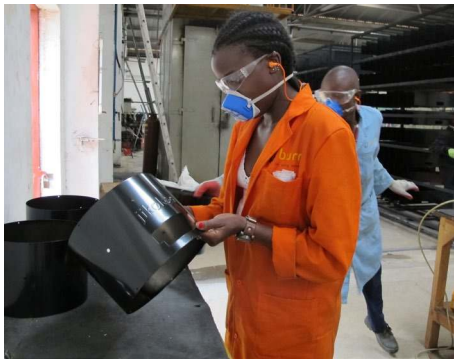
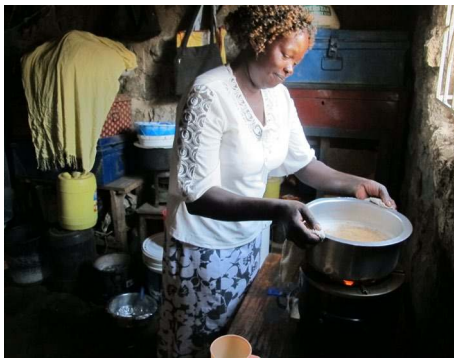
Winner case study summary
BURN Manufacturing, Kenya

Ashden Clean Energy for Women and Girls Award, supported by UK aid

Supported by UKaid from the British people



Quality inspector Cindy checks the cladding for a jikokoa before final assembly.



Mary boils tea on her jikokoa.

over 50%
female employment

62,000
jikokoa stoves sold to date

170,000
tonnes of CO_2 saved per year

"BURN must be commended not just for producing a great charcoal stove that saves women time and money, but also for employing women in significant numbers and enabling them to increase their economic independence and improve their position in society."

Ashden judging panel

The context

In East Africa, most urban households cook on charcoal, despite its increasing cost and damage to health and the environment. Improved charcoal stoves that cut these impacts include the Kenya Ceramic Jiko (KCJ), now used by 87% of urban homes in Kenya.

Local artisans make the KCJ, but have not succeeded in making stoves with higher performance. Most such stoves are therefore manufactured in China, and this means that jobs are exported.

BURN's approach

BURN Manufacturing took on the challenge to not just design better stoves, but to manufacture them in Kenya. BURN's first success is the jikokoa™, a cleaner and more efficient charcoal stove which, thanks to market research with local women, is also a desirable consumer product.

"I gave a jikokoa to my mother, and now I'm her favourite son."
Stephen Macharia
General Manager Market Research and Product Development, Equity Bank

The jikokoa is manufactured at BURN's modern factory in Kenya, which also acts as the hub for sales, distribution and market research. And, by appointing and promoting solely on merit, BURN has achieved over 50% female employment, with women in all types and levels of job.

Women benefit as the main users of jikokoas, as well as from employment.

The stove lights easily, cooks fast and – from independent tests – produces over 60% less health-damaging particulate matter and carbon monoxide than the KCJ. Charcoal use is cut by 45%, saving around US$200 per year, or five times the purchase price. About one third of sales are through partners like Equity Bank, who provide credit to help low-income purchasers.

Cutting charcoal use helps to reduce deforestation, a huge problem in East Africa, and greenhouse gas emissions.

Why they won

BURN's 2015 Ashden Award highlights the benefits that it has brought to women and girls through clean energy. Based on merit, women have achieved equal employment in production and sale of jikokoas. Women and girls also benefit most from the time and money saved by using the jikokoa.

BURN Manufacturing profile
For-profit business
US$1.5m income 2014, 70% from sales
87 employees in Kenya

Ashden
Sustainable solutions, better lives

info@ashden.org
www.ashden.org/winners/Burn15
Document last updated May 2015

Boston Nyer, Chief Product Officer
bostonnyer@burndesignlab.org
www.burnmfg.com

Case study
BURN Manufacturing, Kenya

Background

Cooking on charcoal is costly and damages health and forests, yet charcoal is a major cooking fuel in many countries of the developing world, particularly in urban areas. 4.5 million urban households in East Africa regularly cook on it, and the number is growing.

Many attempts have been made to reduce the impacts of charcoal use by improving the efficiency of cooking stoves. A successful example is the Kenya Ceramic Jiko, or KCJ (jiko means stove in Swahili), developed in 1980s, which cuts charcoal use by adding an insulating ceramic liner to the tradition metal jiko. KCJs are produced by many local artisans using locally available materials, and around 87% of urban households in Kenya use them.

However, attempts to achieve higher efficiency and also cut health-damaging emissions through this type of manufacture have not succeeded. Most companies developing higher-efficiency stoves rely on precision manufacture in China, but this means that jobs are exported and transport adds to the cost of a stove.

BURN Manufacturing took on the challenge of designing a much cleaner and more efficient charcoal stove, the jikokoa™, and manufacturing it in Kenya. BURN deliberately employs women, the main users of the stove, in all aspects of the design, manufacture and promotion of the jikokoa.

