

Promoting energy efficient technologies in small scale industries in India

SWISS AGENCY FOR DEVELOPMENT AND COOPERATION - SOUTH ASIA DIVISION

SDC has been promoting clean and energy efficient technologies for India's small industry sector for more than 15 years. This has resulted in substantial CO2 reductions, improvements of health and security conditions and emerging markets for new technologies and energy services. A network of Indian, international and Swiss partners continue to spread the benefits of energy efficient technologies in India, South Asia and some African countries.

The energy challenge in small enterprises

India ranks among the top ten countries in the world when it comes to energy consumption. The per capita energy use, however, is still very low – seven times less than that in Switzerland. In recent years, the economy in India has been growing by an average of 8 percent per year, which inevitably entails an increase in energy consumption. India today faces the challenge of meeting these rapidly growing energy needs in a sustainable and equitable manner. With the nation facing an overall shortage of energy, adopting a strategy to promote the efficient and environment friendly use of energy for all consumers, ranging from industries to small farmers, is an important element to reduce the gap between energy demand and supply.



Getting more out of wood: Biomass gasifier for silk reeling

Within the industrial sector, the micro, small and medium enterprises face particular difficulties in meeting their increasing energy requirements. Nearly 13 million such enterprises, spread all over India, produce over 40% of the country's manufacturing output and employ an estimated 40 million people. For the most part, micro and small enterprises are unorganized and lack sufficient resources to develop and use clean and energy efficient technologies. With little access to new or improved technologies, they continue to use low efficiency technologies resulting in wastage of fuels and poor working conditions. Furthermore micro, small and medium enterprises mostly burn coal and biomass, which leads to high emissions of greenhouse gases and other pollutants.

To improve the poor working conditions and the health of the labour forces, reducing air pollution at working sites is key.

The SDC response: Energy efficient and clean technologies

Since 1992 the Swiss Agency for Development and Cooperation (SDC) has been working continuously with Indian and Swiss partners to promote energy efficiency in micro and small enterprises.

The approach followed has been to develop and replicate energy efficient and environment friendly technologies in cooperation with Indian industry associations and entrepreneurs.

At the same time, the know-how to deal with these new technologies has been strengthened locally and additional funds have been mobilised from sources other than SDC. The successful demonstration of economical and environmental benefits has enabled more than 600 replications of technologies in selected areas across India.

SDC has also supported initiatives to improve the working and living conditions of workers and their families. In addition, SDC has striven to establish knowledge platforms to share know-how of efficient energy use and to collaborate with interested parties from the private sector, governments, non-governmental organizations and donors to promote energy efficient solutions at national and international levels.

In 2007, the Bureau of Energy Efficiency of the Government of India launched the Energy Efficiency in Small and Medium Enterprises (BEE SME) programme with TERI, the Energy and Resources Institute in India as its knowledge partner thus acknowledging the approach followed by SDC. SDC and BEE as well as TERI now work towards the common goal of promoting energy efficiency and energy conservation measures in the micro, small and medium enterprise sector all over India.

A "joint venture" of Indian and Swiss partners

SDC's main role in the energy efficiency programme for small industries has been that of a promoter. Its networking and cooperation over long periods of time with competent and committed partners in India, Switzerland and other countries has been key to achieving results. Neither SDC nor the partners presented below had prior experience of working in the small-scale industry sector focusing on energy efficiency. Hence, this has been a joint learning curve for all institutions involved.

The following partners played a key role:

The Energy and Resources Institute (**TERI**) is an India based institute working towards global sustainable development with emphasis on local solutions. TERI played a pivotal role in the programme right from the stage of identifying the energy intensive sectors of intervention, to demonstrating and disseminating energy efficient technological solutions in different small-scale industry sectors. TERI established credibility for the interventions in select industry clusters where no agency had been able to provide technical support before.

Development Alternatives (**DA**) is an Indian group of development organisations committed to the creation of sustainable livelihoods on a large scale. DA championed and anchored the adoption of the energy efficient brick kiln technology and energy efficient housing material technologies in India and other countries of the South.



