

FIELD NOTES

STORIES FROM THE FIELD

Summer/Fall 2021



DesignOutreach

CECILIA'S STORY IS ONE LIKE MINE

By Dr. Beatrice Chisenga, Regional Africa Field Director



"...WE CAN CHANGE
THE STORY FOR
CHILDREN LIKE
CECILIA AND
MILLIONS OF
OTHERS!"

The story of 15-year-old Cecilia Leward and her family from Chikwangwala Village in Malawi has greatly impacted our Design Outreach (DO) team, both here in Malawi and in the United States.

Before receiving a LifePump in December 2020, Cecilia and the other children in her community had to walk a kilometer one way—often in scorching heat—to collect water for their families. They faced many dangers and difficulties on the long and lonely walk. The river where they gathered water was contaminated and lurking with crocodiles.

One day, Cecilia's niece was gathering water at the river when a crocodile attacked her, and she lost her life. Cecilia and her family still face the grief of losing someone they love. This tragedy is just one of many dangers affecting the millions of children globally who struggle with water insecurity every day.

I know this from firsthand experience. As someone who grew up gathering unsafe water and risking my life and education to do so, I can attest to the fact that Cecilia's story is not an isolated one. **Millions of girls and children around the world face the dangers and difficulties Cecilia did. They risk their lives and sacrifice opportunities to simply collect water for their families.**



I started collecting water as a young 5-year-old. The water was not near—it could be one to two kilometers away. One day in particular is etched in my memory. The other girls and I had to get up very early to go and get water. While on our way, we were chased by a man who wanted to abuse us. We had to throw the buckets off our heads and run for our lives so that we wouldn't be abused. People are at high risk if the water is not near to them.

But we can change the story for children like Cecilia and millions of others! Working with Design Outreach, I am seeing how LifePump changes lives. A LifePump can reach water even during the dry season and can go three times deeper than other pumps, which

means that they should never run out of water. The reliability of LifePump also assures people that it won't break down, and they can trust that they will always have water to drink, to feed their animals and to water their gardens. Children, like Cecilia, can now go to school, as the task that used to take hours, now takes only minutes.

When we installed a LifePump in Cecilia's village last December, we could not help but be touched by the hope and light in her eyes. Clean water truly has the power to change everything. By providing safe and reliable water through LifePump, we can bring light, life, and the love of Jesus to these children.

Thank you so much for bringing hope and light to children like Cecilia by supporting Design Outreach. Your generosity truly is changing the future for Malawians, and we cannot thank you enough for showing love, sharing hope, and being a light around the world.

Also in this issue:

The Gen4 Gearbox: A Challenge Overcome Through an Amazing Answer to Prayer - page 3

LifeLatrine: Reimagining Basic Sanitation - page 5

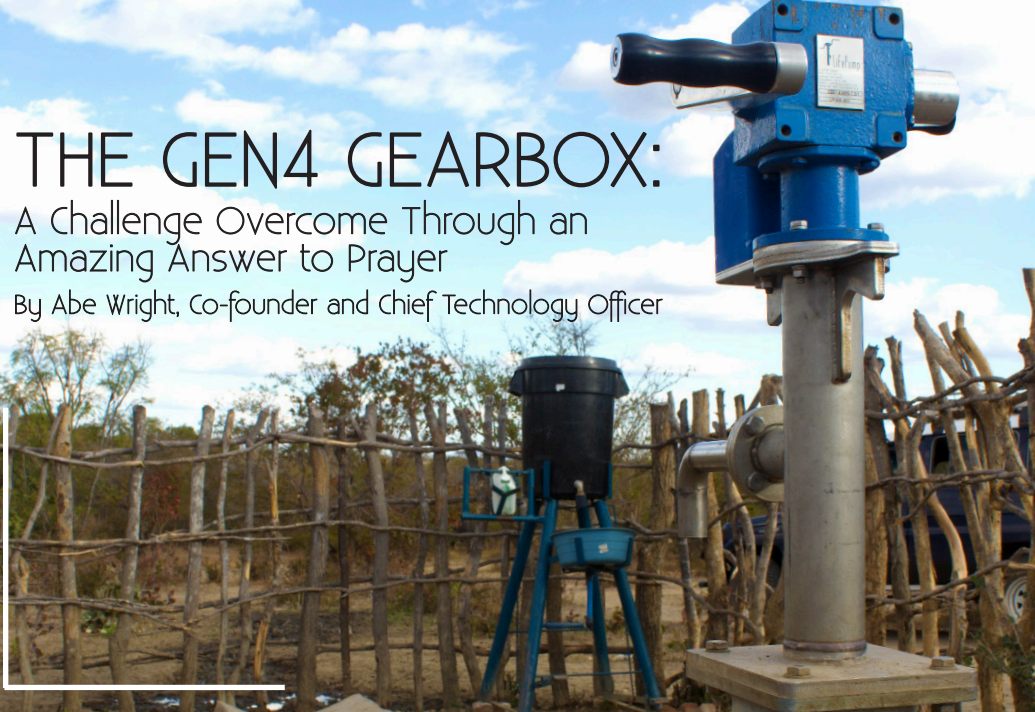
Zimbabwe Trip: The LifePump That Was Just In Time - page 7

