INNOVATIONS IN DEVELOPMENT

8

FLY ASH BRICKS REDUCE EMISSIONS

The FaL-G Brick Technology and Carbon Finance Project

MINISTRY OF FINANCE
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Summary

Environmental and Social Benefits of Fly Ash Bricks

Two Indians have invented a climate-friendly technology that produces bricks without using any coal whatsoever. The new fly ash brick technology has the potential to completely eliminate carbon emissions from India's large brick-making industry which burns huge amounts of coal and emits millions of tons of carbon dioxide each year.

Another significant benefit of the new technology is that unlike clay bricks that use valuable top soil as raw material, the new method uses fly ash, an unwanted residue from coal-fired power plants. This fly ash is presently dumped on acres of land, damaging both the environment and the health of populations around power plants. The use of fly ash is particularly important as, with India's plans to use coal to expand power production, the generation of fly ash is set to increase while the availability of top soil is bound to decrease.

A further advantage is that fly ash bricks can be produced in a variety of strengths and sizes. This means that apart from their conventional use in building walls etc. fly ash bricks can also be used for the construction of a variety of infrastructure projects such as roads and pavements, dams and bridges.

Given the numerous benefits of the new fly ash brick technology, the inventors are providing the technology without invoking the patent. The Government of India has also issued a number of notifications encouraging its use. In addition, a World Bank Project is helping to promote the new method by enabling entrepreneurs to earn carbon credit revenues to offset some of their initial costs.

Over 16,000 FaL-G brick plants are now in operation throughout the country, up from just 100 in 2000. Fly ash bricks account for about one sixth of India's annual brick production, putting over 20 million tons of fly ash to productive use each year.

So far, the World Bank project has enabled 108 fly ash brick plants to earn about $3.2 million, or approx Rs. 14.5 crores, in carbon credit revenues. About 12 percent of these revenues have been allocated for improving the working conditions of fly ash brick plant laborers.

However, pro-active government policies are needed to further spread this environment-friendly technology.

Last year, 200 billion bricks were produced in India. Almost all of them were fired in kilns that burnt huge amounts of coal and emitted 76 million tons of carbon dioxide. In 1990, two Indian inventors developed a new climate-friendly technology that produces bricks without using any coal whatsoever. The technology has the potential to eliminate carbon emissions altogether from India's brick-making industry, which consumes as much as 40 million tons of coal a year.

The new method, known as FaL-G or Fly ash-Lime-Gypsum, also saves huge quantities of valuable top-soil that is traditionally used in clay brick production. It replaces soil with fly ash, an unwanted residue from coal-fired power plants that currently occupies over 125,000 acres of land. Putting fly ash to productive use thus not only reduces water, air, and soil pollution, but also improves the health of populations living near these plants, who often complain of respiratory problems.

Almost all the bricks produced in India are fired in kilns that burn huge amounts of coal and emit millions of tons of carbon dioxide

Moreover, unlike traditional clay bricks whose quality is deteriorating day-by-day due to the depletion of good quality soil, FaL-G bricks are strong. They can also be produced in a variety of strengths and sizes to suit a number of infrastructure projects ranging from roads and pavements, to dams and bridges. Large size fly ash bricks and blocks also help save mortar and speed up the construction process.

Another important aspect is that traditional coal-fired brick kilns do not provide a stable source of income for workers. The kilns close down during the monsoon, forcing the workers to move away to look for other work. This leaves their children unable to attend school; in fact, many children end up working alongside their parents in these kilns in contravention of laws prohibiting child labor. By contrast, FaL-G brick plants operate throughout the year, providing year-round employment.

Encouraging fly ash brick technology

Given the numerous environmental and social benefits of using fly ash, the Government of India has mandated thermal power plants to provide fly ash free of cost to brick manufacturers and stipulated time-bound targets to achieve high levels of ash utilization.

However, the wider adoption of FaL-G brick technology is proving to be a challenge. Clay brick production remains a popular family business in India, with no incentives to innovate or modernize. Moreover, manufacturers still have to bear the cost of transporting fly ash to their production sites. In

contrast, top soil for making clay bricks is easily available around production sites.