The organisation

BURN Manufacturing was set up by stove pioneer Peter Scott and nine other partners in 2011. The company was spun out from US not-for-profit, BURN Design Lab. In 2014 BURN Manufacturing Kenya had an income of US$1.5 million, 70% of which was from sales. It employs 87 people (46 of whom are women) in Kenya. Around US$7 million in debt, grants and equity has been sourced to fund the company, and it has also secured US$0.75 million credit finance for distributors.

The business model

The design of the jikokoa (and other efficient stoves) was initiated by the BURN Design Lab, and is continually refined through market research with individuals and focus groups in Kenya. This achieves not just technical performance, but also user acceptance - crucial to ensure that the stove is bought and used. The jikokoa is manufactured at the BURN factory in Ruiru, just outside Nairobi.

Jikokoas are sold through more than 150 partners including banks and micro-finance organisations, social distributors, and retail outlets ranging from supermarkets to small stores. Sales representatives from BURN are responsible for building these partnerships, and BURN's sales activators help drive demand from the ground.

The jikokoa stove

How is it designed?

The jikokoa is designed for household use and can cook a single pot of food, up to 12 litres in size – the sort of quantity needed for a family of eight to ten people. It is similar in external size to the KCJ (see photo), because this is what users wanted. User opinions also led to the smart external finish, with stainless steel for exposed metal parts and black powder-coated steel for the curved surface.

Charcoal and deforestation

East Africa has been losing forest cover for many years, and deforestation continues. Between 1990 and 2010, about 7% more forest was lost in Kenya, 19% in Tanzania and a staggering 37% in Uganda. Firewood and charcoal production is the single largest driver of deforestation in Sub-Saharan Africa: about six tonnes of wood is needed to produce the 0.75 tonnes of charcoal used each year by a typical urban home in Kenya. And deforestation is not just an environmental problem: a 2012 UNEP report suggests that it loses the Kenyan economy nearly US$70 million per year.

TV celebrity Wilbroda helps market the jikokoa

The jikokoa (right) on display next to a Kenya Ceramic Jiko (left) in Tusky's supermarket

Inside, the jikokoa is different. The combustion chamber (where the charcoal burns) is much smaller than in the KCJ, and is made of a metal alloy which can cope with high temperature, rather than ceramic. There is an ash-tray underneath the grate where the charcoal sits. Not only does this provide a clean way to collect ash, it can also be moved in and out to light the charcoal from underneath. It also allows accurate control of the air flow and thus the rate of burning. Around the combustion chamber and underneath the ash tray is a thick layer of ceramic wool insulation to cut heat loss. All parts are made to strict specifications, and components fit tightly, to minimise air leakage.

How is it manufactured?

BURN's stoves are made in a modern, continuous flow manufacturing facility that is capable of making one stove per minute. In this factory, first all stove components are fabricated from raw materials. Four sub-assembly lines then combine components into different sections (stove top, base, combustion chamber and outer cladding). The final assembly line combines these four sections together, and fits the insulation around the combustion chamber. To achieve high standards, incentive payments to assembly line teams are based not just on quantity of production, but also on quality, safety and tidiness.

How much does it cost and how do users pay?

US$1 = 95 KSh (April 2015)

High specification materials and manufacture obviously carry a price tag: the current model of the jikokoa retails at KSh 3,800 (US$40) compared to around KSh 1,000 (US$11) for a similar-sized KCJ. Despite the substantial savings that the jikokoa brings (payback around 11 weeks, see later), the initial cost puts it out of reach for many low income households without credit.

BURN is therefore actively growing a network of partners who can provide credit. These now represent over one third of sales. As well as traditional micro-finance organisations, finance partners include Equity Bank, one of the largest banks in East Africa, which is rolling out an innovative six-month loan programme for energy products including the jikokoa. Another recent partnership that is proving successful is with M-Kopa. The jikokoa is also sold through conventional channels including all four large supermarket chains in Kenya, a wide range of smaller shops, social programmes and some large employers.

Achievements

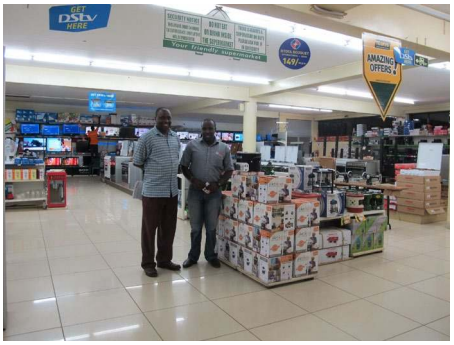
The jikokoa was launched commercially in 2013 and by the end of April 2015 over 62,000 had been sold. Most sales are in Kenya, but several thousand have been sold elsewhere in the East African region to gauge the market, with expansion planned to Tanzania and Uganda during 2015. The low rate of products returned (see box 'Warranty and lifetime') suggest that most are still in use, bringing benefits to over 340,000 people.

