Sector Highlights

Cement is one of the basic construction materials. According to CMAN (Cement Manufactures Association of Nepal) there are 45 cement plants active in Nepal, with a total installed capacity of 6 million tons per annum (CMAN 2013/14). Of the total 45 units, 12 produce clinker meeting almost 60% of the domestic demand. The annual requirement of 4 million tons is met from domestic sources contributing 80%. The capacity utilization of cement units is of around 50%.

Load shedding is one of the major problems with costlier diesel generation leading to an additional manufacturing cost. With foreign direct investment (FDI) and capacity addition envisaged, the Nepalese cement sector is going through a transitional phase.

Energy Use

Main sources of energy used in the Cement industries in Nepal are electricity and coal and Diesel Generator power plant. Coal is mainly used in limestone-based units for calcinations, whereas in some cases, in plants having co-generation system used for electricity generation.

Energy Use for Nepal Cement Industry

- **DG Power (NRs)**: 19%
- **NEA Power (NRs)**: 16%
- **Coal Cost (NRs)**: 65%

Table 1: Specific energy consumption in Nepalese Cement Sector

<table>
<thead>
<tr>
<th>Types of Cement Plant</th>
<th>Specific Energy Consumption</th>
<th>Baseline 2012</th>
<th>2015 Scenario</th>
<th>Potential Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone based</td>
<td>Electrical</td>
<td>149 kWh/t*</td>
<td>80 – 550 kWh/T*</td>
<td>65-140 kWh/T*</td>
</tr>
<tr>
<td></td>
<td>Thermal</td>
<td>1295 kCal/kg**</td>
<td>779 – 1071 kCal/kg**</td>
<td>710 – 875 kCal/kg**</td>
</tr>
<tr>
<td>Clinker based</td>
<td>Electrical</td>
<td>49 kWh/T*</td>
<td>38 kWh/T*</td>
<td>34 kWh/T*</td>
</tr>
</tbody>
</table>

* MT Cement  ** MT Clinker

Experiences from the past have identified many energy saving options for the cement sector that are highly profitable with payback periods of investment of less than 3 years.

<table>
<thead>
<tr>
<th>Option</th>
<th>Payback of investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in power consumption of Pre-heater fan due to reduction in exit temperature of PH gas</td>
<td>Immediate</td>
</tr>
<tr>
<td>Reduction in power consumption in cooler Fan-2 by avoiding pressure drop due to manual shut off damper</td>
<td>Immediate</td>
</tr>
<tr>
<td>Energy Savings by Arresting False Air in Cooler Bag House</td>
<td>Immediate</td>
</tr>
<tr>
<td>Reduction in Heat Loss due to CO Formation</td>
<td>Immediate</td>
</tr>
<tr>
<td>Efficiency Improvement of Cooler Fans</td>
<td>10 months</td>
</tr>
<tr>
<td>Efficiency Improvement of Cement Mill Vent Bag House Fan</td>
<td>1 year</td>
</tr>
<tr>
<td>Reduction in Klin Radiation and Convection Loss by installing new refractory lining in burning zone</td>
<td>10 months</td>
</tr>
<tr>
<td>Replacement of Conventional Lights by LED</td>
<td>1.5 Years</td>
</tr>
<tr>
<td>Partial Replacement of Coal with Rice Husk (5% of coal replaced by rice husk)</td>
<td>5 months</td>
</tr>
<tr>
<td>Capacity enhancement and reduction in energy consumption in Cement Mill section by having a combine circuit of roller press and ball mills</td>
<td>2.1 years</td>
</tr>
</tbody>
</table>

Table 2: Energy saving option and payback period of investment for cement sector (EEC/NEEP, 2015)

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1. GIZ/NEEP, 2012: Baseline study of selected sector industries
2. EEC/NEEP, 2015: Pre-market assessment of audited industries
### Energy Saving Tips

**General measures**
- Install capacitor bank for power factor improvement
- Use energy-efficient drives with proper sizing
- Install Variable Frequency Drives (VFD)
- Use natural lighting during day time
- Install energy-efficient lighting, e.g. CFL or LED
- Eliminate compressor leakage
- Optimize compressor pressure setting
- Optimal loading of Diesel gensets (DG) is not less than 60%
- Install waste heat recovery system in DG sets

**Raw material preparation**
- Use high efficiency drives
- Avoid idle running of drives
- Use Vertical Rolling Mill (VRM) instead of Ball mill
- Install Variable Frequency Drives (VFD)

**Fuel preparation**
- Use high efficiency mills
- Avoid idle running of crusher
- Mix biomass base fuel if possible

**Clinker Making**
- Use multichannel burners
- Install Variable Frequency Drives (VFD) for cooler fans and cooler ID fans
- Use high efficiency coolers
- Install waste recovery system and monitor flue gas

**Clinker cooling**
- Recover waste heat
- Install Variable Frequency Drives (VFD)

**Finish grinding**
- Reduce cement mill vents to decrease cement loss
- Install belt conveyor instead of pneumatic system
- Use higher efficiency mills & motors

### Case Study

Energy Audit conducted by EEC under NEEP, recorded specific energy consumption (SEC) of 250 kWh/Ton of electricity and 1,415 MCal/Ton of Coal in one of the cement units with a total capacity of 98,575 T/year. The industry was able to reduce its specific energy consumption to 240 kWh/T and 1,071 MCal/Ton of Coal respectively after implementing the recommended process optimization measures: the industry was able to make saving of NPR 193 million annually.

<table>
<thead>
<tr>
<th>During energy audit (SEC):</th>
<th>250 kWh/T and 1415 MCal /T @ Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>After implementation (SEC):</td>
<td>240 kWh/T and 1071 MCal /T @ Coal</td>
</tr>
<tr>
<td>Savings Per Ton:</td>
<td>10 kWh/T and 344 MCal /T @ Coal</td>
</tr>
<tr>
<td>Total Production:</td>
<td>98,575 T</td>
</tr>
<tr>
<td>Annual Savings:</td>
<td>985,750 kWh and 7536 T of coal @ 4500Kcal/kg</td>
</tr>
<tr>
<td>Monetary Savings:</td>
<td>Rs. 4,928,750@5/KWh and Rs. 188,400,000@25/ kg.</td>
</tr>
<tr>
<td>Total Investment Made:</td>
<td>Negligible (through Process optimization)</td>
</tr>
</tbody>
</table>

**Table 3: A success case from NEEP (EEC/NEEP, 2015)**

### Contact details

If you are interested to know more about energy efficiency, please, do not hesitate to contact us!

- **If you are a business man**
  get information about energy saving opportunities in your company and get an energy audit done by our professional expert team

- **If you are an engineer**
  explore the articles in our energy efficiency knowledge website and participate in our training programs

- **If you are a banker**
  participate in our awareness raising seminars and explore the new market of energy efficiency investment.

- **If you are an energy auditor**
  register in our database of energy efficiency professionals and be listed on our webpage.

- **If you are a supplier for energy-efficient technology**
  register in our online B2B portal and list your products and services.