To encourage the widespread adoption of this environment-friendly technology, the inventors of FaL-G are providing their technology without invoking the patent. (They filed a patent for FaL-G brick technology in 1996.) They also provide microenterprises that opt for this technology with technical assistance on production techniques, skills training for workers, and advice on the marketing of bricks.

Tapping carbon credits

From 2006, the World Bank's FaL-G Brick Technology and Carbon Finance Project has been helping fly ash brick enterprises to earn carbon credit revenues. These revenues provide microenterprises with an additional incentive and enable them to offset some of their initial costs. This is because fly ash brick making, although a viable industry in urban areas, is often unable to compete with the low cost of clay bricks in the rural areas. In such instances, fly ash brick manufacturers often dilute the quality of their bricks by compromising on inputs to compete with the clay brick market. Carbon credits help to overcome this problem in addition to supporting manufactures with their marketing expenses.

Improved working conditions

So far, the project has enabled 108 FaL-G brick plants to earn about $3.2 million, or approx Rs. 14.5 crores, in carbon credit revenues. About 12 percent of these revenues have been allocated for improving the lives and working conditions of FaL-G brick plant laborers. Workers are covered by health and accident insurance and provided with protective gear for use at the workplace. In addition, HIV awareness programs are conducted. Toilets, showers, and drinking water facilities - all of which are rarely found in rural India - have also been installed at FaL-G production sites.

Unlike clay bricks that use thermal energy, the new FaL-G technology achieves strength through hydraulic bond under tropical temperatures

Women workers spray water to cure FaL-G blocks, Vijayawada, Andhra Pradesh

Impact

The inventors' decision not to invoke the patent to facilitate the diffusion of FaL-G technology has paid off:

- Over 16,000 FaL-G brick plants are now in operation throughout the country, up from just 100 enterprises in 2000.
- Fly ash bricks account for about one sixth of India's annual brick production.
- Fly ash brick plants use over 20 million tons of fly ash which would otherwise have been dumped into hazardous ash mounds and ponds.
- The timely flow of carbon revenues through the World Bank project has helped in increasing the participation of microenterprises.
- FaL-G technology is providing workers a stable year-round income nearer their homes and allowing their children to attend regular school, giving them reason not to migrate to a city.
- Until March 31, 2012, Rs. 1.6 crores had been spent for the benefit of workers' communities.
- Interestingly, a sizeable number of women entrepreneurs are setting up FaL-G brick manufacturing plants.

Spreading the Innovation

Today, the manufacture of clay bricks is becoming increasingly unviable given the spiraling costs of the clay (land) and fuel. On the other hand, ample opportunities exist for the growth of Fal-G brick technology for fly ash output is bound to spiral as a result of India's planned increase in coal-fired power plants.

Carbon credit revenues can also be expected to continue to facilitate the deployment of FaL-G technology even after the end of the Kyoto Protocol's first commitment period (2008-2012), because many potential carbon credit buyers value the social, environmental and developmental impacts generated by such projects.

Women workers stacking FaL-G bricks

Pavement constructed with FaL-G bricks in Parawada, Visakhapatnam District, Andhra Pradesh

Need for Proactive Government Policies

However, pro-active government policies are needed to help spread this new technology in order to reap its considerable environmental and social benefits. This is because unlike the informal sector clay brick industry, Fal-G bricks incur all the fiscal burdens of the organized sector such as sales tax, excise duty, service tax etc., making it difficult for fly ash brick entrepreneurs to compete with their informal sector counterparts.

Books being distributed among FaL-G brick workers' children in Narsapur, Andhra Pradesh

HIV/AIDS awareness program being conducted among FaL-G brick plant workers in Tamil Nadu

Mosquito nets being distributed to fly ash brick workers as part of an employee benefits program at Bhimadole in Andhra Pradesh

Brick factory workers' children attend regular school at Vijayawada in Andhra Pradesh

THE FAL-G BRICK TECHNOLOGY AND CARBON FINANCE PROJECT

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