A Win for Karanda and Design Outreach - page 9

THE GEN4 GEARBOX:

A Challenge Overcome Through an Amazing Answer to Prayer

By Abe Wright, Co-founder and Chief Technology Officer



NOT GOOD

This was the text message I received from Greg Bixler, my co-founder and CEO, last December. He followed it with several pictures of a LifePump from Zimbabwe that had experienced a rare but catastrophic early mechanical failure. Our field partners in Zimbabwe discovered that the gearbox, the blue box on top of the LifePump that connects the handles to the pump drive rods, was broken and leaking gooey grease. Fortunately, our partners had a spare gearbox and were able to repair the pump. However, failure is obviously not an option when we claim that a LifePump should operate for 5 to 10 years without any maintenance.

Within a week, the Design Outreach R&D team had assembled a "Tiger Team," which is a group of experts

brought together to solve a critical issue—think 'NASA engineers tasked with returning the Apollo 13 astronauts safely to earth'. As urgent and important as the Apollo 13 rescue was, there are also thousands of people in communities around the world depending on DO engineers for safe water and life through a well-engineered LifePump. With that sense of urgency, we got to work.

Many LifePumps experience more than 25 million handle rotations—in a single year! Designing a durable, long-lasting hand pump requires high-performance engineering. Our first challenge as a team was the humbling realization that we lacked the specialized technical expertise needed to solve the gearbox problem and not inadvertently create new ones. We needed the "world's expert" in gearbox design. I remember writing in our Tiger Team project charter, "Objective #1:

Find the world's expert in gearbox design." It seemed like a long shot at the time, but that was our need and prayer.

We knew a critical situation like this demanded a God-sized solution, so we prayed a bold and specific prayer. We asked God to send us the world's expert in gearboxes to solve the problem. We had no idea what would happen or how God would provide someone with that kind of very specialized expertise.

God answered our prayer a short three days later. In speaking to one of our engineering volunteers, Jim Ordo, Greg Bixler mentioned that we were rethinking the gearbox design but lacked the technical resources, and that we needed to find "the world's leading gearbox designer." Jim replied, "I know a guy."

Don Klemen, a recently retired engineer, worked with Jim for decades in previous careers, and Don was by all accounts a world's expert in gearboxes. Within a week, Don was on the phone with Jim Ordo and me to start digging into the gearbox challenge. It was clear within a few weeks that Don knew more about gearboxes than anyone else we knew and was our answer to prayer.

Don is more than "just a guy," as mentioned by Jim Ordo. Don is the holder of over 100 patents and has 42 years of experience in working with gears, including those for Rolls-Royce aircraft engines.

Don is part of the afore-mentioned Tiger Team of engineers and technical experts who have been dedicating hundreds of hours to design the next generation gearbox.

The Tiger Team has accomplished much in a short period of time. Since the team first met in January 2021, they have been able to diagnose the likely cause of the gearbox failure and design and test the next generation gearbox for LifePump—what we call "Gen4." Not only has the team figured out how to eliminate the possibility of the catastrophic failure observed in Zimbabwe, they have also found opportunities to improve durability, manufacturability, and to simplify future field service of the gearbox.

"We knew a critical situation like this demanded a God-sized solution, so we prayed a bold and specific prayer."

But this is more than an engineering story; although, as an engineer, it is exhilarating to be problem solving along with some truly brilliant and humble people. We are doing it for a much greater reason. Our team's efforts are being channeled into a solution that will ensure that LifePump provides future generations with safe water and hope for the future—so that when someone's mother, child, wife, or grandmother turns the handles, the precious and priceless gift of water will flow freely. This is simply what we do, our mission at Design Outreach. We are privileged to have the opportunity to refocus engineering resources on alleviating global poverty and building bridges for the Gospel.

