no real time to do homework."

And then the light bulb switched on in Markham's head.

Back in the states, he began working with Brigham Young University (BYU) students and faculty to develop electricity-generating merry-go-rounds. And thus, in 2007, Empower Playgrounds, Inc. (EPI) was formed as a 501(c)3 public charity.

Although children have a reputation for housing excessive amounts of energy, they can't quite power a village on their own. "People think children generate a lot of energy, but it's not when you measure it in watts," Markham says.

Part of his goal is for the children to have fun while participating in valuable science education and providing a much-needed resource to their communities. "We try to design things so they're fun and not just work wheels. Most of their play energy goes for play, with about 30 percent being used to generate power."

It takes two to three children typically to produce 100 watts of energy on the merry-go-rounds. The mechanical design is responsible for everything else. "The children typically push the merry-go-round at 8-10 rpm," Markham explains, "The gearbox increases the rpm to 200 to 300, so the generator will produce an interesting amount of power."

The design of the merry-go-rounds has evolved since the first of 10 complete systems was installed in 2008. Markham describes the design: "The main bearing for the merry-go-round is a series Land Rover hub axle. These are readily available from Ghanaian junkyards. The entire deck of the merry-go-round—including the center covering—bolts onto the hub using the Land Rover lug nuts. It's like the merry-go-round is the wheel and tire on the vertical hub axle. From the hub, the axle is cut and machined for the u-joint coupling to an SEW-Eurodrive helical gearbox. The gearbox, which runs in reverse as a speed increaser,

is coupled to the Ginlong Technologies 3-phase AC windmill generator.

"The 3-phase AC power wires run from the merry-go-round to a small enclosure inside the school. Inside the enclosure, a bridge rectifier changes the AC to constant polarity DC current, so it doesn't matter which direction the merry-go-round is pushed. The DC current goes to a smart power controller that manages recharging of the deep cycle 12-volt storage battery."

Markham has a patent pending on the design, not because he has any fear of revealing his trade secrets, but because he was concerned others could try and block him from using it for humanitarian reasons to pursue commercial ventures.

Four new systems were installed in 2009, while donations from the year provided funding for 25 complete merry-go-rounds. EPI recently received a major corporate sponsorship to develop custom LED lanterns designed specifically for its systems, which lower total system cost, recharge easier, improve the lighting and are more reliable.

Markham and his small staff are developing other projects, which include a power-generating glider swing-set that is in the prototype testing phase, but Markham remains dedicated to his initial goal of promoting fun education. "We have some other ideas, but we're not chasing development too much," he says, citing the substantial costs inherent in developing technology. "We would rather spend the money on building the merry-go-rounds, which we know work well."

For more information and to make a donation, visit www.empowerplaygrounds.org.

