



ENVIROFIT DRIVES PUBLIC HEALTH IMPACT

WITH THE POWER OF PARTICLE

Envirofit is using Particle to remotely monitor the indoor emission reduction impacts of their ultra-efficient, clean energy cookstoves. These wood-fueled stoves are engineered to reduce harmful emissions and conserve fuel, all while taking traditional cooking customs into consideration. Recently, the Honduran government partnered with Envirofit to deliver stoves to local communities in need. To ensure the stoves were being adopted Envirofit equipped 1,000 stoves with temperature sensors and Particle Electrons to record exactly when and for how long the stoves are in use by the families who own them. Moving forward, they plan on using the Particle platform to gather even more data on their stoves in the field, including real-time emissions monitoring.

THE HIGH COST OF TRADITIONAL COOKING

Over 3 billion people around the world cook with biomass over open fires inside their home. That's nearly half of the global population that must rely on antiquated, unsustainable harvested energy sources like wood and charcoal to warm their houses and cook their food.

And while cooking over an open fire might seem romantic to some, it comes with a heavy price to families and the environment. The use of wood-fired stoves releases large amounts of CO₂ and other harmful emissions that actively contribute to climate change. In fact, open fires produce over 1 billion tons of CO₂ per and are responsible for roughly 25% of all global black carbon emissions.

Meanwhile, those same emissions that are harming the environment are also extremely harmful to humans. Cooking over an open fire is equivalent to burning 400 cigarettes per hour, and approximately 4.3 million deaths per year can be attributed to household air pollution. That's more than HIV, malaria, and TB combined.

What's more, families living in extreme energy poverty typically have to spend exorbitant amounts of time and or money to acquire firewood. Those families that collect their cooking fuel spend an average of 2 hours per day gathering wood, while those families that purchase their fuel can spend up to a third of their income on it.

Although the governments in emerging markets are working to bring electricity, modern cooking, and a better quality of life to their citizens, those efforts are typically slow moving. That's why there remains a strong need for more immediate and accessible solutions to the problem of energy poverty.

1 BILLION TONS OF CO₂
ARE PRODUCED BY OPEN FIRES EACH YEAR

\$40 BILLION A YEAR
IS SPENT ON COOKING FUEL



A CLEAN, EFFICIENT, & COMFORTABLE SOLUTION

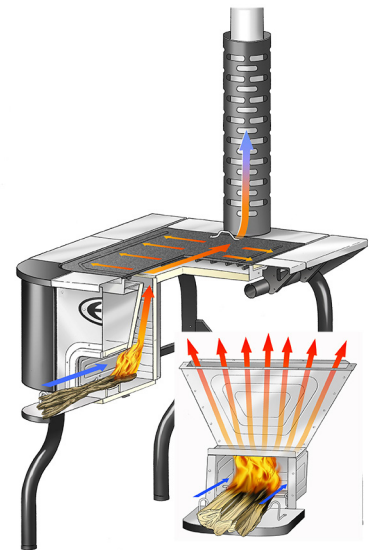
Since its founding in 2003, Envirofit's mission has been to help families living in energy poverty access cleaner, less hazardous means of cooking. To that end, they've technically engineered a diverse line of ultra-low emission, fuel-efficient cookstoves, which they now sell around the globe. And although they test their products meticulously in the lab, the benefits they offer will only come to fruition if truly adopted by the end user. That's why, each one of Envirofit's stoves is also designed to accommodate existing cultural and culinary preferences of its target market.

"We spend a lot of time trying to really understand our customers," said Nathan Lorenz, Vice President of Engineering, Manufacturing & Supply Chain at Envirofit. "Everywhere you go around the world cooking is a little different. Some cultures use round-bottom pots, while in other places they prefer flat-bottom pots. In some places, they need really high firepower cooking, and in other they prefer really long duration simmers. So, you do have to customize the product to what each market needs."

