Energy Conservation at cement plant

Workshop on Low Carbon Technologies
- NAMAs and JCM -
3 December 2013
Ulaanbaatar, Mongolia
1. Outline of the project

<table>
<thead>
<tr>
<th>Type of survey</th>
<th>JCM / FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project name</td>
<td>Energy Conservation at cement plant</td>
</tr>
<tr>
<td>Mongolian Counterpart</td>
<td>EREL Cement</td>
</tr>
<tr>
<td>Proposed Project site</td>
<td>Darkhan (Дархан), Mongolia</td>
</tr>
<tr>
<td>Brief description of the project</td>
<td>Conserve energy at cement manufacturing and reduce GHG emission by converting cement manufacturing process from wet to dry, mentioned in NAMA 8-C</td>
</tr>
</tbody>
</table>

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1. Outline of the project (Cont’d)

EREL Cement plant (wet process)
1. Outline of the project (Cont’d)

Existing wet process

Raw material

Limestone

Iron ore

Wet process material grinding

Slurry tank and basin

Wet process kiln (long kiln)

Clinker cooler

Cement grinding

Cement

Gypsum

Exhaust Fuel gas

Air

Clinker

Conventional Planetary cooler

Tube mill
1. Outline of the project (Cont’d)

Proposed dry process

- GHG mitigation countermeasures
- Proposed dry process
- Alternative fuel
- New type burner
- Alternative fuel
- Clinker cooler
- Blending material
- Gypsum
- High efficiency separator
- New generation grate cooler
- Raw material grinding
- Cement grinding
- Cement

- Limestone
- Iron ore
- Raw material grinding
- Pre-heater (NSP)
- Rotary kiln
- Clinker cooler
- Air
- Exhaust gas
- Fuel
- Air
- New type burner
- Fuel
- Exhaust gas
- Raw material

- Tube mill
- Low pressure type cyclones
- Cement grinding
- Tube mill
Example of dry process plant   (similar to project capacity)
1. Outline of the project (Cont’d)

Issues considered for this project

• Site condition
  • High altitude of proposed site reduces heat efficiency
  • Low calorific value coal

• Scale of proposed plant
  • Considering long-term cement demand, large scale plant is not economical.

• Equipment selection considering local condition
  • Operation and maintenance availability of Mongolia should be considered for stable operation and easy maintenance
2. Proposed project schedule

* 2014  Completion of FS, decision of implementation and confirmation of finance scheme
* 2015-2017  Construction of plant
* Approval of Methodology is expected
* 2017  Completion of plant construction, commissioning and commencement of commercial operation
* 2018 onward  Calculation of emission reduction
3. Proposed Methodology

3.1 Eligibility Criteria
3.2 Proposed Reference Scenarios
3.3 Basis for reference emission
3.4 Monitoring of project emission
3.5 Emission reduction
3.6 Contribution to sustainable development of Mongolia
### 3.1 Eligibility Criteria

<table>
<thead>
<tr>
<th>No.</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| 1   | Introducing process should improve energy efficiency of existing cement plant  
     | Capacity: 2,500t/d or more  
     | Heat consumption: 900kcal/kg-clinker or less  
     | Electricity consumption: 105Kwh/t-cement or less |
| 2   | Up to existing capacity, 35% and above unit CO2 emission reduction comparing to reference scenario (Scenario 1) should be expected at planning base |
| 3   | Above existing capacity, 8% and above unit CO2 emission reduction comparing to reference scenario (Scenario 1) should be expected at planning base |
| 4   | Proposed process should be equipped with bag-filter or ESP |
| 5   | Energy loss should be minimized by operation efficiency and stability with Japanese technology |
3.2 Calculation of reference emission (Proposed Reference Scenarios) (t.b.c.)

Scenario 1
Current wet process emission---up to rated capacity of wet process and dry process emission---exceed to wet process capacity

Scenario 2
Wet process emission with operation management at all production capacity

Scenario 3
Reference dry process emission at all production capacity
3.2 Calculation of reference emission (Proposed Reference Scenarios) (Cont’d)
### 3.3 Basis for reference emission

<table>
<thead>
<tr>
<th>Items</th>
<th>Unit heat consumption Kcal/kg-clinker</th>
<th>Unit electricity consumption kWh/t-cement</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current wet process</td>
<td>around 2000</td>
<td>around 170</td>
<td>=BaU</td>
</tr>
<tr>
<td>Managed wet process</td>
<td>1600</td>
<td>170</td>
<td>Estimated reduction</td>
</tr>
<tr>
<td>Reference dry Process</td>
<td>t.b.c.</td>
<td>t.b.c.</td>
<td>Appropriate data required</td>
</tr>
<tr>
<td>Proposed dry process</td>
<td>900</td>
<td>105</td>
<td>Estimated</td>
</tr>
</tbody>
</table>

**Note:** T.b.c. = To be confirmed

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3.3 Basis for reference emission (Cont’d)

Necessary data for reference emission

- Current wet process emission
  - Obtained from surveyed plant --- to be used as national value.
- Wet process emission with operation management
  - Derived from plant survey.

- Reference dry process emission
  - Assumed energy consumption for dry process under construction should be obtained and used.
### 3.4 Monitoring of project emission

<table>
<thead>
<tr>
<th>Item</th>
<th>method</th>
<th>Frequency</th>
<th>Proof</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission from thermal energy</td>
<td>Coal transaction record and inventory</td>
<td>Per transaction</td>
<td>RegULARLY certified by Mongolian Department of Metrology</td>
</tr>
<tr>
<td>Emission from electricity</td>
<td>Reading of transaction instrument</td>
<td>Per month</td>
<td></td>
</tr>
<tr>
<td>Cement production</td>
<td>Weighing by truck/car scale at plant</td>
<td>Per shipment</td>
<td></td>
</tr>
</tbody>
</table>
Based on scenario 1, within annual production capacity

<table>
<thead>
<tr>
<th></th>
<th>CO2 from Thermal energy t</th>
<th>CO2 from electricity t</th>
<th>Total CO2 emission t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference emission</td>
<td>89,216</td>
<td>18,330</td>
<td>107,546</td>
</tr>
<tr>
<td>Project emission</td>
<td>38,238</td>
<td>11,320</td>
<td>49,558</td>
</tr>
<tr>
<td>Estimated emission reduction</td>
<td>50,978</td>
<td>7,010</td>
<td>57,988</td>
</tr>
</tbody>
</table>
3.6 Contribution to sustainable development of Mongolia

- Cement is essential commodity for infrastructure development in Mongolia.
- Existing cement plants are of old technology, their energy consumption and environment impact may affect the sustainable development.
- Proposed system reduces energy consumption and eliminate environment impact, and mitigate GHG emission.
- Utilization of waste material such as coal ash can be considered.
- These points will contribute the sustainable development of the country.
4. Way to JCM Registration

- Acquisition/preparation of necessary data.
- Consideration of criteria
- Confirmation of reference scenario
- Precise re-calculation of emissions
- Establishment of proposed methodology
Баярлалаа !