Energy efficient brick technology: Vertical shaft brick kiln

DA demonstrated the necessary collaborative spirit while bringing in and adapting the vertical shaft brick kiln from China, anchoring the technology in a network of partner organisations in India, other South Asian countries and South Africa.

Sorane SA, a Switzerland based consulting company played the role of a technology advisor. It provided strategic inputs and advise on energy management and system integration and the identification and coordination of various international experts in India and in other countries.

SKAT, a Swiss resource centre and consulting company for development and humanitarian aid partnered with Indian organisations and Chinese and international experts to transfer the vertical shaft brick kiln technology to India. It provided strategic advise and management support to ensure the successful adaptation of the technology in India.

The interventions of SDC and its partners in the past 15 years focused on small enterprises in energy intensive industries: glass, foundry, bricks and several sectors using biomass for heating. With new technologies and accompanying measures, energy efficiency was to be increased, the use of clean energy spread, conditions of the workforce improved and the competitiveness of small industries enhanced.



Improved workplace conditions at a bangle factory

The table below provides an overview of the sectors, technology spreads between conventional and new technologies, potential energy savings and geographic areas (Indian States) in which the programme has been operational.

Sectors	Conventional technology	Improved/new technology	Energy saving potential	Cluster locations
Foundry	Coke fired cupola to melt iron wet cap, dry cyclone	Divided blast cupola(DBC), Venturi Scrubber	25-65%	West Bengal, Gujarat, Tamil Nadu
Glass	Coal/natural gas – fired glass melting pot furnace	Natural gas-fired glass melting pot furnace with heat recovery device	25-50%	Uttar Pradesh
	Coal-fired muffle furnace	Natural gas-fired muffle furnace	10-15%	Uttar Pradesh
Food processing, institutional cooking, rubber drying, silk reeling, textile dyeing, chemical and steel industry, non-ferrous industrial heating	Direct burning of biomass and other fossil fuels	Biomass gasifier based burning	35-60%	Karnataka, Rajasthan, Kerala
Brick	Biomass/coal fired clamps, coal fired Bull's trench kilns to burn bricks	Vertical shaft brick kilns	20-40%	Madhya Pradesh, Uttar Pradesh, Orissa,
		Promoting best operating practices	10-15%	Karnataka, Tamil Nadu

Today, the ever-growing demand for energy, the increasing costs of energy based on fossil fuels, and the issues arising from climate change have led India and other developing countries and emerging economies to actively promote energy efficiency. SDC's work in this area has gained recognition in India and abroad.

Steps for lasting results and for disseminating new energy solutions

Generating trust, pooling expertise and talent

The clean and energy efficient technologies developed under the programme of SDC have brought about two changes in local communities. The first is a better operational profitability for entrepreneurs through fuel savings, and the second the drastically improved conditions for the workers through pollution reduction in their work environment. Both these results have been instrumental to create the trust needed for the technologies' dissemination and sustainability.

While developing the technologies, a participatory approach was followed. This was to respond adequately to the realities in the small industries sector, and to ensure the sustainability of the intervention. Careful studies have been undertaken to understand the dynamics of different industrial clusters, and to identify entrepreneurs who could take forward the use of new technologies and energy efficient practices.

Local unit owners and workers, industry associations and non-government organisations have been closely and actively involved in the development processes.

A team of experts from India and abroad pooled their competencies to develop the technologies and undertake these interventions. Over the years, a dynamic network of specialists has come into being; a synergistic pool of expertise that can be tapped when the need arises.

Demonstrating economic viability and developing a host of complementing capabilities, services and instruments

A significant achievement of the programme has been to raise awareness among the small-scale entrepreneurial community that to invest in clean, energy efficient technology makes sound economic sense. Even though the capital costs may be higher than that of a traditional technology, the awareness has spurred, and continues to sustain replications.

