CLUSTER PROFILE

BHUBANESHWAR BRASS CLUSTER

Background

A traditional small-scale brass industry cluster is located near the ancient city of Bhubaneshwar, in Orissa. The brass units are spread across four villages, of which Bainchua is around 8 km from the old city while Balakati, Pratap Sasan and Rathijema are adjacent to one another and located about 22 km away. The units are very small and community-based, with manufacturing activities conducted by the artisans in the backyards of dwellings.

There are around 120 operational units in the cluster, with annual production levels ranging between 2–8 tonnes per unit. The main products comprise traditional brassware like *thali* (plates and trays), *lota* and *ghara* (pots), *bela* and *kansa* (cups), *diya* (lamps), *ghanti* (bells), etc. About half the units (65) make only *thalis*, while the others make a range of products. The units operate seasonally (typically, for 5–6 months a year), depending on the market demand and the availability of sufficient quantities of raw materials. The working of the brass units is influenced greatly by a group of middlemen, known as 'Mahajans', who control the supply and prices of raw materials as well as the prices and sale of finished products. This situation squeezes the profit margins of units, and leaves them with few options to improve profitability other than to reduce running costs. However, even in this they are constrained by the lack of financial resources and technical know-how.

A few brass products

Technology status and energy use

All the units follow traditional manufacturing processes that are largely manual, and that have been handed down over generations with little or no change. The main raw materials are copper, zinc, and brass scrap. These materials are mixed in the required proportion, placed in a crucible and melted in a melting furnace (*chulla*) at about 950° C. The molten metal is poured into moulds, called *acchu*, for casting into ingots/biscuits, or into the shapes of products like *lota, ghara* or *diya*. The cooled castings are reheated in a reheating furnace to about 800° C, and then beaten, scraped and polished to yield the finished products.

The melting process takes about 5–6 hours, and is carried out in batches, with two to four batches melted in a week. The melting furnace is a pit in the ground, about 40–70 cm wide and 15–60 cm deep. The reheating furnace is usually a built-up open furnace. The melting and reheating furnaces use charcoal and hard coke as fuels, and are invariably made by the artisans themselves, using traditional methods. The artisans use locally made tools like hammers of different sizes, pincers, stone and iron anvils, etc.

Energy use

The annual energy consumed by the Bhubaneshwar cluster is about 420 tonnes of oil equivalent (toe), almost entirely in the form of thermal energy in the melting and reheating furnaces (table 1). These furnaces are very low in energy efficiency (typically, below 5%). Electricity is primarily used for lighting, and in a few units, to operate polishing tools.

Table 1. Annual energy consumption in Bhubaneshwar brass cluster

Energy source	*Annual consumption*	*Annual energy consumption (toe)*
Electricity	15670 kWh	1.4
Hard coke	310 tonnes	170.3
Charcoal	359 tonnes	247.5
	Total	419.2

* toe—tonnes of oil equivalent

Melting furnance

Detailed energy audits were conducted on 29 units, from which the specific energy consumption (SEC) was found to vary between 0. 46 toe/t and 2.08 toe/t, depending on the kind of product(s) being manufactured. The average SEC was 1.36 toe/t. About 14 of the units studied (50%) showed SEC values above this average value, indicating considerable potential for energy savings (figure 1).

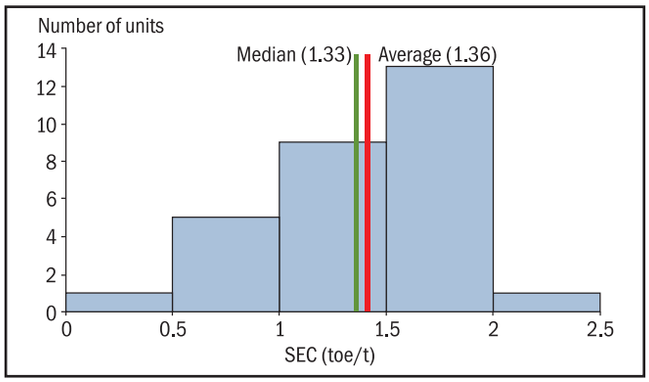

Figure 1. Distribution of SEC among the 29 brass units studied

The total energy saving potential in the Bhubaneshwar brass cluster is estimated at 241 toe, about 57% of the total annual energy consumed.

Options for energy saving

While identifying and implementing energy conservation measures (ECMs) for the Bhubaneshwar brass units, the following major challenges have to be taken into account:

- the tiny size of the units (in terms of capacity and turnover)
- their discontinuous (seasonal) operations
- their dependence on Mahajans for buying raw materials as well as selling their products, which restricts profits and leaves little or no surplus funds for investing in technology improvement

Considering these factors, investments in ECMs could become technically feasible and economically viable if three or four units collectively implemented each project. Some of the possible ECMs that could be considered for adoption by the units are listed in table 2.

Table 2. Energy conservation measures for units in Bhubaneshwar brass cluster

No.	*ECM*	*Replication potential (units)*
1	Redesign melting furnace with WHR system	19
2	Redesign melting furnace with rice husk gasification system	21
3	Redesign reheating furnace with WHR system	17
4	Redesign reheating furnace with rice husk gasification system	19
5	Energy efficient lighting	40

Compiled by TERI from (i) 'Manual on energy conservation measures in brass cluster, Bhubaneshwar' under the BEE-SME Program, 2011; (ii) 'Benchmarking and mapping Indian MSMEs energy consumption': a BEE–AfD–TERI study, 2012