Employment: opening opportunities for women

BURN currently employs 87 people in Kenya and aims to be an exemplary employer. All employees are salaried, and thus get paid annual leave, sick leave and maternity pay. Women account for 53% of the workforce and are in all types of job and at all levels, representing 46% of those employed in production, and 65% of those in administration, sales and management.

This gender equality has been achieved through fair and consistent employment practice, rather than quotas or positive discrimination. BURN makes very clear that appointment is based on merit and that all positions are open to women. Through this it has recruited both women and men to all types of job. Once in post, bonuses and promotion are given solely on the basis of performance. BURN's experience is that women work well and they have therefore risen through the company. Retention of female workers is high: none have left and only one has been dismissed.

"I can sleep soundly doing this job, I know I'm selling a good product."
Raphael Waweru, BURN senior sales representative



Display of jikokoa stoves in the hardware section of Tusky's supermarket, Thika

Warranty and lifetime
The jikokoa is sold with a one year warranty, and is expected to last for at least 18 months in normal use. The components that wear out first can be replaced. To date BURN has received less than 0.2% warranty returns. Purchasers can register their warranty through the mobile-phone based EchoMobile platform, which BURN also uses for surveys and market research.

Production line leader Jane Wanyonyi completing the final assembly of a stove

Benefits to women from using the jikokoa

Most of the benefits of the jikokoa have an impact on women in particular, as they are usually responsible for cooking and purchasing fuel in Kenyan homes.
Compared to the KCJ (which most households previously used) the jikokoa lights more easily, and can cook faster because the charcoal burns at a high temperature. In addition, the cooking rate can be controlled using the ash tray. It also looks good and is easy to carry around – so elderly women don't mind using the jikokoa in the living room, where they can cook in more comfort.

Independent testing by the Berkeley Air Monitoring Group found that the jikokoa used 45% less charcoal than the KCJ, and BURN's in-house user surveys find even higher savings. These translate into significant financial saving for a household, typically US$0.5 per day or nearly US$200 per year. Thus the US$40 sale price of the jikokoa can be recovered within just 11 weeks through savings on charcoal.

Equally important is the reduction in health-damaging pollution. Measurements by Berkeley Air showed that the jikokoa produces over 60% less carbon monoxide and particulate matter than the KCJ. (See box 'IWA metrics').

Environmental benefits

Cutting charcoal use helps reduce deforestation in Kenya (see box 'Charcoal and deforestation'). The 62,000 jikokoa stoves currently in use are saving around 160,000 tonnes of wood each year.

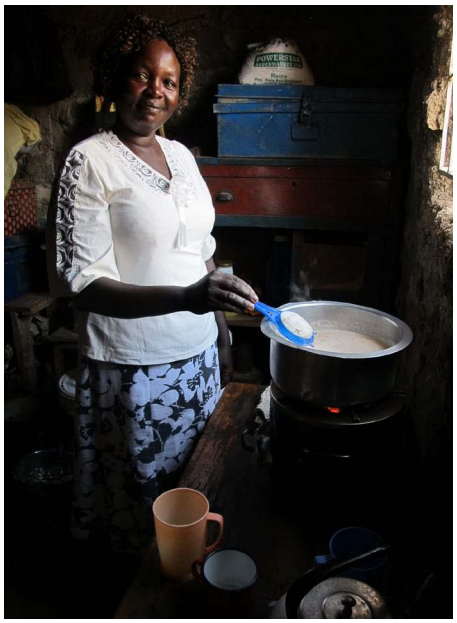
Jikokoas also cut greenhouse gas emissions. These include CO_2 from unsustainable wood use, and other greenhouse gases released during charcoal production. Berkeley Air found that the jikokoa saved equivalent of 2.8 tonnes/year CO_2 compared the KCJ, thus a significant 170,000 tonnes/year CO_2e are saved in total.

The future

BURN Manufacturing aims to scale-up sales rapidly in Kenya, in particular through the different microfinance routes which are making jikokoas affordable to increasingly low-income households. Pilot sales in Tanzania have gone well, and mark the start of expansion throughout East Africa starting in 2015. New jikokoa models are under development, with a larger version for restaurants likely to launch later in 2015. The Nairobi factory has space for expansion of production to meet this growing demand. It is also expanding its research and prototyping capacity, to localise and speed up the development of new stoves.

IWA metrics
The Global Alliance for Clean Cookstoves is leading efforts to provide good comparative information on the performance of stoves. An interim set of nine comparison metrics has been developed, grouped into the performance categories of efficiency, overall (air-pollution) emissions, indoor (air-pollution) emissions and safety. Stoves are tested using agreed procedures, and awarded a 0 (worst) to 4 (best) rank for each metric. The current model of the jikokoa achieved a rank of 3 or 4 in seven out of the nine metrics. The only metrics where the jikokoa did not perform well relate to emission of carbon monoxide. Carbon monoxide emission is a challenge for all charcoal stove manufacturers.

The ash tray can be used to control the heat from a jikokoa



"What I like most is the money that I save on charcoal. But it's not just the money: the jikokoa lights really quickly and cooks quickly too."
Mary, Ruiri Town, pictured above