Energy Saving through Clean Production

Industrial sector has been the largest energy consumer across world. In India, with growth in the industrial sector, energy consumption by the sector has also been increased. The following table shows the energy consumption by the industrial sector in the last 10 years.

Energy Consumption in India, by Sector (in MTOE)[1]

Sector	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2007-08
Agriculture	1.6	2.4	4.9	8.4	15.2	15.1	18.4
Industry	36.9	49.2	62.9	77.5	77.4	96.2	129.6
Transport	17.4	21.7	28.0	37.2	33.5	36.5	41.6
Residence and commercial	5.6	8.9	12.6	15.3	24.1	32.6	36.8
Other	1.9	2.7	3.9	6.8	13.4	18.7	22.8

As it is evident from the above table that energy consumption by the industrial sector has increased by 251.2 percent in the last 10 years. While SMEs are tagged as growth engine of India which contributes 40 percent of industrial outputs and constitutes 90 percent of the total industrial units. Therefore, while talking for energy saving in industrial sector, small and medium enterprises (SMEs) are major stakeholders, whose issues must be addressed.

A survey conducted by VIKSAT in Gujarat has shown that SMEs are not much open for energy efficiency. The major challenges faced by the SMEs are found to be:

- lack of appropriate technology
- high replacement cost
- affordability
- doubt about cost-benefit ratio against investment

Despite such challenges some SMEs has been able to overcome these by taking a different approach and thinking out of box. 'Mehta Alloy' is one such who has taken the path of Clean Production and saved substantial amount of energy consumption along with environmental contribution while cutting its cost.

About Mehta Alloy: Mehta Alloy is a SME located in Naroda Industrial Estate, Ahmedabad. The company produces stainless steel sheets of 14 to 28 gauges. The installed capacity of the firm is 400 metric tonne. Annealing, pickling, rolling and degreasing are major steps of the process. The number of these steps in rolling depends on the required final gauge of the SS sheets.

[1] Source: TERI Energy Data Directory and Yearbook 2010

About Clean Production: Clean production is a concept which means robust management of resources in an industry to maximise outputs and minimise wastes at minimum use of resources. The concept is about customised solution for each company to minimise waste and emission and maximise production; energy saving is a crucial part of the process since energy consumes a huge portion of production cost.

Mehta Alloy's Initiative

The whole industrial process of producing stainless steel sheets is completed in about 15 steps. Annealing, pickling and rolling are major steps of the process. Electrical consumption is about 50, 000 kWh/month. The firm has two annealing furnaces of different dimensions and insulation. About 600 kg of fuel is used per day in each of the furnaces.

This was a difficult choice for Alloy Mehta as how to plan efficiency enhancement through such a lengthy process with best feasible technology and affordable costs. The Centre for Environment Education (CEE) – working on the emission reduction activities – studied the production process and suggested the company for a few actions which are as follows:

1. Annealing Furnaces

It is observed through the present project that the potential for primary energy saving is in the furnace area which consumes about 85 percent of total energy. The plant is having two annealing furnaces, which are operated for 24 hours depending on the load details. It was observed that:

- the length of the furnace no. 1 (26 feet) is 10 feet lesser than furnace no. 2 (36 feet)
- furnace No. 1 (small) which is insulated with ceramic fibre at top and gets hot rapidly (800°C in 3 hours) than furnace no. 2 (big). Furnace no. 2 takes 6 hours for 800°C temp
- maintenance in rolls of furnace no. 1 is also higher than furnace no. 2, due to high temperature because of the ceramic fibre insulation; further the ceramic fibre gets burnt in every ½-1 year.

Suggestions

- The length of heating chamber in furnace no 1 should be increased by 10 feet to improve annealing quality and the insulation should be of ceramic.
- Install a burner with separate entry for atomisation and combustion air, so that the combustion air can be pre-heated to about 200°C by using recuperator. This will require only Rs 40000 additional investment and payback period is five months
- Installation of an additional recuperator for an investment of Rs 1 lakh for a payback period of seven months
- Application of energy efficient coating on inside surface of furnaces by investment of Rs 1 lakh with payback period of one year.

2. Electrical Equipment's

The plant is having many motors for air compressor, furnace blowers etc. running under 40 percent load with variation in voltage level.

Suggestions

It was suggested to run all under-loaded motors in star connection instead of Delta running. Since the starting torque is high it is useful to install automatic star delta energy saver. By using star delta energy saver 2-3 percent energy can be saved with improving the efficiency and power factors for these motors. The effective replacement cost would be Rs 2.5 lakh for a payback period of one year.

3. Improvement in Quality of Sheets

The firm was not achieving the best quality of the product, desired by the market. Some pinches of dust were left on the sheets. By analysing the furnace and pickling sections of the firm, it was found that emission of carbon dust from the furnace section was very high and the dust was deposited on sheets after annealing and in the pickling section. These sheets with carbon dust were probably interfering during rolling also, due to which the desired quality was not obtained.

Suggestion

Proper cleaning of all sheets before rolling. The quality of sheets improved thereafter.

4. Metal loss

Metal losses occur mainly in the annealing and pickling processes in the form of oxides of metals.

Suggestions

It was found that maximum reduction of 0.5 percent could be achieved by improving process practices and MIS development.

After adopting the suggestions company has saved energy as stated in the table below. And all these savings, improved productivity and quality have been achieved within a payback period of one year.

Type of energy	**Consumption /annum**	**Emission Ton/annum**		**Resultant saving /annum**	**Resultant emission reduction ton/annum**	
		CO_2	SO_x		CO_2	SO_x
Fuel consumption at user end	296 tonne	887	14	53 tonne	241	3.9
Electricity at generating point	6,00,000 kWh	534	-	18,000 kWh	16	-
Total		**1421**			**257**	

The table shows that the initiative taken by Mehta Alloy has not only saved substantial volume of energy but also reduced GHG to a large extent.

Key Learning Points

- Cost and technology is not always the barrier of energy saving. It can be overcome by proper integration and planning.
- Energy saving is not a isolated activity but a integrated part of the whole production process of an industry
- Energy efficiency for SME must be seen as an customised solution, not in a generic view

Way Forward/Replication Issues

- There is need for service provider in total efficiency enhancement (along with energy saving) as customised solution
- Appropriate technology integration can be taken as the approach for energy efficiency in SME sector
- Demystification of the perception that energy efficiency is an expensive, technology driven process and cannot substantially contribute towards net profit of the company; while to establish the fact that it is possible without heavy investment, not a technology but process driven and can contribute substantially to net profit of the company

Note: All facts and figures related to Mehta Alloy used in this case study has been provided by Industrial Initiative Unit of CEE, Ahmedabad