The first Gen4 gearboxes have gone into production and will be deployed to the field in early 2022.

LifeLatrine

Reimagining Basic Sanitation

Going to the bathroom is not something one discusses in polite conversation. However, the way that much of the world handles human waste can be a matter of life and death.

In rural communities in the developing world, the bathroom facility is a community pit latrine. It includes a dugout pit with a brick liner covered by a platform and an enclosure for privacy. However, there are several issues with pit latrines, including that the pit needs to be lined, often with expensive bricks, to prevent the pit's walls from collapsing. Once the pit is full, emptying it is difficult and hazardous, and the brick lining cannot be removed. At that point, the community must decide: can they afford the brick lining for a new pit, or do they have to revert to open defecation.

The community doesn't want to face the indignity or unsanitary conditions that open defecation causes, but they may not have a choice.

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“We are asking ourselves what we would want if we were in this situation...”

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One of our partner organizations approached us with this problem and asked Design Outreach to find an appropriate solution to address this most basic need—for safe, clean, sturdy, and moveable latrine facilities—as a key to reducing diarrheal diseases. Sadly, young children are most vulnerable to diarrheal diseases that can lead to death. According to the CDC, diarrhea is the cause of death for an estimated 446,000 children under the age of 5 each year.

The LifeLatrine project is to create a removable and reusable pit liner. When a pit fills up, the LifeLatrine liner can be removed and reused in a new pit. Likewise, the platform and privacy structure could also be moved onto the newly-dug pit.

The project is being tackled by a team of engineers. Dale Andreatta, a volunteer who has extensive pit latrine sanitation experience, put it like this, “We’re looking to create a solution that is healthier and safer.” He continued, “We are asking ourselves what we would want if we were in this situation. We are working to create solutions that meet those needs and give the community a sense of dignity.”

The LifeLatrine development team includes Greg Kramer, who serves as the project manager; Les Shephard, a soils expert; Matt Heidecker, an expert in plastics manufacturing; Mike Simon, a mechanical designer; Kevin Zylka, an industrial designer, and Dale Andreatta. Greg Bixler rounds out the team with his extensive knowledge of field conditions and community life.

Without dedicated volunteer engineers and experts, projects like this one would not be affordable or possible. It is a blessing to see people devote hundreds of hours to designing, prototyping, and testing solutions for people they will never meet—all because they share with us a common goal of helping others through engineering and technology.

Thank you to all the volunteers who support DO’s mission to alleviate global poverty through appropriate technology. You are making a difference in this world.



“...We are working to create solutions that meet those needs and give the community a sense of dignity.”

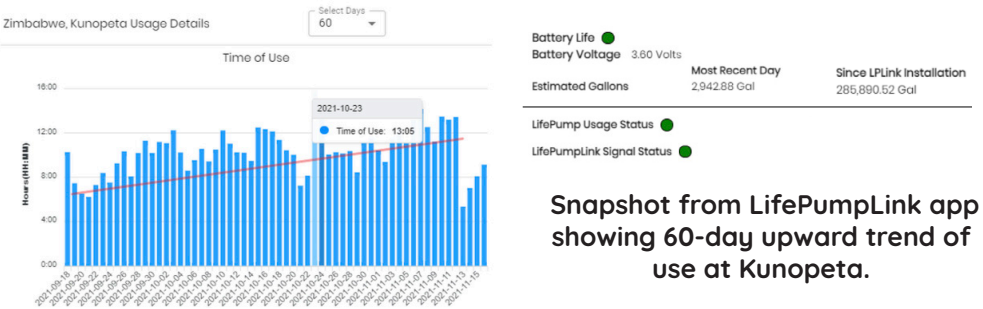
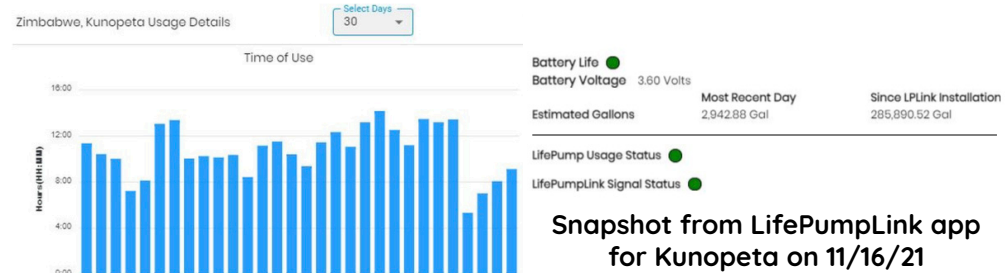
ZIMBABWE TRIP