One of Envirofit's most recent campaigns took them to Honduras, where the government partnered with the company to deploy 300,000 plancha cookstoves to families living at the base of the economic pyramid. As in many Central American countries, the tortilla is a staple of the Honduran diet. Because of that, Envirofit had to develop a specific stove with a flat "plancha-style" grill top suited for making tortillas as well as heating pots and pans.

However, despite being specially designed for the Central American market, Envirofit and the Honduran government still wanted to ensure that its use was being adopted. Thus they took a sample of 1000 customers from the stoves that were deployed to understand cookstove adoption.

"We put on remote temperature monitors that can tell when the stove is turned on, how long it was turned on per day, and how many times it was used," explained Lorenz. "Those sensors are connected to Particle Electronics, which then report the usage data back to us in real time. That gives us much more realistic usage data on how the customers are using the stoves, or in some cases, not using them. In those cases, it's invaluable for us to know that those stoves are going unused, so we can follow up with the customer and learn why."



A CLEAN, EFFICIENT, & COMFORTABLE SOLUTION (CONT.)



"In most cases, it's a problem with a ready solution. Often, they simply weren't trained properly on how to use the stove. In other cases, the stove was installed in the wrong part of the home, which makes using it inconvenient. No matter what the reason,, it's imperative that we can understand it, fix it, improve the customer experience and generate better cookstove designs and training in the future."

Lorenz went on to explain that, in the past, when relying on over-the-phone and in-person interviews, their data might have fallen victim to the "niceness bias" meaning, customers would be hesitant to express anything but satisfaction. With this theory, Lorenz and the Envirofit team tried a different approach.

They installed static data loggers on a number of their stoves prior to deployment, which would record total hours of use. However, these loggers suffered from a number of limitations, the worst of which being that they weren't internet connected. As a result, Envirofit had to regularly send representatives into the field to retrieve the data physically. And with deployments everywhere from Latin America to Southeast Asia, the time and cost involved with that data collection were considerable. What's more, the data loggers could only retain two months' worth of data at a time, then they would begin to overwrite. So, if for whatever reason Envirofit couldn't get to the devices in time, much of their data would be lost.

PARTICLE PROVIDES A PATH FORWARD

To overcome that hurdle, Envirofit integrated the Electron and the Particle Device Cloud into their operations and began collecting data. In addition to solving the problems of physical data collection, Particle also helped stave off data loss, and reduce time to market.

"One of the main reasons we chose Particle is their out-of-the-box functionality," said Lorenz.

"We didn't have to do a lot of work to be up and running really quickly with it."

"Plus, the back end of the Particle system provides so much functionality with so little setup required. Having the device console already ready for us and being able to control our fleet remotely without having to build an interface of our own is invaluable. We didn't have to do all that heavy coding or worry about security and all sorts of other major headaches associated with IoT. It really was a much quicker, easier, and cost-effective way to get operational than trying to build something from the ground up."

With the Electron and Particle platform in place, Envirofit looks to add even more functionality in the near future. Although they perform extensive emissions testing on their stoves in the lab, Lorenz explained that real, in-field conditions can be different. That's why he and the Envirofit team are exploring the possibility of adding real-time emissions monitoring to their IoT application. As many of their



PARTICLE PROVIDES A PATH FORWARD (CONT.)



initiatives are done in cooperation with governments and NGOs, having robust, in-field evidence of their products' benefits could prove incredibly valuable in their efforts to forge new partnerships. More importantly, having that data will help the engineers at Envirofit fine-tune their designs to become even more clean and efficient.

CONCLUSION

Envirofit represents the very best of technology working for the greater good. Their one-of-a-kind cookstoves stand to save money, lives, and the environment all at once. And by integrating Particle into their operations, they've been able to reduce costs, increase transparency, and gain invaluable insights into the efficacy of their products. By doing so, Envirofit is even better equipped to serve their mission of public health and environmental sustainability.

There are few things in life more essential than cooking. It gives life, bonds families, and builds communities. We should all be able to fulfill this basic need without sacrificing our health or degrading the environment. Thanks to Envirofit, families all over the world are finding a way to do just that.

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