The project-trained technicians in the industry clusters support the ongoing adoption of energy efficient technologies. Thus, while developing and promoting biomass gasifiers for various thermal applications, the gasifier system designs have been standardized, companies have been identified and licensed to manufacture the systems, and a network of more than 800 local masons, technical consultants, steel fabricators and other manpower categories has been established to provide ongoing monitoring, advisory, as well as maintenance and repair services. Similarly, local and

Central Pollution Control Boards and the Ministry of Environment and Forests have come along and developed emission norms for the brick sector. And Development Alternatives established the first Community Development Carbon Fund project to promote efficient brick technology.

Encouraging replication, adaptation and innovation

The demonstrated success and economic gain through reduction of fuel consumption has encouraged others to adopt new technologies.

In Firozabad, inspired by the concept of heat recovery used in the project, the entrepreneurs developed simple heat recovery devices, which are now used in 60 different furnaces in glass factories.



Cleaning the indoor air helps to focus on melting the glass

Creating an enabling environment

Energy efficient technologies by themselves cannot bring about transformation in the resources-scarce, tradition-bound small scale industry sectors. To adopt them on a wide scale, an enabling environment, including complementing services and instruments are required. Recognizing this, SDC and its partners have been engaged with various state institutions to establish supportive frameworks and policies related to development, technology acquisition, access to clean fuels, fuel pricing, financial mechanisms for acquiring new and improved technology, pollution control norms, as well as to the development of markets for energy efficient technologies, products and services. Among the institutions the programme has engaged with are the Ministry of Micro, Small and Medium Enterprises, the Petroleum Conservation Research Association (PCRA), and the Small Industries Development Bank of India (SIDBI).

TERI was instrumental in raising the issue of small enterprises during the preparation of India's National Action Plan on Climate Change (NAPCC). Development Alternatives and TERI worked closely with Afghanistan, Bangladesh, Vietnam and South Africa in promoting energy efficient technologies in foundries and brick kilns.

Social action

Apart from the improvement of working conditions through new technologies, a few specific social action initiatives have been undertaken jointly with non government organisations. Objectives have been the improvement of the socio-economic conditions of labourers in the foundry industry in Bengal, in glass industry clusters in Firozabad in Uttar Pradesh and among the brick firemen community in Eastern Uttar Pradesh.



Reducing drudgery: Moulding machine for making bricks

The focus has been on improving the skills of workers, on encouraging solidarity and cooperative ventures and on promoting self-help groups to mobilize finances for the benefit of the community. Workers have been organised to advocate for better working and living conditions as well as to provide services and support to their communities. These efforts are slowly bearing fruit and help workers and their families to enhance their self-reliance as well as to improve their health and social situation.

Disseminating know-how to other developing countries

To ensure that the improved technologies yield maximum benefits, entrepreneurs, technology operators, and workers receive training in best operating practices.

The energy efficient technologies developed by the programme have also been promoted successfully in other developing countries: improved foundries in Bangladesh, brick kilns in Nepal and biomass gasifiers for various thermal applications in Myanmar, Sri Lanka and a number of African countries. In a sense, India has played the role of an “incubator” for these energy efficient technologies, which have matured and are now moving beyond India's shores.

Overall achievements in short:

- § The cumulative CO₂ reduction until 2008 was 340, 000 tonnes, which is equivalent to the total carbon sequestered annually from around 70, 000 acres of pine or fir forests.
- § There is now an increased awareness on issues related to social security and health among small and micro enterprises.
- § In the targeted sector of glass melting for bangle production, the new technology for glass melting is being used in more than 60% of the 100 furnaces in the cluster.
 - There is now a market demand (from 32 entrepreneurs in the first year of a specifically set-up new company) for vertical shaft brick kilns and the project designed Divided Blast Cupola (about 50 demands/year).
 - There is also a demand for services of TERI and DA from other countries (Bangladesh, Sri Lanka, South Africa etc.) for technology transfer and design of new initiatives.

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Sources for additional Information

www.cosmile.org
www.vsbkindia.org

Photos

The Energy and Resources Institute (TERI)
The Development Alternatives Group (DA)

Copies can be downloaded from www.sdc.admin.ch
or www.sdcindia.in