THE LIFEPUMP THAT WAS JUST IN TIME

As we prepare to celebrate Christmas, our thoughts are filled with preparing to stuff turkeys and stockings—it is the season of plenty. But in the country of Zimbabwe, November marked the end of the long and dusty dry season. Back in April the rains stopped falling, rivers dried up into trickles, and many bush pumps ran dry.

Even the deepest-reaching traditional hand pumps can only extract water from up to 50 meters (164 feet). In October, at the height of the dry season, the water table drops below the bottom of many hand pumps. Functioning hand pumps that run dry during the peak of the dry season are a common but untold story. Unfortunately, there is no data to show the exact number of seasonal boreholes, but our co-founder and CEO Dr. Greg Bixler describes it as a “global epidemic.”

That is why we designed LifePump to go deeper than other hand pumps—up to 150 meters (nearly 500 feet)! By reaching deeper into aquifers, the water level will not drop below the bottom of the pump. **Communities need water every day of the year, but even more so when all other water sources are drying up.**





We sent a team of engineers to Zimbabwe in July to train our partners on the installation of LifePumps and LifePumpLinks in communities surrounding Karanda Mission Hospital. In a community named Kunopeta, the team was greeted by Edison who told them, “You arrived just in time.” Edison was referring to the dry season that was upon them.

LifePumpLink, our innovative remote satellite monitor developed in partnership with SonSet Solutions, allows us a glimpse into daily LifePump usage around the world. In Kunopeta, Zimbabwe, the app connected to the monitor shows us that the LifePump was used an average of nine hours a day in October, with some days reaching 13 hours a day. The hours of usage are actual turn time of the handles. This means that on those higher-use days, there is a line of people at the pump all day and probably into the night—the need is so great!

Thanks to technological advances like LifePumpLink, we can know that water is flowing at Kunopeta, and the community members there can have the confidence to invest in seeds for a garden and livestock to help feed their families—because of the confidence that tomorrow there will be water.



— A Win for KARANDA

A mission hospital faces many challenges. Much of the equipment at Karanda Mission Hospital in Zimbabwe was designed for the developed world, including the oxygen concentrator.

An oxygen concentrator includes a part called a humidifier bottle that humidifies the oxygen to make it less dry for the patient. This part is typically considered a disposable—to be used once and then replaced with a new one. That is not possible in places like Karanda Mission Hospital. Due to lack of supply chain and resources, the hospital was forced to reuse the plastic humidifier bottles repeatedly and over time the threads attaching the lid of the bottle would shred and have to be held on with tape. With oxygen needs on the rise due to COVID-19, this situation was quickly becoming unsustainable.

Karanda approached Design Outreach about finding a solution in December 2020. As part of the inspiration phase of the DO Way for



& Design Outreach

Appropriate Technology Development, the assembled team explored many different solutions but were able to find an off-the-shelf option that would likely work to replace the disposable bottle. What they found was a high-quality bottle with a stainless-steel lid that would hold up to repeated use and be easier to keep clean. When the DO team traveled to Zimbabwe in July, engineer Hannah Tilley had the opportunity to deliver the new bottle to Karanda and test its compatibility. She was happy to report that the new reusable bottle fit the oxygen concentrator and that they plan to use this as the solution to their problem.

Design Outreach is committed to solving problems for partners around the world. Sometimes that means developing a new and robust technology like LifePump; sometimes it means doing the research to find an existing appropriate solution for our partners. Either way, it is a win for both Karanda and Design Outreach, as the hospital can now produce the humidified oxygen required to meet the needs of its patients.



Alleviating Global Poverty Through
Life-Sustaining Technology

DID YOU KNOW?

- DO has supplied over 100,000 people with a source of safe and reliable water.
- There are over 160 LifePumps now installed in 10 countries.
- The original LifePump in Malawi has been operational for over 8 years, providing water with no downtime.
- Hugo and Bre van der Walt have safely moved to Malawi and are serving in the Malawi Field Office.